Ultramark 4

ULTRASOUND SYSTEM

field service manual

Service Manual 4730-0001-06 Rev B consists of:

UM-4 Service Manual P/N 4720-0001-06 (9/6/94)

with the following manual changes inserted:

4725-0001-10 (9/6/94)
4725-0001-11 (4/14/95)

September, 1999

A detailed Table of Contents and List of Effective Pages begins on Page i. It includes the latest change date for each page in the manual. Original pages will not have any date in the Contents and List of Effective Pages or at the bottom of the page. A change bar (█) located in the outside margin of a page denotes the specific part of a page that was changed at that date. A pointing hand (☞) indicates the portion of a figure that has been revised.

Introduction

Introduction

This manual provides only information most often needed in the field.

Experienced personnel will be able to use accompanying performance testing, and preventive maintenance checklists.

Organization

The manual contains major tab divisions for diagrams, procedures, adjustments, fault isolation, configuration supplement, Operating Notes, Service Bulletins, reference, and parts.

ACTIVE DOCUMENT LIST: lists all active documents pertaining to the Ultramarkr 4 Ultrasound System. Listed are active service bulletins, service manuals, operation manuals and operating notes.

DIAGRAMS: includes diagrams of system/ data paths, power distribution, and cabling.

PROCEDURES: contains information on installation, performance testing, and preventive maintenance.

ADJUSTMENTS: procedures for field authorized adjustments, including adjustment parameters and location diagrams.

FAULT ISOLATION: fault isolation information in tabular format.

CONFIGURATION: hardware and software compatibility information for specific system configurations.

OPERATING NOTES: contains operating information not incorporated into the operation manual.

SERVICE BULLETINS: copies of all active service bulletins are included. "Hot Tips" may be added as they are received by the CSR.

REFERENCE: for information regarding interconnecting cables and connectors used in the Ultramarkr 4, as well as other miscellaneous information.

REPLACEABLE PARTS: illustrated parts listings of parts commonly replaced in the field.

REFERENCE: included are connector pinouts, difficult removal/install instructions and other material not suited for inclusion in other manual sections.

Manual Usage and Update Information

The Table of Contents and List of Effective Pages have been combined for this manual. There is no List of Illustrations or List of Tables. This will facilitate frequent updating of the manual and allow TSRs to easily determine the effective date of referenced information.

The contents of manual change packages should be inserted as indicated on the cover sheet attached to the package. Changed or added pages can be identified by the change date at the bottom of the effected page. No change date indicates the page is an original page. Change bars

located in the outside margin of the page denotes the specific part of a page that was changed at that date. A pointing hand indicates the portion of the figure that has been changed.

Page numbers are divided into three parts. The prefix indicates the system. The middle portion indicates the section within the major tab. The suffix indicates the actual page number.

Safety and Precautions

This section provides biological, procedural, environmental, electrical and mechanical safety information.

WARNING statements identify conditions or practices that could result in personal injury or death.

CAUTION statements identify conditions or practices that could result in equipment damage.

Biological Safety

The assessment of the biological effects of diagnostic ultrasound on humans is not complete. Diagnostic ultrasound procedures should be used only for valid reasons, for the shortest period of time, and at the lowest power settings necessary to produce diagnostically acceptable images.

Procedural Safety

WARNING: *Do not service or adjust a system unless another person capable of rendering first aid is present.*

CAUTION: *Scanheads must be connected and selected before turning a system on. Do not disconnect scanheads while systems are on. Disconnect with power on only if image has been frozen or if scanhead has been deselected.*

CAUTION: *Do not sterilize scanheads with heat, liquid, gas, or solvents. Do not autoclave or expose to temperatures exceeding 50_C (131_F). Permanent damage may result.*

WARNING: *Disconnect power source and scanheads prior to cleaning.*

WARNING: *Inspect the transducer face, housing, and cable before using the instrument. Do not use damaged transducers.*

WARNING: *Equipment grounding: This equipment is classified Class I, Type B as defined in IEC Standard 601-1 Safety of Medical Electrical Equipment. Electrical shock protection is provided by connecting the instrument chassis to safety ground using the 3-wire power cable provided. This cable must be connected to a properly grounded receptacle. Do not defeat the grounding integrity of the equipment.*

WARNING: *Shock hazards exist if the system is not properly grounded. The system must be plugged into a hospital-grade outlet.*

WARNING: *Do not replace components with power connected. Under certain conditions, dangerous voltages may exist with power removed. Disconnect power and discharge circuits before touching.*

WARNING: *Fuse replacement is to be done by qualified service personnel only. Avoid electric shock and fire hazard by using proper fuses.*

CAUTION: *Verify the system is set to proper power source voltage and the cart*

power plug mates with the power receptacle.

WARNING: *Additional hazards may be introduced by using substituted parts or modified instruments.*

WARNING: *Using accessories not recommended by ATL may cause electrical shock or other unsafe conditions.*

CAUTION: *Verify circuit boards and components are dry before applying power to the system.*

Electro-Static Precautions

CAUTION: *This equipment contains compoents which are electro-static sensitive. Proper static procedures, protection and equipment must be used prior to opening, and during handling of of this equipment. Failure to use proper ESD procedures will cause damage to these components. Such damage to components is not covered by ATL warranties. Refer to General Field Service Manual, (P/N 4720-0219-01) for details.*

Environmental Safety

WARNING: *Do not operate a system in the presence of flammable gases or anesthetics or in an oxygen enriched environment (i.e., in an explosive atmosphere). An explosion could result.*

Mechanical Safety

CAUTION: *Use caution when transporting the system over uneven surfaces, including entry to or exit from elevators.*

WARNING: *Stacking equipment, other than equipment specified by ATL, on the system.*

can cause it to become mechanically unstable.

CAUTION: *Do not use esters or ketone solutions to clean parts. Discoloration (or worse) will result.*

System Safety Symbology

Document IEC601-1, International Electrotechnical Commission: Safety of Medical Electrical Equipment, classifies patient connections according to whether the outer enclosure is grounded or floating (non-conducting). The classifications are shown below.

Grounded chassis. Protection against electrical shock is provided by connection of chassis to the safety ground (IEC601-1 Type B).

Isolated patient connection (IEC 601-1 Type BF).

Isolated patient connection (IEC 601-1 Type CF).

I and O on circuit breaker and power switch represents ON and OFF, respectively.

This symbol identifies safety note. Be sure you understand the function of this control before using it.

Drip-proof hand-held appliance (trans-ducer assembly). This instrument may be safely handled with wet hands.

Identifies protective earth ground (located next to ground stud on the rear panel).

The following are internal symbols (for reference only):

Identifies the point where the system safety ground is fastened to the chassis.

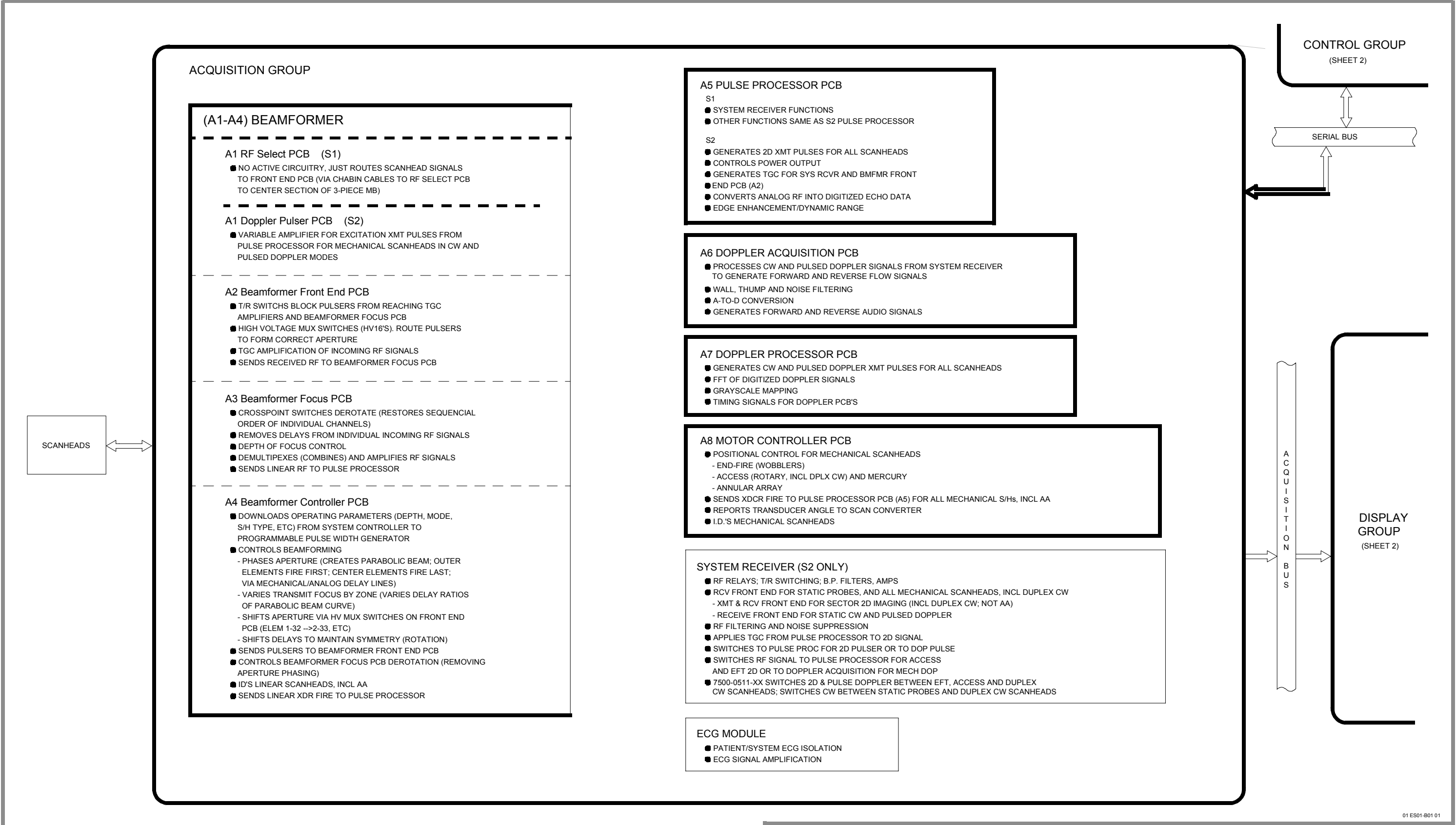Identifies high voltage components operating above 1000 Vac or 1500 Vdc.

ACQUISITION GROUP

A5 PULSE PROCESSOR PCB
S1
- SYSTEM RECEIVER FUNCTIONS
- OTHER FUNCTIONS SAME AS S2 PULSE PROCESSOR

S2
- GENERATES 2D XMT PULSES FOR ALL SCANHEADS
- CONTROLS POWER OUTPUT
- GENERATES TGC FOR SYS RCVR AND BMFMR FRONT
- END PCB (A2)
- CONVERTS ANALOG RF INTO DIGITIZED ECHO DATA
- EDGE ENHANCEMENT/DYNAMIC RANGE

A6 DOPPLER ACQUISITION PCB
- PROCESSES CW AND PULSED DOPPLER SIGNALS FROM SYSTEM RECEIVER TO GENERATE FORWARD AND REVERSE FLOW SIGNALS
- WALL, THUMP AND NOISE FILTERING
- A-TO-D CONVERSION
- GENERATES FORWARD AND REVERSE AUDIO SIGNALS

A7 DOPPLER PROCESSOR PCB
- GENERATES CW AND PULSED DOPPLER XMT PULSES FOR ALL SCANHEADS
- FFT OF DIGITIZED DOPPLER SIGNALS
- GRAYSCALE MAPPING
- TIMING SIGNALS FOR DOPPLER PCB'S

A8 MOTOR CONTROLLER PCB
- POSITIONAL CONTROL FOR MECHANICAL SCANHEADS
  - END-FIRE (WOBBLERS)
  - ACCESS (ROTARY, INCL DPLX CW) AND MERCURY
  - ANNULAR ARRAY
- SENDS XDCR FIRE TO PULSE PROCESSOR PCB (A5) FOR ALL MECHANICAL S/Hs, INCL AA
- REPORTS TRANSDUCER ANGLE TO SCAN CONVERTER
- I.D.'S MECHANICAL SCANHEADS

SYSTEM RECEIVER (S2 ONLY)
- RF RELAYS; T/R SWITCHING; B.P. FILTERS, AMPS
- RCV FRONT END FOR STATIC PROBES, AND ALL MECHANICAL SCANHEADS, INCL DUPLEX CW
  - XMT & RCV FRONT END FOR SECTOR 2D IMAGING (INCL DUPLEX CW; NOT AA)
  - RECEIVE FRONT END FOR STATIC CW AND PULSED DOPPLER
- RF FILTERING AND NOISE SUPPRESSION
- APPLIES TGC FROM PULSE PROCESSOR TO 2D SIGNAL
- SWITCHES TO PULSE PROC FOR 2D PULSER OR TO DOP PULSE
- SWITCHES RF SIGNAL TO PULSE PROCESSOR FOR ACCESS AND EFT 2D OR TO DOPPLER ACQUISITION FOR MECH DOP
- 7500-0511-XX SWITCHES 2D & PULSE DOPPLER BETWEEN EFT, ACCESS AND DUPLEX CW SCANHEADS; SWITCHES CW BETWEEN STATIC PROBES AND DUPLEX CW SCANHEADS

ECG MODULE
- PATIENT/SYSTEM ECG ISOLATION
- ECG SIGNAL AMPLIFICATION

(A1-A4) BEAMFORMER

A1 RF Select PCB (S1)
- NO ACTIVE CIRCUITRY, JUST ROUTES SCANHEAD SIGNALS TO FRONT END PCB (VIA CHABIN CABLES TO RF SELECT PCB TO CENTER SECTION OF 3-PIECE MB)

A1 Doppler Pulser PCB (S2)
- VARIABLE AMPLIFIER FOR EXCITATION XMT PULSES FROM PULSE PROCESSOR FOR MECHANICAL SCANHEADS IN CW AND PULSED DOPPLER MODES

A2 Beamformer Front End PCB
- T/R SWITCHS BLOCK PULSERS FROM REACHING TGC AMPLIFIERS AND BEAMFORMER FOCUS PCB
- HIGH VOLTAGE MUX SWITCHES (HV16'S). ROUTE PULSERS TO FORM CORRECT APERTURE
- TGC AMPLIFICATION OF INCOMING RF SIGNALS
- SENDS RECEIVED RF TO BEAMFORMER FOCUS PCB

A3 Beamformer Focus PCB
- CROSSPOINT SWITCHES DEROTATE (RESTORES SEQUENCIAL ORDER OF INDIVIDUAL CHANNELS)
- REMOVES DELAYS FROM INDIVIDUAL INCOMING RF SIGNALS
- DEPTH OF FOCUS CONTROL
- DEMULTIPEXES (COMBINES) AND AMPLIFIES RF SIGNALS
- SENDS LINEAR RF TO PULSE PROCESSOR

A4 Beamformer Controller PCB
- DOWNLOADS OPERATING PARAMETERS (DEPTH, MODE, S/H TYPE, ETC) FROM SYSTEM CONTROLLER TO PROGRAMMABLE PULSE WIDTH GENERATOR
- CONTROLS BEAMFORMING
  - PHASES APERTURE (CREATES PARABOLIC BEAM; OUTER ELEMENTS FIRE FIRST; CENTER ELEMENTS FIRE LAST; VIA MECHANICAL/ANALOG DELAY LINES)
  - VARIES TRANSMIT FOCUS BY ZONE (VARIES DELAY RATIOS OF PARABOLIC BEAM CURVE)
  - SHIFTS APERTURE VIA HV MUX SWITCHES ON FRONT END PCB (ELEM 1-32 -->2-33, ETC)
  - SHIFTS DELAYS TO MAINTAIN SYMMETRY (ROTATION)
- SENDS PULSERS TO BEAMFORMER FRONT END PCB
- CONTROLS BEAMFORMER FOCUS PCB DEROTATION (REMOVING APERTURE PHASING)
- ID'S LINEAR SCANHEADS, INCL AA
- SENDS LINEAR XDR FIRE TO PULSE PROCESSOR

SCANHEADS

CONTROL GROUP (SHEET 2) — SERIAL BUS
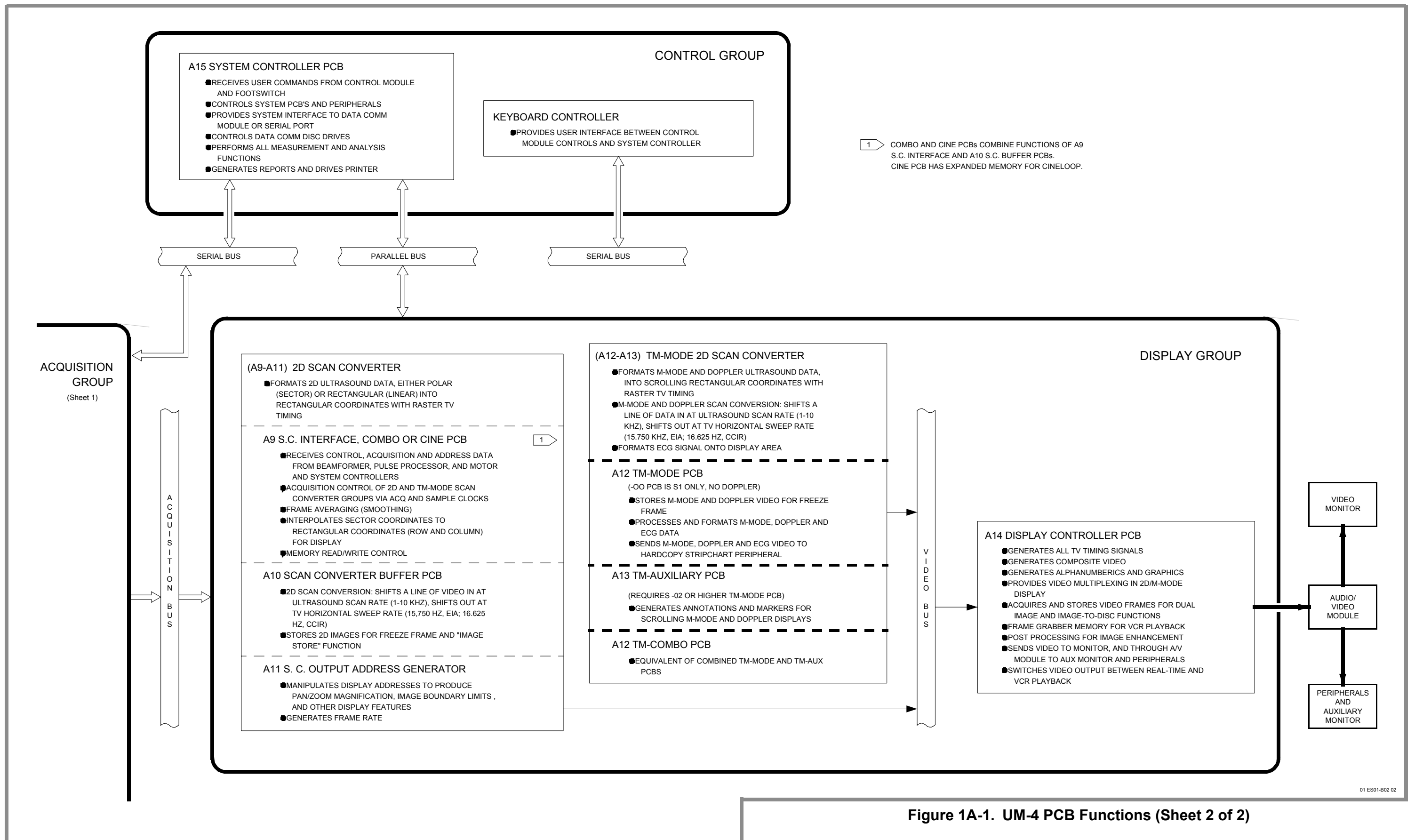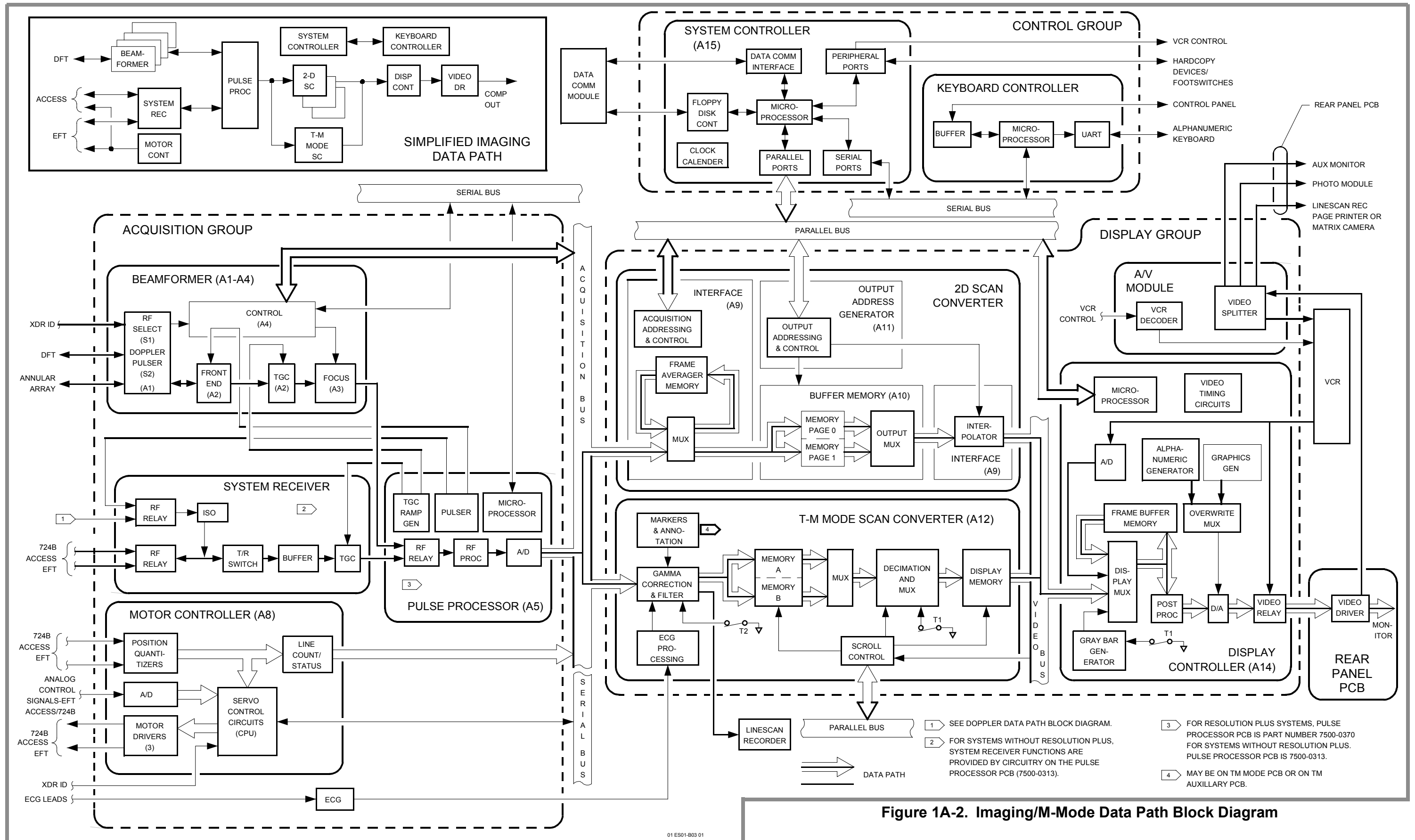
DISPLAY GROUP (SHEET 2) — ACQUISITION BUS

01 ES01-B01 01

Figure 1A-1. UM-4 PCB Functions (Sheet 1 of 2)

CONTROL GROUP

A15 SYSTEM CONTROLLER PCB
- RECEIVES USER COMMANDS FROM CONTROL MODULE AND FOOTSWITCH
- CONTROLS SYSTEM PCB'S AND PERIPHERALS
- PROVIDES SYSTEM INTERFACE TO DATA COMM MODULE OR SERIAL PORT
- CONTROLS DATA COMM DISC DRIVES
- PERFORMS ALL MEASUREMENT AND ANALYSIS FUNCTIONS
- GENERATES REPORTS AND DRIVES PRINTER

KEYBOARD CONTROLLER
- PROVIDES USER INTERFACE BETWEEN CONTROL MODULE CONTROLS AND SYSTEM CONTROLLER

1 ▷ COMBO AND CINE PCBs COMBINE FUNCTIONS OF A9 S.C. INTERFACE AND A10 S.C. BUFFER PCBs. CINE PCB HAS EXPANDED MEMORY FOR CINELOOP.

SERIAL BUS   PARALLEL BUS   SERIAL BUS

ACQUISITION GROUP
(Sheet 1)

ACQUISITION BUS

DISPLAY GROUP

(A9-A11) 2D SCAN CONVERTER
- FORMATS 2D ULTRASOUND DATA, EITHER POLAR (SECTOR) OR RECTANGULAR (LINEAR) INTO RECTANGULAR COORDINATES WITH RASTER TV TIMING

A9 S.C. INTERFACE, COMBO OR CINE PCB   1 ▷
- RECEIVES CONTROL, ACQUISITION AND ADDRESS DATA FROM BEAMFORMER, PULSE PROCESSOR, AND MOTOR AND SYSTEM CONTROLLERS
- ACQUISITION CONTROL OF 2D AND TM-MODE SCAN CONVERTER GROUPS VIA ACQ AND SAMPLE CLOCKS
- FRAME AVERAGING (SMOOTHING)
- INTERPOLATES SECTOR COORDINATES TO RECTANGULAR COORDINATES (ROW AND COLUMN) FOR DISPLAY
- MEMORY READ/WRITE CONTROL

A10 SCAN CONVERTER BUFFER PCB
- 2D SCAN CONVERSION: SHIFTS A LINE OF VIDEO IN AT ULTRASOUND SCAN RATE (1-10 KHZ), SHIFTS OUT AT TV HORIZONTAL SWEEP RATE (15,750 HZ, EIA; 16.625 HZ, CCIR)
- STORES 2D IMAGES FOR FREEZE FRAME AND "IMAGE STORE" FUNCTION

A11 S. C. OUTPUT ADDRESS GENERATOR
- MANIPULATES DISPLAY ADDRESSES TO PRODUCE PAN/ZOOM MAGNIFICATION, IMAGE BOUNDARY LIMITS , AND OTHER DISPLAY FEATURES
- GENERATES FRAME RATE

(A12-A13) TM-MODE 2D SCAN CONVERTER
- FORMATS M-MODE AND DOPPLER ULTRASOUND DATA, INTO SCROLLING RECTANGULAR COORDINATES WITH RASTER TV TIMING
- M-MODE AND DOPPLER SCAN CONVERSION: SHIFTS A LINE OF DATA IN AT ULTRASOUND SCAN RATE (1-10 KHZ), SHIFTS OUT AT TV HORIZONTAL SWEEP RATE (15.750 KHZ, EIA; 16.625 HZ, CCIR)
- FORMATS ECG SIGNAL ONTO DISPLAY AREA

A12 TM-MODE PCB
(-OO PCB IS S1 ONLY, NO DOPPLER)
- STORES M-MODE AND DOPPLER VIDEO FOR FREEZE FRAME
- PROCESSES AND FORMATS M-MODE, DOPPLER AND ECG DATA
- SENDS M-MODE, DOPPLER AND ECG VIDEO TO HARDCOPY STRIPCHART PERIPHERAL

A13 TM-AUXILIARY PCB
(REQUIRES -02 OR HIGHER TM-MODE PCB)
- GENERATES ANNOTATIONS AND MARKERS FOR SCROLLING M-MODE AND DOPPLER DISPLAYS

A12 TM-COMBO PCB
- EQUIVALENT OF COMBINED TM-MODE AND TM-AUX PCBS

VIDEO BUS

A14 DISPLAY CONTROLLER PCB
- GENERATES ALL TV TIMING SIGNALS
- GENERATES COMPOSITE VIDEO
- GENERATES ALPHANUMBERICS AND GRAPHICS
- PROVIDES VIDEO MULTIPLEXING IN 2D/M-MODE DISPLAY
- ACQUIRES AND STORES VIDEO FRAMES FOR DUAL IMAGE AND IMAGE-TO-DISC FUNCTIONS
- FRAME GRABBER MEMORY FOR VCR PLAYBACK
- POST PROCESSING FOR IMAGE ENHANCEMENT
- SENDS VIDEO TO MONITOR, AND THROUGH A/V MODULE TO AUX MONITOR AND PERIPHERALS
- SWITCHES VIDEO OUTPUT BETWEEN REAL-TIME AND VCR PLAYBACK

VIDEO MONITOR

AUDIO/ VIDEO MODULE

PERIPHERALS AND AUXILIARY MONITOR

01 ES01-B02 02

Figure 1A-1. UM-4 PCB Functions (Sheet 2 of 2)

Figure 1A-2. Imaging/M-Mode Data Path Block Diagram

SIMPLIFIED DOPPLER DATA PATH

DOP PULSR
SYSTEM CONTROLLER
KEYBOARD CONTROLLER
SYSTEM REC
PULSE PROC
STATIC XDCR (CW)
ACCESS
EFT
DOP ACQ
DOP PROC
TM SC
DISP CONT
VIDEO DR
COMP OUT
MOTOR CONT

CONTROL GROUP

SYSTEM CONTROLLER (A15)

DATA COMM MODULE
DATA COMM INTERFACE
PERIPHERAL PORTS
FLOPPY DISK CONT
MICRO-PROCESSOR
CLOCK CALENDER
PARALLEL PORTS
SERIAL PORTS

VCR CONTROL
HARDCOPY DEVICES/ FOOTSWITCHES
CONTROL PANEL
ALPHANUMERIC KEYBOARD

KEYBOARD CONTROLLER

BUFFER
MICRO-PROCESSOR
UART

PARALLEL BUS
SERIAL BUS

REAR PANEL PCB
AUX MONITOR
PHOTO MODULE
LINESCAN REC PAGE PRINTER OR MATRIX CAMERA

ACQUISITION GROUP

CW PULS
PD PULS
2D PULS

DOPPLER PULSER (A1)

CW BUFFER
PULSE AMP

STATIC TRANSDUCER

PULSE PROCESSOR (A5)

MICRO PROC
RF RELAY
RF PROC
A/D
PULSER
TGC RAMP GEN

DOPPLER PROCESSOR (A7)

SERIAL BUS INT
MICRO-PROCESSOR & MEMORY
CW PULSER INTFC
DOPPLER ACQ INT
CLOCK
TEST

SYSTEM RECEIVER

RF RELAY
ISO
BUF-FER
TGC
RF RELAY
T/R SWITCH
BUFFER
AMP
B.P. FILTER

ACCESS EFT
STATIC TRANSDUCER

DOPPLER ACQUISITION (A6)

RF RELAY
ATTEN
MIXERS
FILT PROC
GAIN
MUX & A/D
CONTROL
PHASE SHIFT & SUMMING
FFT INPUT
FFT
ACQ BUS INT

MOTOR CONTROLLER (A8)

POSITION QUANTI-TIZERS
LINE COUNT/ STATUS
A/D
SERVO CONTROL CIRCUITS (CPU)
MOTOR DRIVERS (3)

ACCESS EFT
ANALOG CONTROL SIGNALS-EFT ACCESS
ACCESS EFT
XDR ID

ACQUISITION BUS
SERIAL BUS

DISPLAY GROUP

T-M MODE SCAN CONVERTER (A12)

MARKERS & ANNOTATION
SCROLL CONTROL
GAMMA CORRECTION & FILTER
MEMORY A
MEMORY B
DECI-MATION AND MUX
DISPLAY MEMORY
ECG PRO-CESSING
T2
T1

LINESCAN RECORDER

PARALLEL BUS
VIDEO BUS

A/V MODULE

VCR CONTROL
VCR DECODER
VIDEO SPLITTER

DISPLAY CONTROLLER (A14)

MICRO-PROCESSOR
VIDEO TIMING CIRCUITS
VCR
A/D
ALPHA-NUMERIC GENERATOR
GRAPHICS GEN
FRAME BUFFER MEMORY
OVERWRITE MUX
DIS-PLAY MUX
POST PROC
D/A
VIDEO RELAY
GRAY BAR GEN-ERATOR
T1

REAR PANEL PCB

VIDEO DRIVER
MONITOR

1 TO 2D SCAN CONVERTER
SEE IMAGING DATA PATH BLOCK DIAGRAM

2 SEE AUDIO DATA PATH BLOCK DIAGRAM

3 MAY BE ON TM MODE, ON TM AUXILIARY PCB, OR TM MODE COMBO PCB

4 ALTHOUGH NOT PART OF THE DOPPLER DATA PATH, THE 2D SCAN CONVERTER IS REQUIRED FOR DOPPLER OPERATION

DATA PATH

5 REFER TO FIGURE 1A-5 FOR 3500-1016-XX RECEIVER AND DUPLEX CW PATH

01 ESO1-B04 01

Figure 1A-3. Doppler Data Path Block Diagram

UM-4 HFC AUDIO DATA PATH

UM-4A, PV, AND CV AUDIO DATA PATH

- A/V MODULE WITHOUT VCR STATUS -

- A/V MODULE WITH VCR STATUS (SMART A/V) -

VCR CONTROL AND STATUS DATA PATH

01 ES01-B05 01

Figure 1A-4. UM-4 Audio Data Paths and VCR Status

Figure 1A-5.   Duplex CW System Receiver Block Diagram

FROM PULSE PROC PCB ⊙ 2D PULS
FROM DOP PULSER PCB ⊙ PD PULS

RELAY → ISOLATION DIODES → T/R SWITCH → BUFFER AMP → PD BUFFER → PDOP ⊙ TO DOPPLER ACQUISITION PCB

TGC AMP → 2DRF ⊙ TO PULSE PROCESSOR PCB

P1

FROM PULSE PROCESSOR PCB

6   PULSEL → LC FILTER → FPULSEL   2 2   FT4   FPULSEL → DRIVER

P2 J2

FRONT PANEL   EFT / ACC → RELAY

5   XDCRSEL → LC FILTER → FXDCRSEL   6 6   FT5   FXDCRSEL → DRIVER

RF RELAYS

RF RELAYS

DUPLEX CW SCANHEAD   AA1 / AA2

CW PULSER ⊙ CWP1
CW TRANS ⊙ CWP0

DUPLEX CW/2D PDOP

DUPLEX CW/NORMAL

FRONT PANEL ⊙ CWIN

INPUT AMP → BAND PASS FILTER → BUFFER AMP → J15 CWOUT ⊙ TO DOPPLER ACQ. PCB

FROM DOPPLER PROCESSOR PCB

4   FSELT 1 → LEVEL TRANSLATION → FSELA 1   7 7   FT1   FSELA 1 (2.25 MHz)

3   FSELT 2 → LEVEL TRANSLATION → FSELA 2   8 8   FT2   FSELA 2 (5 MHz)

2   FSELT 3 → LEVEL TRANSLATION → FSELA 3   3 3   FT3   FSELA 3 (10 MHz)

PULSE PROC PCB ⊙ TGC → TGC → TGC DRIVER

9   +15V → LC FILTER → REG → +8V   1 1   FT8   +15V → TO RELAYS

10 10   FT6   +8V → CMOS SOURCE BUS

7   -15V → LC FILTER → REG → -8V   4 4   FT7   -8V → CMOS SOURCE BUS

CASE

8

FILTER PCB

SYSTEM RECEIVER ASSY W/DUPLEX CW
3500-1016-XX

1 ▷ DASHED LINE INDICATES CHANGES TO 3500-0581-XX SYSTEM RECEIVER TO INCORPORATE DUPLEX CW; RF RELAYS SHOWN IN DUPLEX CW MODE.

◯ MINIATURE RF CONNECTORS MOUNTED ON SYSTEM RECEIVER BOX. THESE HAVE NO REFERENCE NUMBERS AND ARE LABELED ONLY WITH THE SIGNAL MNEMONIC.

☐ FEEDTHROUGHS MOUNTED ON SYSTEM RECEIVER BOX

━━▶ DATA PATH

01 ES01-B06 01

Figure 1A–6.   Dual Access and Dual Linear Circuit Details

Figure 1A–7.   UM-4 CAD Block Diagram

HAND CONTROLLER

9

SYSTEM CONTROLLER PCB

9

T-M MODE PCB

ECG

ECG MODULE

SINGLE BOARD CPU PCB

HARD DRIVE

FLOPPY DRIVE

PARALLEL PRINTER

AT BUS

EM REAR PANEL

CAD VIDEO IN

40-40-10
40-40-40

VIDEO MEMORY PCB (RAM)

VIDEO RAM BUSES 1 & 2

CINE SYSTEM CONTROLLER PCB

VIDEO

DISPLAY CONTROLLER PCB

CAD VIDEO OUT

26-26

OVERLAY PCB

SYSTEM MONITOR

UM-4 SYSTEM

CAD MODULE

AUX VIDEO OUT

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Figure 1A–8. Data Comm Block Diagram

ELECTRONICS MODULE (EM)

DATA COMM MODULE

SYSTEM CONTROLLER PCB

ISOLATION PCB

CPU

DATA COMM INTERFACE

OPTO-ISOLATORS

MUX AND DRIVERS

OPTO-ISOLATORS

RCVRS & MUX

FLOPPY DISK CONTROLLER

FLOPPY DISK DRIVE A

FLOPPY DISK DRIVE B

RS-232 PORTS

01 ES01-B09 01

Figure 1B-1. Power Module Block Diagram

01 ES01-B10 01

| 1 | +70V AND -70V USED ON S2 SYSTEMS
+80V AND -80V USED ON S1 SYSTEMS |
| 2 | 1:1 EXCEPT FOR 3500-1096-XX
WHICH IS 2:1 (240V IN / 120V OUT) |
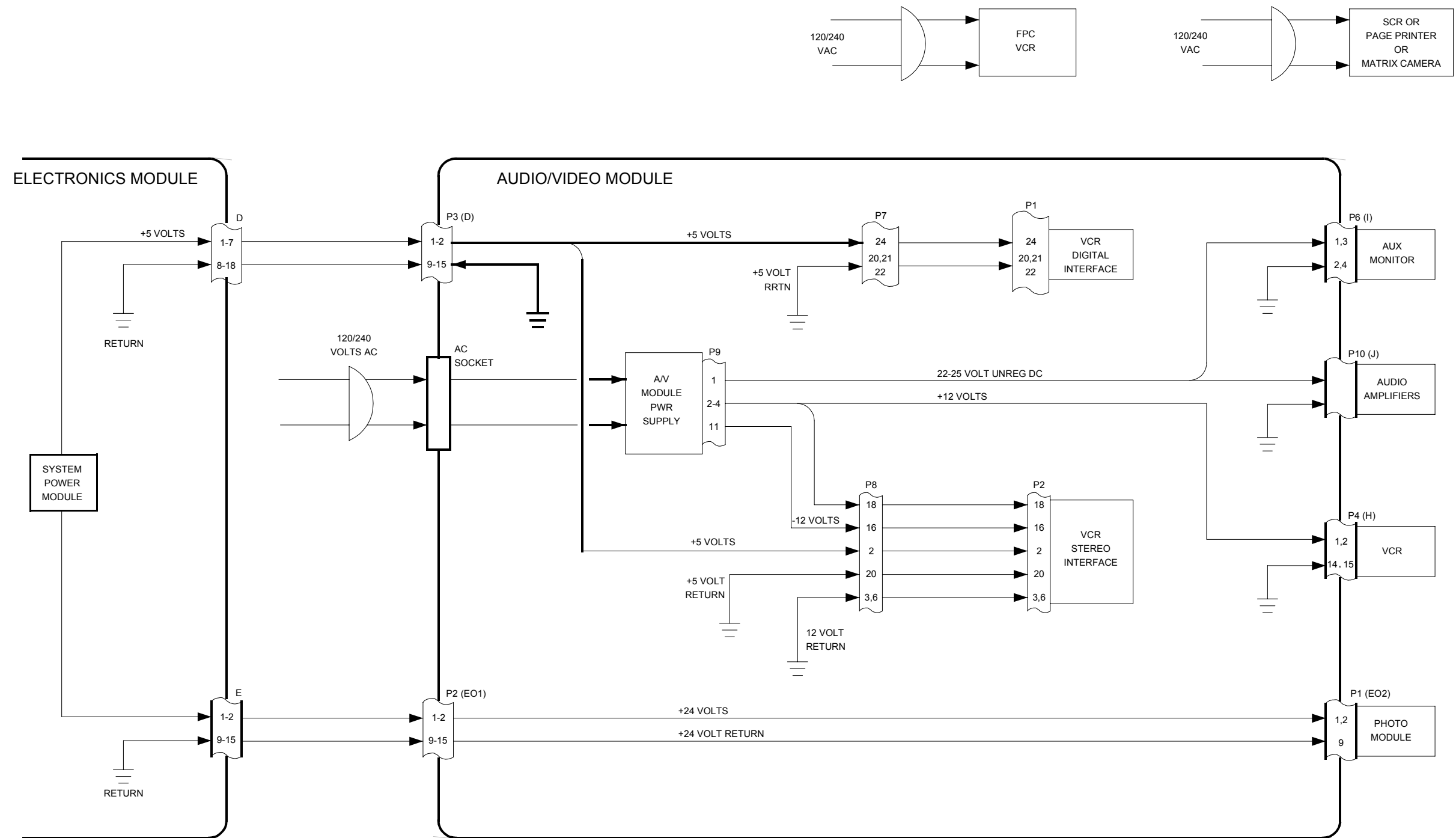
Figure 1B-2. A/V Module Power Distribution

01 ES01-B11 01
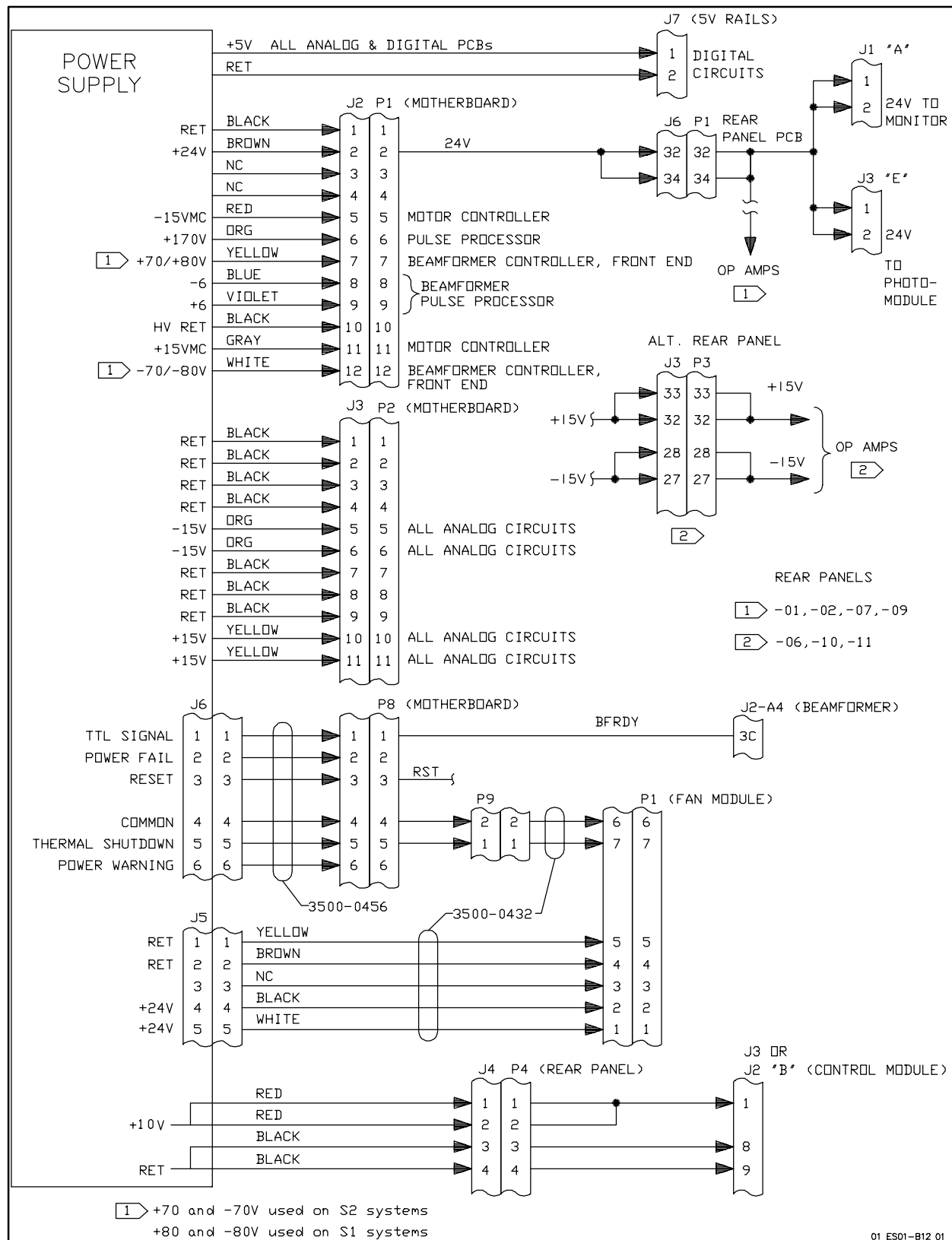
Figure 1B–3.   UM-4 Power Distribution

Table 1B–1.   Power Distribution

POWER SUPPLY	
TTL Control Signal	J6-1
Power Fail	J6-2
Reset	J6-3
Thermal Shutdown	J6-5

MOTHERBOARD	
+5 Volts	+5 Volt Rail
5 Volt Return	5 Volt Return Rail
+170 Volts	J2-6
+80 Volts, S1;	J2-7
+70 Volts, S2	
- -80 Volts, S1;	J2-12
- -70 Volts, S2	
HV Return	J2-10
- -15MC Volts	J2-5
+15 MC Volts	J2-11
15 MCV Return	J3-1,2
+15 Volts	J3-10,11
- -15 Volts	J3-5,6
Analog Ground	J3-3,4,7,8,9
+6 Volts	J2-9
- -6 Volts	J2-8
+24 Volts	J2-2
24 Volt Return	J2-1
XDR Ground	5 Volt Return Rail

SYSTEM RECEIVER	
+15 Volts (analog)	P1-9
- -15 Volts (analog)	P1-7
Ground	P1-8

DOPPLER PULSER (A1)	
+5 Volts	P3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Digital Ground	P3-1A,1B,1C,2A,2B,2C,3A, 3B,3C
+15 Volts (analog)	P3-25A,25B,25C
- -15 Volts (analog)	P3-27A,27B,27C
Ground	P2-2A,2B,4A,4B,4C,5A,6A P3-26A,26B,26C,31A,31B, 31C

BEAMFORMER FRONT END (A2)	
+80 Volts, S1;	J4-1,2
+70 Volts, S2	
- -80 Volts, S1;	J4-5,6
- -70 Volts, S2	
Return	J4-3,4,7,8,10,12,14,16,18
+15 Volts	J3-25A,25B,25C
- -15 Volts	J3-27A,27B,27C
Analog Ground	J3-26A,26B,26C,32B
+6 Volts	J3-32A
- -6 Volts	J3- -32C

BEAMFORMER FOCUS (A3)	
+15 Volts	J3-25A,25B,25C
- -15 Volts	J3-27A,27B,27C
Analog Ground	J1-8A,8B,8C,9A,9B,9C,10A, 10B,10C,12A,12B,12C, 13C,14A,14B,14C,16A, 16B,17B,17C,23A,23B, 23C,24B,25B,25C,26B, 26C,28A,28B,28C
+6 Volts	J3-32A
- -6 Volts	J3-32C

BEAMFORMER CONTROLLER (A4)	
Return	J4-3,4
+80 Volts, S1;	J4-5,6
+70 Volts, S2	
- -80 Volts, S1;	J4-1,2
- -70 Volts, S2	
TTL Control	J2-3C
Reset	J3-18B
+5 Volts	J3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Return	J3- -1A,1B,1C,2A,2B,2C,3A, 3B,3C,7B,8B,9B,10B,11B, 19A,19B,19C
+80 Volts, S1;	J3-23C
+70 Volts, S2	
- -80 Volts, S1;	J3-23B
- -70 Volts, S2	
HV Return	J3-24A,24B,24C
+15 Volts	J3- -25A,25B,25C
- -15 Volts	J3-27A,27B,27C
Analog Ground	J3-26A,26B,26C

Table 1B–1.   Power Distribution (Cont'd)

PULSE PROCESSOR (A5)

Reset	J3-18B
+5 Volts	J3-4A,4B,4C,5A,5B,6A, 6B,6C
Return	J3-1A,1B,1C,2A,2B,2C, 3A,3B,3C
+170 Volts	J3-23A
HV Return	J3-24A,24B,24C
+15 Volts	J3-25A,25B,25C
- -15 Volts	J3- -27A,27B,27C
Analog Ground	J2-9-20A,9-27B,9-30C J3-26A,26B,26C,31A,31B, 31C
+6 Volts	J3-32A
- -6 Volts	J3-32C

DOPPLER ACQUISITION (A6)

+5 Volts	P3-4A,4B,4C,5A,5B,5C, 6A,6B,6C
Digital Ground	P3-1A,1B,1C,2A,2B,2C, 3A,3B,3C
+15 Volts (analog)	P3-25A,25B,25C
- -15 Volts (analog)	P3-27A,27B,27C
Ground	P3-26A,26b,26C,31A,31B, 31C

DOPPLER PROCESSOR (A7)

+5 Volts	P3-4A,4B,4C,5A,5B,5C, 6A,6B,6C
Digital Ground	P3-1A,1B,1C,2A,2B,2C, 3A,3B,3C
+6 Volts	P3-32A
- -6 Volts	P3-32C
Analog Ground	P2-2A,2B,4A,4B,4C,5A, 6A P3-26A,26B,26C,31A,31B, 31C

MOTOR CONTROLLER (A8)

Power Fail	J3-16A
Reset	J3-18B
10.00 Volts	J1-29A
+5 Volts	J3-4A,4B,4C,5A,5B,5C, 6A,6B,6C,16A,16B,16C
Return	J3-1A,1B,1C,2A,2B,2C, 3A,3B,7B,8B,9B,10B, 11B,14B,15A,15B,15C, 19A,19B,19C,21C
- -15 Volt Motor Control	J3-20A,20B,20C
+15 volt Motor Control	J3-22A,22B,22C
Return	J3-21A,21B,21C

ECG ISOLATION

+15 Volts	J2-9
- -15 Volts	J2-7
Analog Ground	J2-1,2,3,4,6,8,10

SCAN CONVERTER INTERFACE (A9)

+5 Volts	J3-4A,4B,4C,5A,5B,5C, 6A,6B,6C
Digital Ground	J1-1A,4A,6B,6C,7A, 10A,13A,15C,16A, 19A,21B,23C,28B, 29B,30B,31B,32B J2-3B,6B,8B,9A,9C, 12B,15B,16A,16C 17B,18B,19A,19C, 22B,26B,27A,27C 31B,32B,32C

SCAN CONVERTER BUFFER (A10)

+5 Volts	J3-4A,4B,4C,5A,5B,5C, 6A,6B,6C
Digital Ground	J1-1A,4A,6B,6C,7A,10A, 13A,15C,16A,19A,21B, 23C,28B,29B,30B,31B, 32B J2-3B,6B,8B,9A,9C,12B, 15B,16A,16C,17B,18B, 19B,19C,22B,26B,27A, 27C,31B,32A,32C J3-1A,1B,1C,2A,2B,2C, 3A,3B,3C,7B,8B,9B, 10B,11B,14B,19A,19B 19C

SCAN CONVERTER OUTPUT ADDRESS GEN. (A11)

+5 Volts	J3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Return	J1-1A,4A,6B,6C,7A,10A,13A, 15C,16A,19A,21B,23C, 28B,29B,30B,31B,32B J2-3B,6B,8B,9A,9C,12B,15B, 16A,16C,17B,18B,19A, 19C,22B,26B,27A,27C, 31B,32A,32C J3-1A,1B,1C,2A,2B,2C,3A, 3B,3C

Table 1B–1.   Power Distribution (Cont'd)

TM-MODE (A12)	
+5 Volts	J3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Return	J2-3B,9A,9C,19A,19C,26B, 27A,27C,32A,32C
	J3-1A,1B,1C,2A,2B,2C,3A, 3B,3C
+15 Volts	J3-25A,25B,25C
--15 Volts	J3-27A,27B,27C
Analog Ground	J3-26A,26B,26B
Reset	J3- -18B
+15 Volts	P4-9
--15 Volts	P4-7
Analog Ground	P4-1,2,6,8,10

TM AUXILIARY (A13)	
+5 Volts	P3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Digital Ground	P3-1A,1B,1C,2A,2B,2C,3A, 3B,3C

DISPLAY CONTROLLER (A14)	
+5 Volts	J3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Return	J3-1A,1B,1C,2A,2B,2C,3A, 3B,3C
+15 Volts	J3-25A,25B,25C
--15 Volts	J3-27A,27B,27C
Analog Ground	J1-30A,30B,30C,31A,31B 32A,32B
	J3-26A,26B,26C

SYSTEM CONTROLLER (A15)	
+5 Volts	J3-4A,4B,4C,5A,5B,5C,6A, 6B,6C
Return	J1-10A,10B,13A,13B,21A, 21B,21C,23A,24B,24C, 25A,25C,26A,27A,30A, 31B
	J2-19A,19C,22B
4.8V Battery	J3-15B
Reset	J3-18B
Power Fail	J3-16A

FAN MODULE	
+24 Volts	P1-1,2
Return	P1-4,5

LINESCAN RECORDER, PAGE PRINTER, VGR	
+5 Volts	J4(C)-12
Return	J4(C)-14-23,25

SYSTEM MONITOR	
+24 Volts	J1(A)-1,3
Return	J1(A)-2,5

PHOTO MODULE	
+24 Volts	J3(E)-1,2
Return	J3(E)-9-15

DATA COMM MODULE	
+5 Volts	J6(F)-34
Return	J6(F)-20,23,28,30,35-37

CONTROL MODULE	
+10 Volts	J2(B)-1
Return	J2(B)-8,9

REAR PANEL (7500-0318-01, -02)	
+5 Volts	P1-21,23
Return	P2-9,11
+24 Volts	P1-1,3
Return	P1-9,11
+10 Volts	P4-1,2
Return	P4-3,4

REAR PANEL (7500-0318-03, above)	
+5 Volts	P3-21,22
+15 Volts	P3-32,33
--15 Volts	P3-27,28
+24 Volts	P3-1,3
Return	P3-9,11
+10 Volts	P4-1,2
Return	P4-3,4

Table 1B–2. Power Module Connections

Power Supply	Mother-board	Rear Panel PCB	Other
J2	P1		
J3	P2		
J4		P4	
	J4	P2	
	J5	P3	
	J6	P1	
	J7		Footswitch cable
	J8	*	
	J9	J8	

*Hardwired in U318-01, -02

Table 1B–3. Power Supply Fuses

Power Supply Part Number	Fuse	Value	ATL Part Number
1700-0009-02 1700-0002-04, -09, -11	F201, F202	15A,125V	2700-0072
1700-0009-01 1700-0002-05, 06, -10, -12	F201, F202	8A,250V	2700-0045
1700-0009-01 1700-0002-01	F300	2.5A	N/A

Section 1C   Cabling

ORIGINAL STYLE
REAR PANEL PCB

NOTE:
-02 AND HIGHER
HAVE 4700 PF
INDUCTOR IN L1

DASH NUMBERS:
NO DASH
-01
-02
-05
-07

CAD-READY
REAR PANEL

Video In
(from CAD)

Video Out
(to CAD)

DASH NUMBERS:
-03
-04
-06
-10
-11

Video In
(from VCR)

Video Out
(to VCR)

Video Out
(to Monitor)

Video Out
(to VCR,
UM4A only)

K1 (may be at
either location)

JUMPER CLEAN-UP
RE-LAYOUT

A — Monitor
B — Control Module
C — Stripchart Recorder
D — A/V Module
E — Photo Module
F — Data Comm Module
G — CAD Module (Printer Interface)
H — CAD Module (SCSI Interface)
P — No Function

COST REDUCTION

DASH NUMBERS:
-12

DASH NUMBERS:
-13
-14

⚠ DO NOT DISCONNECT OR CONNECT THE
CONTROL MODULE WITH POWER APPLIED.
THIS WILL RESULT IN A BLOWN FUSE
INSIDE THE POWER SUPPLY.

01 ES01-A01 05

Figure 1C-1.   EM Rear Panel Connections

P8

Motherboard

P9

P2

P1

Card Cage

J4

J5

J7

J9

P4

J8

J6

J2

J3

J8

J4

P1

J5

P3

J6

P2

NOTE:
Power supply is removed
and turned to show connectors

01 ES01–A02 01
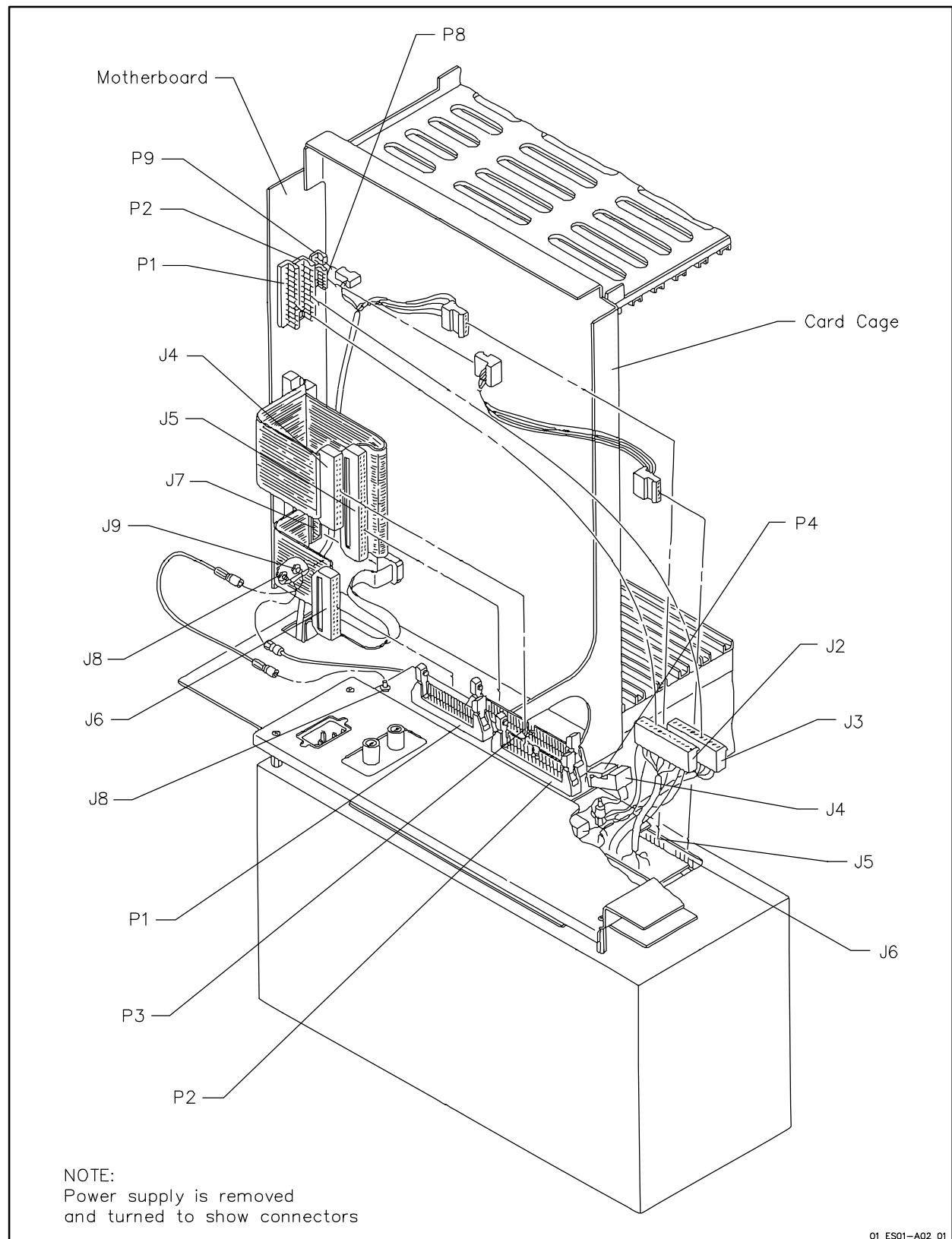
Figure 1C–2.   Power Module Connections

Figure 1C-3. UM-4 Human Factors Cart (HFC) Cabling Diagram

NOTES:

1 — CABLE IS PART OF ASSEMBLY INDICATED BY FLAG

2 — CABLE IS HARDWIRED AT THIS FLAG

3 — ONLY ONE OF THE CABLES SHOWN MAY BE CONNECTED TO THIS CONNECTOR

4 — TWO CABLES ARE CONNECTED IN OEM TO ALLOW SEPARATION OF NEWER HUMAN FACTORS MODULE FROM EM

5 — ATTENUATOR CABLE REQUIRED WITH -04 AND -05 A/V MODULE

6 — PART NUMBER SPECIFIES PANEL AND CABLE

7 — EITHER DATA COMM OR CAD; EITHER PHOTO MODULE OR CAD

8 — CABLE SELECTION DEPENDS ON HF MODULE DASH LEVEL

9 — SEE PARTS, TABLE 8-11

01 ES01-B13 04

Figure 1C–4.   UM-4A (OB) Cabling Diagram
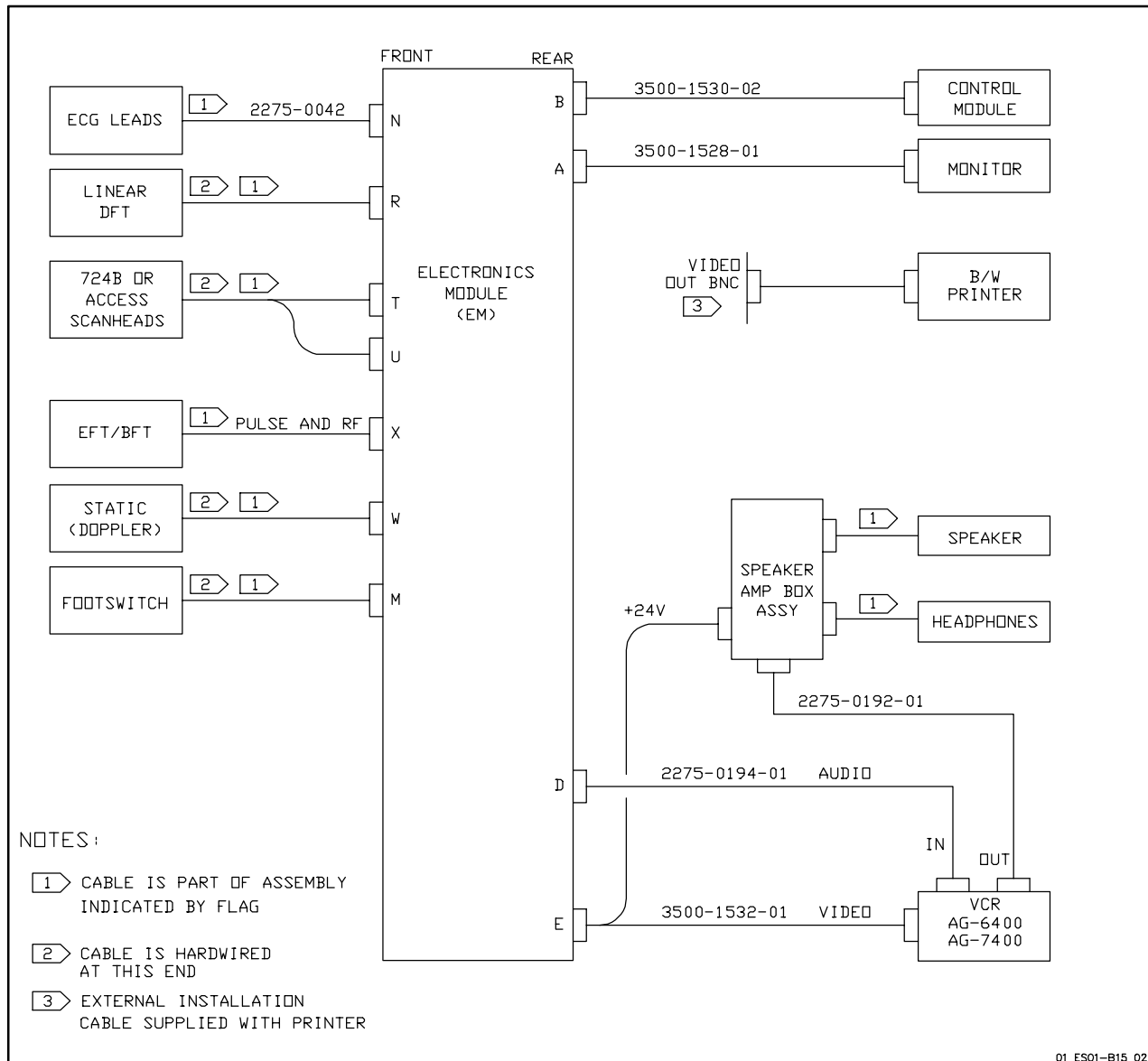
Figure 1C–5.   UM-4CV Cabling Diagram
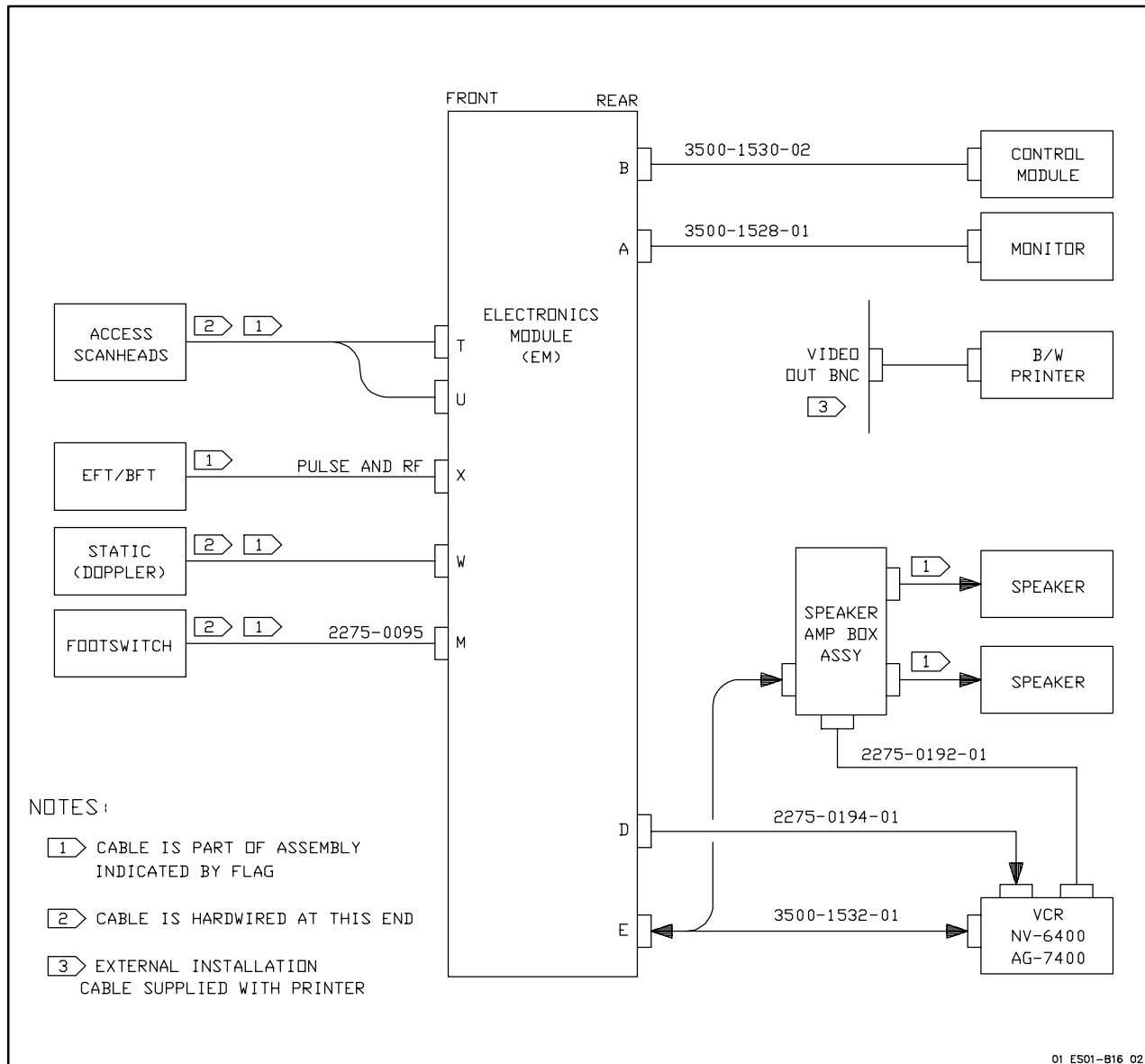
Figure 1C–6.   UM-4PV Cabling Diagram
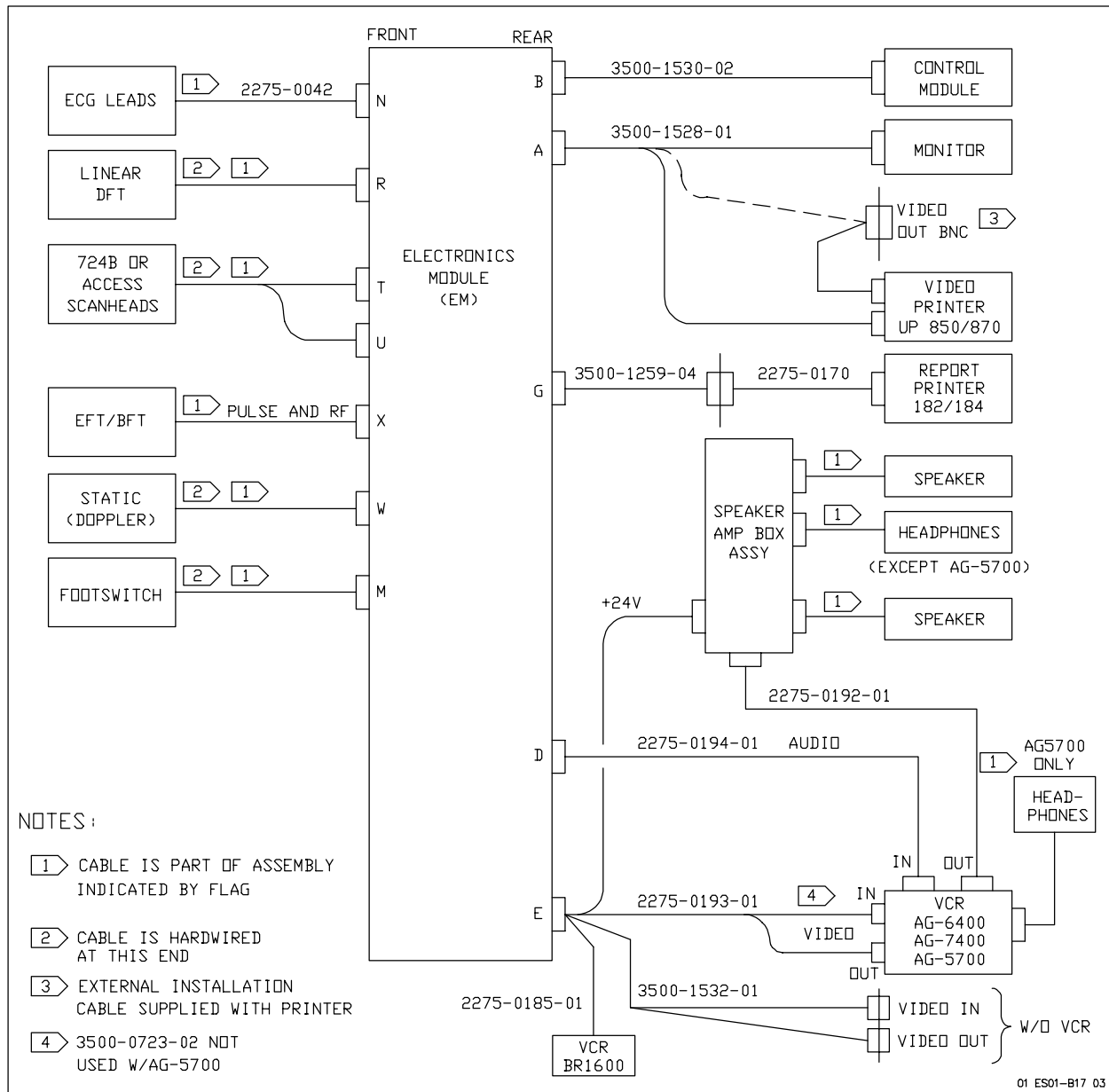
Figure 1C–7.   UM-4A (Full Feature) and 4APLUS **Cabling Diagram**

Section 2A   Pre-Installation Requirements

2A–1 Introduction

The purpose of this evaluation is to ensure a trouble-free installation and to assist the customer in providing an environment that supports the reliable performance of an ATL ultrasound system. This document is intended to guide you through a comprehensive inspection that ensures all physical, electrical and environmental conditions are appropriate for optimum system operation.

NOTE: *Some parts of this section include policies, equipment requirements, and procedures that may apply only to U.S. field use. For dealers, affiliates, or other authorized service personnel who do not use the domestic U.S. service documents, use your equivalent document, where applicable.*

NOTE:

Two documents are used exclusively with the site evaluation program.

• A comprehensive Site Evaluation FSR is used to accurately record and document all pertinent customer information as well as the actual site findings. It accommodates evaluating two sites.

• The Customer Information Directory (CID) is a resource document that enables the customer to more easily communicate with ATL. It also serves as a convenient file for keeping FSRs, MAs and other pertinent documentation. The

CID should be presented to, and reviewed with, the primary service contact and made accessible to both the equipment user and the CSR.

In addition, system specifications (**Table 2A–1**) are included at the end of this section to assist in evaluating the site.

2A–2 Required Materials

• Tool Kit
• DVM
• Oscilloscope
• ONEAC Line Viewer
• Three-pronged Outlet Tester
• Measuring Tape
• ATL General Service Manual (4720-0219-01)
• ATL Power Primer (4760-0215-XX)
• Power Line Data Sticker (4765-0247-XX)
• Site Evaluation FSR (4765-0298-XX)
• Installation Planning Manual (4765-0001-XX)

2A–3 Initial Customer Contact

In notifying you of a pending new system delivery, the Customer Support Center (CSC) will give you as much lead-time as possible. Although it is our goal to perform an on-site inspection thirty days or more prior to system installation, it is not always possible. For those accounts in which travel is excessive or costly, or in the event that you are given less than three weeks notice before system delivery, exercise good judgement in determining if you will do a site evaluation prior to installation. In either case, conduct some of the site eval-

uation over the telephone, completing it at installation. In all cases, the Site Evaluation FSR must be completed.

NOTE: *You are required to perform a pre-site evaluation prior to installation if given three weeks notice and the customer is within reasonable travelling distance.*

To assist you through the proper flow of the pre-installation process (including how the pre-instal-lation action items will be completed), a flow chart has been incorporated into the Site Evaluation FSR. As you step through the process, circle the action items contained in this flow chart.

When you make your initial call to the customer, include the following steps.

1. Introduce yourself.

2. Thank the customer for purchasing an ATL ultrasound system.

3. Confirm the system delivery date. Ask your customer if this date is acceptable and if they have any special needs or requirements.

4. Explain the intent of the site evaluation.

5. Schedule an appointment for the site evaluation.

6. Request that a facilities representative (usually an electrician or BMET) be available, if possible.

2A–4   Creating a Positive First Impression

Help your customer get off to a smooth start. Position the site inspection as a value-added service that enhances system performance and reliability. This is an opportune time to begin differentiating yourself from other service vendors.

1. Introduce yourself to the doctors, the technologists, the head of the department and the BMETs. Present your business card to each of them and thank them for their purchase of an ATL ultrasound system.

2. Inquire about current problems they may be having with other equipment in the general vicinity.

3. Also ask about any current or planned construction. This step and the previous one may provide insight into both existing conditions and the potential for future environmental improvements.

4. Circle the applicable steps in the Pre-Installation Flow Chart section of the Site Evaluation FSR.

2A–5   Physical Access for Delivery, Installation, and Operation

Perform the following steps to ensure the delivery and placement of the system go smoothly.

1. Inform the customer about the dimensions of the system, both crated and uncrated.

2. Using these dimensions, evaluate the site for delivery. Pay particular attention to the availability of a loading dock, the availability of elevators or ramps and the width of passageways and doors.

3. Verify that adequate space is available for installation.

4. At each operational location, verify the physical space for the system and any external peripherals.

5. Circle the appropriate steps on the Site Evaluation FSR Pre-Installation Flow Chart and note any potential difficulties.

2A–6   Ventilation Requirements

It is not possible to verify the ventilation capacity of the site with the test equipment currently in your possession. The intent of these steps is to bring to the attention of the appropriate facility representative the cooling requirements of the system.

1. If the room(s) seems excessively hot or humid to you, ask for the facility engineer to make the appropriate adjustments (and explain why).

2. Circle the appropriate items on the Site Evaluation FSR Pre-Installation Flow Chart and note any potential difficulties.

2A−7   Electrical Power Requirements

WARNING: *For safety and liability reasons, do not remove the outlet from the wall or gain access to any electrical systems. Have the facility representative describe the wiring and inspect for the criteria specified here.*

1. Explain to the facilities representative that the electrical supply to the system should be a dedicated line (noother equipment on the same line) conforming to the specifications outlined in the System Specifications sheet.

2. To verify the presence of a dedicated line, have the facility representative open the circuit breaker and with a DVM or the three-wire test plug, check other outlets and hard-wired devices in the immediate area for a loss of power.

NOTE: *Another method of verifying a dedicated line is to have the facility representative measure the current draw of the line at the distribution panel with the system off. There should be no current flow at this time.*

3. Verify the proper wiring of the outlet using a three-wire test plug. This plug also tests for the presence of a ground, but it cannot detect neutral/ground reversals.

4. Inform the facility representative of the current draw of the system and its acceptable voltage range. It is the responsibility of the facility representative to determine the proper size of the wire based upon the length of the feed.

5. Using your DVM at the outlet, measure the hot/neutral, hot/ground, and neutral/ground voltages with a comparable load (for example, another ultrasound system) on the line.

6. If a facility representative is not available, skip to step 7. To determine line loss if a facility representative is available, perform the following steps:

    a. Have the facility representative measure the voltage at the primary of the line's circuit breaker in the distribution sub-panel.

    b. Measure the voltage at the wall outlet.

    c. Calculate the percentage of voltage loss across the line using the formula:

    $[(A - B)/A] \times 100$

    where A is the voltage at the circuit breaker with the system on and B is the voltage at the wall outlet with the system on.

7. If a facility representative is not available, use the following steps to determine line loss:

    a. Measure the voltage at the outlet with the load on and then with the load off.

    b. Calculate the percentage of voltage loss across the line using the formula:

    $[(A - B)/A] \times 100$

    where A is the voltage at the wall outlet with the system off and B is the voltage at the wall outlet with the system on.

8. Using the ONEAC line viewer and oscilloscope, measure the power-line noise following the procedures specified in the Power Primer document.

9. Record your observations and measurements relative to power quality on the Site Evaluation FSR.

10. Affix a Power Line Data sticker to the most qualified outlet in each of the primary operating areas.

11. With the assistance of the facility representative, review the supplemental electrical survey questions on the Site Evaluation FSR.

12. Circle the appropriate steps on the Pre-Installation Flow Chart and note any potential difficulties.

2A–8   Electrostatic Discharge

The presence of electrostatic discharge (ESD) can cause system lock-ups and reliability problems. Because it is beyond the scope of this procedure to quantify ESD levels, you will need to use your senses to qualify the obvious presence of ESD. You can judge the severity of ESD by observing the following characteristics:

• ESD voltages in excess of 2,000V cause a shock.

• To create an audible discharge, the ESD must reach 5,000V.

• A visible ESD discharge occurs at or above 10,000V.

ESD can result from low humidity, carpeting, linen, and clothing. Avoid placing the system directly under or close to HVAC vents.

1. Check for the presence of ESD by walking around the immediate area where the system will be installed and touching grounded surfaces.

2. Ask the operators about their experiences with static discharge.

3. Suggest possible ESD minimizing devices/techniques such as static mats, humidifiers and sprays.

4. Circle the appropriate step on the Site Evaluation FSR Pre-Installation Flow Chart and note any potential difficulties.

2A–9   Radio Frequency Interference

Radio frequency (RF) interference can be generated from a large variety of electrical devices, and may not present itself as a problem until installation. RF typically causes image noise. If a noise problem occurs at the time of installation, you will need to use the process of elimination to determine the RF source. Familiarizing yourself with these sources now will help you quickly solve RF problems found during installation.

1. Note any obvious or potential RF generators. Typical RF generating devices include (but are not exclusive to) gel warmers, coffee pots, air conditioners, fans, photocopiers, computers, lab equipment, surgical equipment, and refrigerators.

2. Circle the appropriate step on the Site Evaluation FSR Pre-Installation Flow Chart and note any potential difficulties.

2A–10   Dust

Customers who use linen frequently have a dust problem. Because of the air circulation requirements of the system and the location of its air filter, dust can accumulate rapidly and cause the system to overheat.

1. Advise the customer about the need to periodically clean the air filter. A dirty filter can be cleaned with a small portable vacuum cleaner.

2. Circle the appropriate step on the Site Evaluation FSR Pre-Installation Flow Chart and note any potential difficulties.

2A–11   Lighting

Ambient light can interfere with the viewing of video monitors. A darkened room is preferred. Ambient light can be controlled through window shades and night lights.

1. Note the presence of shades or blinds, lights, and dimmer controls.

2. Circle the appropriate step on the Site Evaluation FSR Pre-Installation Flow Chart and note potential difficulties and suggestions for improving lighting control.

2A–12   Establishing Customer Expectations

Upon completing the site evaluation, share your findings with the customer and address questions and concerns. The CID contains system specifications if the customer requires documentation.

NOTE: *Although your customer needs to be informed of system specifications and possible site issues, be cautious in discussing site problems and corrective actions. If you note customer distress while discussing site problems, end the discussion immediately and advise your regional manager of the situation. Continuing such a conversation could jeopardize the sale of the system.*

1. Preview the installation process with the customer, addressing questions your customer may have.

2. Review the CID with the customer. Make your customer aware of ATL Professional Medical Supplies (particularly if they are a first-time ultrasound user) and assist them in ordering consumables.

3. Take the time to learn the needs of your new customer. Follow-up on specific concerns with the appropriate ATL representative.

4. Circle the appropriate steps on the Site Evaluation FSR Pre-Installation Flow Chart and note any potential difficulties.

2A–13   Completion and Follow-up

1. Review the Site Evaluation FSR to assure total compliance with the pre-installation process.

2. Close out the site evaluation as you would any normal service call.

3. Submit the top copy of the Site Evaluation FSR with your weekly paperwork, and keep the carbon copy.

Table 2A–1.   UM-4 System Specifications

System Dimensions (Crated/Uncrated)

Height	50 / 46 In (127 / 117 cm)
Width	30 / 24 In (76 / 61 cm)
Depth	42 / 36 In (107 / 92 cm)
Weight	290 / 220 lb (132 / 100 kg)

Cooling and Ventilation

Operational Temp	50 to 104°F (10 to 40)°C
Storage Temp	-29 to 149°F (-34 to 65°C)
Operational Humidity	15-95%
Storage Humidity	5-95%
Heat Output	2560 BTU/HR (750 W)

Cooling and Ventilation (cont'd)

With This Amount of Room Air Circulation:	Room Temp Will Rise (Due To UM-4):
1320 cfm (37 cmm)	1.8° F (1° C)
660 cfm (19 cmm)	3.6° F (2° C)
440 cfm (12 cmm)	5.4° F (3° C)
330 cfm (9 cmm)	7.2° F (4° C)
264 cfm (7 cmm)	9.0° F (5° C)
220 cfm (6 cmm)	10.8° F (6° C)
189 cfm (5 cmm)	12.6° F (7° C)
165 cfm (4 cmm)	14.4° F (8° C)

cfm = cubic feet per minute
cmm = cubic meters per minute

Electrical Power Requirements

Measurement	120 VAC	230 VAC
Hot/Neutral	108-132 VAC	207-253 VAC
Current Draw	10.0 A	5.0 A
Neutral/Ground	<3 VAC RMS	
Line Loss	<3 %	
Distortion	<20 %	
Common Mode Noise	<1.5 V P-P	
Normal Mode Noise	<10 V P-P	

Wiring Requirements

The electrical feed to the system shall be a dedicated line (no other equipment on the same line) with a third-wire ground. The ground wire shall be an insulated solid copper conductor bonded to the ground bus of the service panel. The outlet shall be a Hospital Grade Receptacle (for installations in North America) or an Isolated Ground Receptacle. Proper installation shall reflect compliance with the national electrical code.

2B–1   Introduction

This section contains procedures for inspecting and installing the Ultramarkᴦ 4 Ultrasound System series (UM-4).

NOTE: *Some parts of this section include policies, equipment requirements, and procedures that may apply only to U.S. field use. For dealers, affiliates, or other authorized service personnel who do not use the domestic U.S. service documents, use your equivalent document, where applicable.*

Before the UM-4 system is delivered to the site, perform a site inspection as described in Section 2A. After you have completed the inspection and installation of the system, verify correct operation using the performance tests described in Section 2C.

When you arrive at the site, introduce yourself to the staff, present your business card, and verify that you may proceed with the installation of the system.

Minimal assembly is required to install the UM-4 or the UM-4A (also known as the "Small Cart"). Inspection includes examining the UM-4 for shipping damage, verifying the component inventory of the system against the customer order, and checking for loose or missing parts. After any necessary corrective action has been taken and the system has been assembled, the performance tests in Section 2C must be performed to verify proper system operation.

A checklist is included at the end of this section.

The UM-4A is a cost-reduced version of the UM-4 and now can be configured with the same features as the UM-4. Several differences are the lack of the Human Factors Module with the adjustable height monitor and keyboard, and a reduced sized Optional Equipment bay (**Figure 2B–1**). Early versions of the UM-4A were limited in the features offered, being configured for specific applications, for example obstetrics (OB) or peripheral vascular (PV).

2B–2   Pre-Installation Preparation

1. When the system has shipped, advise the customer and provide them with the projected delivery date. If the delivery date is acceptable to the customer, tentatively schedule the installation, allowing time for a late delivery.

NOTE: *If you must schedule an installation for a specific arrival date, ask the ATL traffic department to schedule a guaranteed delivery time. Such a guarantee results in additional cost to ATL, so request it only when necessary.*

2. Preview the installation process with your customer and resolve any questions or conflicts. Be sure to discuss the following topics:

- Time needed to complete the installation
- Delivery access
- Set-up facilities
- Staffing needs
- Disposal of non-returnable packing materials

3. Ask the customer to notify you via CSC at (800) 433-3246 once their system arrives.

4. Notify the Sales Representative of your arrangements.

2B–3   On-site Preparation

1. Introduce yourself to the staff, present your business card and verify that you may proceed with the installation of their system.

2. Inspect the operational location for the system to verify that it will comply with the physical needs of the system and any external OEMs.

3. Inspect the location where the system will be uncrated to verify that you have a safe, adequate and well lit-space.

4. Inspect the packing material for shipping damage including the Shock-watchr and Tilt-watchr indicators. Notify Traffic immediately at x7100 for guidance if any shipping problems are encountered. Open the packaging and perform a brief physical inspection of the system and accessories for signs of shipping damage.
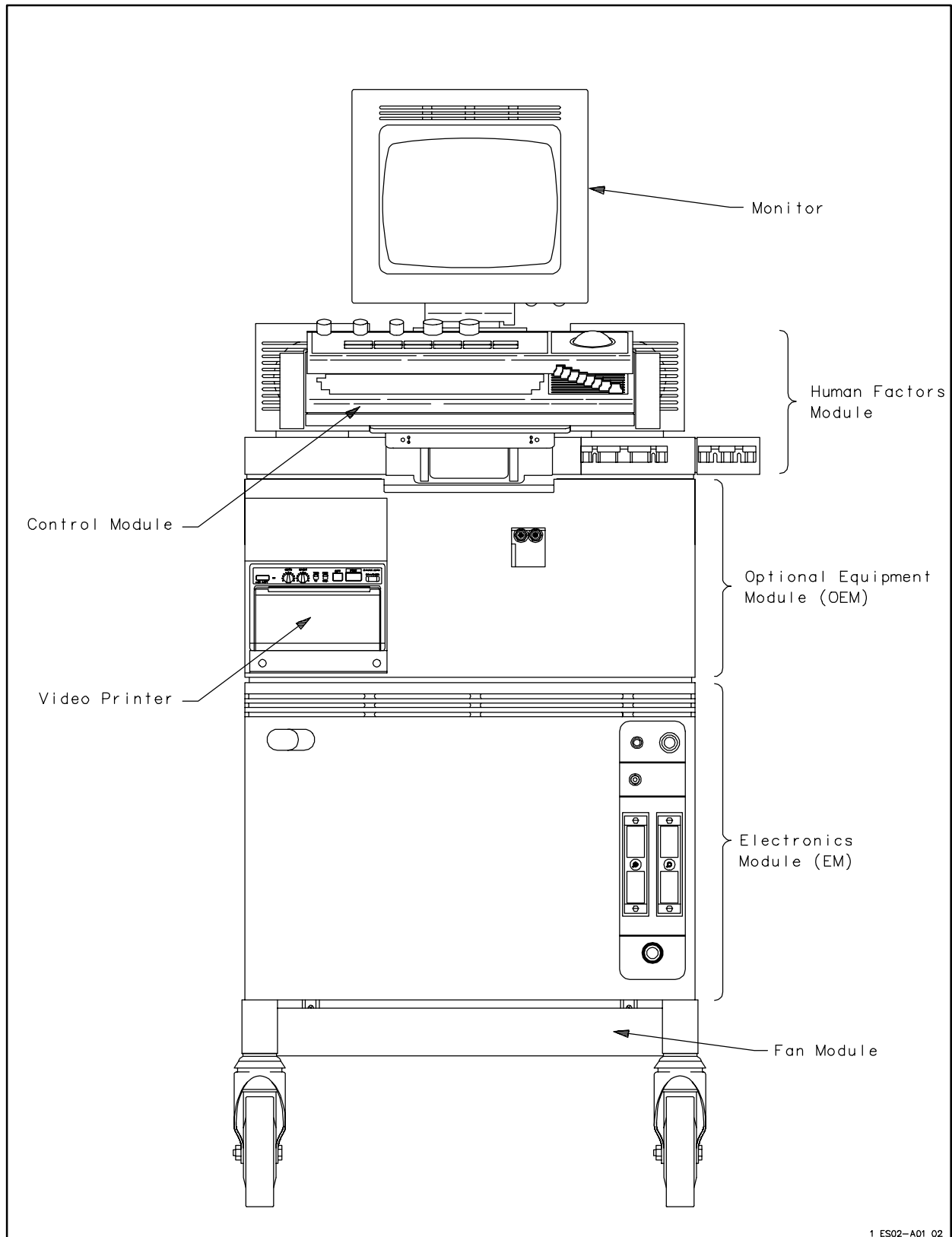
Figure 2B–1.   UM-4 Series Configurations (Sheet 1 of 2)

- UM-4A -

01 ES02-A02 02
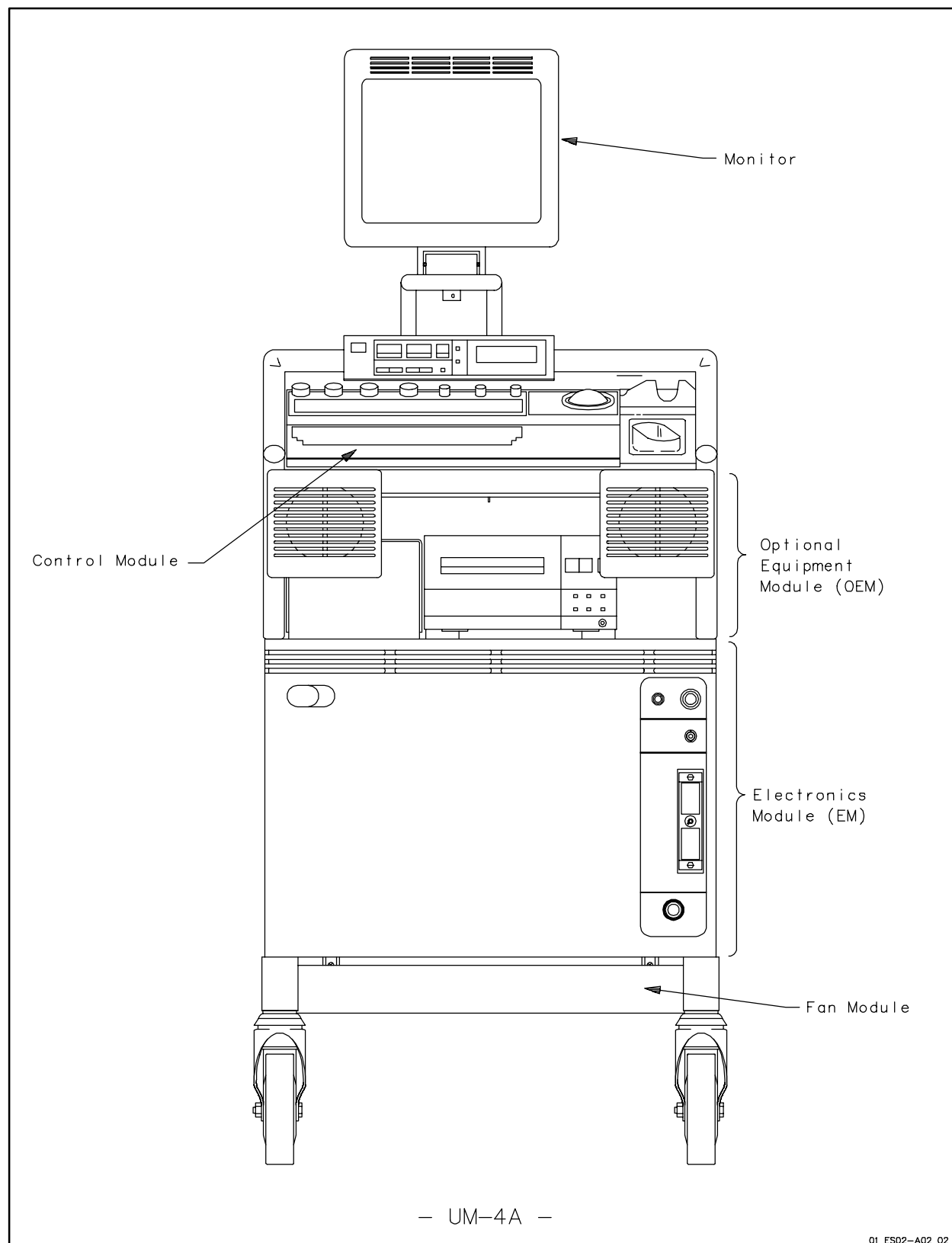
Figure 2B-1.   UM-4 Series Configurations (Sheet 2 of 2)

2B–4   Installation Procedure

The UM-4 Human Factors Cart (HFC) and the UM-4A (Small Cart) are shipped in either a wooden or corrugated container. The wood container is used for domestic ground shipments and the corrugated container is used for international and domestic air shipments. Both of these containers are discarded after installation. The carton containing the system monitor will be in either the main shipping container or another carton. Accessories, manuals, and other system components are packed in another carton, which is shipped separately.

Occasionally, the old-stye container shown in **Figure 2B–2** may be used for certain systems configured with a Lenzar Camera.

CAUTION: *Systems configured with Lenzar Cameras may have rail crossbrace removed. Proceed carefully to prevent damage to rails or Electronic Module (EM). Install brace as soon as system is lowered from pallet.*

2B–4.1   Tools Required

- CSR Tool Kit (193-90003-01)
- Ratchet or impact wrench with 9/16 inch socket;
  – Impact wrench (198-12396-00)
  – Impact socket (198-12395-00)
- UM-4 Service Manual (4720-0001-05)
- Applicable OEM Service Manuals
- Pre-Installation Procedure
- Customer Information Directory and Inserts
- Pre-Installation FSR
- Installation FSR
- PM Sticker (4725-0265-01)
- Power Data Sticker (4765-0247-01)

- Cable Management Hooks (2950-0464-01)
- CSR Tool Kit
- Three Pronged Outlet Test Plug
- Oscilloscope
- ONEAC Line Viewer
- Multimeter
- Tissue Phantom

WARNING: *Dangerous voltages are present inside the UM-4. Do not connect system to AC line voltage until proper line voltage has been verified and a thorough inspection of system has been performed.*

2B–4.2   Unpacking and Preliminary Inspection (Figure 2B–2)

Before unpacking the system, inspect the shipping carton using the following procedure:

1. Examine the shipping container for damage caused by rough handling. Look for evidence that might indicate that the carton has been opened.

2. Verify that the Shockwatchr and Tiltwatchr indicators on the shipping container have not been activated (showing R50).

3. Report any damage or loss to the carrier.

4. Determine the container type and use the following steps to remove the UM-4 from its shipping container and pallet:

Corrugated Container

1. Cut and remove banding around container. Carefully cut tape on top of container (don't cut deeply or monitor can be damaged).

2. Lift carton off pallet. Remove plastic from system.

WARNING: *Do not remove bands securing the monitor arm at this time. If monitor is not mounted, the arm can spring upwards and cause injury.*

3. Remove part boxes from around system.

4. Unbolt and remove two rail braces (secured with wingnuts on inside).

5. Unlock casters. Roll system backwards to edge of pallet and lower system to floor. (A ramp may be provided for HFC systems.)

6. Continue with paragraph 2B–4.3, Preliminary Inspection.

Wood Container

1. Remove top and front panels (secured by wingnuts).

2. Remove plastic from system.

WARNING: *Do not remove bands securing the monitor arm at this time. If monitor is not mounted, arm can spring upwards and cause injury.*

3. Remove part boxes from around system.

4. Unbolt and remove two rail braces (secured with wingnuts on inside).

5. Unlock casters. Roll system backwards to edge of pallet and lower system to floor. (A ramp may be provided for HFC systems.)

6. Continue with paragraph 2B–4.3, Preliminary Inspection.

Old-Style Container

1. Cut steel bands around container and remove staples securing carton to pallet or remove the wingnuts.

WARNING: *Do not remove bands securing the monitor arm at this time. If the monitor is not mounted, the arm can spring upwards and cause injury.*

2. Lift carton or wood panels off UM-4 pallet.

3. If the monitor is packed in a separate carton, cut tape band securing monitor carton to cart and remove carton. Take care not to drop monitor.

4. The footswitch assembly is wrapped in cardboard and stapled to the pallet beneath the cart. Pull staples, remove package, and take footswitch assembly out of its packing.

5. Release the plywood ramp and lay ramp edge against pallet edge (**Figure 2B–3**).

6. Using a socket or impact wrench with a 9/16 inch socket, remove bolts from blocks securing cart, and remove blocks.

7. Gently roll UM-4 off the pallet and down the ramp.

8. Continue with paragraph 2B–4.3, Preliminary Inspection.

2B–4.3   Preliminary Inspection

1. Inventory system components against system configuration.

2. Unpack monitor and inspect for damage.

3. Inspect all covers, bezels, dress panels, and other external surfaces for damage.

4. Verify that all casters roll smoothly and that when the rear casters are locked, they neither turn or roll.

5. Check control module for damage to keys and softkey control panel.

6. Inspect Human Factors Assembly for damage. Verify that monitor arm and keyboard support both move up and down smoothly, and lock in the down position. To release one or both mechanisms, pull forward on release bar (located under front edge of keyboard support), while pushing down on the mechanism.

7. On Lenzar systems, verify that rail crossbrace is securely attached.

2B–4.4   HFC Mechanical Inspection (Figure 2B–4)

1. Remove two screws securing front EM bezel and remove bezel.

2. Remove five or six screws securing front shield to card cage and remove shield.

3. Remove two screws securing front OEM bezel and remove bezel.

4. Remove four screws securing rear OEM bezel and remove bezel.

5. Remove screws securing EM rear panel cover and remove cover.

6. Remove two screws securing rear EM bezel and remove bezel.

7. Check for loose or missing fasteners, and tighten or replace as necessary.

8. Verify that six screws securing rails to EM are tight. These screws are accessible from underside of rails, and require a 1/4 inch hex wrench.

9. Inspect the system for mechanical discrepancies or damage. Document any discrepancies on the Installation FSR.

2B–4.5   UM-4A Mechanical Inspection (Figure 2B–5)

1. Remove two screws securing front EM bezel and remove bezel.

2. Remove five or six screws securing front shield to card cage and remove shield.

3. Remove screws securing EM rear panel cover and remove cover.

4. Remove two screws securing rear EM bezel and remove bezel.

5. Remove two screws securing rear OEM bay cover and remove cover.

6. Check for loose or missing fasteners, and tighten or replace as necessary.

7. Verify that six screws securing rails to EM are tight. These screws are accessible from underside of rails, and require a 1/4-inch hex wrench.

8. Inspect the system for mechanical discrepancies or damage. Document any discrepancies on the Installation FSR.

NOTE: The monitor can either be mounted or in a carton depending on which UM–4 configuration is shipped.

9/16in. Bolts
(4 plcs)

Blocks

Cable tray or
rail crossbrace on
Lenzar systems
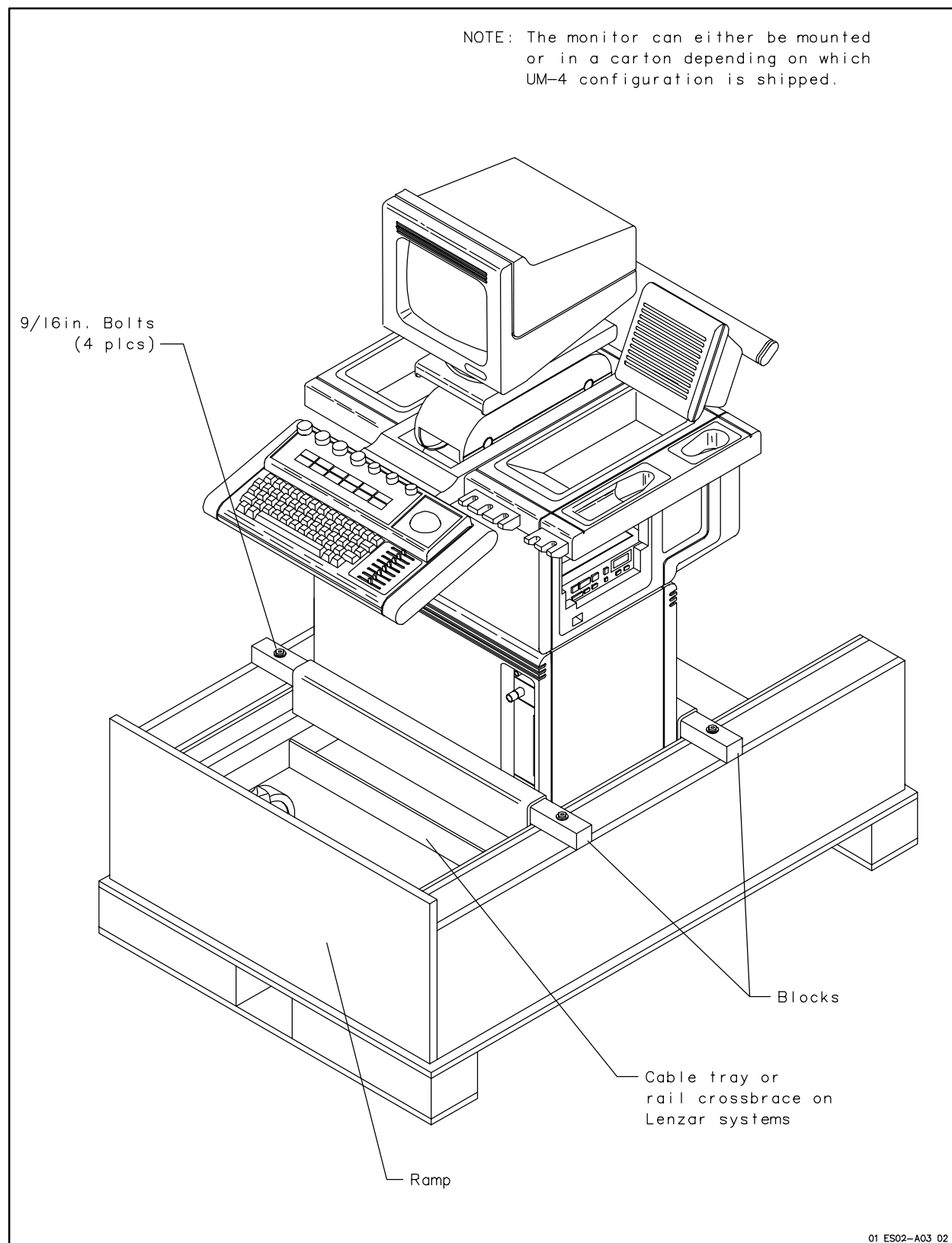
Ramp

01 ES02–A03 02

Figure 2B–2.   UM-4 on Shipping Pallet

NOTE: The monitor can either be mounted
      or in a carton depending on which
      UM–4 configuration is shipped.
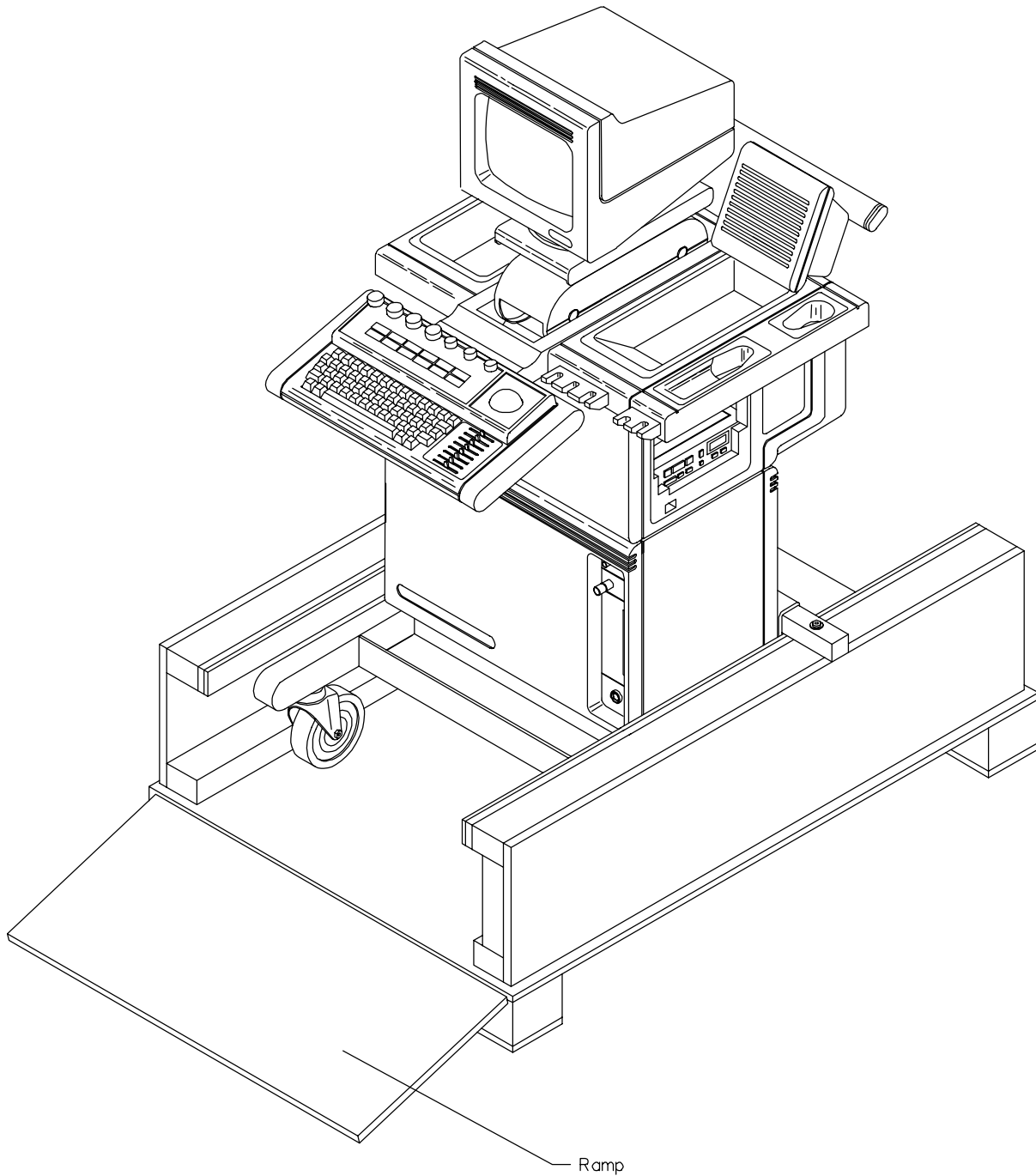
— Ramp

01 ES02–A04 01

Figure 2B–3.   Shipping Pallet Ramp
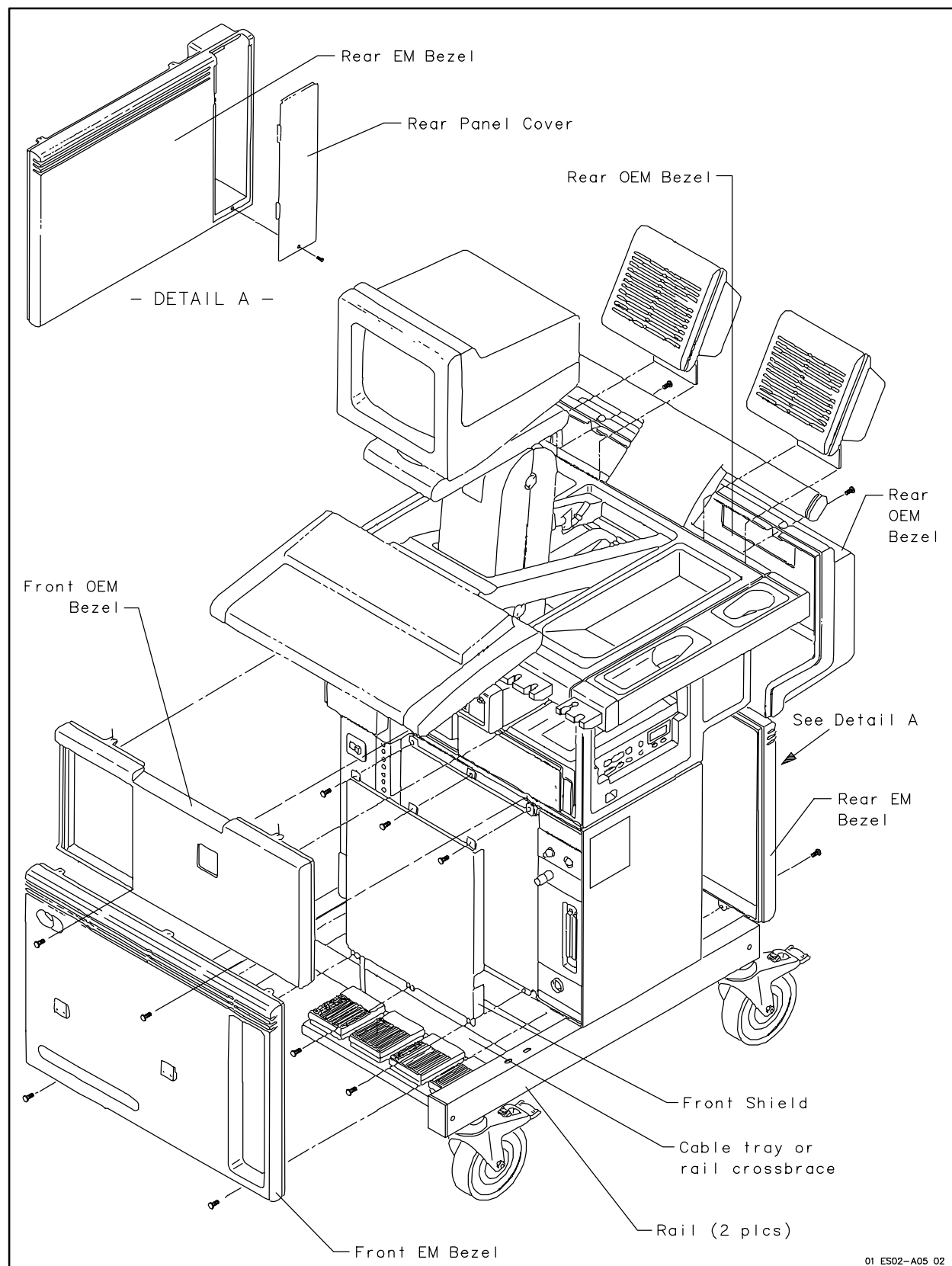
Figure 2B–4.   HFC Disassembly

Rear EM Bezel

Rear Panel Cover

— DETAIL A —

Rear OEM Cover

Rear EM Bezel

See Detail A

Front Shield

Front EM Bezel

Rail (2 plcs)
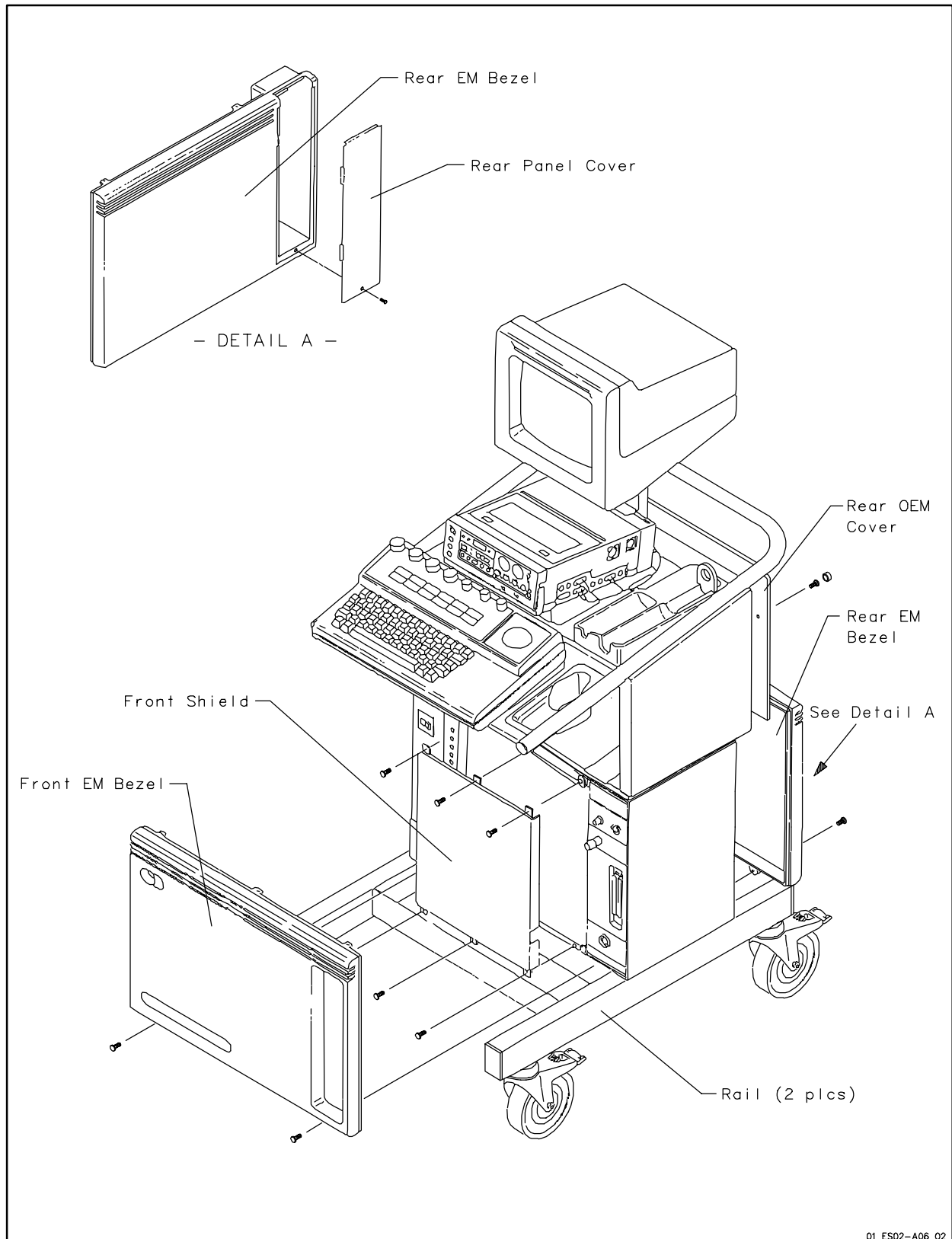
01 ES02–A06 02

Figure 2B–5.   UM-4A Small Cart Disassembly

2B–4.6   Electrical Inspection

NOTE: *Do not handle PCBs without proper static protection or damage can result.*

1. Check all PCBs in card cage and ensure that they are firmly seated in correct slots. Slot designations are stamped on the top card ejectors as shown in **Figure 2B–6**.

NOTE: *The actual PCB complement and PCB and PROM dash levels are dependent upon feature options and software levels. Refer to COA or Shipping Manifest, PCB/PROM Matrices in Section 5 and* **Figure 2B–6** *for part numbers, dash levels, and locations. Document any PCB, software, feature discrepancies or backorders on the Installation FSR.*

2. Verify that PCBs required for the system configuration are installed.

3. Verify that miniature RF connectors are securely connected to the front edge of the following PCBs, if installed: Doppler Pulser (A1), Beamformer Focus (A3), Pulse Processor (A5), Doppler Acquisition (A6), Doppler Processor (A7), and Motor Controller (A8).

4. Verify secure connection of ribbon-cables between Beamformer Front End (A2) and Beamformer Controller (A4) PCBs (if installed), and between 2D Scan Converter Interface (A9) and 2D Scan Converter Buffer (A10) PCBs. The tracer stripe must be on the bottom edge of all ribbon-cables.

5. On systems with ECG, verify that ribbon-cable connector on front edge of TM-mode Scan Converter PCB (A12) is securely seated and is positioned as shown in **Figure 2B–6**. The tracer stripe on the ribbon cable must be on the bottom edge.
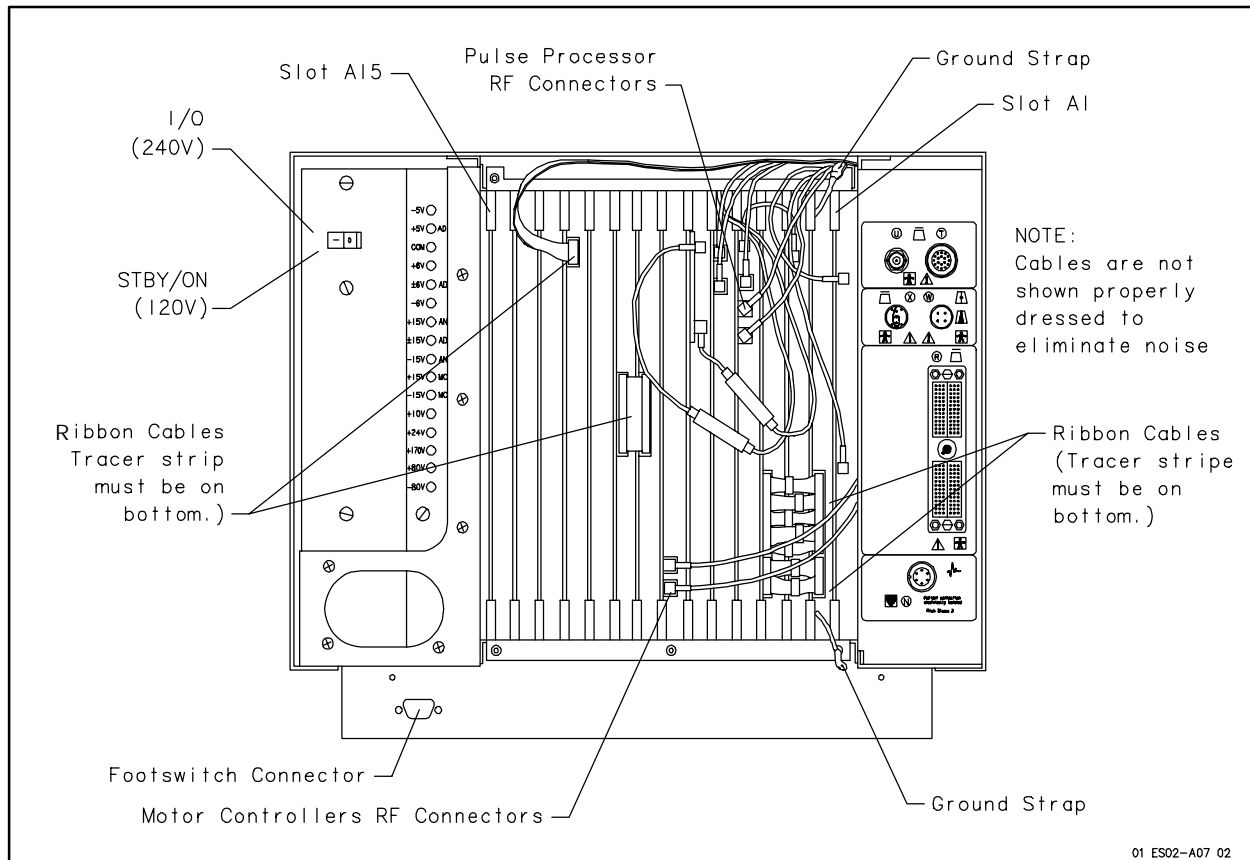
Figure 2B–6.   Electronics Module PCB Slot Designations

6. Verify rear panel connectors are seated correctly (**Figure 1C–1**) and that all screws are in place.

7. On the HFC's OEM, verify that cables from power strip assembly are securely connected to peripheral devices.

8. Verify that cables from EM to peripherals are properly and securely connected.

9. Insure proper switch configuration of installed OEMs per instructions in appropriate peripheral manuals.

2B–4.7   HFC Assembly

1. Position front OEM bezel on locating pins and secure with two screws.

2. Position both A2 ground straps over bushings on EM so that when front shield is installed, ground straps are secured between shield and bushings by mounting screws. Install front shield over card cage and secure with five screws.

3. Position front EM bezel on locating pins and secure with two screws.

4. Position rear OEM bezel on OEM and secure with four screws.

5. If necessary, mount monitor onto Human Factors monitor platform (**Figure 2B–7**) using the following steps:

WARNING: *Use caution when removing the bands securing the monitor arm or releasing the monitor latch. If the monitor is not mounted, the arm can spring upwards and cause injury.*

    a. Extend monitor arm.

    b. Feed monitor cable through access hole in monitor platform.

    c. Insert monitor shaft through access hole in monitor platform.

    d. Install mounting collar, flat side up, and secure with three 5/32 inch Allen setscrews.

    e. Connect monitor cable to video cable on underside of monitor platform.

    f. Verify that monitor can swivel 180 degrees from stop to stop.

    g. Adjust setscrews in side of monitor mounting block (see **Figure 2B–7**) so that monitor does not fall forward or backward.

NOTE: *Do not connect or disconnect the Control Module with system power turned on. A blown fuse in the Power Supply will occur. This fuse is not field replaceable.*

6. Connect coiled cable located on keyboard support to connector on rear of Control Module. Secure connector using captive screws.

7. Lay coiled cable into channel (**Figure 2B–8**) and set rear of control module into keyboard support. Press into place to lock Velcro pads (on bottom of Control Module). Metal key on keyboard support fits into slot in bottom of control module to help hold it in place.

8. Connect footswitch assembly cable to connector located on lower left front corner of EM. Lock connector in place using its captive screws.

9. Hang storage bin on front bezel of EM (system without Lenzar camera).

NOTE: *Before installing a peripheral not shipped with or configured specifically for the UM-4 system, call ATL Technical Support for information on compatibility and installation. This includes peripherals originally purchased for use with other ATL products.*

System Monitor

Monitor Mounting
Block

See Detail A

See Detail B

Monitor Platform

Monitor Swivel Ass'y

Mounting Collar
(Bevel side down)

DIN Connectors

Monitor Arm

Monitor
Platform

Bottom
Platform Cover

Spacer

Set Screws

ROTATED 180°
— DETAIL A —

— DETAIL B —

01 ES02—A08 02
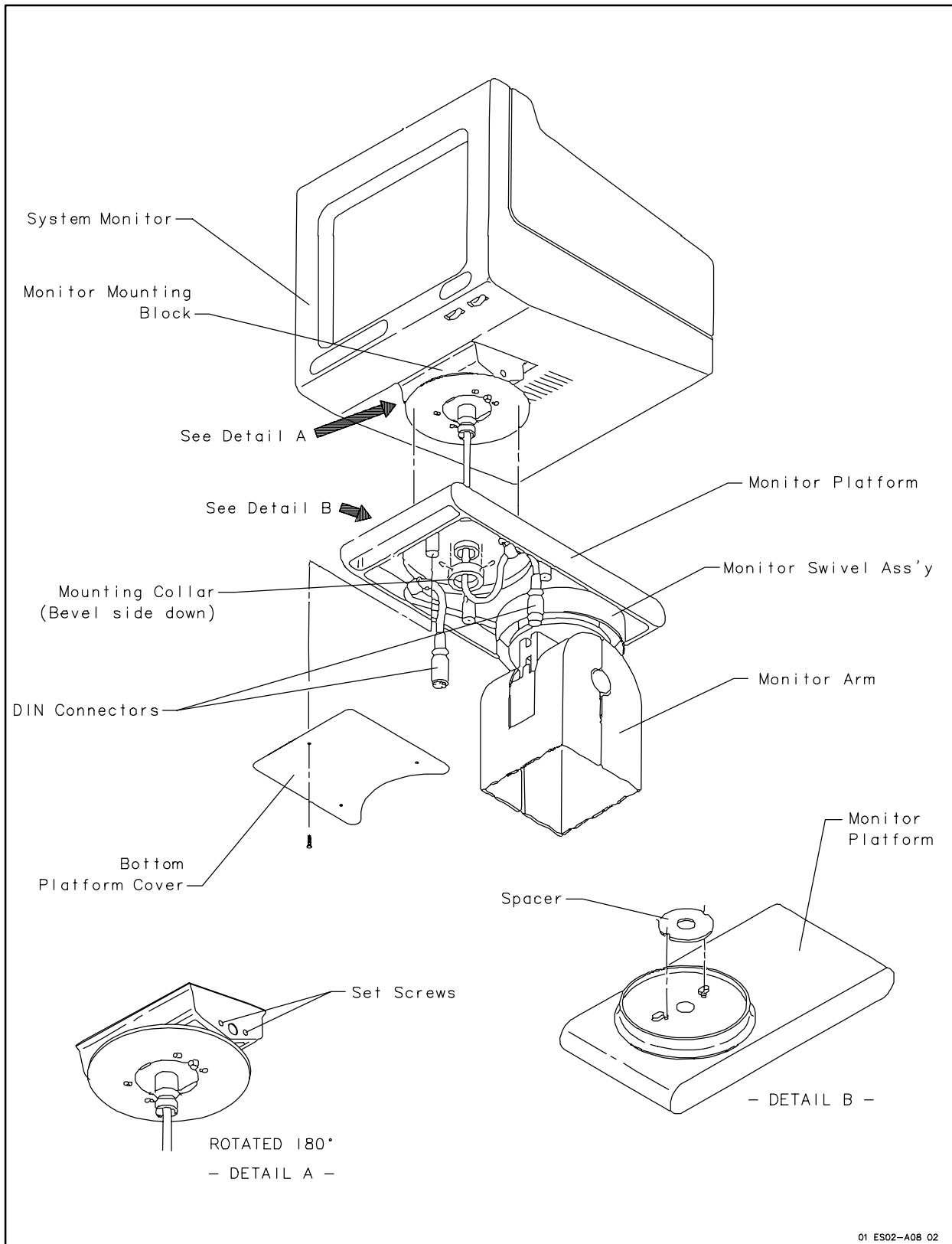
Figure 2B−7.   HFC System Monitor Installation
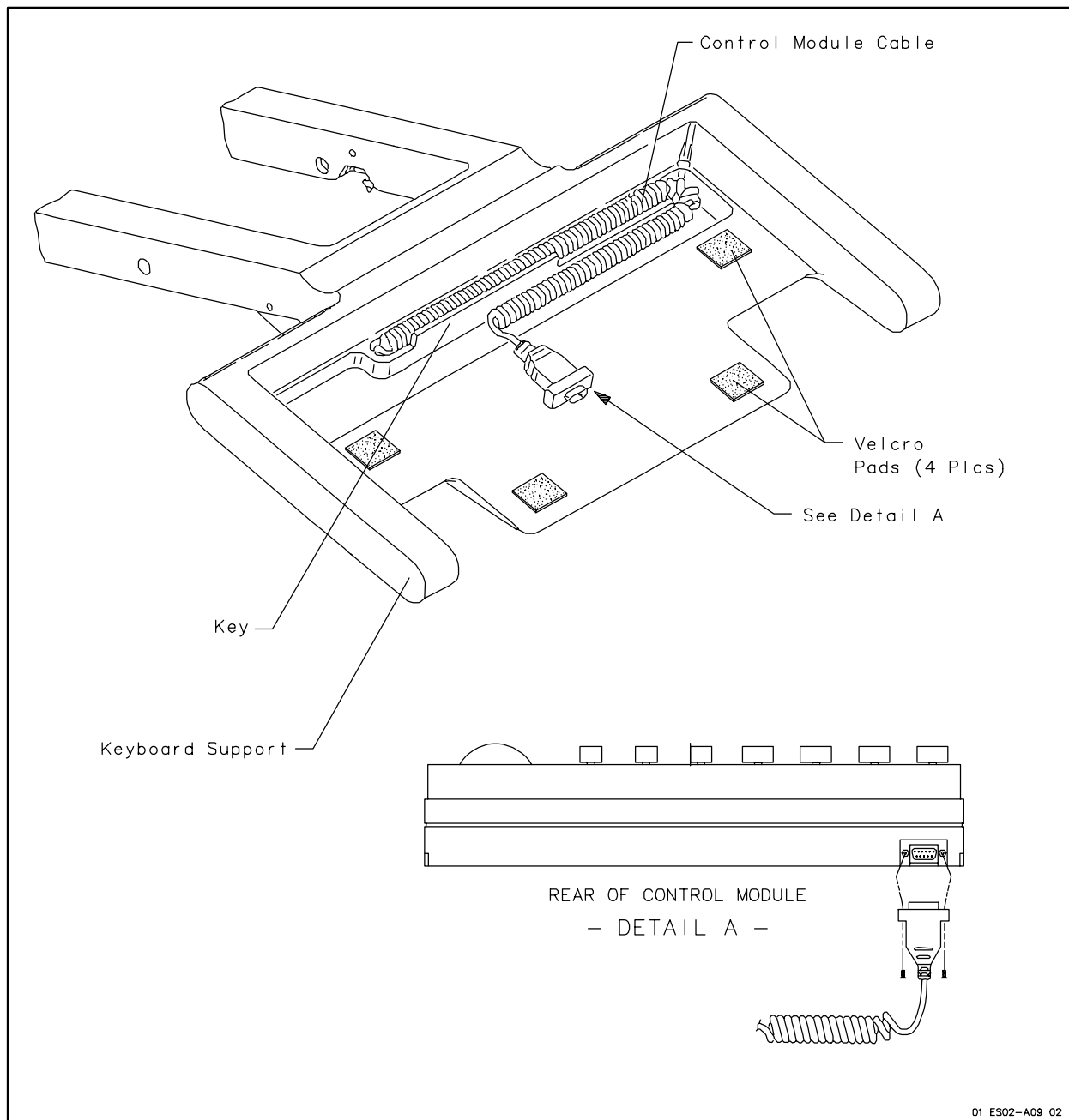
Figure 2B–8.   HFC Control Module Installation

NOTE: *Control setups are included only for peripherals shipped with new systems due to the variety of OEM types that may be shipped with refurbished systems. Please refer to the appropriate OEM field service manual for other cabling details and switch settings.*

10. If the system is configured with an internally mounted VCR, verify the cable connections per **Figure 1C-2.**

11. If a generic (user-supplied) VCR is to be connected, the system must be configured with a generic VCR panel assembly. Use cables supplied with the VCR or obtained at a local electronics supply stores. No provision is made for mounting external VCRs to the cart.

12. Verify the switch settings on the VCR. Refer to **Table 2B–1** through **Table 2B–5**.

Table 2B–1. BR1600 Control Settings

Control	Setting
Front Panel	
POWER	OFF[1]
SP/EP REC LENGTH	SP
MEMORY	OFF
Rear Panel	
TRACKING	FIX
Top Panel	
RF	CH3 (L)

1. Turn on only after system power.

Table 2B–2. AG-5700 Control Settings

Control	Setting
Front Panel	
AUDIO OUT SELECT	L AND R
HI-FI LEVEL, L/R	Both 3:00
2H/6H (NTSC Only)	2H
Rear Panel	
AUTO REPEAT	OFF
SENSOR RECORD	OFF
MODE LOCK	OFF
S-VHS	ON
VIDEO	LINE

Table 2B–3. AG-6400/7400 Control Settings

Control	Setting	
	AG-6400	AG-7400
Front Panel		
POWER	ON	ON
LIGHT	ON	
CAMERA REMOTE	OFF	
S-VHS		ON
TRACKING	CENTER	CENTER
SLOW TRACKING	CENTER	CENTER
AUDIO LIMITER	ON	ON
NORMAL/HD LEVEL	5	5
AUDIO SELECTOR	NORMAL	NORMAL
AUDIO DUB	OFF	OFF
MEMORY	OFF	OFF
Side Panel		
HEADPHONE LEVEL		CENTER
AUDIO IN SELECT		HD OFF
Bottom Panel		
CAMERA EXT AUDIO IN	OFF	OFF
FRAME	ON	
AUDIO DUB		CH2
VERTICAL LOCK ADJUST		CENTER
Rear Panel		
DOLBY NR	OFF	OFF
YC FILTER		OFF
FRAMING		OFF
DETAIL		OFF
PICTURE QUALITY		CENTER

Table 2B–4.   NV-180 Control Settings

Control	Setting
Front Panel	
TAPE SELECT	T180
CAMERA SELECT	NORM
Side Panel	
LIGHT	ON
Bottom Panel	
COLOR	AUTO

Table 2B–5.   AG-2400 Control Settings

Control	Setting
Front Panel	
CAMERA REMOTE	OFF
POWER	ON
TRACKING	FIX
SLOW TRACKING	CENTER
SPEED	SP
TAPE REMAIN	NORM
MEMORY	OFF
AUDIO DUB	OFF
Side Panel	
RF OUTPUT/LIGHT	ON
CONVERTER	CH3

13. Reinstall rear panel cover using mounting screws.

14. If a Lenzar 2100 Multi-Image Camera is included, connect IMAGE PRINTER connector (D-SUB on underside of rear OEM bezel) to 2100 MIC using cable, part number 3500-0623-01.

15. Verify the switch settings on the MIC. Refer to **Table 2B–6**.

16. If included, connect a serial Report Printer to either connector K (left-most sub-D) on Data Comm Module or to the printer interface panel with cable, part number 2275-0170. No provision is made for mounting printer to cart.

Table 2B–6.   Recommended Settings for Medical Recording Film/Paper

Parameter	Film[1]	Paper[2]
User Number	N/A	N/A
Input Number	N/A	N/A
Exposure Time	T1	T1
Image Polarity	IMG+	IMG+
Brightness	B70	B115
Contrast	C180	C210
Image Sequence	N/A	N/A
Multiple Interlace	INOR	INOR

17. Verify the switch settings on the printer. Refer to **Table 2B–7**.

18. Perform a printer self-test.

19. Confirm report printer switch settings by printing either a cardiac or obstetrical report. Refer to the Operation Manual for this procedure.

NOTE: *If the report is double spaced, verify the printer Line Feed switch is set to OFF.*

20. If an external video printer is included, connect the video out BNC (on underside of rear OEM bezel) to printer using the cable supplied with the printer.

21. Verify the switch settings on the video printer. Refer to **Table 2B–8**.

22. Connect scanheads to appropriate connectors on EM front panel.

23. Remove and discard packing material. Clean up the area where the system was uncrated.

Table 2B–7. Okidata Microline 184 DIP Switch Settings

NOTE: These settings are for serial printers. NLQ setting will make printing extremely slow.

SWITCH	1	2	3	4	5	6	7	8
Control Circuit Board								
CHARACTER SET								
ASCII with 0	OFF	OFF	OFF					
ASCII with O	ON	OFF	OFF					
British	OFF	ON	OFF					
German	ON	ON	OFF					
French	OFF	OFF	ON					
Fr. Canadian	OFF	ON	ON					
Spanish	ON	ON	ON					
PAPER LENGTH								
5.5"				OFF	OFF			
8.5"				ON	OFF			
11.0"				OFF	ON			
14.0"				ON	ON			
LINE FEED						OFF		
DATA BITS (8)							ON	
FIRMWARE SWITCH								OFF[1]
High Speed Serial Interface Board (one switch on PCB)								
BUSY SIGNAL POLARITY	OFF							
BAUD RATE (9600)		ON	ON	ON				
NOT USED					OFF			
PARITY (ON/OFF)						OFF		
DTR BUSY-LINE							OFF	
NOT USED								OFF
Super Speed Serial Interface Board (two switches on PCB)								
SW1								
PARITY (EVEN/ODD)	OFF							
PARITY (ON)		ON						
DATA BITS (8)			ON					
PROTOCOLS				ON				
SERIAL CABLE TESTS					ON	ON		
BUSY SIGNAL LINE/POLARITY							OFF	ON

SW2								
BAUD RATE	OFF	ON	ON					
DSR INACTIVE				OFF				
PRINT BUFFER/BUSY SIGNAL					OFF			
BUSY TIME						ON		
NOT USED							OFF	OFF

1. **Do not adjust.**

Table 2B–8.   UP-860/870 Video Printer Control Settings

Control		Setting
Front Panel		
ON/OFF	Power	ON
CONTR		Centered
BRIGHT		Centered
THRU/EE		THRU
POSI/NEGA		POSI(tive)
Rear Panel		
GAMMA		II
DIP SW 1	Paper type	OFF (always)
DIP SW 2	Paper type	ON (Type II, High Density)
DIP SW 3	Postfeed	ON (off to conserve paper)
DIP SW 4	Aspect	ON
DIP SW 5	Memory	ON
DIP SW 6	Direction	ON (Bottom first)
DIP SW 7	Scan	ON
DIP SW 8	Scan	ON
DIP SW 9	Video input type	ON (B/W) OFF (color)[1]
DIP SW 10	75 ohm termination	ON
D ADJ		Centered

1. Set DIP SW 9 to OFF to print from color video (print will be black and white).

24. Move the system to its operational location.

25. Continue with paragraph 2B–4.9, Line Voltage Verification.

2B–4.8   UM-4A Assembly

1. Position front OEM bezel on locating pins and secure with two screws.

2. Position both A2 ground straps over bushings on EM so that when front shield is installed, ground straps are secured between shield and bushings by mounting screws. Install front shield over card cage and secure with five screws.

3. Position front EM bezel on locating pins and secure with two screws.

4. Position back cover on OEM and secure with two screws.

5. Connect footswitch assembly cable to connector located on lower left front corner of EM. Lock connector in place using captive screws in connector.

6. Hang storage bin on front bezel of EM.

NOTE: *Before installing a peripheral not shipped with or configured specifically for the UM-4 system, call ATL Technical Support for information on compatibility and installation. This includes peripherals originally purchased for use with other ATL products.*

7. Reinstall EM rear panel cover using mounting screws.

8. Connect scanheads to appropriate connectors on EM front panel.

9. Remove and discard packing material and shipping containers. Clean up the area where the system was uncrated.

10. Move the system to its operational location.

11. Continue with paragraph 2B–4.9, Line Voltage Verification.

2B–4.9   Line Voltage Verification

WARNING: *If the outlet for the system has not been checked during a Pre-site Inspection using the Power Primer (4760-0215-XX) or Section 3, Power, in the General Field Serivce Manual (4720-0219-01), do so before proceeding. Complete appropriate paperwork.*

1. Utilizing your three pronged outlet test plug and Multimeter, verify proper outlet wiring and voltage levels.

WARNING: *Do not connect the system if a wiring fault is discovered. Advise customer immediately. Proceed only after the fault has been corrected.*

2. Continue with **Section 2C**, Performance Tests then return to paragraph 2B–4.10 below.

2B–4.10   In-Service Preparation

1. Adjust the ambient lighting and align the monitor brightness and contrast to operator preference.

2. Use the applicable procedures in the OEM Service Manuals to adjust hardcopy quality to customer preference. It is advisable to gain final approval from the end user of the hardcopy rather than to rely on your own personal preference or that of the sonographer. Retain the final hardcopy for insertion into the Customer Information Directory (CID).

3. Program the institution name, date and time.

4. Repeat verification of electrical power quality using the UM-4 and its external OEMs as the final load. Also review the ambient temperature, RF and ESD conditions recorded earlier. Record all measurements and observations on the Installation FSR. Verify that the tested outlet is clearly marked.

5. Install any Manual Changes and Operation Notes into the Operator's Manual. Separate OEM manuals can be inserted into the pouches of the same manual. Have the Operator's Manual and the Operator's Reference Guide handy for review with the system operator so that questions can be answered during their in-service.

6. If a CID was not presented during a Pre-Installation Inspection, update a CID for presentation during the in-service. Insert all hardcopies taken during system set-up.

7. Complete and attach a PM sticker to the left side of the monitor.

8. Position the system in the optimal location to perform an in-service. Install cable management hooks as required. Make sure that the area is cleared of any materials used during the installation process and that your tools and test equipment are removed. This is "first impression time" for their new system.

9. Notify the facilities representative that the system is installed and ready for any safety tests that they normally conduct.

2B–4.11 Customer In-Service

1. Once you're sure that the system and the lab are ready, bring the staff into the room. Introduce the system and *review the COA* with them to familiarize them with the system and its options and to assure that they have received what they ordered (or thought they ordered).

2. Begin the in-service by presenting the Operator's Manual and the Reference Guide. Show the major sections of these manuals and emphasize that all the information needed to operate the system and its peripherals is in them. As questions come up during the in-service, it is beneficial to guide the operators through these manuals.

3. Show the operators how to power-up the system and any external OEMs.

4. Once the system is fully booted, give the operator a quick tour of system controls and describe the philosophy behind the use of the plasma display (or Hardkeys depending upon configuration) and its associated functions. Be sure to include all front panel controls:

   - Monitor Brightness and Contrast controls
   - Rotary Controls – Power, Zoom, Depth, Imaging Gain, Doppler Gain
   - Softkey – (contains higher level controls, tracks modality functions, e.g., S-FUNC and <CTRL>)
   - TGC Slide Pots
   - Hardkey – Mode, Image Processing, VCR and Measurement keys, Rotary TGC
   - Trackball
   - Keyboard – Alphanumeric controls
   - Volume control
   - All Transducer Ports including Scanheads and ECG
   - Monitor arm and Keyboard latches

5. Describe the hardcopy devices provided with the system and have the operator reload the applicable OEM paper, VCR tapes, film, etc*.*

6. Demonstrate the New Patient (<CTRL>–P) function.

7. Demonstrate the Patient Data Entry function.

8. Demonstrate the Xducer Select function.

9. Discuss the philosophy behind the system and scanhead-specific defaults and how they are used to quickly program the system for specific applications.

10. Discuss and demonstrate how to connect and disconnect scanheads.

11. Describe and demonstrate the primary 2D controls:

    - Mode Select, Depth, Focus, Gain, Power, TGC, Freeze
    - Cineloop Image Review

12. Describe and demonstrate the keyboard-based Annotation function.

13. Describe and demonstrate the primary 2D Measurement controls;

    - Show the operator the appropriate section in the Operator's Manual

- Linear measurements
- Circumference measurements
- OB Analysis

14. Describe and demonstrate the use of the VCR and Hardcopy Devices:

- Exposure controls – Print button, Footswitch, OEM Exposure control
- VCR controls – Softkey, Hardkey or VCR controls

15. Discuss and demonstrate the primary M-Mode controls:

- Mode Select, Depth, Gain, Power, TGC, Freeze
- M-Line Position

16. Discuss and demonstrate the primary Doppler controls:

- Modality Select, Depth, Gain, Power, Freeze
- Sample Volume Positioning
- Velocity Range
- S-FUNC and <CTRL> controls

17. Describe and demonstrate system maintenance procedures:

- System cleaning
- Scanhead disinfection
- B/W Printer head cleaning

2B–4.12   Customer Acceptance

1. Discuss the present status of the system with your customer and review hardcopies. Be sure to cover any environmental concerns as well, making suggestions as appropriate.

2. Present your customer with their CID and review each section. If this was done at the Pre-Installation Inspection, review it again. Topics to be covered include;

- The system's SO #
- System warranty
- ATL support phone numbers
- Service call process (set expectations for response times)
- Scanhead replacement process
- Supplies and consumables
- Continuing Education and BMET training
- Extended warranty programs (look for and act on buying signals)

3. Ask your customer if there are any other issues or concerns that they have with their new system or with ATL. Document them on the Installation FSR and make a commitment to follow-up on those issues.

2B–4.13   Installation Closure

1. Complete the Installation FSR in full. If the installation is 100% complete, the call may be closed with CSC. If problems were encountered, document them on the Installation FSR along with any parts used, in addition to labor and travel times. If the installation is not complete, hold the Installation FSR open and complete it at the conclusion of the installation.

2. Have your customer sign the Installation FSR and insert it in the CID.

3. Call CSC and advise them of the status of the installation. Be prepared to provide them with the following information;
   • Verification of the SO #
   • Verification of customer name, address, contact and phone number
   • Information relevant to the quality of the system and its installation
   • Any other information that the CSR feels pertinent to his new customer

4. Notify Sales on the status of the installation. If there are issues that will affect the Applications in-service, advise the Applications Representative or the Regional Clinical Specialist.

5. Time-activate a commitment in your Day Planner to make a follow-up phone call to your customer within several days and again one week after completion to assure satisfaction with their new system.

6. Retain a copy of system records and create a file for your new account.

7. Submit the Installation FSR and the Pre-Installation FSR (if done at the time of Installation) via normal procedures.

2B–4.14   Customer Follow-Up

1. As per your commitment in your Day Planner, call your customer and verify that they are satisfied with their system's performance.

2. Verify that Applications has been scheduled and take ownership of any concerns that the customer presents to you.

3. Again, time-activate your commitment to make a follow-up call to your customer once those issues have been resolved and report them to CSC as applicable.

2C–1   Introduction

This section contains a series of performance tests to be performed on the Ultramark® 4 Ultrasound system following installation, upgrade, or repair. The purpose of these tests is to verify the correct operation of the system hardware and firmware. Tests described in paragraphs 2C–4 through 2C–11 apply to the UM-4 system core and must be performed on all UM-4 systems at the time of installation, regardless of configurations or options. The remaining performance tests apply to specific options or configurations and must be performed at the time of installation as applicable.

WARNING: *Caliper measurement accuracy and Monitor aspect ratio must be verified after installation, after every repair involving PCB replacement or power supply adjustment, and during every preventive maintenance inspection.*

WARNING: *Wrist straps should not be worn when working on a system when it is powered on. The +5 VDC supply is a very high current supply. Use caution when troublshooting.*

NOTE: *Before performing these tests it is recommended that the site power be inspected in accordance with the pre-site inspection procedures detailed in the Site Inspection section of the General Field Service Manual.*

2C–2   Test Equipment and Materials

- CSR Tool Kit   (193-90003-01)
- Scanheads   (as required)
- RMI Model 413A Tissue
  Phantom (0.7dB)   (199-12204-00)
- Linearity Graticule   (198-19079-00)
- ECG Cable Kit   (101-20357-11)
- Aquasonic Gel   (2301-0378-01)
- Dynatech Model 232A
  Safety Analyzer   (if available)
- Peripheral supplies   (as required)

2C–3   Initial Set-Up Procedure

WARNING: *The following series of tests requires applying power to the system while the protective covers are removed. Dangerous voltages are present. Use extreme caution.*

WARNING: *The five-volt power supply produces high current. Do not wear wrist straps while power is applied to system.*

The following set-up procedure is used to prepare the UM-4 for System Core Performance Tests.

1. Disassemble the UM-4 for electrical inspection as described in Section 2B.

2. Connect available scanheads to the appropriate connectors on the UM-4.

3. Ensure that the peripherals contain paper, film or cassettes, as required.

4. Connect footswitches, headphones, ECG devices, as required and available.

5. Connect the power cord to a hospital grade AC outlet, specifically: *a single branch circuit, 15 or 20 Ampere, 120 Vac, with an Isolated and Insulated ground wire* (or the equivalent International circuit).

NOTE: *Table 2C–1 (Performance Tests Matrix) is included for reference only. It lists only those tests specific to the PCB indicated. Additional tests should be performed to verify all system functions are operational. This is especially true when cables not associated* *with the replaced PCB must be disconnected during replacement. If not reconnected, another service call will be required when the operator discovers the error the next day during an examination.*

Table 2C–1.   Performance Test Matrix

When Replacing this PCB:	Part Number(s)	Then perform these tests
RF Select	7500-0317	None
Doppler Pulser	7500-0369, 7500-0525	2C–9.3
Beamformer Front End	7500-0288	2C–4; 2C–6; 2C–8.2
Beamformer Focus	7500-0320, 7500-0361, 7500-0549	2C–4; 2C–6; 2C–8.2
Beamformer Controller	7500-0324, 7500-0362, 7500-0548	2C–4; 2C–6; 2C–8.2
Pulse Processor	7500-0313, 7500-0370, 3500-1261/62 (7500-0561)	2C–8.1
Doppler Acquisition		2C–9.3
Doppler Processor	7500-0347, 7500-0390	2C–9.3
Motor Controller	7500-0304, 7500-0348, 7500-0517	2C–8.1; 2C–9.1; (2C–10; 2C–11 for CAD systems only)
2D Scan Converter	7500-0273, 7500-0314, 7500-0315, 3500-1413/14 (7500-0778), 3500-1425/26 (7500-0798)	2C–4; 2C–7; 2C–8.1; 2C–9.4
TM-Mode	7500-0322	2C– 4; 2C–9; 2C–9.1; 2C–9.2; 2C–9.3; 2C–13
TM Auxiliary	7500-0374	2C–9; 2C–9.1; 2C–9.2; 2C.9.3; 2C–9.3.1
TM-Combo	7500-0411	2C–4; 2C–9; 2C–9.1; 2C–9.2; 2C–9.3; 2C–13
Display Controller	3500-1409/10 (7500-0300)	2C–3; 2C–4; 2C–6; 2C–7; 2C–8.2; 2C9.1; 2C–9.2; 2C–9.3; 2C–9.4; 2C–10
System Controller	7500-0312	2C–3; 2C–8.2; 2C–6; 2C–9.4; 2C–9.2

2C–4   Power-Up and Initialization Test

The initial setup procedure consists of turning on power, observing the initialization routine, verifying system configuration using the hidden defaults (<CTRL>-L) and the customer order acknowledgement (COA), testing the user interface with the control panel test, and adjusting the monitor for optimal viewing.

The following test requires careful observation of the system during its power-up and boot-up routines (a successful boot is indicated by a sector or linear display appearing on the monitor with all graphic annotations present, refer to **Figure 2C–1** or **Figure 2C–2**). If the system successfully completes its power-up routine, it can be assumed that the following parts of the system are operating:

- System Controller PCB
- Serial communication link between the Control Module and the System Controller PCB
- Softkey display
- Pulse Processor PCB
- Motor Controller PCB (if present)
- 2D Scan Converter PCBs
- Display Controller PCB
- Beamformer Controller PCB (if present)
- Doppler Processor PCB (if present)
- Monitor
- CAD Module (if present)

NOTE: *It is possible that portions of the listed components may be defective (signal path*

components, etc.) but this test assumes that there is communication between the PCBs and that the Monitor is functioning.

1. Set the POWER switch to ON.

2. On the system peripherals, observe and verify the following as applicable:

   a. VCR STOP indicator LED is on.

   b. Linescan Recorder or Page PrinterPOWER switch is illuminated.

   c. Multi-image Camera displays warm-up time count.

3. Verify the following:

   a. The softkey control panel (if present) displays the Main Panel.

   b. One of the attached scanheads is selected, and if the scanhead is a mechanical acquisition type, the scanhead rotor is turning. (The scanhead selected at power-up is determined by the value set in the default table.)

   c. A sector or linear image is displayed on the monitor, corresponding to the scanhead selected. The information on the display includes the correct scanhead frequency and other data similar to that in either **Figure 2C–1** or **Figure 2C–2**.
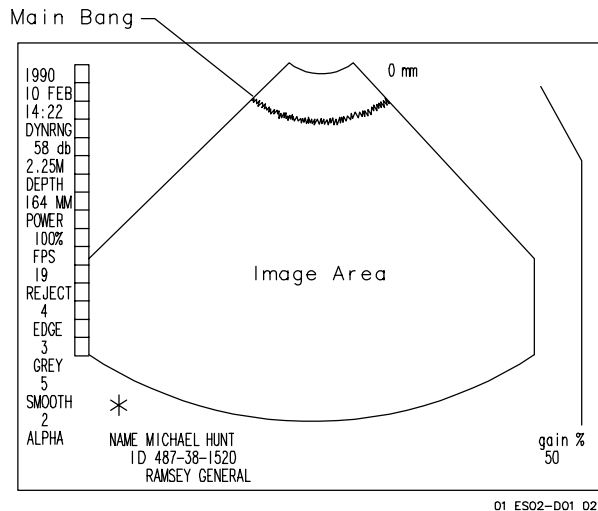
Figure 2C–1.   Sector Display
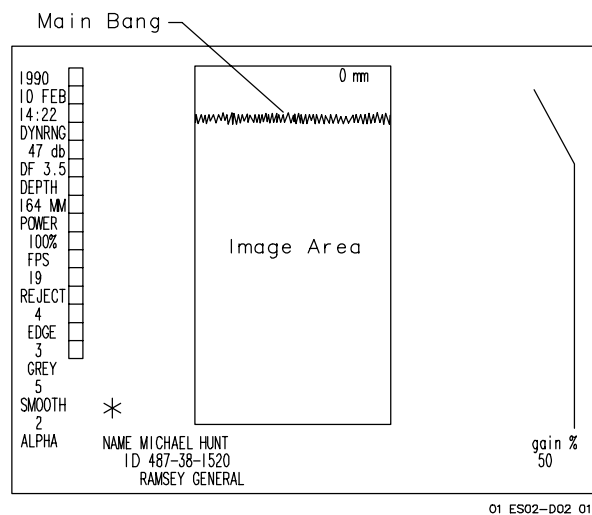
Figure 2C–2.   Linear Display

4. Select a sector scanhead and use a linearity graticule to verify that the sector image is 90.3_ (±1 degree).

5. Check the operation of the monitor CONTRAST and BRIGHTNESS controls:

    a. Rotate the CONTRAST control on the monitor all the way counterclockwise and verify that the screen becomes nearly black.

Rotate the CONTRAST control all the way clockwise and verify that the white areas of the image display bloom. Readjust the CONTRAST control for correct contrast of the 16 gray bars.

    b. Rotate the BRIGHTNESS control counterclockwise and verify that the screen becomes nearly black. Rotate the BRIGHTNESS control all the way clockwise and verify that the screen washes out.

    c. Readjust the BRIGHTNESS and CONTRAST controls for the best display of the gray bars.

6. On the softkey Main panel, press XDR. Press the scanhead keys on the Transducer Select panel and verify that the corresponding scanheads are selected.

7. On the hardkey control panel, press SCANHEAD SELECT repeatedly and verify that all scanheads connected to the system are selected one at a time.

2C–5   System Defaults

This test is used when installing a system to ensure that certain system defaults are correctly set. This procedure is not required for upgrade or repair unless default changes or reentry are necessary, for example, before replacing the System Controller PCB.) **Table 2C–2** lists the defaults for pre-25X systems (refurb) or **Table 2C–3** for 25X and up systems. These recommended settings are merely starting points which the operator can change as needed to suit individual requirements.

1. Compare the default values in **Table 2C–2** or **Table 2C–3** against those of the system under test.

NOTE: *Change default settings only on systems being installed. Do not change operator-set default values unless requested to do so by the operator.*

    a. Pre-25X systems: press the alpha-numberic key(s) corresponding to the default name on the monitor display and press ENTER. Change values as necessary.

    b. 25X or higher: select scanhead, change parameters then press<CTRL>-U and select YES. Press ENTER.

Table 2C–2.   Recommended Image Quality Default Settings For Pre-25X Systems

2D REJECT	1	(40dB)
2D GRAY SCALE	1	(Curve 1, normal)

EDGE ENHANCEMENT	1	(Filter)
POWER OUTPUT	5	(50%)
M-MODE GRAY SCALE	1	(Curve 1, normal)
SMOOTHING	1	(No averaging)
DYNAMIC RANGE	0	(40dB)

2. Pre-25X systems, only:

    a. After making changes, exit the menu by pressing DEL. This stores the changes in nonvolatile memory and resets the system using these new default values.

NOTE: *Do not turn the system power off before pressing "DEL" or new defaults will be lost.*

    b. Enter the default mode again and verify that parameters have been reset to the values you entered in step 3.

    c. Press DEL to store the settings and exit from the default table.

Table 2C–3.   Recommended Image Quality Default Settings For 25X (and above) Systems

Scanhead	Dynamic Range	Depth[1]	Gain/Power[2]	Reject	Edge	Gray	Smooth	Focal Zones
3.5 MHz DFT	58	160	74% 79%	1	2	3	F2	1, 2, 3
5.0 MHz DFT	58	127	85% 49%	1	2	3	F2	1, 2, 3, 4
7.5 MHz HRLA	47	48	85% 79%	1	2	3	F2	1, 2, 3, 4
5.0 MHz HRLA	58	50	49% 49%	1	2	3	F3	1, 2, 3, 4
3.5 MHZ CLA 76mm	58	158	49% 30%	1	2	3	F2	1, 2, 3
3.5 MHz CLA 40mm	47	149	49% 30%	1	2	3	F2	All

Scanhead	Dynamic Range	Depth[1]	Gain/ Power[2]	Reject	Edge	Gray	Smooth	Focal Zones
5.0 MHz CLA 40mm	47	111	49% 30%	1	2	3	F2	1, 2, 3, 4
5.0 MHz IVT 11mm	47	109	79% 75%	1	2	3	F2	All
5.0 MHz TRT	47	80	85% 24%	1	2	3	F2	1, 2, 3, 4
5.0 MHz IVT	47	159	100% 100%	1	2	3	F2	
5.0 MHz MFI	47	64	57%[3] 69%	1	2	3	F2	
7.5 MHz MFI	47	64	100%[3] 69%	1	2	3	F2	
7.5 MHz ICT	47	88	100% 100%	1	2	3	F2	
5.0 MHz M/L Access A	47	32	100% 100%	1	2	3	F2	
3.0 MHz L Access A	47	164	80% 80%	1	2	3	F2	
3M/5M/7.5S Access A	47	164	79% 79%	1	2	3	F2	
Scanhead	**Dynamic Range**	**Depth[1]**	**Gain/ Power[2]**	**Reject**	**Edge**	**Gray**	**Smooth**	**Focal Zones**
2.25 MHz M Access C	47	164	49% 30%	2	2	2	F2	
3.0 MHz M Access C	47	164	49% 30%	2	2	2	F2	
5.0 MHz M/L Access C	47	111	49% 30%	2	2	2	F2	
7.5 MHz S Access C	47	67	49% 86%	2	2	2	F2	
5S/7.5S/10S Access C	47	111	49% 100%	2	2	2	F2	

1. POWER and GAIN values displayed on the screen may vary ± 1 digit but shall not exceed 100%.
2. DEPTH values displayed on the screen can vary ± 3 digits.
3. Select frequency of scanhead then press <CTRL>−P to reset the system before reading.

2C–6 Miscellaneous Controls

To perform steps 1 through 3 on a UM-4 with a softkey control module, first press FORMAT on the main panel.

1. Press B/W and verify that the tonal values of the image and the graybars are reversed (i.e., from black to white or white to black). Return the image to its normal state.

2. Press L/R and verify that the image reverses from left to right (observe the traingle or asterisk in the image area). Return the image to its normal state.

3. Press UP/DOWN and verify that the image is inverted top to bottom. Return the image to its normal state.

4. Perform the following steps to test the real-time clock hardware and software, and the NiCad batteries or Super Caps used to power the clock while the system power is switched off.

   a. Press <CTRL>-Z on the alphanumeric keyboard.

   b. Enter the date and time on the alphanumeric keyboard: day (dd), month (mm), year (yyyy) hour (hh), minute (mm). Leave a space between each element of the date and time.

5. Rotate the OUTPUT POWER control while observing the POWER display on the left side of the screen. Verify that the power level can be varied from 0 percent to 100 percent and that the intensity of the main bang changes.

6. Rotate the DEPTH control. Verify that the depth can be changed, and that as the depth increases, the frame rate decreases.

7. Select PAN/ZONE then:

   a. Move the trackball or joystick to activate the PAN/ZONE cursor and move it to one side of the scan image. (Pan/Zone cursor will disappear several seconds after movement has stopped. Time is set under 2D defaults.)

   b. Rotate the ZOOM control clockwise and verify that the display zooms in on the area of the image targeted by the PAN/ZONE cursor. The cursor should be in the center of the screen at the end of the zoom.

2C–7   Monitor Aspect Ratio

WARNING: *This procedure only validates Monitor alignment but must be performed before validating measurement accuracy in paragraphs 2C–8.1 and 2C–8.2.*

1. Set the "+" calipers horizontally centered, 100 mm apart on the display.

2. Set the "x" calipers vertically centered, 100 mm apart on the display.

3. Physically measure and compare the distances between the two pairs of cursors. Verify that the distances are within .05 inches (1.25mm).

2C–8   Mechanical Scanheads (Including Annular Array)

NOTE: *While Annular Array scanheads (AA) are mechanical scanheads, they are also arrays whose signal paths are through the Beamformer. Also perform the Linear tests in paragraph 2C–8.2.*

NOTE: *TRT scanheads contain both mechanical and linear scanheads. Test TRTs using paragraphs 2C–8.1 and 2C–8.2 as appropriate.*

2C–8.1   AA, Access, 724B, EFT, BFT, IVT, MFI, ICT, or TRT Sector Scanheads

1. Select the AA, Access, 724B, EFT, BFT, IVT, ICT, MFI or TRT sector scanhead by pressing SCANHEAD SELECT on the hardkey control panel or by pressing AA, ACCESS or EFT on the softkey Transducer Select panel.

2. Use this step to check only multi-frequency scanheads:

   a. On the hardkey control panel, press DYNAMIC FOCUS to select each of the three transducers on the scanhead.

   On the softkey control panel, press 2DPROC on the Main panel, then press FOCUS on the 2D Image Processing panel to select each of the three transducers on the scanhead.

   On MFI scanhead, use switch to select each transducer.

   b. Verify that the transducer frequency (displayed on the left edge of the screen) changes as you select the transducers. Also verify that the frame rate changes as the transducers are selected. Select the lowest transducer frequency.

3. Set the controls on the UM-4 Control Module as follows:

POWER OUTPUT	100 percent
REJECT	1 (Special Function O)
EDGE ENHANCEMENT	1
GRAY SCALE	5
SMOOTHING	F1 (<CTRL>-B
DYNAMIC RANGE	58 dB (47 dB, $\leqq$ 16X)
DEPTH	200mm (approximately)

4. Cover the phantom surface with about 1/8 inch (3 mm) of water or a coat of acoustic gel.

2C

5. Position the scanhead on the phantom to obtain an image showing all depth markers, cysts, horizontal and axial resolution pins (refer to the Scanhead section in the General Field Service Manual 4720-0213-05 for definitions of the following parameters).

6. Verify that the image meets the following requirements:

Jerk	< 1/2 the width of 4 cm depth marker
Jello	< 1/2 the width of 4 cm depth marker
Wobble (check at all depths)	No gross lateral movement; wobble should be restricted to the edges of the pie shape and shared equally by the near and far field. Wobble shall not exceed 4 scan lines.
Static Noise	Must be minimal: < 5 instances per sector scan
Scanhead Motor Noise	< 3 instances per sector scan
Tearing	No sector edge tearing allowed
Penetration	≥ **Table 2C–4** or **Table 2C–6**

7. Use the DEPTH control to set the display depth to the minimum value. Verify that there is no sector break-up.

8. Set the depth to 15 cm. Position the scanhead on the tissue phantom to provide the best image. Press FREEZE and evaluate the frozen image for the following qualities.

Penetration Specifications	≥ **Table 2C–4** or **Table 2C–6**
Axial Resolution	within **Table 2C–4** or **Table 2C–6** specifications

9. Check the spatial accuracy of the image using the system's measurement functions:

NOTE: *Monitor Aspect Ratio verification, paragraph 2C–7, must be performed before continuing.*

a. Couple the probe to the RMI phantom and obtain an image that clearly shows the horizontal and vertical rows of pins.

b. Ensure that the ultrasound scanning plane is perpendicular to the pins.

c. Adjust so all pins can be viewed.

d. Press FREEZE while scanning the phantom. Press MEAS.

e. Press + CAL to display the + caliper cursor.

f. Use the trackball or joystick to position the cursor on the left or right edge of a centimeter marker.

g. Press MARK to lock the first + cursor and call up the second + cursor.

h. Move the second + cursor horizontally and position it on the same side (as in step f) of a centimeter marker 6 centimeters from the first + cursor. Verify the measurement displayed is 6.0 centimeters ±3 mm (±5 mm for EFT, IVT, and TRT sector scanheads).

CAUTION: *Verify Scan Converter and Display Controller frequencies with a 3 MHz Linear or 3 MHz Access scanhead, if available. A 10PV will not meet these criteria with 17.X software (problem was corrected with 23.X). Use the 5S transducer of a 10PV and measure in the far field if no other scanhead is available. Sector IVT/ICT/TRT failure to meet this test may be due to a faulty Motor Controller.*

i. Repeat steps b through h to measure the vertical distance between two pins spaced 8.0 centimeters apart. Verify the measurement displayed is 8.0 centimeters ± 3 mm).

j. Repeat steps b through h for all sector scanheads supplied with the system.

10. Remove the scanhead from the phantom, wipe excess water or gel from the scanhead, and set GRAY to 1. There must be no noise in the image.

11. For multifrequency scanheads, repeat steps 5–10 for each transducer.

Table 2C–4.   Sector Scanhead Image Quality Characteristics

Sector Scan-head Type[1]	Minimum Depth Penetration[2] (cm)	Axial Resolu-tion (mm)	Lateral Resolu-tion (mm) at Focal Point (cm)	Focal Point (cm)	Near Field Artifact (cm)
ACCESS					
A 3L	10.5	1.3	4.2	7.0	2.0
A 3M	10.5	1.3	3.5	4.2	1.5
A 5ML	6.3	0.8	2.2	5.0	1.0[3]
A 5M	5.6	0.8	2.1	3.3	1.0
A 3/5/7.5					
A 3M	10.5	1.3	3.5	4.2	1.5
A 5M	5.6	0.8	2.1	3.3	1.0
A 7.5S	3.0	0.6	1.3	2.3	0.7
A 5/5/7.5					
A 5M	5.6	0.8	2.1	3.3	1.0
A 5S	5.3			2.0	
A 7.5S	3.0	0.6	1.3	2.3	0.7
B 3/5/7.5					
B 3M		1.0 ± 0.5mm	1.8 ± 15%	3.0-7.0	
B 5M		0.60 ± 0.5mm	1.5 ± 15%	2.0-6.0	
B 7.5		0.40 ± 0.5mm	0.9 ± 15%	1.0-4.0	
B 5/5/7.5					
B 5M		0.60 ± 0.5mm	1.5 ± 15%	2.0-6.0	
B 5S					
B 7.5		0.40 ± 0.5mm	0.9 ± 15%	1.0-4.0	
C 2.25M	12.5	1.9	3.1	4.0	1.9
C 3M	10.5	1.3	3.5	4.2	1.5
C 5ML	6.3	0.8	2.2	5.0	1.0
C 5M	5.6	0.8	2.1	3.3	1.0
C7.5S	3.0	0.6	1.3	2.3	0.7
C10 Multi					
5M	6.3	0.8	2.1	3.0-7.0	1.2
7.5S	3.0	0.6	1.3	1.5-4.0	0.7
10S				0.5-2.0	0.5
10 PV 5/7.4/10					
5S	5.3	0.8	2.0	1.9	1.2
7.5S	3.0	0.6	1.3	2.3	0.7
10S	2.0	0.4	1.0	1.0	0.5

1. Refer to Scanhead Matrix in Section 5 for label definitions.
2. Corrected penetration using 0.7 dB/MHz phantom.
3. 5 ML allows light rings at 1.4 cm.

NOTE: *Scanhead specifications not listed are not available. Test for system performance with scanheads that have specifications listed..*

Table 2C–5.   Sector Scanhead Image Quality Characteristics

Sector Scan-head Type[1]	Minimum Depth Penetration[2] (cm)	Axial Resolution (mm)	Lateral Resolution (mm) at Focal Point (cm)	Focal Point (cm)	Near Field Artifact (cm)
DUPLEX CW					
D/D 3.0	12.0	1.0	4.0	7.0	
MERCURY					
DD 2.25	12.5	2.0	3.0	6.5 ± 0.5	2.3
DD 3.0	10.5	1.0	3.0	6.5 + 0.5	2.3
SPECIAL PURPOSE					
IVT 3	7.9	2.0	3.0	4.5	1.5
IVT 5	6.0	0.6	1.5	3.6	0.8
ICT 7.5	4.1	0.5 @ 2.0 ≤ 1.0 @ 4.0	≤ 2.0 @ 1.0- -3.5 ≤ 3.0 @ 3.5- -4.5	2.5	0.7
MFI 5.0	>6.3	≤ 1.0 @ 40 mm	< 2.0 @ 40 mm	3.0 (± 0.5) (21-52 mm)	< 1.5
MFI 7.5	>2.5	1.0 @ 40 mm	< 1.0 @ 20 mm	1.2 (5-17 mm)	<0.8
TRT L5(.5) (Sector, also see Linear table)	4.3	0.8	1.3	2.5	1.0

1. Refer to Scanhead Matrix in Section 5 for label definitions.
2. Corrected penetration using 0.7 dB/MHz phantom.

Table 2C–6.   Annular Array Scanhead Image Quality Characteristics

NOTE: 7500-0362-04 and higher Beamformer Controller PCBs. 7500-0362 and lower PCBs and 7500-0548-XX PCBs do not support Annular Array scanheads.

Sector Scan-head Type[1]	Minimum Depth Penetration (cm)[2]	Axial Resolution (mm)	Lateral Resolution (mm) at Focal Point (cm)	Focal Point (cm)	Near Field Artifact (cm)
AA 3.5M	11.5	< 1.0			2. 9
AA 5M	8.0	< 0.6			2.1
AA 3.5 DBF	10.7	1.0	1.2	4.0	2.2
			2.2	8.0	
			3.0	12.0	
AA 5.0 DBF	8.0	0.6	0.7	2.5	1.5
			1.1	5.0	
			1.4	7.0	

1. Refer to Scanhead Matrix in Section 5 for label definitions.
2. Corrected penetration using 0.7 dB/MHz phantom.

2C–8.2   Linear Scanheads

This test checks the performance of linear and curved linear scanheads and the Beamformer PCB sets used in the UM-4 series.

1. Select LINEAR (softkey) or press SCANHEAD SELECT (hardkey). The scanhead label must be displayed on the left side of the image, for example, "DF 3.5", "35CV76" or "TRT L5".

2. Press FOCUS (softkey 2D Image Processing panel) or DYNAMIC FOCUS (hardkey).

   a. Verify that each key depression adds another focal zone indicator to each side of the image display.

   b. When five zones are displayed, the next key depression must reset the display to a single focal zone.

   c. Move the PAN/ZONE cursor up and down using the trackball or joystick and verify that the focal zone indicators move with the cursor (you may have to press PAN/Z first).

3. Set the controls as follows:

POWER OUTPUT	100 percent
REJECT	1 (Special Function O)
EDGE ENHANCEMENT	1
GRAYSCALE	5
SMOOTHING	F1 (<CTRL>-B)
DYNAMIC RANGE	58 dB (47 dB, $\leqq$ 16X)
DEPTH	180 mm (for 3.5 MHz)
	160 mm (for 5.0 MHz)
FOCAL ZONES	All 5

4. Lightly coat scanhead face with about 1/8 inch (3 mm) of water or a coat of acoustic gel.

5. Perform a tower test (refer to General Field Service Manual).

6. Verify five separate focal zones, and that only one image is displayed.

7. Select the fifth focal zone by selecting the first focal zone and then moving the Pan/Zone cursor down as far as possible. Repeat step 5.

8. Verify that nine reception focal zones are discernable. It may be necessary to adjust the TGC and ZOOM controls for best image.

9. Press <CTRL>-P to reset the Pan and Zoom functions. Ensure that the system parameters remain as set in step 3.

10. Set the depth to 15 cm. Position the scanhead on the tissue phantom to provide the best image. Press FREEZE and evaluate the frozen image for the following qualities.

Penetration Specifications	$\geq$ **Table 2C–7** or **Table 2C–8**
Axial Resolution	within **Table 2C–7** or **Table 2C–8** specifications

11. Check the spatial accuracy of the image using the system's measurement functions:

   a. Press FREEZE while scanning the phantom. Press MEAS.

   b. Press + CAL to display the + caliper cursor.

c. Use the trackball or joystick to cen-
ter the cursor on a centimeter
marker.

d. Press MARK to lock the first + cur-
sor and call up the second + cursor.

e. Move the second + cursor horizion-
tally and center it on a centimeter
marker 6 centimeters from the first
+ cursor. Verify the measurement
displayed is 6.0 centimeters
±3 mm.

f. Repeat steps b through e to mea-
sure the vertical distance between
two pins spaced 8.0 centimeters
apart. Verify the measurement dis-
played is 8.0 centimeters ±3 mm.

g. Repeat steps b through f for all sec-
tor scanheads supplied with the
system.

12. Use thin screwdriver and perform a
tower test for each linear scanhead:

• Verify that eight sections (focal
zones) of the image are discernible.
• Verify that all elements are operating
(there are no drop-outs).

13. Remove the scanhead from the phan-
tom and set GRAY to 1. There must be
no noise in the image.

14. Adjust GRAY to 1 and FAR FIELD
GAIN until far field noise just disap-
pears. Reset GRAY to 5.

Table 2C–7.   Linear Scanhead Image Quality Characteristics
(7500-0362-04 or higher Beamformer Controller

Linear Scan-head Type[1]	Minimum Depth Penetration[2] (cm)	Axial Resolution (mm)	Lateral Resolution (mm) at Focal Point (cm)	Focal Point (cm)	Near Field Artifact (cm)
DFT					
DF 3.5	11.5	0.5	2.0	4.0	2.4
		1.0	2.0	4.0- -8.0	
		1.0	2.0	> 8.0	
DF 5.0	6.6	0.5	1.5	< 3.0	1.7
		1.0	1.5	3.0- -6.0	
		1.0	1.5	> 6.0	
HRLA					
LA 5.0	5.0	0.5 (Zones 1- -3)	1.0 (Zones 1- -4) (0- -30mm)	2.6	1.5
		1.0 (Zones 4- -5)	2.0 (Zone 5) (30- -45mm)		
HFLA					
LA 7.5	3.3	0.25 @ 1 cm	1.0 (Zones 1- -3)		0.5
		0.30 @ 2 cm	2.0 (Zones 4- -5)		
		0.50 @ 3 cm			
		0.35 @ 4 cm			
76CLA					
35CV76	10.0	0.5 @ < 30 mm	2.0 @ < 30 mm		0.5
		1.0 @ 30- -110 mm	3.0 @ 30- -60 mm		
			4.0 @ 60- -75 mm		
			5.0 @ 75- -110 mm		
			6.0 @ > 110 mm		
TRT					
TRT L5(.5) Linear, also see Sector table)	6.0	0.5	1.0	1.0	1.7
			2.0	5.0	

1. Refer to Scanhead Matrix in Section 5 for label definitions.
2. Corrected penetration using 0.7 dB/MHz phantom.

**Table 2C–8. Linear Scanhead Image Quality Characteristics
(7500-0548-XX Beamformer Controller)**

Linear Scan-head Type[1]	Minimum Depth Penetration[2] (cm)	Axial Resolution (mm)	Lateral Resolution (mm) at Focal Point (cm)	Focal Point (cm)	Near Field Artifact (cm)
DFT					
DF 3.5	11.5	0.5 @ 25 mm	2.0	< 12.0	2.4
		1.0 @ 25–100 mm			
DF 5.0	7.5	0.5 @ < 25 mm	1.0	< 6.0	1.7
		1.0 @ 25–100 mm	2.0	> 6.0	
HRLA					
LA 5.0	5.0	0.5 @ < 25 mm	1.0	< 4.0	1.5
		1.0 @ 25–100 mm	2.0	> 4.0	
HFLA					
LA 7.5	3.3	0.5 @ < 25 mm	1.0	< 5.0	0.5
		1.0 @ 25–100 mm			
76 mm CLA					
35CV76	10.0	0.5 @ < 25 mm	1.0	< 20 mm	0.5
		1.0 @ 25–100 mm	2.0	20- -80 mm	
			3.0	> 80 mm	
40 mm CLA					
35CV40	9.5	0.5A < 25 mm	1.0	< 20 mm	0.5
		1.0 @ > 25 mm	2.0	20- -50 mm	
			3.0	50- -80 mm	
			4.0	> 80 mm	
50CV40	7.0	0.5 @ < 25 mm	1.0	> 60 mm	0.5
		1.0 @ > 25 mm			
11 mm IVT					
IVT 5.0	5.0	0.5 @ < 25 mm	1.0	< 20 mm	0.5
		1.0 @ > 25 mm	2.0	20- -40 mm	
			3.0	> 40mm	
TRT					
TRT L5(.5)	6.0	0.5	1.0	1.0	1.7
			2.0	5.0	

1. Refer to Scanhead Matrix in Section 5 for label definitions.
2. Corrected penetration using 0.7 dB/MHz phantom.

2C–9   M-Mode, ECG, Doppler, and Cineloop Tests

The following tests must be performed on systems equipped with M-mode, ECG, Doppler, and/or Cineloop options.

2C–9.1   M-Mode Tests

Use steps 1 through 8 to test the sector/M-mode function, and steps 9 through 16 to test the Linear/M-mode function. Test both functions on systems configured with those functions.

Before beginning these tests, the system should be set up as follows:

• The appropriate scanheads are connected to the system.

• The system is set to its power-up default values except that a sector scanhead should be selected.

• The footswitches are connected to the system.

• The Main panel is displayed on the softkey control panel.

1. On either the softkey control panel or the hardkey control panel, press M-LINE.

2. Verify that a sector image with the M-line bisecting it is displayed.

3. On the softkey M-line panel, press M-MODE or, on the hardkey control panel, press 2D/TM.

4. Verify that M-mode is selected and that the M-mode markers scroll across the screen.

5. Repeat steps 3 and 4 using the 2D/TM footswitch.

6. Move the trackball or joystick and verify that the M-line cursor moves in response to it.

7. On the softkey M-mode panel, press FRZ or, on the hardkey control panel, press FREEZE. Verify that the image is frozen and returned to real time with alternate key depressions.

8. Repeat step 7 using the FREEZE foot-switch.

9. On the softkey control panel, press RETRN, RETRN, XDR, and LINEAR to select the DFT scanhead. On the hardkey control panel, press SCAN-HEAD SELECT until a linear scanhead is selected.

10. Verify that the linear image is displayed in the center of the screen.

11. On either the softkey control panel or the hardkey control panel, press M-LINE.

12. Verify that the real-time linear image is displayed on the left, and that the M-mode markers scroll across the rectangle on the right.

13. Press the 2D/TM footswitch several times and verify that the display switches between the M-mode split screen format and the full screen M-mode format.

14. Move the trackball or joystick and verify that the M-line cursor moves in response to it.

15. On the softkey control panel, press FRZ or, on the hardkey panel, press FREEZE. Verify that the image is frozen and returned to real time with alternate key depressions.

16. Repeat step 15 using the FREEZE footswitch.

2C–9.2   ECG Test

Before beginning this test, the system should be set up as follows:

• A sector scanhead is connected to the system.

• The system is set to its power-up default values except that a sector scanhead is selected.

• The footswitches are connected to the system.

• The Main panel is displayed on the softkey control panel.

1. Connect an ECG harness to the UM-4 ECG connector on the Scanhead Connector Panel.

2. Connect the ECG harness to a subject. (For this test, the technician performing the test may also act as the subject.)

3. On the softkey Main panel, press ECG, and on the ECG panel, press ECG ON. On the hardkey control panel, press ECG/TRIGGER.

4. Verify that the ECG trace begins to scroll across the bottom of the 2D image.

5. On the softkey control panel, press TRGSEL or, on the hardkey control panel, press TRIGGER SELECT.

6. Verify that the solid line on the right end of the ECG display (Trigger Cursor 1) has changed to a dotted line (Trigger Cursor 2). Verify that the trackball or joystick moves the trigger point on the trace (while the dotted line remains stationary).

2C–9.3   Doppler

If an Access scanhead with a Doppler arm is used with the system under test, connect it to the system before beginning this test. A CW static transducer should also be connected if used with the system.

1. Press XDR, then press ACCESS on the Transducer Select panel to select the connected mechanical scanhead, and press RETRN.

2. Press FOCUS on the 2D Image Processing panel to select a transducer frequency.

3. Press DUPLEX. The M-line is superimposed on the 2D display. The sample volume/flow volume are positioned on top of the M-line.

4. Rotate the trackball from side to side and verify that the M-line moves in response.

5. Rotate the trackball from front to back and verify that the sample volume/flow volume cursor moves up and down the M-line in response.

6. If the scanhead connected has a Doppler arm, press LCLRMT and verify that the controls on the scanhead operate the M-line and the sample volume/flow volume cursor. Press LCLRMT again to return control to the system.

7. Verify that ANG LT and ANG RT rotate the flow cursor in the corresponding direction and that the angle annotation on the screen changes in 2-degree increments. Also verify that in special function mode, the left and right arrow keys on the keyboard rotate the flow cursor continuously when pressed and held.

8. Operate SV INC and SV DEC controls on the Duplex panel and verify that the sample volume cursor can be sequenced up and down through eight sizes, and that the display contains the appropriate annotation for each size. The sizes are 1.5, 2.0, 3.0, 5.0, 10, 15, 20, and 25 mm.

9. Press DOP or PDOP on the Duplex panel. Doppler acquisition should begin; a spectral display is scrolled across the screen while a reduced 2D image is displayed in the upper left corner of the screen. White noise may be heard from the speakers.

10. Press DOPSET. Press DEL UP and verify that the periodic update of the 2D image halts. Pressing DEL UP again should delete the 2D image, and pressing it a third time should restore the image and updating.

11. Press RETRN. Verify that pressing W FIL causes the display annotation for the wall filter to sequence through the following settings: 50, 100, 200, 400, 800, and 1600 Hz.

12. Verify that VEL INC and VEL DEC change the scale annotated on the right side of the display in the corresponding direction.

13. Press BASE and verify that the baseline shifts from its default position through a series of eight positions, one per keystroke. Leave the baseline in a position other than its original position.

14. Press DOPSET. On the Doppler Setting panel, press ZERO and verify that the baseline returns to its original (default) position.

15. Press SWEEP and verify that the scrolling display changes to one of three speeds with each key depression.

16. Turn up the system volume control (located on the right side of the human factors cart, and the left front corner of the UM-4PV and UM-4CV) and verify that white noise is heard. Tapping lightly on the front end of the scanhead should modulate this noise.

17. Press the 2D/TM footswitch. The Main panel is called up and Doppler acquisition ceases.

18. If a CW static transducer is connected, press XDR, then CW on the Transducer Select panel. When the CW Select panel is called up, select the frequency corresponding to the transducer connected to the system.

19. The CW panel is called up and CW acquisition starts immediately; a spectral display sweeps across the screen.

20. Verify that TH FIL causes the thump filter annotation to appear and disappear on the screen.

21. Verify that F/R causes the display to switch between NORMAL and INVERT annotation.

22. Turn up the system volume control (located on the right side of the human factors cart, and the left front corner of the UM-4A) and verify that white noise is heard. Tapping lightly on the front end of the transducer should modulate this noise.

23. Press RETRN. CW acquisition ceases and the Main softkey panel is called up.

2C−9.3.1   Doppler Measurements

1. Enter Doppler Mode and set it up as follows:

    FR/VEL: M/SEC
    SV_DEP: 50 mm
    ANG: any
    SV_SIZ: 1.5mm
    VELINC: Select 3.00 to −3.00 M/SEC with 1.00 M/SEC increments (Access B3, select 1.50 to −1.50 M/SEC).

2. Center the Zero Baseline to mid-screen.

3. Freeze the Doppler spectral display.

4. Press the (MEAS) softkey and the (+ CAL) softkey.

5. Use the trackball and place the cursor over the indicated markers and verify the following readings:

MARKER	READING
+3.00	2.96 ± 0.04 M/SEC
−3.00	3.03 ± 0.04 M/SEC
+1.50	(Access B3 only yields ± 1.50 M/SEC: no specs available.)

2C−9.4   Cineloop

1. Scan yourself or move the scanhead while scanning a phantom to obtain an active 2D display.

2. Press FRZ, then CINE.

NOTE: *Do not remove the scanhead after accessing Cineloop images with the Trackball for at least 45 seconds.*

3. Rotate the trackball right and left to verify a Cineloop sequence has been captured and stored.

4. Press RETRN and enter any other mode to leave Cineloop mode.

2C−10   VCR Tests

The following set of tests is used to check the performance of the HFC- or Full Peripheral-mounted VCRs, all of which can be operated from the system control panel.

Test VCRs on the UM-4A (small cart) using the controls on the VCR, since they cannot be controlled from the system Control Module. All controls and connectors used in this procedure are located on the front or side panel of the VCR.

1. Load a blank VHS video cassette into the recorder.

2. Plug a microphone into the microphone jack on the A/V Module. If you are using a condenser microphone, ensure that a fresh battery is installed in the microphone.

3. On the hardkey control panel, press RECORD or, on the softkey control panel, press VCR and then press RECORD. Verify that both the PLAY and RECORD indicator LEDs on the VCR are lit, or that the information display on the VCR indicates REC.

4. Scan the phantom and speak into the microphone while the VCR is recording.

5. After recording for at least 30 seconds, press STOP on either the softkey or the hardkey control panel. Verify that the VCR stops.

6. Press REWIND on either control panel. Verify that the VCR rewinds and stops at the beginning of the tape.

7. Press PLAY on either control panel. Verify that the VCR plays back the image recorded in steps 3 through 6.

8. Verify that the image is sharp and clear, and that there is no jitter or tearing in the image. Also verify that the audio output of the VCR can be heard clearly through the speakers. Plug a pair of headphones into the headphone jack on the A/V Module and

ensure that the speakers are disconnected and that the audio coming through the headphones can be heard clearly.

9. Press PAUSE on either control panel. Verify that the VCR stops and that an image is displayed on the screen without an excessive amount of distortion or tearing.

10. Press PLAY, then FR GRB to test the framegrabber, if installed. Verify that the image is sharp and clear, and that there is no jitter or tearing in the image.

11. Press STOP on either control panel. Press EJECT on the VCR and remove the cassette.

2C–11   Data Communications Module

1. Eject and remove the customer's disks from both disk drives (if installed), and insert a disk which can be used for testing into each drive. (Use DSDD disks, ATL P/N 2100-0153.)

2. Press DISK on the Freeze softkey panel or special function DISK ("/") on the hardkey keyboard. The Disk Menu should be displayed on the system monitor (see **Figure 2C–3**).

NOTE: *To delete errors while entering menu selections or text in the main disk menu and all subsequent menus, us the left arrow key (z) instead of DEL. This is necessary because in the disk menus, DEL is used to return to a previous menu.*

```
┌─────────────────────────────────────┐
│           —DISK MENU—               │
│                                     │
│      1)   Disk Drive Select         │
│      2)   Disk Format               │
│      3)   Disk Directory            │
│      4)   Store Image/Report        │
│      5)   Recall Image/Report       │
│      6)   Delete Image/Report       │
│      7)   Directory Edit            │
│      8)   Copy Disk/Image/Report    │
│      9)   Serial Communications     │
│         ENTER CHOICE    (1–9)       │
└─────────────────────────────────────┘
```
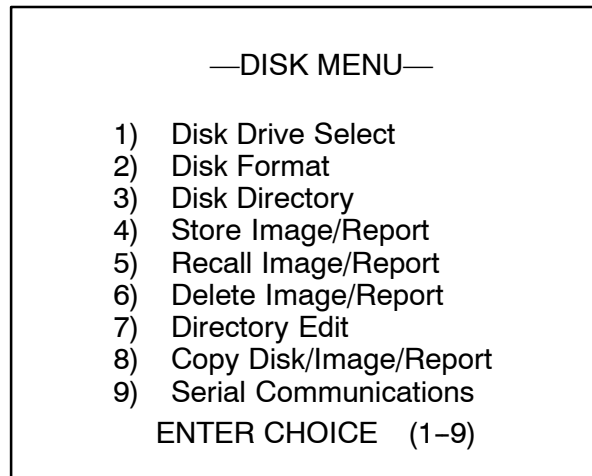
Figure 2C–3.   Data Communications Disk Menu

3. With the Disk Menu displayed, press 1, then ENTER. When the Disk Drive Select menu is displayed, enter 2, then ENTER. The double-arrow symbol should now be in front of Select Drive B, indicating that drive B is selected. Press 3, then ENTER.

4. Format the disk in drive B by pressing 2 and ENTER. If the Format Disk warning is displayed, press Y. Enter your name into the NAME field, press ENTER, and press DEL. The message "Disk Format in Progress!" is displayed.

5. When formatting is complete and the Disk Menu is displayed (three or four minutes), press 4 and ENTER. From the Store Image/Report menu, press 1 and ENTER. Enter "test" into the EXAM TYPE field, then press DEL. The message "File Transfer in Progress" should be displayed while the transfer is taking place.

6. From the Disk Menu, press DEL. The system should return to the normal operating mode. Press CTRL S to store the image from the scanning mode.

7. Press DISK on the Freeze softkey panel or special function DISK on the hardkey keyboard.

8. When the Disk Menu is displayed, press 5 and ENTER. At the file # prompt, enter 1, then ENTER. Once the file is recalled from the disk, it is displayed on the screen. Verify that the image is the first one you stored.

9. To return to the Disk Menu on a softkey system, press RETRN and then DISK, both on the Freeze panel. On a hardkey system, press special function DISK. The Disk Menu should be displayed.

10. Press 3 and ENTER to call up the disk directory. Verify that the two images you stored are listed in the directory.

11. While in the directory, delete the second image by pressing 2 and ENTER. At the file # prompt, press 2 and ENTER. When the warning message is displayed, press Y. Verify that the second image is deleted.

12. Return to the Disk Menu by pressing 3 and ENTER.

13. Press 7 and ENTER. The disk directory is displayed. Move the cursor to the NOTES/LOCATION field of the first image by pressing ENTER. Verify that annotation can be entered into the field. Press DEL to return to the Disk Menu.

14. To copy an image from one disk to the other, press 8 and ENTER. At the Copy Disk/Image/Report menu, enter 2 and ENTER. At the file # prompt, press 1 and ENTER. When the Disk Menu is again displayed, the image has been copied.

15. Select drive A by pressing 1 and ENTER. Then press 1 and ENTER. The double-arrow symbol should be in front of "Select Drive A". Press 3 and ENTER to return to the Disk Menu.

16. Call up the disk directory by pressing 3 and ENTER. Verify that the image from disk B has been copied into the directory.

17. Press 9 and ENTER to enter the communications mode. The menu shown in **Figure 2C–4** is displayed.

```
—COMMUNICATIONS MENU—

   1)   TRANSMIT
   2)   RECEIVE
   3)   CONFIGURE
   4)   PORT SELECT

ENTER CHOICE   (1–4)
```

Figure 2C–4.   Communications Menu

18. From the Communications Menu, press 4, then ENTER. The Select Port menu is displayed. Press 1 and ENTER. The double-arrow symbol should switch from Port 2 to Port 1. Press DEL to return to the Communications Menu.

19. Press 3 and ENTER. The Configuration Menu is displayed. Move the flashing double-arrow symbol to another baud setting by using the up and down arrow keys. When you press ENTER, the symbol should stop flashing, and the one in front of the parity settings should start flashing. Press DEL to return to the Communications Menu. Press DEL again to return to the Disk Menu.

20. Press DEL and UNFRZ to return the system to normal operation.

2C–12   Matrix 1010 Multi-Image Camera

1. Set system power to ON. On power-up, the camera goes through a four minute warm-up period (display indicates WT4, WT3, WT2, WT1). When the sequence is completed the display indicates #0 and generates a tone. If desired, the warm-up period can be overridden by holding down EXP (Expose) for approximately one second. See **Figure 2C–5** for front panel controls.

2. Perform the camera self test function by pressing the EXP (Exposure Interval Count) and then simultaneously pressing CNT. The self test has passed when AOK appears on the display. See the 1010 Camera Service Manual for explanations of error messages.

3. Press PRINT on the UM-4 control panel under the following conditions (in the order listed) and verify that the error message "MI CAMERA ENTRY ERROR" is displayed on the system monitor.

    • without film cassette inserted
    • with cassette inserted and top dark slide in place
    • with cassette inserted, top dark slide out, and view port door open.

4. Install a fresh sheet of film in the cassette.

5. Insert and latch cassette, then remove top dark slide. Cassette should be pulled into camera and camera display should indicate #1.

6. Using the procedure below, set exposure interval, brightness, and contrast to the setting listed in **Table 2C–9** for position 1.

    a. Select camera memory #1 by pressing the 1 switch on the camera.

    b. Select negative image by pressing POS/NEG.

    c. Press EXP (Exposure Interval Count) and set exposure interval by pressing and holding the + (increment) and - (decrement) keys.
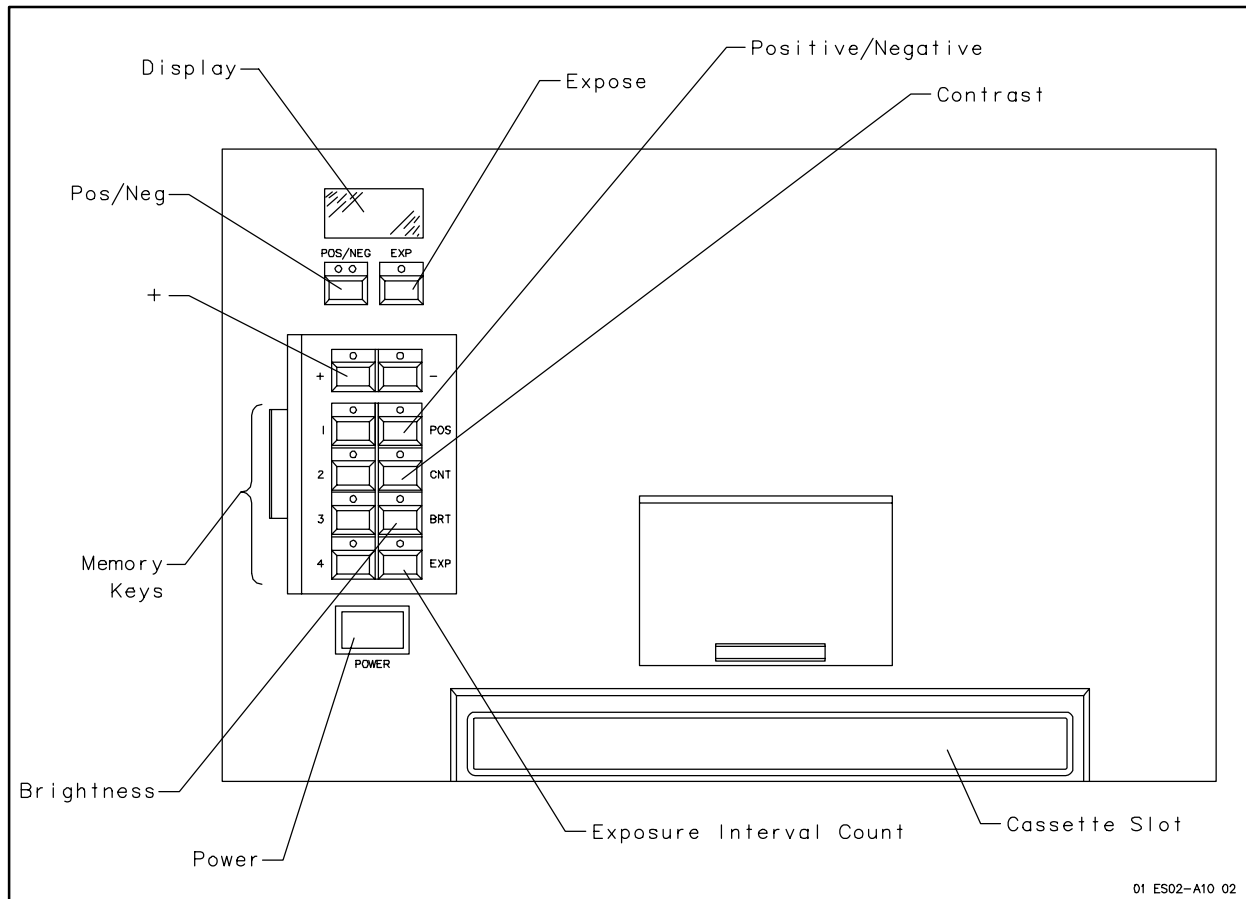
Figure 2C–5.   Matrix 1010 Camera Front Panel Controls and Indicators

d. Press BRT. Using **Table 2C–9**, set brightness to the desired setting with + and -.

e. Press CNT. Using **Table 2C–9**, set contrast to the desired setting with + and -.

7. With a frozen image displayed on the UM-4 system, annotate the image with the settings you just programmed into the camera. For example, the first exposure should be annotated with "25/100/15".

8. Make an exposure by pressing PRINT on the UM-4 control panel.

9. Repeat steps **6** and 7, using the setting from the next position in **Table 2C–9.** Continue changing settings and making exposures using the PRINT key, the camera EXP (Expose) key, and the Freeze/Print footswitch until all six positions have been exposed.

10. Insert the dark slide into the film cassette, and remove the cassette.

Table 2C–9.   Recommended Camera Settings for Initial Test Film

Position	"BB" Brt	"C" Cnt	"EE" Exp
1	25	100	15
2	25	150	15
3	40	150	15
4	40	100	15
5	55	100	15
6	55	150	15

11. Develop the film and verify the following:

    a. The graphics on the print are legible and accurately reproduced.

    b. The gray scale bar and the TGC curve are accurately reproduced.

    c. No light leaks, speckling, or dark bands are present.

    d. Sixteen shades of gray are distinguishable on the grayscale bar.

    e. Sector images are 90.0 degrees $\pm$1 degree measured with a linearity graticule.

    f.   Sector images are not bowed more than 1.5 mm.

    g. The four sides of the print do not display evidence of edge blanking.

12. If the camera does not work properly, refer to the Camera Field Service Manual.

2C–13   LS-8 Linescan Recorder

In order to operate the LS-8 recorder from the UM-4 for this test, the system defaults must be configured correctly for the peripherals installed.

1. Turn system power OFF.

2. Remove transport, remove paper cassette from transport, and install transport.

3. Turn system power ON. Green indicator on recorder should be lit.

4. Press EJECT on recorder front panel. Alarm should sound indicating an out-of-paper condition. Release EJECT.

5. Turn system power OFF. Reload paper cassette into transport, and install transport. Turn system power ON.

6. Set recorder controls to settings in **Table 2C–10**. Allow the recorder to warm up for several minutes.

    a. Set UM-4 TM-mode/TM-mode Combo PCB switch S1-4 to CLOSED for UM-4 grayscale test pattern.

    b. Set LS-8 SCRIF Interface PCB Gray Scale switch (S2) to OPEN for LS-8 grayscale test pattern.

Table 2C–10.   Initial Recorder Control Positions

Control	Position
POWER	1 (ON)
SPEED	10mm/sec (Higher settings will affect calibration)
INTENSITY	5.0
CONTRAST	5
VIDEO CONTRAST	Midrange
TEMP(erature)	5.0
RECORD WIDTH switch	As Necessary

7. With the system in sector or linear mode, press PRINT on the 2D Processing softkey panel, or on a hardkey system, press PRINT.

8. When the paper stops, press EJECT on the recorder front panel until the print clears the transport. Verify that the recorder produces a print of the 2D image.

9. Verify that the print represents all sixteen gray shades on the gray scale bar, and that the gray shades are evenly spaced.

10. On a softkey system, press RETRN, and then press M-LINE. On the M-line panel, press M-MODE. On a hardkey system, press M-MODE CURSOR and then 2D/TM.

11. Press the footswitch assigned to "Strip Chart". The recorder should start printing a strip chart recording at the system default sweep speed.

12. The strip chart recording should display little or no blotching or burning of the paper (a bronze coloring). If the blotching is excessive, adjust the temperature control on the recorder.

13. Adjust the intensity control or the contrast control as necessary to produce an acceptable recording.

14. On a softkey system, press SWEEP on the M-mode panel. On a hardkey system, press SWEEP RATE on the control panel. Verify that the recorder changes recording speed each time the control is pressed.

15. Press the Strip Chart footswitch to halt recording.

16. If the recorder does not work properly, refer to the LS-8 section of the Cameras Field Service Manual.

2C–14   Lenzar 2100 Multi-Image Camera

1. Load one sheet of fresh, unexposed film or paper into a cassette. If using film, the dull side (emulsion) of the film must face the dark slide.

2. Switch the UM-4 ON and verify that the camera exhibits the following:

   a. Each of three test messages, "TEST", "****", and "0000" are displayed three times in sequence for one second each. When the "****" message is displayed, all switch LED indicators are lit.

   b. A short 1-KHz tone is sounded.

   c. "COLD" is displayed for approximately one minute during warm up.

d. "CAL" is displayed during the calibration sequence.

e. "CASS" is then displayed.

3. Insert the cassette into the camera (with the loaded side toward the camera) and remove the dark slide.

4. The camera display should now read "EXP 1".

5. Press and hold PROGRAM (P), and press DECREMENT (#) to display "USER 8", then release PROGRAM.

6. Turn the UM-4 OFF for one minute, then turn it ON again.

7. Once "EXP 1" is again displayed, press and hold PROGRAM to verify that the camera is still set to "USER 8". While still holding PROGRAM, press DECREMENT to change to "USER 1".

8. Using PROGRAM, ADVANCE, DECREMENT, and INCREMENT as before, set parameters to the recommended values in **Table 2C–11**.

9. Press EXPOSE to make a test exposure.

10. Change brightness to "B70" and make another exposure by pressing PRINT on the UM-4 Control Module.

11. Make exposures at "B60", "B50", and "B40" using the PRINT footswitch on the UM-4.

12. Process the film and inspect for proper exposure, image sharpness, and correct image positioning on the film.

13. If the camera does not work properly, refer to the Lenzar 2100 section of the Cameras Field Service Manual.
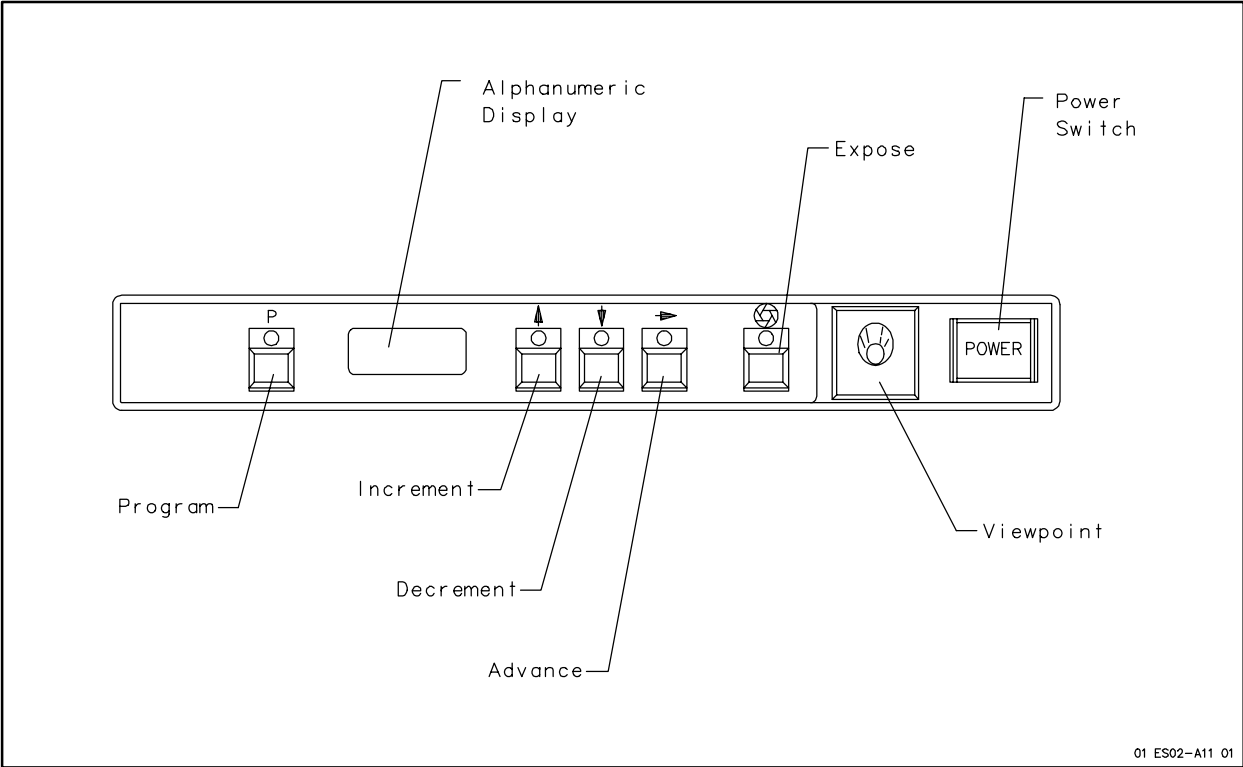
Figure 2C−6.   Lenzar Multi-Image Camera

Table 2C−11.   Initial Camera Control Positions

Parameter	Setting
User Number	As required
Input Number	As required
Exposure Time	T 1
Image Polarity	IMG+
Brightness	B 80
Contrast	C110
Multiple Interlace	IDBL

2C−15   Report Printers

This test procedure applies to the TP-10 and Alphacom 42 small report printers, and to the Microline 92, 182, 184 and 320 large report printers.

1. Verify that paper is properly loaded in the printer.

2. Turn printer power off at the printer.

3. Press and hold the button appropriate to the printer, as listed below:

Printer	Button
TP-10	PAPER FEED
ALPHACOM 42	PAPER ADVANCE
MICROLINE 92	LINE FEED
MICROLINE 182	LINE FEED
MICROLINE 320	TOF/QUIET

4. Switch ON the printer and continue to hold PAPER FEED, PAPER ADVANCE, LINE FEED, or TOF/ QUIET for about two seconds, then

release it. The printer begins printing the ASCII characters in sequence.

5. After about ten seconds, turn the printer OFF and remove the printed test from the printer.

6. Examine the test and verify that all characters are properly formed and readable, and that no dots in the character matrix are missing.

7. If printing on a Microline 92, 182 or 320 is too light to evaluate, replace the printer ribbon and repeat steps 1 through 6.

8. Print a report to verify correct operation with system.

2C–16   UM-4CAD System Operation Verification

NOTE: *Due to differences in CAD operation between domestic and international CAD software, this procedure is only to be used as a reference for checking international CAD systems.*

The following outlines the procedure to follow to verify correct operation of a NTSC UM-4CAD system (with intergrated CAD module and 23.XX or higher software) upon installation.

2C–16.1   Quantitized Frame Rate

1. Select a single-frequency mechanical scanhead from the XDR panel.

2. Returning to the main softkey panel, select CAD.

3. Select various depth settings ranging from minimum to maximum and verify

that scan acquisition rates are quantitized as follows:

NTSC video format systems at 15, 20, and 30 frames per second (± 2 fps).

4. Press <CTRL>-V to de-synchronize the scan acquisition. Verify that frame rates are continuously variable.

5. Press <CTRL>-V again to return to quantitized frame rates.

6. Select a scanhead depth for a frame rate of 20 FPS.

2C–16.2   Reduced Image Area

Verify that the ECG display doesn't encroach into the 2D area under any circumstances, permitting the user to see the full depth at all times.

2C–16.3   Automatic Display of Real-Time Clock

1. Press CINE, then CAPTUR, then CINE.

2. The display should show two timers–T1: and T2: with both values set to 00:00.

2C–16.4   Timer Function

1. Press NEXT T and wait. Verify T1 timer begins counting seconds.

2. Press NEXT T and wait. Verify T1 timer stops and T2 timer begins counting seconds.

3. Press NEXT T and wait. Verify both timers are stopped.

4. Press NEXT T. Verify both timer values are reset to 00:00.

2C–16.5   Timer Display Control

1. Press TIMER. Verify that the timer display is removed from the screen.

2. Press TIMER. Verify the display has timers T1: and T2: on-screen.

2C–16.6   Heart Rate Display

1. Connect the ECG simulator and turn the unit on at 60 beats per minute.

2. Verify the heart rate display converges to 60 beats per minute (± 1 bpm).

2C–16.7   Heart Rate Display Control

1. Press H RATE. Verify the heart rate display is removed.

2. Press H RATE. Verify the heart rate display is restored on-screen and converges to 60 beats per minute (± 1 bpm).

2C–16.8   Cineloop Setup

1. Select CINE.

2. Select CAPSET.

3. From the CAPSET panel, select CINE.

4. Set Play Delay (PLY D) to the minimum value.

5. Set Cineloop Image Resolution (RES) to Normal Res, Windowed, Zoom 256 x 120.

6. Set Capture Length (FRAME $\pm$) to 64.

7. Set Interim Delay (INTRM $\pm$) for minimum.

8. Set Initial Delay (INIT $\pm$) for minimum.

9. Connect the hand controller if it is not already connected.

10. Press RETRN.

11. Press RETRN again.

12. Press SETUP.

13. Press ECG Trigger to on (TR ON).

14. Select WINDOW.

15. Verify that the window moves as the trackball is moved. Set the window to the desired location, then enter this location by pressing WINDOW.

16. Press GREY to call up the prompt "Hit any key to capture an image with a grey bar".

17. Press any alphanumeric key to calibrate the grey scale. The message "Setting grey scale" appears on the screen.

18. Press CMP ON (data Compression ON), which is used to compress data being stored to floppy) and PD ON (Footswitch Pedal on-screen annotation ON).

19. Press RETRN.

2C–16.9   Acquire Images

1. Press CAPTUR.

2. Press CINE.

3. Verify the display shows "Cine Armed" and "Trigger ON" in upper right corner.

4. Press the SET WINDOW button on the hand controller and verify that the window can be positioned with the system trackball. Press SET WINDOW again to lock the window position.

5. Press footswitch #1 (CAPT) to acquire a cineloop sequence of a rapidly moving image.

NOTE: *A rapidly moving image may be obtained by rocking the sector scanhead on the phantom.*

6. Verify that the system acquires a cineloop sequence and begins to play it back.

7. Verify that the trackball controls the speed and direction of the playback.

8. Verify that the hand controller ▲ and ▼ keys control playback speed and the ◀ and ▶ keys step the cineloop one frame at a time.

9. Press PLAY on the hand controller and verify that the cineloop sequence advances continuously.

10. Using a playback speed of approximately two frames per second, verify all images and all frames meet the following requirements:

    • All frames must be free of jitter (caused by differences in the two video fields making up the frame).
    • Each frame must have a unique image. No duplicate images are to appear in consecutive frames.
    • There should be no data dropouts in any of the images.

• Image gray scale matches the original live image.

2C–16.10   Image Select/Store/Recall

1. Ensure that there is a blank floppy disk in the disk drive. If the disk isn't formatted, the system will format it before storing the data.

2. Press the STOR footswitch to store the cineloop sequence on the hard disk. The message "Storing Data—Please Stand By" appears at bottom of the screen.

3. Press the DONE footswitch when storage has been completed.

4. Press CINE.

5. Press FL STR to store the images on the floppy disk.

    a. Using the trackball, move the highlighted area down to the "Cine , 64 Fr..." line.

    b. Press SELECT, then CONTUE. The message "Saving Patient Data" appears on screen.

    c. Follow any system prompts that appear on-screen until the message "Successfully Completed Storing Patient Data to Floppy" appears.

6. Press any alphanumeric key on the keyboard to continue.

7. Press RETRN, then CINE.

8. Recall the cineloop images from the hard disk by pressing RECALL, then HD DSK.

a. Using the trackball, move the high-lighted area down to the "Cine , 64 Fr..." line.

b. Press SELECT, then CONTUE. The message "Loading Data—Please Stand By" appears.

9. Verify that the cineloop begins playing and that all images meet the criteria in the "Acquire Images" section, steps 10a through 10d.

10. Verify that the trackball controls speed and direction of the cineloop sequence.

11. Verify that FRAME+ or FRAME– stops the cineloop sequence, and additional actuation steps the sequence to the next or previous frame, respectively.

12. Verify that PLAY restarts the cineloop sequence.

13. Press CTRL P to reset the system and delete the file from the hard disk.

14. Press CAD, then CINE.

15. Recall the cineloop images from the floppy disk by pressing RECALL, then FL DSK.

a. Using the trackball, move the high-lighted area down to the "Cine , 64 Fr..." line.

b. Press SELECT then CONTUE. The message "Restoring Selected Image Sets from Floppy" appears on-screen. The system automatically transfers the floppy disk file to the hard disk.

16. After floppy disk recall has been completed, recall the cineloop sequence from the hard disk by pressing RECALL and HD DSK. Verify that the only file present is the one just recalled from the floppy disk. Follow the prompts to recall the cineloop sequence.

17. Verify that the cineloop sequence can be successfully recalled and meets the criteria specified in "Acquire Images," with the exception of step 10 c.

2C–16.11   VCR Cineloop Capture

1. Load a VCR tape that contains cardiac images (including ECG), that have been recorded on the system under test.

2. Go to the SETUP panel, then press PLAY on the VCR front panel to initiate tape playback of cardiac images containing a gray bar.

3. From the SETUP panel, press GRAY to initiate the gray scale matching process. Follow the system prompts.

4. Verify the TR ON softkey is flashing. If it isn't, actuate it.

5. With the VCR in playback, press ECG. The first press displays the word NEXT on the softkey panel. A white reference bar appears on the left of the video screen and at the top the message:

   Choose the level of the ECG trigger

6. Use the hand controller ▲ and ▼ keys to set the reference bar to intersect the top of the ECG R wave, but high enough not to intersect the T wave (see **Figure 2C–7**). Press NEXT. The following message appears:

   Choose the left edge of the ECG window
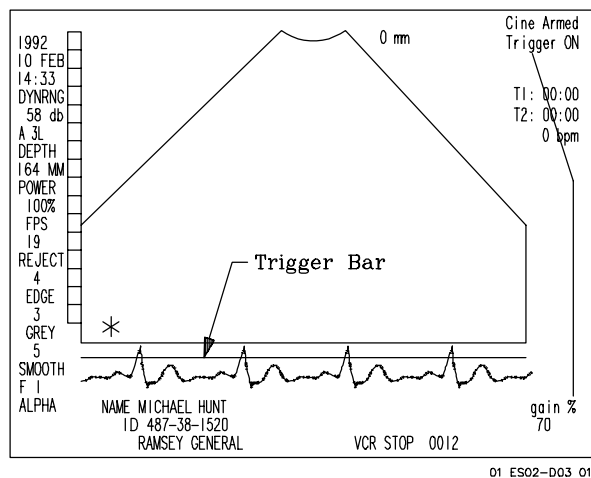
Figure 2C–7.   ECG Reference Bar Positioning

7. Use the hand controller ◀ and ▶ keys to set the left edge of the white reference bar at the left edge of the ECG trace. Press NEXT. The following message appears.

   Choose the right edge of the ECG window

8. Use the hand controller ▶ keys to set the right edge of the white reference bar at the right edge of the ECG trace. The reference bar extends the width of the ECG trace as you press the hand controller ▶ key. Press NEXT.

9. Press RETRN, then CAPTUR, then CINE.

10. Press the CAPT footswitch.

11. Verify that the system acquires a cineloop sequence and begins to play it back.

12. Verify that the hand controller ◀ and ▶ keys step the cineloop one frame at a time.

13. Press PLAY on the hand controller and verify that the cineloop sequence advances continuously.

14. Press STOP on the VCR.

15. Press RETRN.

2C–16.12   CAD Default Setup

1. From the CAPTUR panel, press CAP-SET, then CINE to enter the Cine Setup Menu. Set the menu as follows:

NOTE: *Set defaults only on new installations, or if directed by customer, etc.*

Play Delay	100 msec
Resolution	High Res, Windowed, Zoom 256 x 240
Capture Length	8 images
Interim Delay	50 msec[1]
Initial Delay	50 msec[1]

2. Press RETRN and EXER to enter the Exercise Setup Menu. Set the menu as follows:

Play Delay	100 msec
Resolution	High Res, Windowed, Quad Display, 256 x 120
Capture Length	4 images
Interim Delay	50 msec[1]
Initial Delay	50 msec[1]
Protocol	2 Stage Prevue

3. Press RETRN and ROUTNE to enter the Routine Setup Menu. Set the menu as follows:

Play Delay	100 msec
Resolution	Norm Res, Quad Display, 256 x 120
Capture Length	8 images
Interim Delay	50 msec[1]
Initial Delay	50 msec[1]

4. Press RETRN, RETRN, and SETUP to enter the GREY panel. Select the following modes:

   TR ON
   CMP ON
   PD ON

   These softkeys will flash when they have been selected.

   Press RETRN to complete the default setting operation.

[1]. Scanhead frame rate must be at 20 FPS to achieve these delays.

2C–16.13   Exercise Capture

NOTE: *This procedure assumes the Exercise Capture default setups are set as in* 2C–16.12.

1. Press CAPTUR, then EXER.

2. After a moment, the TIMER panel comes up. Exercise Armed, Trigger ON, Rest Supine and Parasternal Long Axis appear in the upper right corner of the screen.

3. Scan the phantom during the following steps.

4. Press the Capt footswitch. The message "Acquiring Images" should flash at the top of the screen. After the system has finished acquiring that image, the screen should display the acquired image.

5. Press the Cont (continue) footswitch. This changes the name of the view to be captured and files the previously captured image in memory.

6. Repeat steps 4 and 5 until all the views are captured. The last view to be captured is Apical *2* Chamber.

7. Press the Done footswitch. The message "Saving Data—Please Stand By" flashes on the screen. After it disappears, the upper right corner of the screen should now display Exercise Armed, Trigger ON, Post Supine and Parasternal Long Axis.

8. Scan the phantom during the following steps.

9. Repeat steps 4 and 5 until all the views are captured. The last view to be captured is Apical 2 Chamber.

10. Press the Done footswitch. The message "Saving Data—Please Stand By" flashes on the screen.

11. After the message disappears, press CINE, then RECALL, then HD DSK.

12. Using the trackball, move the highlighted area down to the "Exercise, 04 Fr. PAGE 256 x 240—B & W" line.

13. Press SELECT, then CONTUE.

14. Press DISPLY. The following message appears on the screen:

    There are image sets associated with this patient that need to have the best cardiac beat selected. Please select the best beat and store the image.

NOTE: *This message is displayed to let the user know that they can select the best image out of the four that are displayed, and store that one selection.*

15. Disregard the message and press the Stor footswitch.

16. Repeat step 15 until the message "Loading Data—Please Stand By" appears on the screen. The stored images have now been recalled and are playing back.

2C–16.14   Printer Functions

1. Press ANALYZ. Half of the screen will have the recalled images on it and the other half will have graphic representations of the views in the images. The first graphics and images that appear are the Parasternal Long Axis views.

2. Press ALL 1.

3. Using SCORE+ or SCORE– and the trackball, assign a different number to all the 1's in the "Exercise" drawing.

4. Press NEXT+.

5. Repeat steps 2, 3, and 4 until the Parasternal Long Axis views return to the screen.

6. Press RESULT. This brings up the "Qualitative Regional Wall Motion Results" screen.

7. Press PRNTER.

8. The messages "Please prepare printer" and "Press any key to continue" appear on the screen.

9. After assuring that the printer is connected correctly, press any alphanumeric key.

10. The following message appears:

    Just a moment please!
    Printing Wall Motion Report

11. Verify that the printer has printed a report similar to **Figure 2C–8**.

NOTE: *The printer will require a few minutes to print out the entire report.*

Figure 2C–8.   Printed CAD Report

2C

Performance Tests   2C

2C–17   Performance Tests Checklist

Initialization . . . . j

Control Panel Test . . . . j

      Keyboard . . . . j

      Interactive Display . . . . j

      Dedicated pushbuttons . . j

      Footswitches . . . . j

      Trackball . . . . j

      Miscellaneous Controls . . j

2D Tests . . . . j

      Gain, Output, and Depth . j

      Pan/Zoom . . . . j

      Freeze . . . . j

System Defaults . . . . j

Monitor . . . . j

      Graphics . . . . j

      Contrast . . . . j

      Brightness . . . . j

      Linearity (Aspect Ratio) . . j

Mechanical Scanheads . . . . . . j

      Scanhead Control . . . . . . j

      Image Quality . . . . j

      Spatial Accuracy . . . . j

Linear Scanheads . . . . j

      Scanhead Control . . . . . . j

      Image Quality . . . . j

      Spatial Accuracy . . . . j

M-Mode . . . . j

      M-line . . . . j

      2D/TM . . . . j

ECG Test . . . . j

      Trigger . . . . j

Doppler . . . . j

      M-line . . . . j

      Access Doppler Arm . . . . . j

      Angle Control . . . . j

      Sample Volume . . . . j

      Update . . . . j

Doppler Measurements . . . . . . j

Cineloop . . . . j

VCR . . . . j

      Framegrabber . . . . j

      Microphone/Dub . . . . j

      Audio/Speakers . . . . j

Internal Hardcopy . . . . j

External Hardcopy . . . . j

Report Printer . . . . j

Data Comm . . . . j

      Storage/Retrieval . . . . j

CAD . . . . j

      VCR Cineloop Capture . . . j

      Report Printer . . . . j

Ultramark 4 Field Service Manual

UM4–02C–39

2D–1   Introduction

The Preventive Maintenance process was designed to address not only the system requirements , but to serve as an official semi-annual audit of our customer. The procedures outlined here are meant to be guidelines and should not replace common sense. Each system has unique preventive maintenance needs depending on the operator(s), the amount of usage, and the type of environment the system is operated in. Each CSR should assess and address any issue which the customer(s) feel is relevant to their relationship with ATL. The CSR is the conduit for total customer satisfaction.

NOTE: *Some parts of this section include policies, equipment requirements, and procedures that may apply only to U.S. field use. For dealers, affiliates, or other authorized service personnel who do not use the domestic U.S. service documents, use your equivalent document where applicable.*

Abbreviations Used
PM - Preventive Maintenance
FSR - Field Service Report

2D–2   Scheduling

On a semi-annual basis, you will be receiving a list of PMs to be performed. The schedule is a convenient means for targeting and tracking PM compliance. When making or confirming an appointment, be sure to set the appropriate time expectations and discuss any system problems with the operator. Order any needed parts in time for the PM inspection.

2D–3   Equipment and Materials Required

The following items are recommended for a CSR PM kit. Develop a method for carrying and maintaining adequate levels of each item. Add other items as necessary.

Equipment
Anti-static mat
CSR tool kit
Phantom
Oscilloscope
Multi-meter
Three-prong line tester
Vacuum cleaner
ONEAC Lineviewer

Materials
PM Parts (see **Table 2D–1**)

2D–4   Reference Documentation
Refer to these documents, as necessary.
- B&W Printer Field Service Manual (4720-0220-XX)
- Color Printers Field Service Manual (4720-0221-XX)
- Camera Field Service Manual (4720-0222-XX)
- VCR and Report Printers Field Service Manual (4720-0223-XX)
- General Service Manual (4720-0219-XX)
- PM FSR Form (198-19055-00)

Table 2D–1.   Preventive Maintenance Parts

General Supplies

Part Description	Part #
Paper towels	local
Glass cleaner, Fantastic, 409, etc.	local
Alcohol wipes	local
Acetone wipes	local
Freon	2301-0546-01
Copper tape	9901-0025-01
Latex gloves	6320-0004-01
15A Hubble plug	3100-0714
Fiberglass brush	6320-0001-01
BNC "T" connector	3100-0800
RCA to BNC connector	3100-1845-01
BNC barrel connector	3100-0799
75 ohm terminator	3100-1062
6 ft. BNC cable	2275-0176
18 in. BNC cable	101-20769-36
Clean filter labels	4100-0355
Access fill kits	130-27009-07
WAA fill kits	8000-0467-01
Yellow Eureka bags	6005-0244-01
Brown Eureka bags	6005-0244-01
PM field service reports	4765-0373-01
PM stickers	4765-0265-01
PM certificate	198-19058-00
Nylon PM bag	6005-0593-01

Cable Management Supplies

Part Description	Part #
Velcro +	2210-0125
Velcro -	2210-0126
Velcro (white)	9901-0035
Plastic "J" hooks	2950-0464-01
Cable ties (small)	2208-0003
Cable ties (medium)	2208-0058
Cable ties (large)	2208-0061
Cable labels	2209-0048
Cable tie blocks	2208-0002
Cable anchors	2208-0070
Cable clamp 1 in.	2208-0116
Cable clamp 2 in.	2208-0063
Cable strap #8	2208-0073
Cable strap #6	2208-0105
Scanhead clip holder (sm)	6005-0461-01
Scanhead clip holder (med)	6005-0461-02
Nylon mesh cable wrap	2210-0191

Adhesives, Paints, and Lubricants

Part Description	Part #
Tak Pak	2301-0244
Super glue	2301-0264
Super gel	2301-0503-01
Adhesive pack	2301-0194
Loctite®	2301-0258
Epoxy silicone sealant	2301-0145
Thermal repair	2301-0369
Blue Loctite®	2301-0256
Ivory paint #1	199-19015-02
Black paint	199-19016-03
Ivory spray paint	2301-0552-01
White paint	199-19015-01

Table 2D–1. Preventive Maintenance Parts (Cont'd)

Adhesives, Paints, and Lubricants	
Tri-Flow lubricant	2301-0565-01
White grease	198-18411-00
General purpose lubricant	198-12226-00
Peripheral Parts and Supplies	
Part Description	Part #
Sony cleaning sheets	2100-0506-01
Mitsubishi cleaning sheets	2100-0519-01
Lens paper	2100-0283
Lens cleaning fluid	2301-0344
Lens static brush	2100-0277
Matrix servo pot	198-16200-00
Matrix dark slide switch	198-16239-00
Matrix cassette switch	198-16238-00

Lenzar lithium battery	6009-0056-01
Lenzar fan shield	6014-0018-01

Sony 811 thermal head	6005-0137-01
Sony 850 thermal head	6029-0009-01
Sony 811 door	6005-0111-01
Sony 850 door	6029-0049-01
UM-4 Replacement Parts and Supplies	
Parts Description	Part #
AA battery	2100-0121
UM4 keyboard shocks	2950-0188
UM4 ECG leads	2275-0231-01
ZIF connector cover	118-27182-01
CRT wiper sheets	6005-0597-01
UM-4A Power Dist. Assy.	3500-1094-04
UM-4A Rear Panel cover	1065-1689-02
Foam tape 18 in.	2210-0135
Keyboard label	4100-0719-02
Ferrite pot core	2604-0041-01

2D–5   Procedure

For every PM procedure, perform each section included here.

2D–5.1   Site Survey

1. Schedule the PM appointment well in advance so that the customer will allow sufficient time for its completion. Discuss system problems at this time so that you are prepared to address and resolve them during the PM appointment.

2. Speak with all available system users about any concerns that they have about ATL or our products. This information should be logged on the PM FSR for appropriate action. Notify the regional/sales manager if appropriate.

3. Communicate issues to the appropriate ATL representative (see **Table 2D–2**).

Table 2D–2.   ATL Department Telephone Extensions

Department	Extension
Applications Hot-line	3500
Applications Coordinator	7329 or 7047
Professional Education	7330
Professional Medical Supply	3502
Sales Switchboard	7255
Graphics Department	7503
Service Hot-line	7911
Customer Complaints/Regulatory Affairs	7179

2D–5.2   System Performance Issues

1. Inquire about system performance since the last service call. Document system performance issues on the PM FSR.

2. Request hardcopy or VCR images that demonstrate reported problems.

3. Examine past FSR activity located in the Customer Information Directory or your own files. Help your customer set up and maintain a system performance file if one does not presently exist.

4. If the reported system problem is a known engineering issue, advise the operator and submit a customer complaint report if the issue is serious to them.

NOTE: *Customer complaints, when used appropriately, can help Engineering prioritize a fix and will ensure that if a correction is implemented, your customer will receive it. Before submitting a customer complaint, verify that the problem is not already known (as documented in operating notes, hot tips, and service bulletins).*

5. Question the operators about environmental conditions including ventilation, electrical power, ESD, and air particulates, etc.

2D–5.3 Environmental Verification

The operating environment can adversely change from time to time for various reasons. A review of electrical, ventilation, ESD, RF and other operational area characteristics is the next step in the PM process. The short time spent in this endeavor may very well save you (and your customer) an unnecessary service call. Measurements and observations will be recorded on the PM FSR for future comparison.

2D–5.3.1 Electrical Power Verification

1. Verify that the system and its external peripherals are all connected to the same circuit. This ensures a single point grounding reference.

2. Inspect the outlet for signs of physical damage and ensure that it maintains good contact with a plug.

3. Verify proper outlet wiring and grounding with a three-wire outlet tester.

4. Verify that the AC line voltage is within the specified tolerance with the load applied. There must be less than 3 VAC (RMS) measured between neutral and ground with full load.

5. Verify that waveform distortion, common mode noise, and normal mode noise are within the specifications

included in the General Service Manual.

6. If a wiring fault has been discovered, advise the customer immediately to have it corrected as soon as possible.

7. Ensure that there is no noise-generating equipment plugged into the same AC line as the ATL system.

   • Refer to the General Field Service Adjustment Procedure and perform the Power Line Test if there appears to be a problem.

8. Affix a Power Line Data sticker next to the qualified outlets in the primary operational areas. Advise the customer to use only the qualified outlet for the system and its associated peripherals.

2D–5.3.2 Electrostatic Discharge

1. Ask the system operators about their experiences with static discharge.

2. Verify the presence of ESD, if possible.

3. Discuss preventive measures, including static mats, sprays, and humidifiers.

2D–5.3.3 Radio Frequency Interference

Note any potential RF generators that can inject noise into the system. Typical generating devices may include gel warmers, coffee pots, air conditioners, fans, computers, lab equipment, surgical equipment, treadmills, and EKG machines.

2D–5.3.4 Ventilation

1. Verify no objects are restricting air flow through vents.

2. Evaluate the heat and humidity in the lab.

3. If the room seems to be out of the normal operating limits, tell the operator. Also explain the cooling/ventilation requirements of the system to the facilities staff.

2D–5.3.5   Dust

Customers who use linen will frequently have a dust problem. Advise them to periodically clean the screen at the bottom of the E.M.

1. Inspect the system for excessive dust accumulation.

2. Recommend a portable vacuum cleaner to customers who have a problem with excessive dust.

2D–5.4   Problem Identification and Correction

1. Before disassembling the system, verify all problems reported by the customer.

2. Perform a brief operational inspection in all modes to identify and document any additional system deficiencies.

3. Review the customer's default settings for each medical specialty. If there is no hardcopy record, photograph or otherwise document them for future reference.

4. Troubleshoot all identified technical faults and correct them at this time if possible. If parts are needed to complete repairs, list them on the PM FSR. (You will order these at the completion of the PM inspection.)

5. If the system has intermittent or reliability problems, verify the PCB and PROM dash levels and the jumper/switch settings.

2D–5.5   Mechanical and Electrical Integrity

1. Remove front and rear covers, shields, and retainers.

2. Verify proper operation of the casters and locking mechanisms. Verify that the wheel is in tight contact with the rim, and that the retaining bolt is tight, applying LoctiteR if necessary.

3. Disassemble the power plug and check for loose connections.

4. Examine the power cable at the bulkhead connection for signs of wear, strain, or discoloration. Ensure adequate strain relief.

5. Inspect the 1.2V nicad batteries (if present) and their connectors and solder joints. These connections can corrode and cause a voltage loss. Clean with contact cleaner if required and replace the batteries if the time/date are not being held. All other user defaults will be retained by U6 on the System Controller.

6. Verify the EM power supply 5 volt lugs are tight at the motherboard.

7. Inspect and clean linear/annular scan-head connector contacts with a brush and solvent. This should be done at both the transducer and system connectors.

8. Verify the proper operation of the monitor springs and tilt and swivel mount.

9. Verify proper operation of the Control Module support on HFC systems.

10. Inspect the system for signs of physical stress (loose hardware or PCBs, bent castors, etc). This is particularly important if the customer uses the system as a mobile unit. Ensure that both PCB extractors are present on all PCBs.

    If you observe signs of physical stress, reseat all PCBs and ICs using anti-static procedures.

11. Inspect all cable assemblies for signs of wear and verify the integrity of their connections.

12. Inspect the external OEM cables for wear.

13. Reconnect all external OEM devices.

14. Power-up the system and verify that all fans are turning.

    • Look between the PCBs with a flashlight, verify that all fans are turning (or examine the lower grid for a lack of dust in one location).

• Verify that the power supply fan is free of dust and operational. Turn the system off. Replace the PCB retainer/cover and ensure that all screws are snug.

2D–5.6   Common Problems and Retrofit Issues

Review Service Bulletins and Hot Tips for information relevant to known system problems and solutions. (Service Bulletin Info–61 and the New Documents Memo are routinely published as a listing of active Service Bulletins.)

2D–5.7   Alignments

1. Verify system power supply and Motor Controller PCB voltage levels with a digital multimeter and oscilloscope. (Specifications are found in Section 3, Adjustments.)

NOTE: *If the system is experiencing noise or reliability problems, be sure to verify AC ripple specifications.*

2. Adjust the system monitor brightness and contrast pots and confirm greyscale images meet the customer preference. It is recomended that monitor pots be highlighted with a marker (white-out) at the center position after the optimal image is acquired. This will aid in achieving consistency between the video monitor images and the associated hardcopy results.

2D–6   Peripheral Devices Preventive Maintenance Inspection Procedure

NOTE: *Perform these preventive maintenance procedures in concert with the procedure for the system under inspection.*

2D–6.1   VCRs

1. Clean external surfaces.

2. Verify all switch settings.

3. Inspect external cable assemblies.

4. Listen for signs of mechanical problems.

5. If playback quality is poor, clean tape path as per Section 2B in the VCRs and Report Printers Service Manual (4720-0123-01). ATL Service Shop personnel do not recommend cleaning the internal tape path on portable VCRs.

2D–6.2   Matrix Multi-Image Camera

1. Clean and inspect external covers and the air filter.

2. Verify the integrity of the interconnect cable assembly and power cable.

3. Remove covers to gain access to all internal assemblies.

4. Perform an internal cleaning and inspection. Verify the integrity of cables (especially the cassette/dark slide detect switch cables), PCBs and socket mounted devices.

5. Using lens cleaner (no alcohol) and tissues, clean the mirrors, lenses and the CRT face.

6. Verify proper operation of the cassette and dark slide detect switches.

7. Verify the security of the view-port door.

8. Lubricate cassette rails with Tri-Flow if they are dry.

9. Inspect the integrity of the window shade and its attachment to the cassette mechanism.

10. Check for excessive play in the cassette mechanism and adjust if required. If unable to adjust cassette driver circuitry, suspect a defective servo pot.

11. Verify that the copper tabs hold the film cassette securely and that it does not interfere with its insertion.

12. Verify that the cassette finds its proper position without searching or chattering.

13. Verify the voltage levels are within specification on the +5, +15, -15 and +26 volt power supplies.

14. Replace the battery if the voltage reads less than 3.2 volts with the power off.

15. Verify the charging voltage of 5.0V at pin #9 (gnd) and pin #18 on U35 or U36 on the Main PCB.

16. Verify that the camera video is properly terminated and that the rear panel switches are properly set.

17. Photograph all system modalities and verify proper video alignment. Listen for signs of mechanical problems.

18. Inspect the customer's film cassettes for physical soundness.

19. Review MIC images with operator for their approval.

20. If the operator has expressed a concern over camera drift, use the following procedure to isolate the problem at the camera, the film, or the processor.

a. After the images have been adjusted to user preference, take two exposures. Do not develop the film.

b. Put the cassette away where it won't be used.

c. After the user reports a camera drift, verify the original settings and reinsert the cassette into the camera.

d. Advance past the first two exposures.

e. Expose positions three and four.

f. Develop the film. If the camera has drifted, positions 1 and 2 will be different from 3 and 4. If the problem is in either the film or the processor, all exposures will be the same.

2D–6.3 Lenzar 2100 Multi-Image Camera

1. Clean and inspect external covers and the air filter.

2. Verify the integrity of the interconnect cable assembly and power cable.

3. Remove covers to gain access to all internal assemblies.

4. Perform an internal cleaning and inspection. Verify the integrity of cables, PCBs and socket mounted devices.

5. Verify that the copper tabs hold the film cassette securely and that it does not interfere with its insertion.

6. Verify the tightness of the allen screws securing the pulley and shutter assemblies.

7. Inspect the pulley belt for proper tension and wear.

8. Verify proper operation of the cassette detect switch. Clean the photo-optic sensor and check the integrity of its spring.

9. Using lens cleaner (no alcohol) and tissues, clean the lenses and the CRT face.

10. Verify that the camera video is properly terminated and that the rear panel switches are properly set.

11. Verify the voltage levels are within specification on the +5, +20, +15 and -15 volt power supplies.

12. Verify the integrity of the lithium battery.

13. Photograph all system modalities and verify proper video alignment. Listen for signs of mechanical problems.

14. Inspect the customer's film cassettes for physical soundness.

15. Review MIC images with operator for their approval.

16. If the operator has expressed a concern over camera drift, use the following procedure to isolate the problem at the camera, the film, or the processor.

    a. After the images have been adjusted to user preference, take two exposures. Do not develop the film.

    b. Put the cassette away where it won't be used.

    c. Later, if the user reports camera drift, verify the original settings and reinsert the cassette into the camera.

    d. Advance past the first two exposures.

    e. Expose positions three and four.

    f. Develop the film. If the camera has drifted, positions 1 and 2 will be different from 3 and 4. If the problem is in either the film or the processor, all exposures will be the same.

2D–6.4   Lenzar Photo Module

1. Clean and inspect external covers and the air filter.

2. Verify the integrity of the interconnect cable assembly and power cable.

3. Remove covers to gain access to all internal assemblies.

4. Perform an internal cleaning and inspection. Verify the integrity of cables, PCBs and socket mounted devices.

5. Clean the rollers with alcohol.

6. Photograph all system modalities and verify proper video alignment. Listen for signs of mechanical problems.

7. Review camera images with operator for approval.

2D–6.5   B/W Printers

1. Clean and inspect external covers.

2. Verify the integrity of the interconnect cable assembly and power cable.

3. Verify the physical integrity and operation of all doors, buttons and knobs.

4. Verify switch settings.

5. Verify print quality. If there are lines in the print, attempt to clean the print head with the appropriate head cleaning sheet.

6. Print all system modalities and verify proper printer alignment. Listen for signs of mechanical problems.

7. Review printer images with operator for their approval.

8. Provide the system operator with a head-cleaning sheet and demonstrate its use. Advise them how to order additional sheets.

2D–7   Scanheads

1. Clean transducer and cable with disinfectant such as Vespore. Avoid using alcohol or lanolin based products as they can soften the transducer cap.

2. Inspect cables, transducer housing and scanhead lens or face for signs of physical damage. Verify that the LEMO connector on mechanical scanheads is tight.

3. Check for air bubbles and purge if required. Verify that the customer has the appropriate fill kits and knows how to purge air bubbles.

2D–8   Reassembly

1. Before reassembling the system, clean all dust build-up for proper ventilation. Surfaces include (but are not exclusive to) air screens, grids, and PCBs.

2. Examine the E.M. screen to verify that the operator is cleaning it.

3. Connect the scanheads and footswitches.

4. Power-up the system and perform a quick functional verification prior to its reassembly.

5. Reassemble the entire system including PCB shields and covers. Verify that all hardware is present.

6. Repair or replace loose or missing scanhead holder inserts.

2D–9   Exterior Clean-up

1. Correct visible flaws with touch-up paint or parts replacement. If the damage is considerable, replace the item rather than using excessive amounts of touch-up paint.

2. Replace all missing hardware.

3. Clean all external surfaces with a non-abrasive cleaner such as glass cleaner. Pay particular attention to frequently used keys and controls.

CAUTION: *Avoid using alcohol on monitor bezels, transducer caps, and the touch panel.*

4. On sales demo systems only: if a cover panel needs to be replaced, order it P1 and install it the next day.

2D–10   Functional Verification

1. Verify that all medical specialty defaults are intact and that the date/time and institution name have been retained.

2. Verify system performance by performing all tests in Section 2C, "Performance Tests." Measurement accuracy must be verified after installation, repair and during every PM.

2D–11   PM Closure and Follow-up

1. If parts are needed to complete your service activities, order them before leaving the account.

2. Place a PM sticker on the system.

3. Complete the PM FSR and review all reported issues and actions with your customer.

4. Commit to follow-up on those issues raised earlier that could not be addressed on-site or that require action by another individual or department.

5. Present the customer copy of the PM FSR to the customer.

6. Place all applicable service documentation into the Customer Information Directory. Documentation might include a copy of the PM FSR, system defaults, and consumables price list.

7. Enter a reminder in your day planner to make a follow-up phone call one week after completion of the PM to ensure all other commitments have been kept.

8. Discuss Extended Warranty programs.

9. Thank the customer.

10. Verify tracking alignment for all EFTs.

11. Verify smooth operation of the locking mechanism on beamformer transducers and tighten if loose.

12. Listen for signs of mechanical problems in rotating and oscillating transducers.

13. Verify performance characteristics during system test.

2D–12   PM Checklist

External Inspection . . . . j
    Casters . . . . j
    Axle bolts . . . . j
    Brakes . . . . j
    Mounting bolts . . . . j
    Control panel controls . . . . j
    Labeling . . . . j
    Cabling . . . . j

Internal Inspection . . . . j
    Connectors . . . . j
    Internal cover . . . . j
    Cabling . . . . j
    Mounting hardware . . . . j
    Cart . . . . j
    Covers . . . . j
    Peripherals . . . . j

External Cleaning . . . . j
    Monitor . . . . j
    Control panel . . . . j
    Cabinetry . . . . j
    Peripherals . . . . j

2E–1 System Disassembly for EM Replacement

CAUTION: *Use proper anti-static prevention procedures when covers are removed from system.*

WARNING: *Do not wear static wrist straps when power is applied to system.*

Figure 2E–1 shows the location of the various components called out in this procedure.

1. Remove Monitor:

WARNING: *The monitor arm assembly is under great tension. It must be in the raised position when removing the monitor or it may cause physical injury when the monitor is lifted from it.*

   a. Power down the system.

   b. Lock the brake casters.

   c. Remove all scanheads and footswitches.

   d. Retain all hardware for use at reassembly.

   e. Release the monitor arm and extend it to the fullest position.

   f. Remove the three screws securing the monitor platform cover plate and remove the cover plate to reveal the monitor cable and mounting collar.

   g. Disconnect the monitor power and video cable — pull only on the connector.

   h. Remove the mounting collar secured by three Allen screws. Note orientation of the collar.

   i. Remove the monitor from the monitor platform by pulling up and away, being careful to guide the cable connector through the hole. Leave the monitor arm in the fully extended position.

2. Remove Control Module:

   a. If the Control Module is held onto the keyboard support with screws, remove the screws, being careful to hold the two halves of the Control Module together. If not, pull the Control Module up from the rear, then the front.

   b. Disconnect the cable from the rear of the Control Module. Remove the Control Module and set it aside.

   c. Leave the keyboard support in the raised position.

   d. If the system does not have a Lenzar Camera, proceed to step 4.

3. Remove Lenzar Camera:

   a. Disconnect the power and video/control cable.

   b. Remove all screws securing the camera (**Figure 8-1, Sheet 4**).

   c. Remove the camera and set it aside.

4. Remove Optional Equipment Module (OEM):

If the system does not have a CAD Module installed, skip to step 4e.

a. Remove CAD front bezel.

b. Remove the screws on the lower front of the CAD Mod and slide it forward slightly.

c. Disconnect the power cord and the data cables. Remove the CAD Mod and set it aside.

d. Remove internal video printer or Photo Module.

e. Disconnect any external devices connected to the system, noting where each is connected.

f. On the back of the EM, remove the cable cover and disconnect all the cables at the EM Rear Panel PCB, noting where each is connected.

g. Pull out the slidelocks located between the OEM and the EM (**Figure 2E–2**).

h. Ensure that the keyboard support and the monitor arm are in the fully raised positions.

i. Use correct lifting techniques to avoid personal injury and remove the OEM by lifting it straight up. Set the OEM assembly aside, being careful to not crush or pinch any cables.

5. Remove Rail Assemblies:

CAUTION: *Do not remove the cable tray while the EM/Rail assembly rests on the casters. Doing so will cause the chassis to bend, necessitating replacement of the chassis.*

NOTE: *Refer to* **Figure 2E–3** *for the following:*

a. *Turn the EM/Rail assembly upside down to rest on its top.*

b. *Remove the cable tray or Lenzar rail strap: Remove the screws securing the cable tray or rail strap to the rail assemblies. Remove the tray or strap and set it aside.*

c. *Remove the rail assemblies: Remove the three Allen bolts and lockwashers securing each rail assembly to the EM. Remove the rail assemblies and set them aside.*

6. Re-Assembly:

a. Ensure that the spacer washers are centered on the bolt holes (**Figure 2E–3**). Set one rail assembly onto the EM (HINT: the brake caster goes to the rear) and insert the rail bolts and lockwashers, but do not tighten the bolts. Repeat on the other rail assembly.

b. Install the cable tray: Set the cable tray on the rails and secure using the screws.

c. Tighten the rail bolts, set the EM/Rail assembly upright and lock the brake casters.

Refer to **Figure 2E–2** for the following:

d. Before attempting to install the OEM/HFC assembly onto the EM/Rail assembly, ensure that the bolts on the top cover of the EM are the same type. Also, ensure that if they are silver in color, that there are no lock washers under them. The bolts are made to different specifications, to be used with or without the lockwashers.

e. Alignment problems between the OEM/HFC and EM/Rail assemblies are common. Some hints for easier assembly are:

(1) Check the EM top bolts as in step 6B, above.

(2) If alignment seems impossible, insert a pry bar into the gap between the EM chassis and the EM top cover and pry the cover up while pulling down on the OEM/HFC assembly.

(3) Push the slidelock(s) in slightly while pulling down on the OEM/HFC assembly.

f. Perform steps 1 through 5 in reverse order to re-assemble the system.
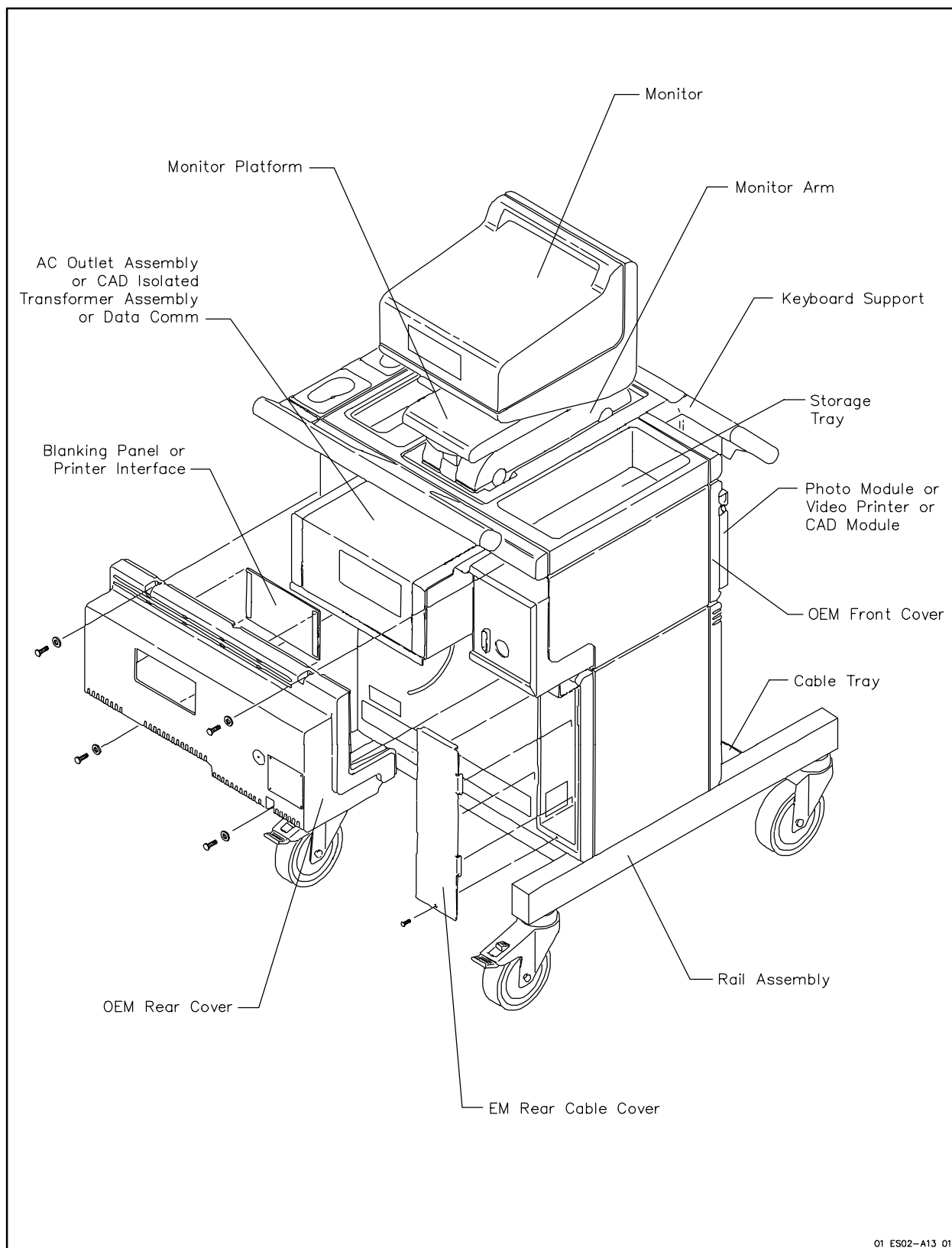
Figure 2E−1.   System Component Locations

Slidelock
1

EM Top
Cover Bolt

EM Top
Cover

ELECTRONICS
MODULE

FRONT

1 > Small Cart Slide
Locks are located
at front of assemby

01 ES02–A14 01
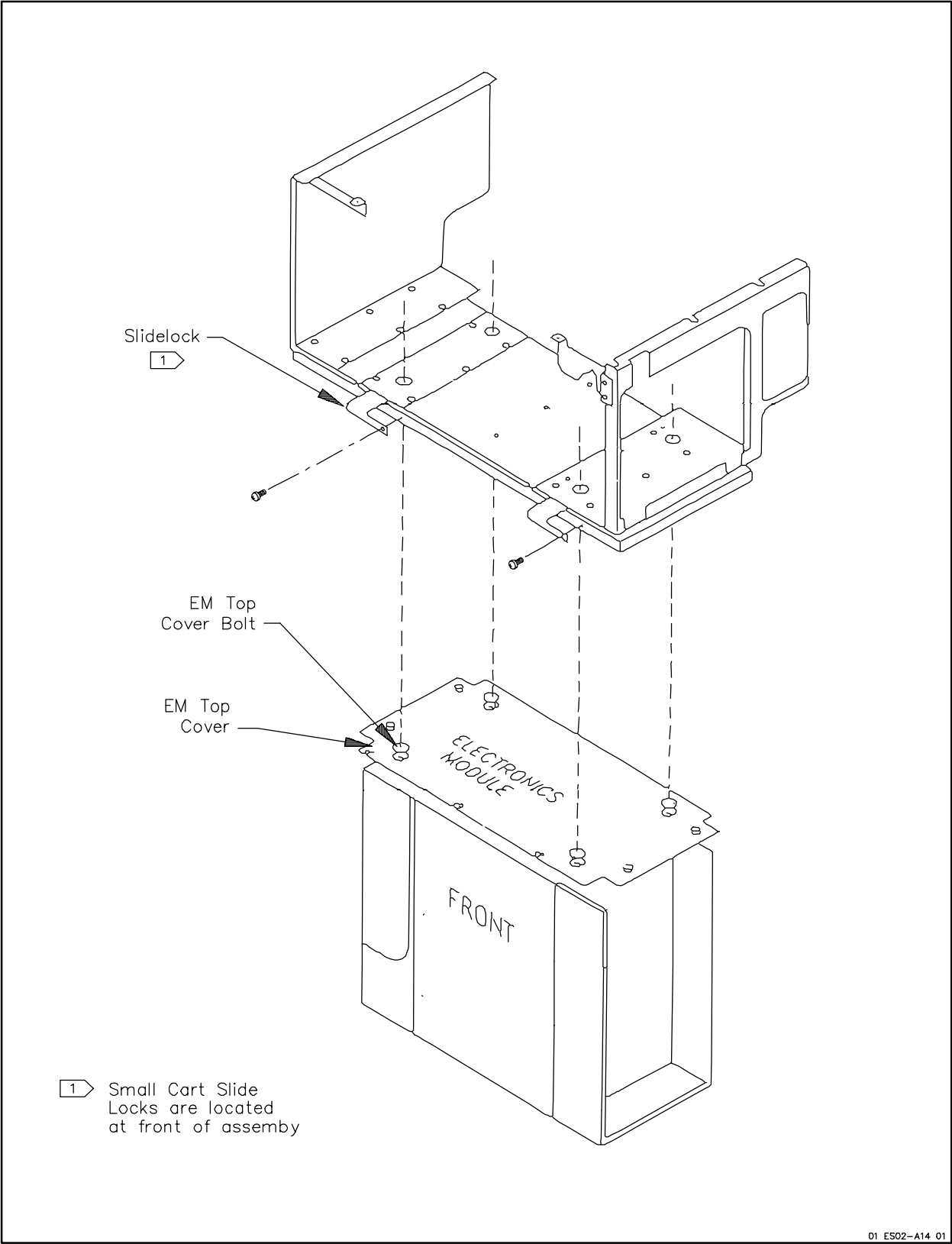
Figure 2E–2.   OEM Mounting Details

CASTERS NOT SHOWN
FOR CLARITY

1516−
0074

1066−
0153

Cable Tray

Rail Strap

1516−
0074

1065−
0646−01

1530−
0036−01

LOCTITE
2301−0146

1561−
0017

1064−
0468

2208−
0125−01

Ground Stud
From Fan Mod

Spacer

01 ES02−A15 01
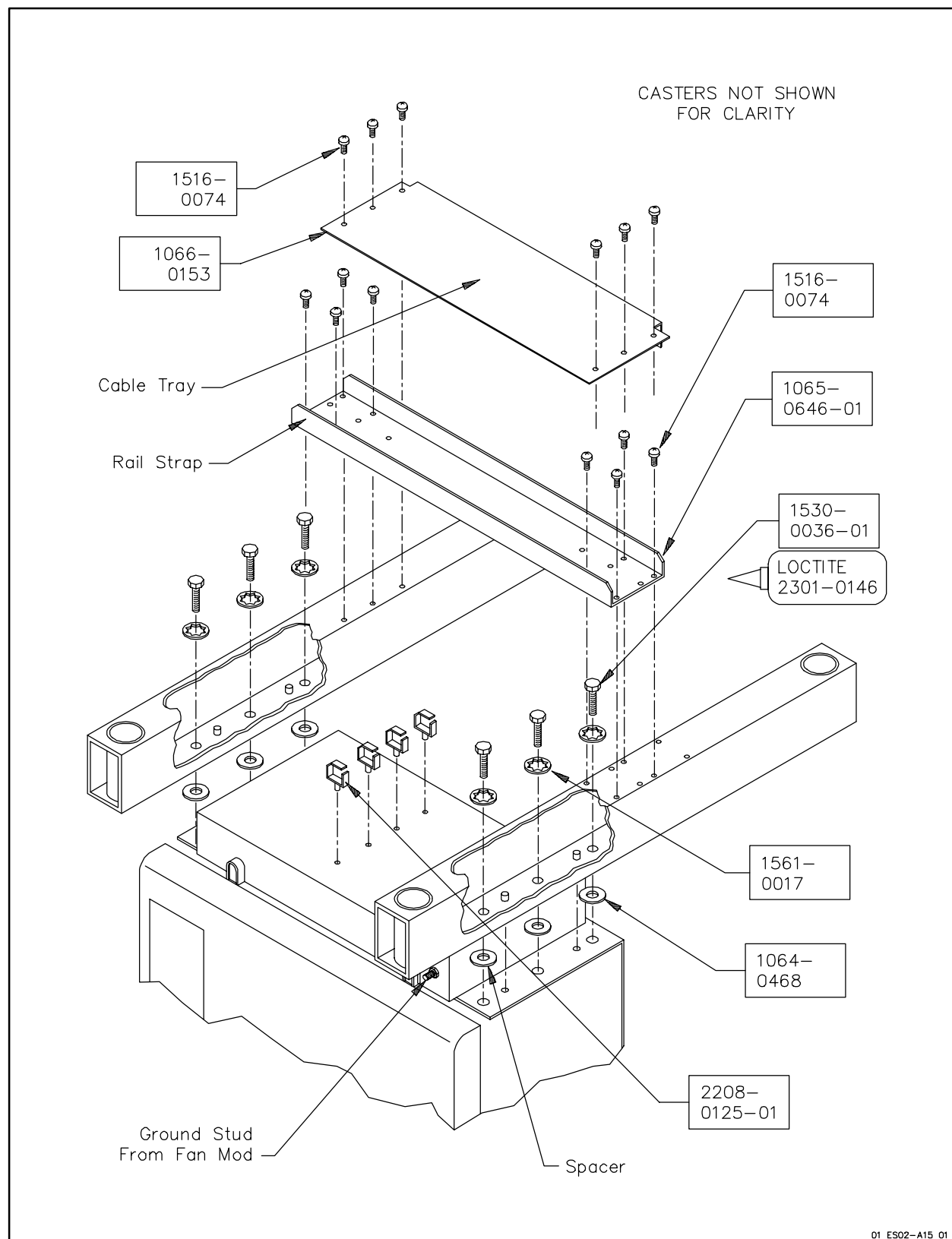
Figure 2E−3.   Rail Mounting Details

Section 3   Adjustments

3–1   Materials and Equipment

DVM
Oscilloscope
Extender PCB (7500–0269)
Test pattern video tape (199–19087–00)
16–inch tweeker (6005–0230–01)
Sector overlay (124–22357)

3–2   HFC Monitor Arm Tension Adjustment (Figure 3–1)

1. Fully extend monitor arm. Remove upper and lower monitor arm covers.

2. Tighten tension nuts on arm to dampen movement (**Figure 3–1**).

3. Replace covers.
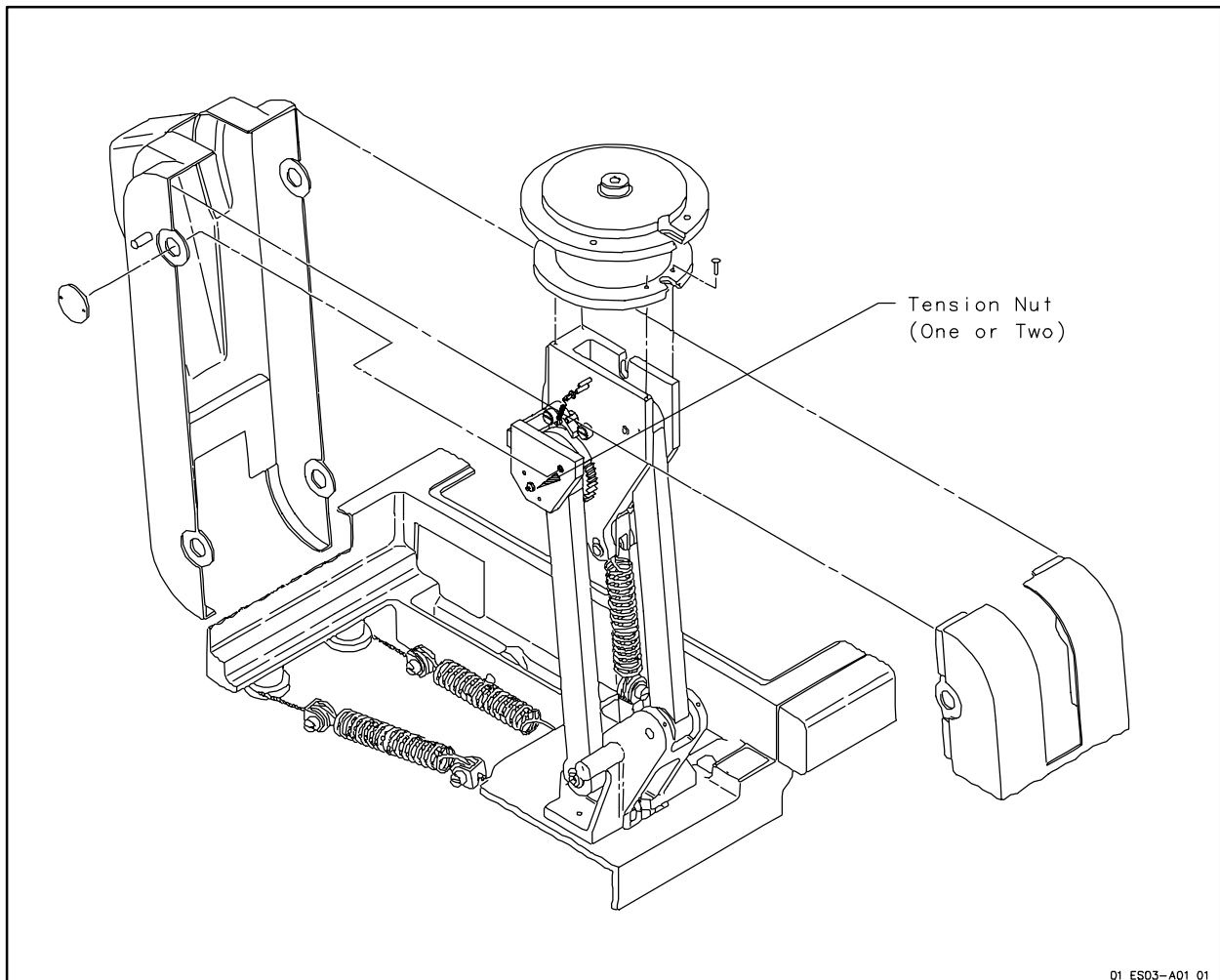
Figure 3–1.   HFC Monitor Arm Tension Adjustment

3 Adjustments

3–3 Power Supply (Figure 3–2)

1. Set system power to OFF and disconnect scanheads.

2. Remove front bezel and card cage shield.

3. Connect DVM common lead to COM test jack on power supply. Connect other lead to jack corresponding to voltage under test (**Figure 3–2**).

4. Check +5, ±6, and ±15 (analog) volt outputs are according to specifications in **Table 3–1**. Adjust if necessary.
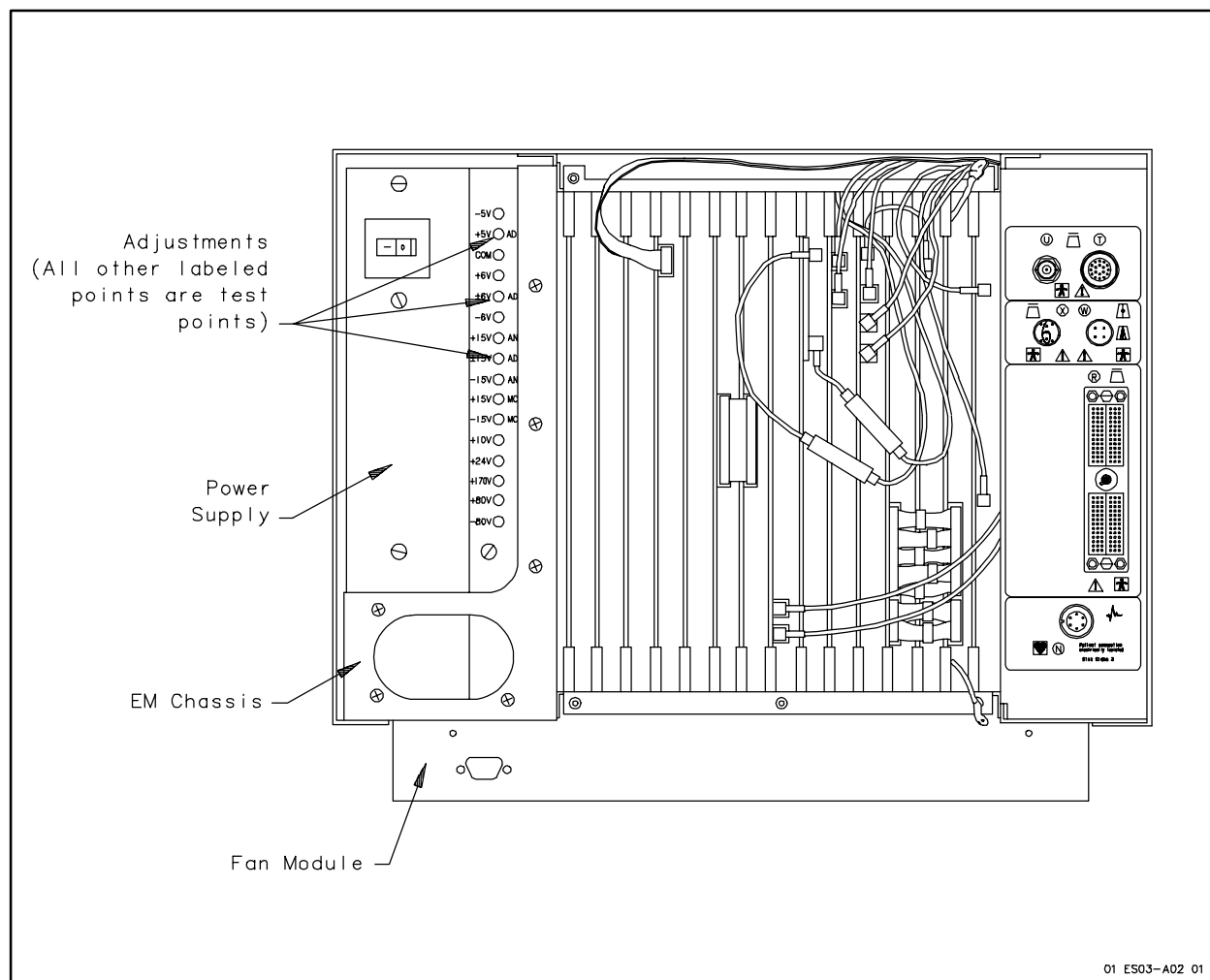
Figure 3–2.   Power Supply Adjustment

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Table 3–1.   Power Supply Output Specifications

DC Output (Volts DC)	Tolerance	DC Current (amps DC)	Min. Load	Ripple[1] Peak/Peak
+5.25 Volts (Adj)	± 1% (0.05V)	46.8 Amps	25 Amps	100 MV P/P
+15 Volts Motor Controller	± 2% (0.3V)	1.6 Amps	0 Amps	100 MV P/P
–15 Volts Motor Controller	± 2% (0.3V)	1.6 Amps	0 Amps	100 MV P/P
+24 Volts	± 2% (0.48V)	3.2 Amps	1-3.2 Amps	50 MV P/P
+6 Volts (Adj)	± 1% (0.06V)	1.1 Amps	0 Amps	50 MV P/P
+15 Volts Analog (Adj)	± 1% (0.06V)	1.2 Amps	0 Amps	50 MV P/P
–15 Volts Analog (Adj)	± 1% (0.15V)	3.2 Amps	1 Amp	50 MV P/P
+80 Volts, S1; +70 Volts, S2	± 3% (2.1V)	2.8 Amps	1 Amp	50 MV P/P
–80 Volts, S1; –70 Volts, S2	± 3% (2.1V)	0.14 Amps	0 Amps	100 MV P/P
+170 Volts	± 3% (5.1V)	0.15 Amps	0 Amps	100 MV P/P
+10 Volts	± 10% (1.0V)	2.0 Amps	2.0 Amps	500 MV P/P

1. Use a 1:1 probe to check Peak/Peak Ripple or inaccurate (too high) results occur.

3–4   Motor Controller (Figure 3–3) 7500-0348-XX

1. Set system power to OFF.

2. Connect DVM micro clips to 10.0V test point and ground on PCB A8, Motor Controller PCB (Figure 3–3).

   If necessary, pull Motor Controller PCB board (A8) far enough to gain access to test points then insert PCB back into card cage.

3. Connect a 5.0 MHz IVT (sector) scanhead to the system. Use an Access S/H if a 5.0 MHz sector IVT is not available.

4. Set system power to ON.

5. Verify that the scanhead annotation displayed on the monitor matches the active scanhead.

6. Verify that voltage is between 9.995 VDC and 10.004 VDC. If necessary, adjust R44 to +10.0 VDC (7500-0517-XX PCBs have no adjustment pot).

7. Set system power OFF.

8. Remove test leads.

9. Verify that the RF connectors to PCB connectors are firmly installed on the PCB.

10. Replace the PCB if the voltage cannot be adjusted into tolerance.

PCB	DVM (+)	DVM (−)	ADJUSTMENT
7500-0304-XX	TP1	Analog Ground	R44
7500-0348-	TP7	TP1 (Analog Gnd)	R1
7500-0348-	TP2	TP1 (Analog Gnd)	R1
7500-0517-XX	TP20	TP27 (Analog Gnd)	NONE

Front Edge

+10.0 VDC
(TP1, TP2 or TP20)

10VDC
Adjust

TP1
Analog
Ground
(-0348)

TP27
Analog
Ground
(-0517)

RF Connectors

Bottom Edge

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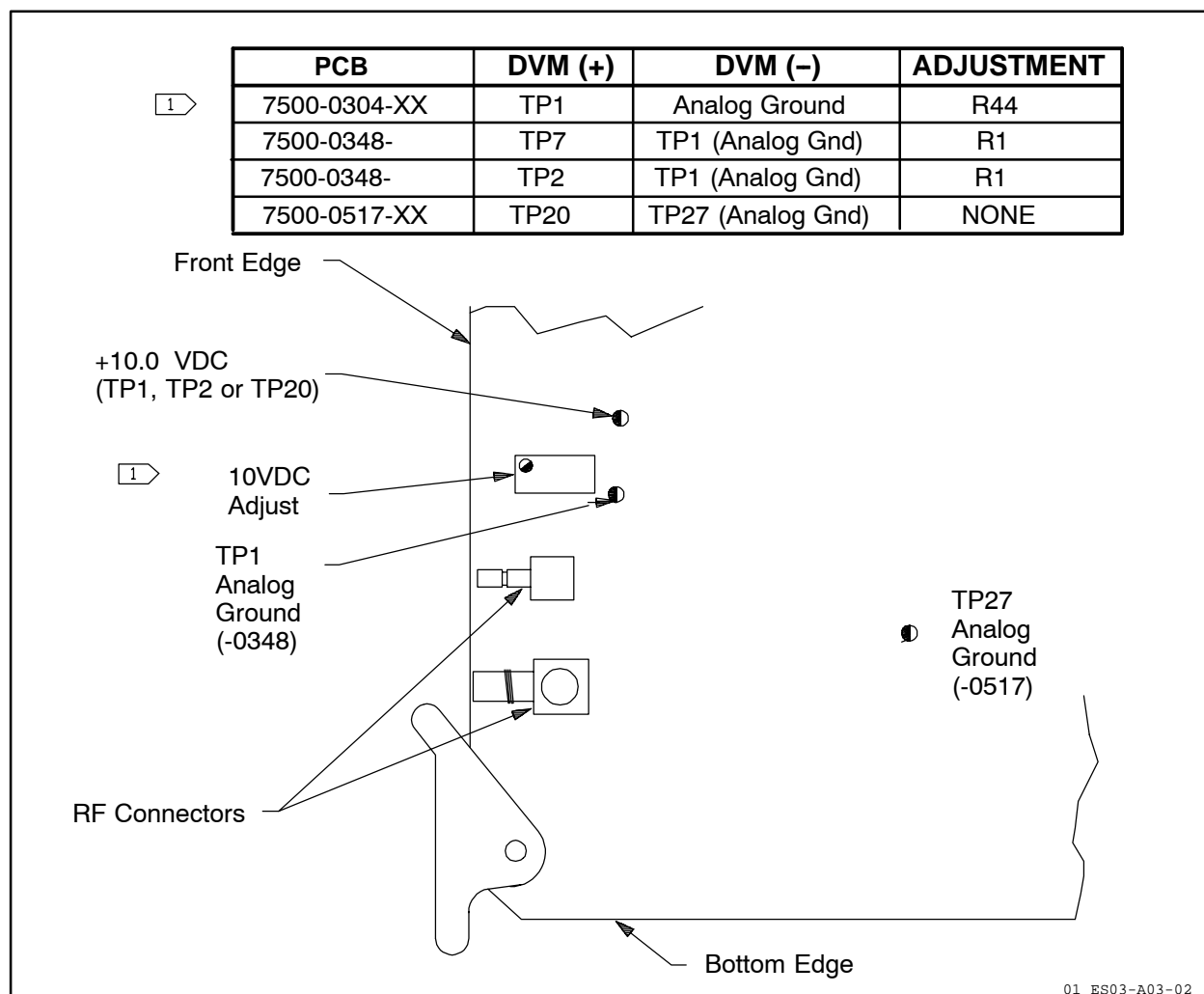
Figure 3–3.   Motor Controller Adjustments

3–5   Old–Style Monitor Adjustments (Figure 3–4, Figure 3–5)

NOTE: *The old and new style monitors are easily identified by removing the monitor cover and comparing the PCBs with Figure 3–4 and Figure 3–6.*

WARNING: *High voltages exist within the monitor at the CRT anode and the encapsulated high–voltage circuit. Use care during adjustment.*

3–5.1   Disassembly

1. Set system power to OFF.

2. Remove monitor top cover and set system power to ON. Allow a ten-minute warm-up.

3–5.2   Voltage Regulator

Adjust R3 for a reading of +20 ($\pm$0.05) volts at pin 2 of U1.

3–5.3   Oscillators

1. Connect pin 14 of U4 to chassis ground.

2. Adjust R27 (horizontal oscillator frequency) until horizontal sync bar is positioned vertically.

3. Connect oscilloscope to high side of R132 (**Figure 3–4**).

4. Adjust R119 (vertical oscillator frequency) for a waveform period of 17.5 msec (525-line video).

5. Remove oscilloscope leads and the ground from U4, pin 14.
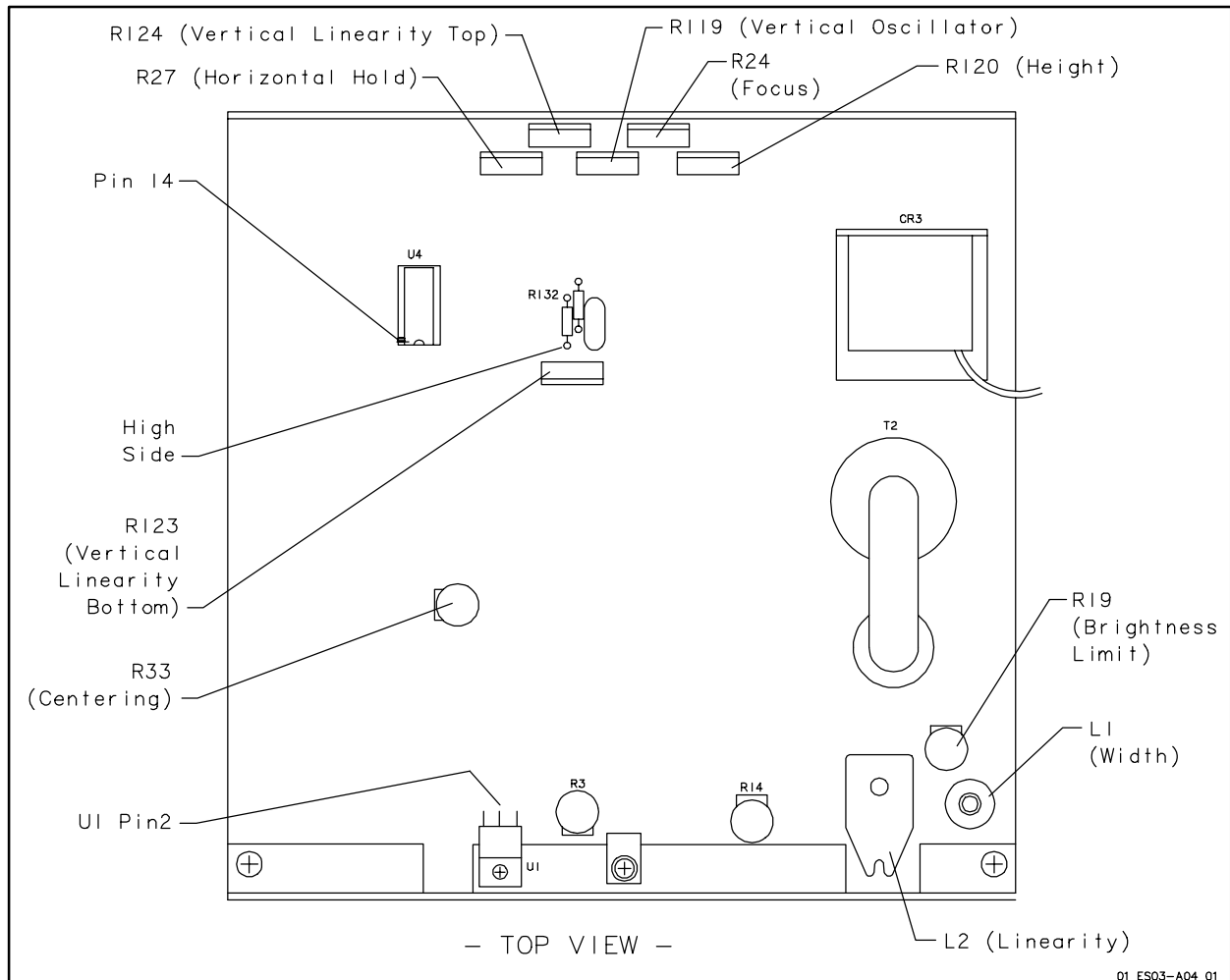
Figure 3–4.   Old–Style Monitor PCB Adjustment Points

3–5.4   Image Adjustments

Linearity

1. Load test pattern video cassette into VCR and rewind.

2. Play VCR to produce a grid pattern.

3. Adjust L2 CW for minimum raster width and CCW for optimum overall horizontal linearity.

4. Stop VCR.

Width

1. Magnify the image using zoom control to make the right border of the ultrasound display visible.

2. Adjust L1. Verify distance between left side of gray bar and right border of the ultrasound display area measures 6.0 inches (**Figure 3–5**).

Phasing

Adjust R33 to center raster horizontally. Verify all display elements are visible.

Height

Adjust R120 so that height of the ultrasound display area is 4 #⌀ inches (**Figure 3–5**).

Top Vertical Linearity

1. Play VCR to produce a grid pattern.

2. Adjust R124 for equal spacing between horizontal grid lines at middle and top of screen.

Bottom Vertical Linearity

1. Adjust R123 for equal spacing between horizontal grid lines at middle and bottom of display.

2. Repeat height and top vertical linearity adjustments to eliminate interaction.
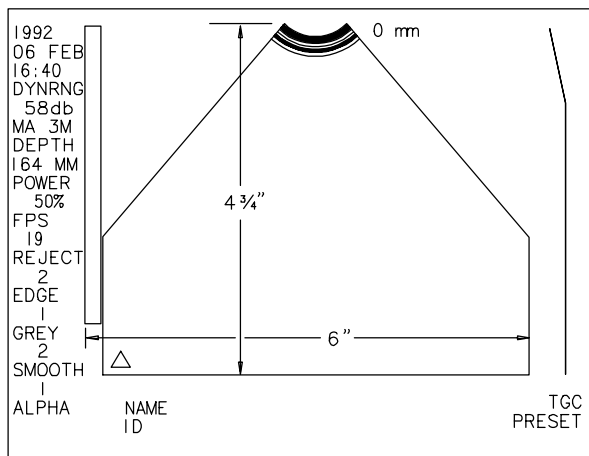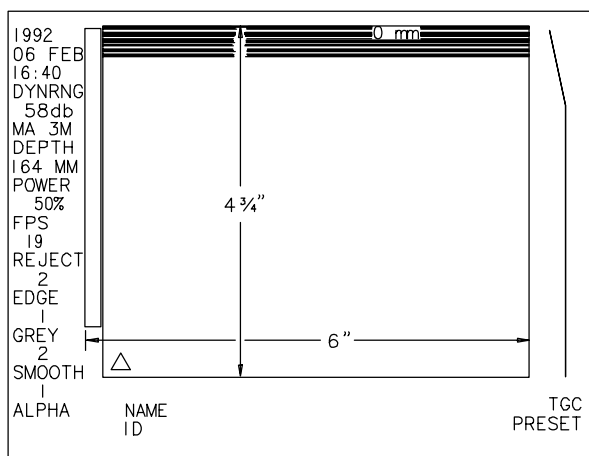
01 ES03–D01 01

Figure 3–5.   Ultrasound Image Measurement

3. Stop VCR.

4. Rewind and remove test pattern video tape.

Aspect Ratio

1. Place the linearity graticle or the 90 degree corner of a piece of paper on the sector display.

2. Adjust R120 (HEIGHT) for a 90 degree sector. The aspect ratio is now set for 1:1.

3. Repeat width, height, centering and aspect ratio until no changes are necessary.

4. Verify that all graphics are visible on screen. (Date in upper left and "TGC PRESET" in lower right.)

Aspect Ratio (Linear-Only Systems)

The "caliper" method uses the system calipers and either a *plastic* ruler or marks on a piece of paper to assure that horizontal and vertical lines of the same displayed length are physically the same length.

5. Set the "+" calipers for 10 cm horizontally centered on the display.

6. Set the "X" calipers for 10 cm vertically centered on the display.

7. Physically measure the "+" caliper distance with the *plastic* ruler or mark the distance on a piece of paper.

8. Place the ruler or paper reference beside the "X" calipers and adjust R120 (HEIGHT) until these calipers are the same distance apart as the "+" calipers.

9. Repeat width, height, centering and aspect ratio until no changes are necessary.

10. Verify that all graphics are visible on screen. (Date in upper left, "TGC PRESET in lower right and "Hospital ID" in lower left.)

Focus

Adjust R24 for optimum focus.

Brightness Limit

1. Adjust brightness and contrast controls fully CCW.

2. Adjust R19 (Brightness Limit) until retrace lines are visible.

3. Readjust brightness and contrast.

3–5.5   Assembly

4. Set system power to OFF.

5. Install cover on bezel.

3–6   Aspect ACM and ALM Monitor Adjustments (Figure 3–6)

WARNING: *High voltages exist within the monitor. Use care during adjustment.*

Perform the following video monitor adjustments with a VCR and scanhead connected.

NOTE: *When two controls are called out, the first pertains to the ACM Monitor and the second to the ALM Monitor, for example, R48/R108.*

3–6.1   Preparation

1. Turn system power off, remove monitor cover and polaroid filter.

2. Verify jumper J8 is to the left for 525-line video or to the right for 625-line video.

3. Turn system and VCR power on. *Warm up monitor for ten minutes.*

4. Verify correct date is displayed on the monitor. Also, verify "TGC PRESET" is shown in lower right of screen. If a "Hospital ID" (<CTRL-E>, B3) has not been entered, enter "ATL Ultrasound".

3–6.2   Contrast and Brightness

1. Place system in linear mode.
2. Set CONTRAST to maximum and BRIGHTNESS to minimum.
3. Adjust G2 (grid 2) pot R48 or R103 until linear image is just visible in a normally lighted room.
4. Set CONTRAST to minimum and BRIGHTNESS to maximum. Verify screen is uniformly gray with no retrace lines.

5. Adjust R48/ R103 until retrace lines disappear.

6. Set BRIGHTNESS to minimum. Verify screen is blanked.

7. Repeat steps 2 – 6 as needed until the monitor meets criteria in steps 4 and 6.

8. Rotate CONTRAST and BRIGHTNESS fully. Verify displayed image responds smoothly.

9. Repeat steps 1 – 8 as needed.

10. Replace polaroid filter and adjust CONTRAST and BRIGHTNESS for best possible image.

NOTE: *Horizontal Centering, Horizontal Width and Aspect Ratio adjustments are interactive. Repeat until all are within specifications.*

3–6.3   Horizontal Centering

1. Verify image is correctly positioned on the display.

2. Adjust using Horizontal Centering pot R32/R73 or Horizontal Phase pot R73 and the CRT deflection rings.

3–6.4   Horizontal Width

1. Verify image width is correct. The first numeral in the date (upper left corner of display) and the "%" or "T" in "PRESET" (lower right corner of display) must be visible when viewed straight on and within ± 0.05 inches of edge when viewed straight on.

2. Adjust L1 until the criteria in step 1 are met.

3. Repeat Centering and Width adjustments until satisfactory.
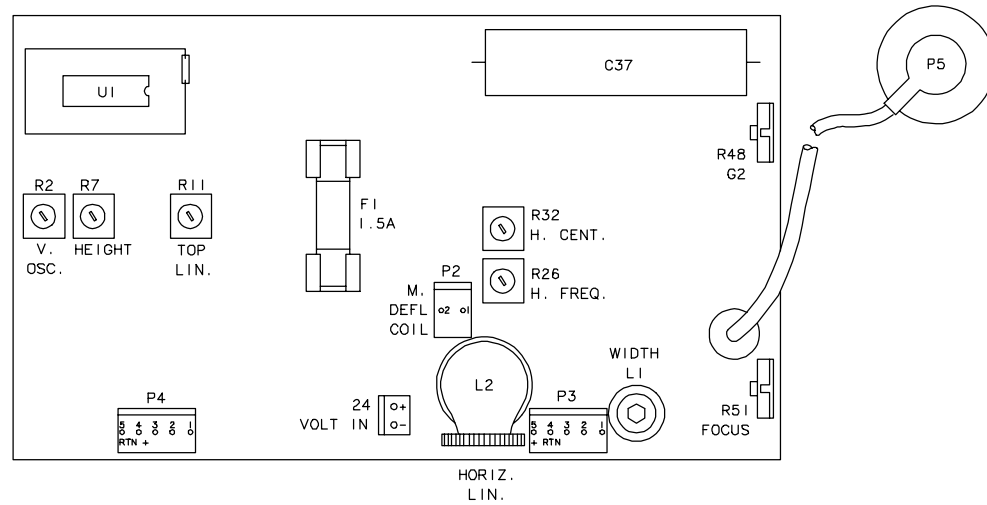
NOTES:
1. CRT Connector to E12, E7, E8, E9, E10, E11 Not Shown
2. Fuse F1: Bus Max 1 1/2A, Slo Blo ATL P/N 2700-0124

— ACM MONITOR —
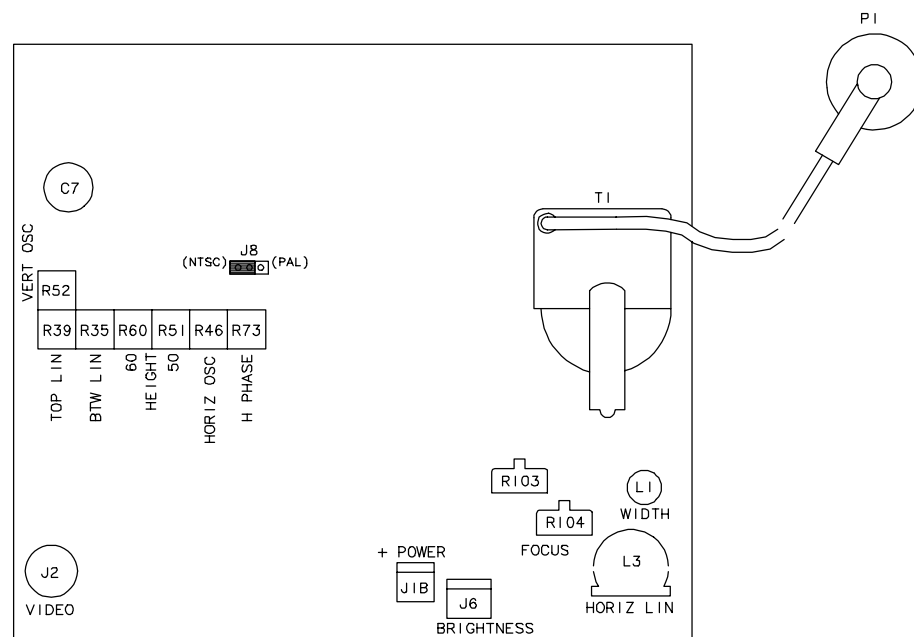
— ALM MONITOR —

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Figure 3–6.   Aspect ACM and ALM Monitor Adjustment Locations

3–6.5   Aspect Ratio (Figure 3–7)

1. Place the linearity graticle or the 90 degree corner of a piece of paper on the sector display.

2. Adjust R7 (HEIGHT) for a 90 degree sector. The aspect ratio is now set for 1:1.

3. Repeat width, height, centering and aspect ratio until no changes are necessary.

4. Verify that all graphics are visible on screen. (Date in upper left and "TGC PRESET" in lower right.)

Aspect Ratio (Caliper Calibration)

The "caliper" method uses the system calipers and either a *plastic* ruler or marks on a piece of paper to assure that horizontal and vertical lines of the same displayed length are physically the same length.

1. Set the "+" calipers for 100 mm horizontally centered on the display (Figure 3–7).

2. Set the "X" calipers for 100 mm vertically centered on the display (Figure 3–7).

3. Physically measure the "+" caliper distance on the screen with the *plastic* ruler or mark the distance on a piece of paper.

4. Place the ruler or paper reference beside the "X" calipers.

   a. **ACM:** Adjust R7 (Height) and R11 (Top Linearity) until these calipers are the same distance apart as the "+" calipers (± 0.05).

   b. **ALM**, **525-line video:** adjust R60 (Height), R39 (Top Linearity), and R35 (Bottom Linearity) until these calipers are the same distance apart as the "+" calipers (± 0.05).

   c. **ALM**, **625-line video:** adjust R51 (Height), R39 (Top Linearity), and R35 (Bottom Linearity) until these calipers are the same distance apart as the "+" calipers (± 0.05).

5. Repeat width, height, centering and aspect ratio until no changes are necessary.

6. Verify that all graphics are visible on screen. (Date in upper left and "TGC PRESET" in lower right.)
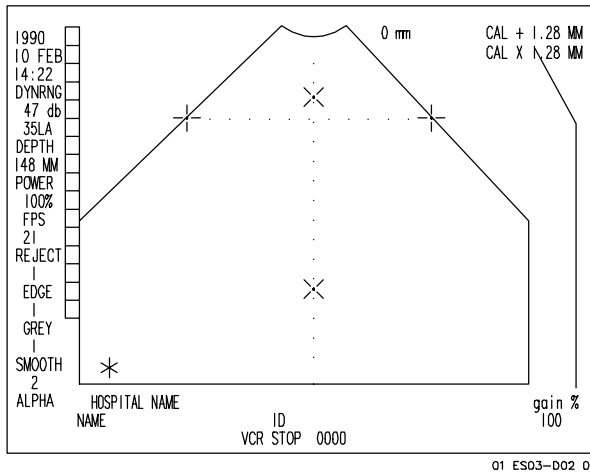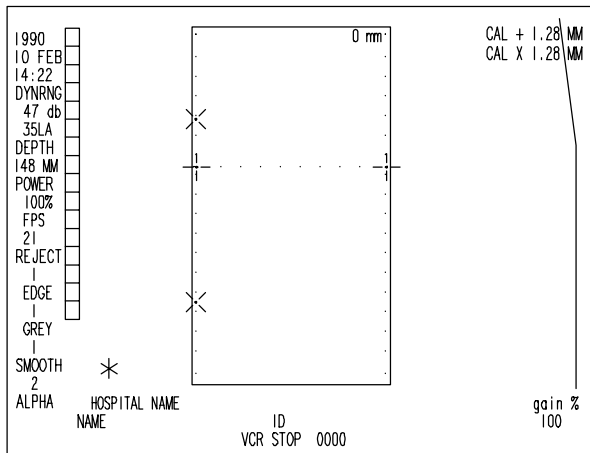
Figure 3–7.   Aspect Ratio Test

3–6.6   Focus

Adjust Focus R51/R104 for optimum presentation.

3–6.7   VCR Roll

1. Verify that the monitor does not roll when the VCR is in forward or reverse search. If the monitor rolls, adjust R2/R52 (Vertical Frequency) until the image is stable in both search modes.

2. Turn off system power and replace monitor cover.

3–7   A/V Module (**Figure 3–8**)

1. Remove A/V Module from cart (Section 2E).

2. Remove cover on the A/V Module enclosure.

3. Connect DVM to test point TP4 and chassis ground.

4. Connect A/V Module to line power. Set system power to ON.

5. Adjust R5 (**Figure 3–8**) for 12.5 ($\pm$ 0.01) volts. Power supply load is not required.
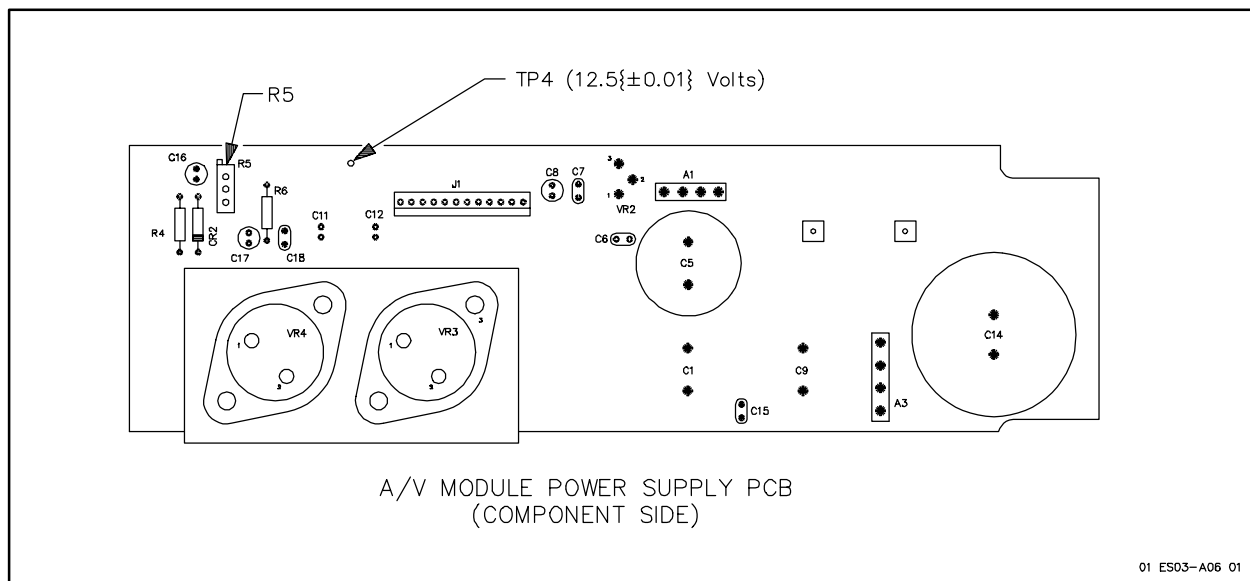
Figure 3–8.   A/V Module Power Supply Adjustment Locations

Table 3–2.   UM-4 Adjustment Summary

Adjustment	Measurement Location	Requirement	Fig.	Component	Notes[1]
Monitor Arm Tension	Tension nuts (2)	Tighten to dampen move-ment	3–1		Ref ⫨ 3–2
Power Supply –					
+5V	+5V jack on power supply	+5.25V (±0.052V) (+5.2V minimum)	3–2	+5V pot	Ref ⫨ 3–3, Tbl 3–1
±6V	±6V jacks on	±6.00V (±0.06V)	3–2	±6V pots	Ref ⫨ 3–3, Tbl 3–1
±15V	±15V jacks on power supply	±15.0V (±0.3V)	3–2	±15V pots	Ref ⫨ 3–3, Tbl 3–1
Motor Controller –					
+10V XDR ID Ref-erence	TP1 on Motor Controller PCB, and chassis ground	+10.000V (±0.005V)	3–3	R44	Use PCB exten-der, Ref 3–4
Old Style Monitor –					
Voltage Regulator	U1 pin 2	+20.0V (±0.05V)	3–4, 3–5	R3	Ref ⫨ 3–5.2
Horiz. Osc.	Connect U4 pin 14 to chassis ground	Horiz. sync bar positioned verti-cally	3–4	R27	Ref ⫨ 3–5.3
Vert. Osc.	Connect U4 pin 14 to chassis ground, scope to high side of R132	17.5 msec wave-form	3–4	R119	Ref ⫨ 3–5.3
Linearity	Display		3–4	L2	Use VCR grid or caliper methods, Ref ⫨ 3–5.4
Width	Display	Verify width in Fig 3–5	3–4, 3–5	L1	Ref ⫨ 3–5.4
Phasing	Display	Center raster hori-zontally	3–4	R33	Ref ⫨ 3–5.4
Height	Display	Verify height in Fig 3–5	3–4, 3–5	R120	Ref ⫨ 3–5.4
Top Vert. Linearity	Display	Equal spacing between horiz. grid lines at middle/top of dis-play	3–4	R124	Use VCR grid or caliper methods, Ref ⫨ 3–5.4

Table 3–2.   UM-4 Adjustment Summary (Cont'd)

Adjustment	Measurement Location	Requirement	Fig.	Component	Notes[1]
Old Style Monitor – (Cont'd)					
Bottom Vert. Linearity	Display	Equal spacing between horiz. grid lines at middle/bottom of display	3–4	R123	Use VCR grid or caliper methods, Ref ⍵ 3–5.4
Aspect Ratio	Display	Horiz. size/Vert. size ratio is 1:1	3–4	R120	Use caliper method, Ref ⍵ 3–5.4
Focus	Display	Adjust for optimum focus	3–4	R24	Ref ⍵ 3–5.4
Brightness Limit	Display	None	3–4	R19	1) Adjust brightness and contrast fully CCW. 2) Adjust R19. 3) Readjust brightness and contrast Ref ⍵ 3–5.4
ALM or ACM Monitor –					
Contrast and Brightness	Display		3–6	R48/103	Ref ⍵ 3–6.2
Horiz Centering	Display	Centered image	3–6	R32/R73 and CRT deflection rings	Ref ⍵ 3–6.3
Horiz Width	Display	Verify image width is correct (Fig 3–5)	3–6	L1	Ref ⍵ 3–6.4
Aspect Ratio	Display	Verify lengths of caliper sets are within ±0.05 inches	3–7	R7, R11 (see procedure for ALM)	R7 = Vert. size pot, R11 = Top linearity pot. Ref ⍵ 3–6.5
Focus	Display	Adjust for optimum focus	3–6	R51/R104	Ref ⍵ 3–6.6
VCR Roll	Display	No picture roll during VCR search	3–6		Para 3–6.7
A/V Module	TP4 and chassis ground	12.5V (±0.01V)	3–8	R5	Ref ⍵ 3–7

1. Ref – refer to; ⍵ – paragraph

Section 4   Fault Isolation

4–1   Introduction

This section includes an outline of general troubleshooting steps, as well as the following specific information:

• UM-4 initialization routine
• LED status indicator data
• Self-test switch data
• Error message data
• Minimum configuration tables
• Fault-isolation tables

4–2   Required Materials

Oscilloscope, Dual Trace
Voltmeter, Digital

4–3   General Troubleshooting Steps

Although each problem is unique, the following steps are usually useful to help isolate the problem and troubleshoot the system:

1. Verify the complaint.

2. Identify other problems or symptoms by performing performance tests.

3. Perform a visual inspection, including all cables and PCBs.

4. Check the power supply for loose connectors, and verify output voltages.

5. Simplify the system: configure the system in the minimum possible configu-

ration for which the problem still exists. Refer to paragraph 4–8.

6. Refer to **Table 4-6** in this section to isolate problems observed during performance tests.

4–4   LED Status Indicators

Status indicators are provided on three PCBs in the UM-4 card cage (see **Figure 4–1**). The Motor Controller (A8) and System Controller (A15) PCBs each have a set of LEDs that can be used to aid troubleshooting in the field. LEDs on the Pulse Processor (A5) PCB are not generally useful in troubleshooting.

4–4.1   Motor Controller LEDs (**Figure 4–1**, **Table 4–1**)

The four LEDs on the Motor Controller PCB (DS1 through DS4) indicate the type of scanhead currently selected. This is a combined function of the input connector selected and the scanhead attached to that connector. **Table 4–1** interprets the legitimate combinations of LEDs. When the LED code does not correctly identify the scanhead connected and selected, verify that the problem is not restricted to a single scanhead. Continue by checking scanhead cables, and input connectors and associated wiring. If these are not the cause of the problem, replace the Motor Controller PCB.

UM4–04–1

Table 4–1.   Motor Controller LED Definitions

	DS1 (GRN)	DS2 (GRN)	DS3 (YEL)	DSR (RED)
DFT TRT (Linear) CVLA	ON	ON	ON	OFF
AA WAAA	OFF	OFF	ON	OFF
BFT EFT IVT TRT (Sector) ICT	ON	OFF	OFF	OFF
ACCESS 72B	OFF	ON	OFF	OFF
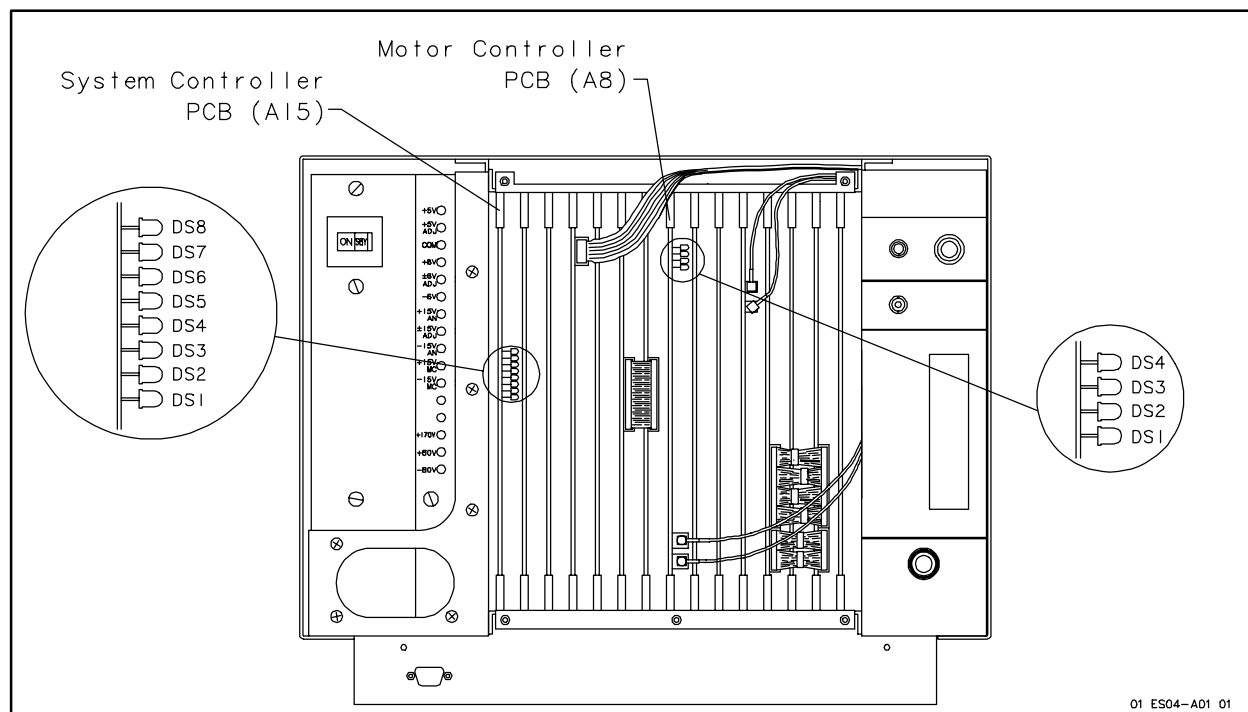
Figure 4–1.   PCB LED Indicators

4–4.2   System Controller LEDs

NOTE: *The following information on System Controller (A15) LEDs is valid through at least version 25.X software.*

Indicators DS1 through DS8 on the System Controller PCB are associated with the initialization process. The yellow LEDs (DS1–6) will turn on and off sequentially (starting at DS1) during the initialization cycle.

S1 systems or 6.X software and below: the bottom LED (DS1) and the green LED (DS7) remain on after system initialization.

8.X through 23.X software: The bottom LED (DS1) will be off after system initialization. If DS1 LED remains on, a problem exists.

24.X and higher software: The LEDs may remain on after system power-up initialization. If this occurs, press CONTROL-P. Verify that the green LED (DS7) is the only LED on and is flashing. If not, a problem exists.

The red LED (DS8) or any other single LED or combination of LEDs indicate a fault condition if they remain on after the initialization period, and point to a possible System Controller failure. Obtain collaborating information by performing performance tests and initializing the system in its minimum configuration before replacing the System Controller PCB.

NOTE: *When only the A15 PCB is installed, its LED's should sequence repeatedly; when only the A14 and A15 PCBs are installed, the system will take longer to boot but will come up with graphics on the monitor.*

4–5 Test Switches (Figure 4–2)

Several PCBs in the card cage contain switches that are intended for use either in testing or system configuration or both (**Figure 4–2**). Switches on the TM-mode PCB, the TM Combo PCB and the Display Controller PCB inject specific test patterns into the data path at known points. If all processing circuitry is operating correctly, the test patterns will be displayed on the system monitor as in **Figure 4–5** through **Figure 4–7**, and **Figure 4–10**.
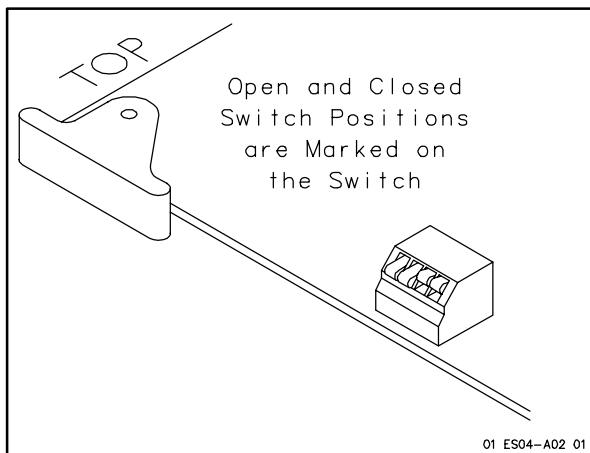
Figure 4–2. PCB Test Switches

NOTE: *The switch package names are printed on the component side of the PCBs, adjacent to the switches. The numbers on the switch package itself denote the switches.*

4–5.1 TM-Mode/TM Combo Test Switches (Figure 4–3 and Figure 4–4)

Test Switches S1-4 (T1), S1-3 (T2), and S1-3 (T3) of SW1 on the TM-mode and TM Combo PCBs inject test patterns into the inputs from the Pulse Processor and ECG box and the output of the M-mode Scan Converter, respectively. Their physical and electrical locations are shown in **Figure 4–3** and **Figure 4–4**.
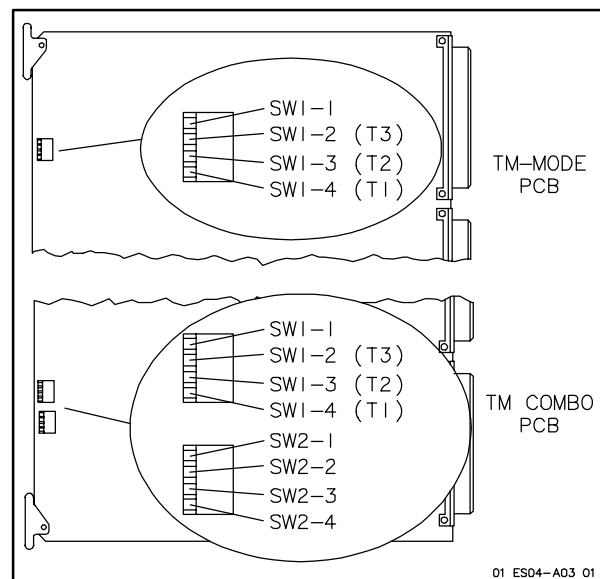

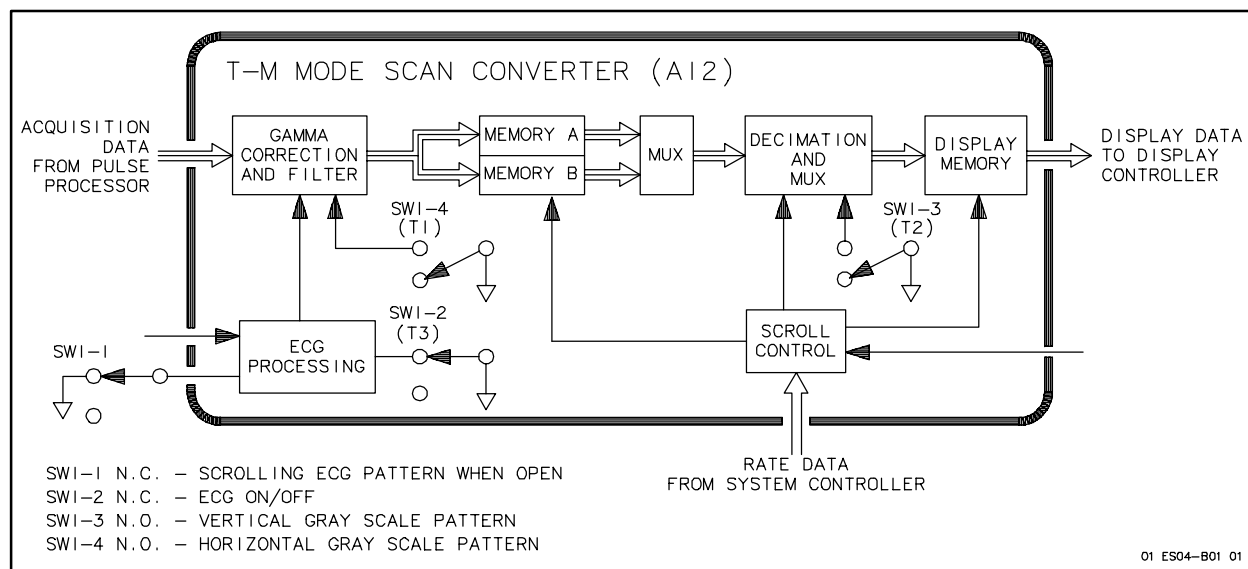**Figure 4–3. TM-mode Test Switch Location (Component side)**

Figure 4–4.   TM-mode Test Switch Diagram

Test One (T1) Acquisition Data Input to TM-mode/TM Combo PCB

This test injects a horizontal gray scale pattern into the input of the Scan Converter section of the TM-mode or TM Combo PCB. System must be in M-mode (from Sector or Linear). This tests the M-mode Scan Converter, the Display Group, Monitor and associated cables.

1. Set S1-4 (T1) to CLOSED.

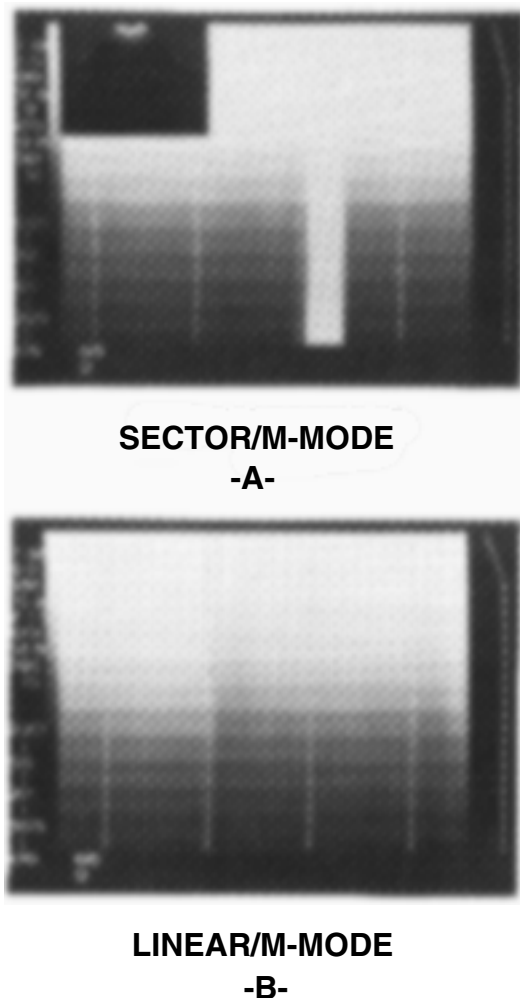2. Verify that a horizontal gray scale pattern is displayed (**Figure 4–5**).

3. Return S1–4 to OPEN.

Test Two (T2) M-mode PCB Output

This test injects a vertical gray scale pattern into the output circuits of the TM-mode or TM Combo PCB. System must be in M-mode (from Sector or Linear). This tests the TM-mode PCB output, the Display Group, Monitor and associated cables.

1. Set S1-3 (T2) to CLOSED.

2. Verify that a vertical gray scale pattern is displayed (**Figure 4–6**).
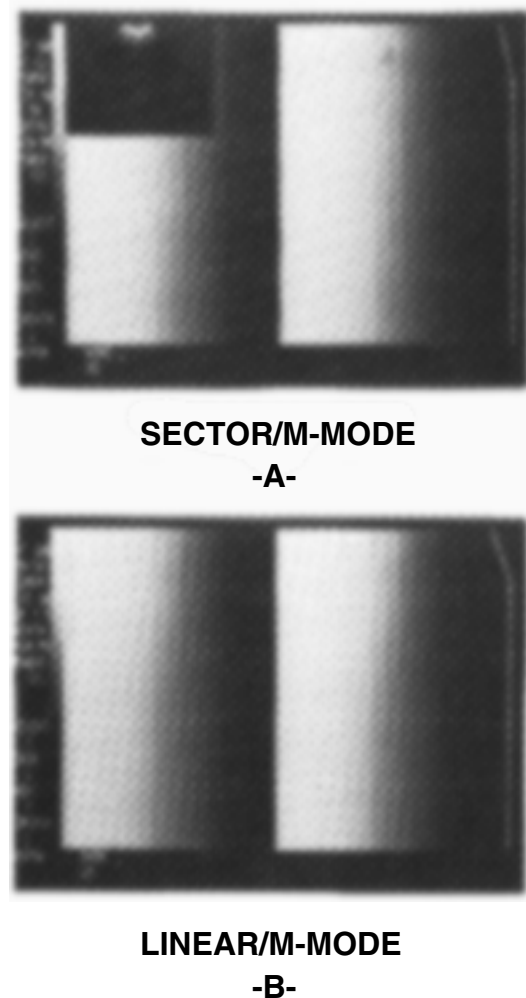
3. Return S1–3 to OPEN.

SECTOR/M-MODE
-A-

LINEAR/M-MODE
-B-

Figure 4–5. TM-mode Test One

SECTOR/M-MODE
-A-

LINEAR/M-MODE
-B-

Figure 4–6.   TM-mode Test Two

Test Three (T3) ECG Circuitry Test

This test injects a diagonal black and white pattern into the ECG overlay circuit on the TM-mode or TM Combo PCB. System must be in M-mode (from Sector only); ECG must also be turned on from Control Panel. This isolates ECG problems to the ECG box and cables or to the TM-mode PCB if M-mode is operating normally (T1).

1. Set S1-1 to OPEN, S1-2 (T3) must be CLOSED.

2. Verify that a diagonal black and white pattern is displayed in the ECG window. (**Figure 4–7**).

3. Return S1–1 to CLOSED.
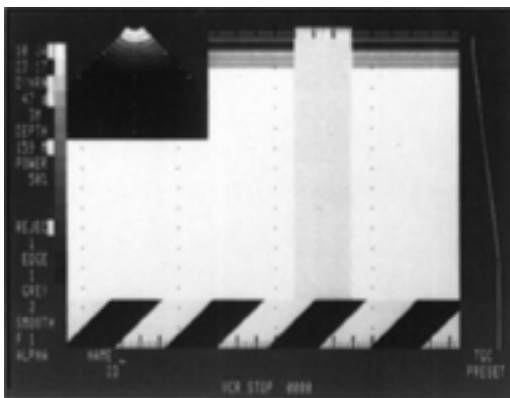
SECTOR/M-MODE
-A-

Figure 4–7.   TM-mode Test Three

4–5.2   Display Controller Test Switches (Figure 4–8 and Figure 4–9)

On the Display Controller PCB, only two switches are operational on SW1: S1–2 (labeled T1), and S1–3 (labeled DOM) (**Figure 4–8**). S1-2 (T1) injects a horizontal gray scale pattern into the input of the Display Controller PCB (either mode). The point at which the test signal is injected into the circuit is shown in **Figure 4–9**. S1-3 (DOM) is set to configure the system's video format for either NTSC (OPEN) or CCIR (CLOSED).

1. Set S1-2 (T1) to CLOSED.

2. Verify that a horizontal gray scale pattern is displayed (**Figure 4–10**).
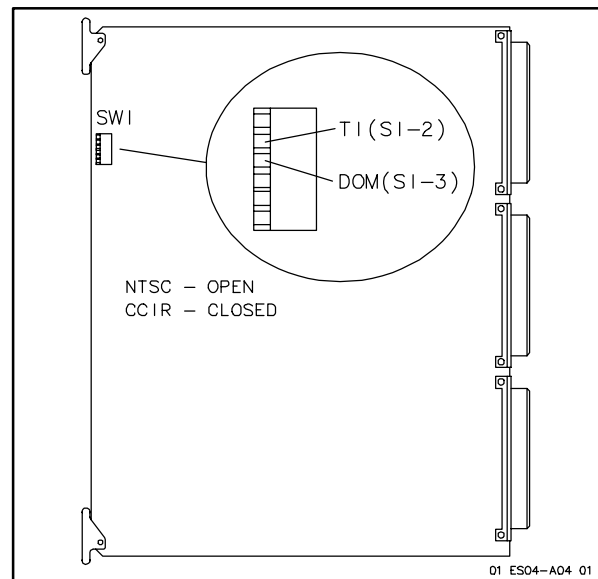
3. Return S1–2 to OPEN.

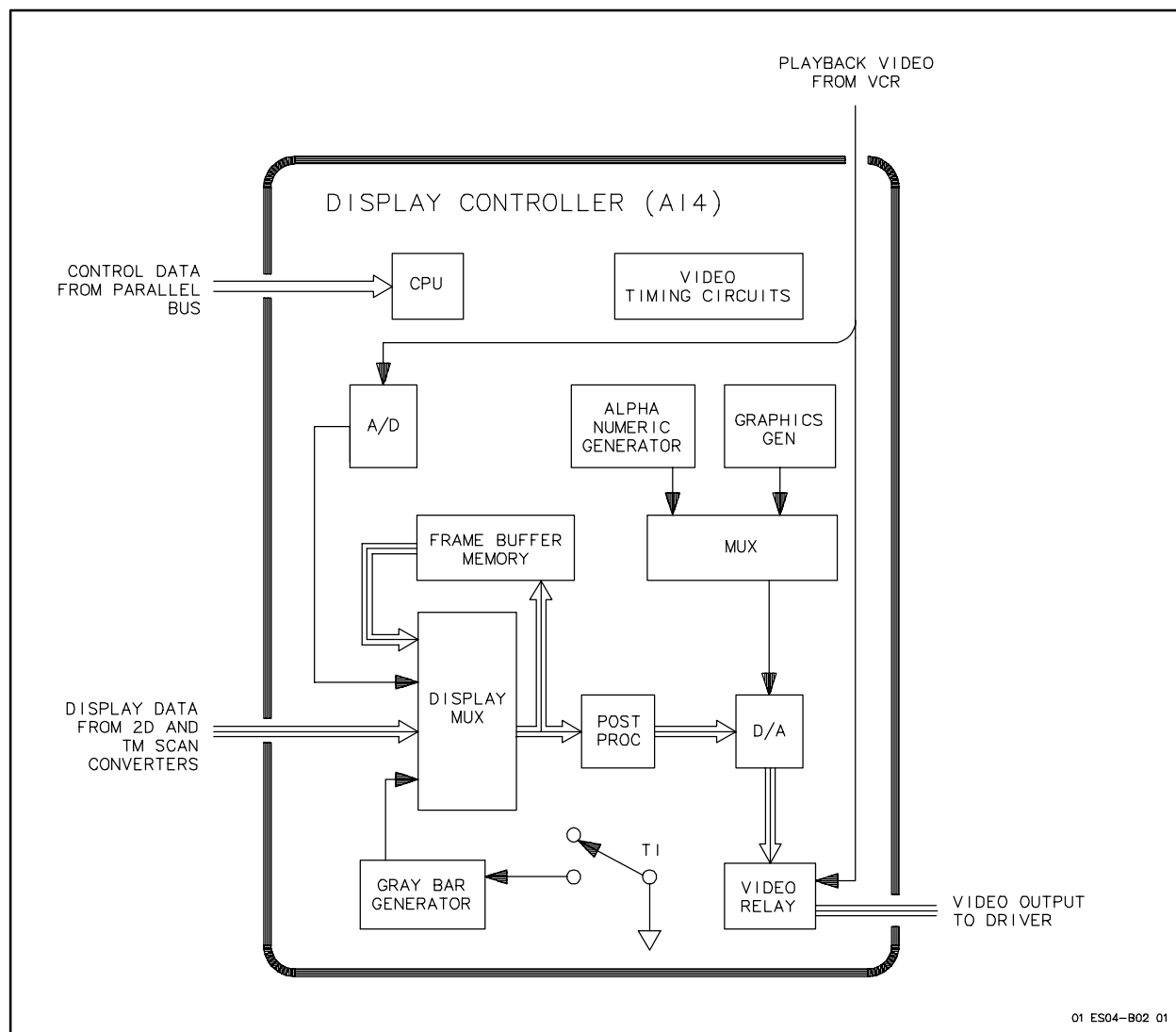**Figure 4–8.   Display Controller Test Location**
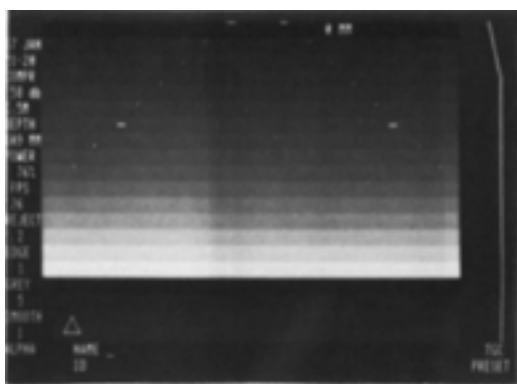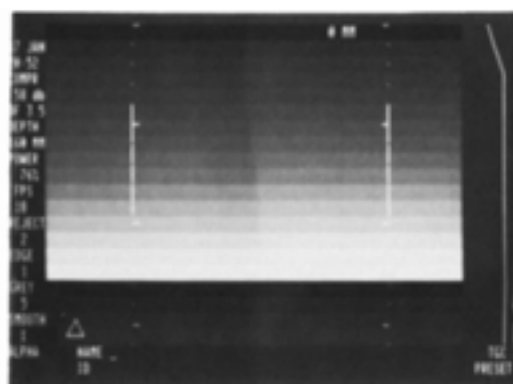
Figure 4–9.   Display Controller Test Switch Diagram

SECTOR
-A-

LINEAR
-B-

Figure 4–10.   Display Controller Test One

4–6   Data Comm Fault Isolation Test

Refer to Peripheral Field Service Adjustment Procedure Manual.

4–7   Error Messages

The UM-4 system at software levels 11.X and above displays error messages on the system monitor in response to error conditions detected within the system, and in its peripheral devices. Error messages initiated in the peripherals are addressed in the Fault Isolation tables. Error messages initiated in the UM-4 are shown in **Table 4–2**. Error messages will appear at the bottom of the monitor screen in the format described in **Table 4–2.**

Table 4–2.   System Malfunction Messages 11.X and higher

The System Malfunction Message will appear at the bottom of the monitor in the following format.

       "XXnnnn: SYSTEM MALFUNCTION—NOTIFY CUSTOMER SERVICE

XX will indicate which board failure was detected. Values for XX are:

00	–	System Controller
10	–	Beamformer
20	–	Motor Controller
30	–	Pulse Processor
40	–	Doppler Processor
50	–	TM AUX
60	–	VCR

nnnn is the error code. Currently the following error codes are assigned:

2	–	3 NAK messages received from front end.
3	–	ACK or NAK received and no message transmitted.
4	–	Front end timeout.
5	–	RFP line remains active.
6	–	Minimum board set not available.
7	–	Received three illegal messages in a row.
8	–	Overflow of system buffer.
9	–	Illegal message sent by front-end.
11	–	Front end received a non ASCII character.
12	–	Front end received illegal message.
13	–	Front end received two start message codes in a row.
14	–	Front end buffer overflow.
15	–	Front end received a message with no start code.
16	–	Front end detected a bad number.
20	–	Range error – bad command code received by front end.

4 Fault Isolation

4–8 Minimum Configuration Tables

Table 4–3 below lists minimum PCB configurations, feature by feature, for 12.X and 25.X systems with and without Doppler, 12 MHz sync.

Table 4–4 and **Table 4–5** provide similar information for 8.X and 6.X systems.

Table 4–3. Minimum Configuration, 12.X and Higher Software

	A	B	C	D	E	F	G
A1							X
A2					X	X	
A3					X	X	
A4					X	X	
A5		1	X	X	X	X	X
A6							X
A7		3	3	3	3	3	X
A8		X	X	X			X
A9			X	X	X	X	X
A10			X		X		
A11			X		X		
A12				X		X	X
A13				2		2	2
A14	X	X	X	X	X	X	X
A15	X	X	X	X	X	X	X

X = PCB installed
1 = A5 necessary for non-Doppler systems with 12 MHz sync
2 = A13 for M-mode depth markers, but not necessary for M-mode echo data
3 = A7 necessary for 12 MHz Doppler sync systems
A   System boot
B   Mechanical scanhead rotation
C   2D sector image only
D   M-mode (Access scanheads) only
E   2D linear image only
F   M-mode (linear, AA) only
G   Doppler only

Table 4–4. Minimum Configuration, Core S–2, 8.X.

	A	B	C	D	E	F	G
A1							X
A2					X		
A3					X		
A4	1			X	X		
A5	X	X	X	X	X	X	X
A6							X
A7							X
A8	1	X	X			X	X
A9			X		X		
A10			X		X		
A11			X		X		
A12						X	X
A13						X	X
A14	X	X	X	X	X	X	X
A15	X	X	X	X	X	X	X

X = PCB installed
1 = Alternatives, one must be installed

A   System boot
B   2D Sector overlay
C   2D Sector image
D   Linear overlay
E   Linear image
F   M-mode image
G   Doppler

Table 4–5.   Minimum Configuration, Core S1, 4.X and 6.X.

	A	B	C	D	E	F
A1						
A2					X	
A3					X	
A4	1			X	X	
A5	1	X	X	X	X	X
A6						
A7						
A8	1	X	X			X
A9			X		X	
A10			X		X	
A11			X		X	
A12						X
A13						
A14	X	X	X	X	X	X
A15	X	X	X	X	X	X

X = PCB installed
1 = Alternatives, one must be installed

A   System boot
B   2D Sector overlay
C   2D Sector image
D   Linear overlay
E   Linear image
F   M-mode image

4–9   Troubleshooting Tables

4–9.1   Layout

Figure 4–11 shows the typical layout of the fault isolation (troubleshooting) tables. To effectively use these tables, work with the assumption that the symptom listed is the only one that exists, and that the proposed solution corrects only that symptom. Other

system functions are presumed to be working properly. The following describes each area of the table.

1. Model – application or subject, in this case the UM-4.

2. Category – classification of a problem into a specific division, class, or system (e.g., System Boot, Image Quality, etc.).

3. Index No. – a number used in this table for reference purposes.

4. Symptom – an indication representing an underlying fault condition or otherwise inappropriate system function.

5. Possible Cause – a condition which may have produced the symptom.

6. Fault Isolation – a step or procedure to help determine the cause of the symptom.

7. Solution – the action to take to correct the cause of the symptom.

8. Reference – a source document or a section within this service manual which can be used to help solve the problem or correct the situation.

NOTE: *In some sections of the following tables, the instructions say to verify a signal at a specific point within the signal path. Unless stated otherwise, TTL activity at that point is usually sufficient to verify proper operation.*

MODEL: **UM-4**   PROBLEM CATEGORY: **SYSTEM BOOT**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference

Figure 4–11.   Fault Isolation Table (Typical Layout)

4–9.2   Index of Symptoms

Table 4–6.   Index of Symptoms

Index No.	Category
1	System Boot
2	Video
3	System Controls
4	2D Sector Image
5	2D Linear Image
6	2D Sector and Linear
7	Image Quality
8	M-mode
9	Doppler
10	Peripherals
11	Annotations
12	Overlays
13	Photo Module
14	VCR
15	Intermittents
16	Measurement
17	Mechanical

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
1.1	System does not boot	A. PCB or other module shorting power supply	1. Check power supply without PCBs/modules.	(1) Repair or replace defective PCB or module.	
		B. Power supply wiring	1. Inspect wiring.	(1) Repair or replace.	Power Distribution, Section 1B.
		C. Power supply	1. Check power supply.	(1) Replace power supply.	Adjustments, Section 3
			2. +5 volt supply too low.	(1) Adjust +5 volt supply to +5.2 volts.	Adjustments, Section 3
			3. Continuous keyboard tone.		
		D. PCB failure	1. Boot system with minimum configuration A.	(1) Isolate to defective PCB and replace it.	
	System does not boot, or intermittent boot or shutdown	E. ON/OFF Switch terminals	1. Connect power cord directly to EM. If EM powers up, then check switch assembly.	(1) Add strain relief to switch assembly. (2) Tighten lug connectors.	
1.2	After power-up: ⁻ Fans are running ⁻ Monitor is blank or has scrambled video ⁻ For softkeys – upper left soft key will display a letter ⁻ For hardkeys – all buttons illuminated ⁻ System Controller PCB (A15) LEDs do not sequence properly or do not illumiate	A. Dirty contacts on Push Button switches on System Controller PCB (A15)		(1) Spray contact cleaner directly into the switch while pressing the switch. Repeat for second switch. (2) Replace System Controller PCB (A15).	
1.3	Access S/H shuts down system with new chassis (3500-0454-07 or higher)	A. 3500-0437-03 Access cable not compatible with 7500-0373-03 or higher motherboard	1. 3500-0437-03 and below access cable has pin 6/grey wire and pin 7/purple wire on conn. to motherboard P5.	(1) Cut these wires to make cable compatible (this makes cable a 3500-0347-04).	

MODEL: **UM-4**

4 Fault Isolation

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Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
2.1	No video to monitor or peripherals	A. Rear Panel PCB or interconnect cable	1. Check for video at Rear Panel Connector A coax A1 or Connector E coax A1.	(1) Repair or replace Rear Panel PCB, or (2) Repair or replace interconnect cable, MBJ9 to Rear Panel J8.	Configuration, Section 5
		B. Motherboard	1. Check for video at J9 on Motherboard.	(1) Repair or replace Motherboard.	Configuration, Section 5
		C. Display Controller PCB (A14)	1. Verify video at pin 31C of Display Controller PCB.	(1) Replace Display Controller PCB if no video.	Configuration, Section 5
2.2	No video on monitor; peripherals ok	A. Rear Panel PCB	1. Verify video at Rear Panel Connector A coax A1.	(1) Repair or replace Rear Panel PCB.	Configuration, Section 5
		B. Video cable	1. Check cable.	(1) Repair or replace cable.	
		C. Monitor failure	1. Verify CRT filaments lit.	(1) Check and replace fuse as required. (2) Repair or replace monitor.	
			2. Verify proper video input.	(1) If video input ok, repair or replace monitor.	
2.3	No video on peripheral; monitor ok	A. No power to peripheral	1. Ensure Data Comm is switched on.	(1) Turn Data Comm on.	
			2. Check fuse in Data Comm.	(1) Replace fuse.	
			3. Check peripheral power input.	(1) Repair or replace peripheral.	
		B. Peripheral failure	1. Verify input to peripheral.	(1) Repair or replace peripheral.	
		C. Interconnect cable	1. Check cable.	(1) Repair or replace cable.	
		D. A/V Module Power Supply	1. Loss of video to VCR and Photo Module. 2. PHOTO MODULE BUSY EXIT ERROR message.	(1) Replace F2 on A/V Module Power Supply with 800 mA fuse, 2700-0066.	
		E. A/V Module	1. Verify A/V Module is switched on.	(1) Turn on A/V Module.	

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
			2. Verify input and output of A/V Module (specific connector varies with peripheral.	(1) Repair or replace A/V Module.	Configuration, Section 5
		F. Rear Panel PCB	1. Verify video at Rear Panel PCB Connector E coax A1.	(1) Repair or replace Rear Panel PCB.	Configuration, Section 5
2.4	No video during VCR playback	A. No power to VCR	1. Check VCR power switch.	(1) Turn on VCR.	
			2. Check 12 volts from A/V Module.	(1) Repair or replace A/V Module.	
		B. VCR	1. Verify output of VCR during playback.	(1) Replace VCR.	
		C. Interconnect cable	1. Check cable.	(1) Repair or replace cable.	
		D. A/V Module	1. Verify output of A/V Module at Connector E	(1) Repair or replace A/V Module. coax A2.	Configuration, Section 5
		E. Rear Panel PCB or interconnect cable	1. Verify VCR video in at MBJ8.	(1) Repair or replace Rear Panel PCB, or (2) Repair or replace interconnect cable, Rear Panel P4 A2 to MBJ8.	Configuration, Section 5
		F. Motherboard	1. Verify VCR video at U 135 pin 5 on Display Controller PCB (A14).	(1) Replace Motherboard.	
		G. Display Controller PCB (A14)	1. If 2.4 "F" above checks ok, PCB is defective.	(1) Replace Display Controller PCB (A14).	Configuration, Section 5

MODEL: **UM-4**

PROBLEM CATEGORY: **SYSTEM CONTROLS**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
3.1	Control panel does not light	A. Power Supply	1. Verify +10 volts (+9 V on some systems) at power supply test point.	(1) Replace power supply.	Configuration, Section 5
		B. Power Supply cable or Rear Panel PCB	1. Verify +10 volts (+9 V on some systems) at Connector B pin 1 on back of EM.	(1) Repair power supply cable, or (2) Repair or replace Rear Panel PCB.	Configuration, Section 5
		C. Interconnect Cable	1. Verify +10 volts (+9 V on some systems) at pin 1 of Control Module side of "EM to Control Module" interconnect cable.	(1) Repair or replace "EM to Control Module" interconnect cable.	Configuration, Section 5
		D. Control Module	1. If 3.1 "C" checks ok, then Control Module is defective.	(1) Repair or replace Control Module.	
3.2	No messages on soft-key panel	A. Softkey display panel or interconnect cable	1. Place jumper across JR 18 on System Controller PCB (A15). Type on keyboard and verify softkey panel responds.	(1) Repair or replace Control Module, or (2) Repair or replace interconnect cable.	Configuration, Section 5
		B. System Controller PCB (A15)	1. If 3.2 "A" checks ok, System Controller PCB (A15) is defective.	(1) Repair or replace System Controller PCB (A15).	Configuration, Section 5
3.3	Keyboard does not respond, audio alarm on; system boots	A. Control Module		(1) Repair or replace Control Module.	Configuration, Section 5
		B. Display Controller PCB (A14)		(1) Repair or replace Display Controller PCB (A14).	Configuration, Section 5
3.4	Control Panel rotary controls inoperable; alphanumerics ok	A. Control Module	1. With o'scope, verify signal at pin 7 of Control Module connector.	(1) Repair or replace Control Module.	Configuration, Section 5
		B. EM to Control Module interconnect cable	1. Verify input signal at J1 pin 15B of System Controller PCB (A15).	(1) Repair or replace interconnect cable.	

MODEL: **UM-4**　　　　　　　　　　　　　　　　　　PROBLEM CATEGORY: **SYSTEM CONTROLS (Cont'd)**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
		C. System Controller PCB (A15)	1. Verify output signal at J1 pin 15A of System Controller PCB (A15).	(1) Repair or replace System Controller PCB (A15).	Configuration, Section 5
3.5	Depth or Zoom settings change with-out touching controls	A. Control Module potentiometer		(1) Replace Control Module.	Configuration, Section 5
3.6	System will not change from sector to linear/ linear to sector	A. Motor Controller PCB (A8)		(1) If rest of system operational, replace Motor Controller PCB (A8).	Configuration, Section 5
3.7	System will not drive multifrequency or 10 MHz scanheads	A. Motor Controller PCB (A8)		(1) If other Access scan-heads ok, replace Motor Controller PCB (A8).	Configuration, Section 5
3.8	System lockup	A. Motor Controller PCB	1. Sector only system. 2. Failure to select sector scanhead.	(1) Replace U27.	Configuration, Section 5
3.9	No auto-repeat function on keyboard	A. Control Module		(1) Replace EPROM (Z5) on the KeyTronic PCB. EPROM part number is 4204-0013-01.	
3.10	No response from the keypad on the Control Module	A. Capacitor C1 on the Keyboard Controller PCB		(1) If C1 has a diameter exceeding .5 inch, then replace C1 with a thinner capacitor (3740-0029). (2) Contact Technical Support.	

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PROBLEM CATEGORY: **2D SECTOR IMAGE**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
4.1	No 2D sector echoes on monitor; mech. operation ok, screen graphics ok	A. Scanhead	1. Try another scanhead.	(1) Replace scanhead.	
		B. Pulse Processor PCB (A5)	1. Verify echoes present in M-mode and Linear.	(1) Replace Pulse Processor PCB (A5).	Configuration, Section 5
		C. Interconnect cabling	1. Verify echoes present in M-mode.	(1) Repair or replace cable.	
		D. System Receiver	1. Verify input and output of System Receiver.	(1) Replace System Receiver.	Configuration, Section 5
		E. Scan Converter PCBs (A9, 10 or 11)	1. Verify echoes present in M-mode; if present, Scan Converter PCB defective.	(1) Replace defective Scan Converter PCB (A9, 10 or 11) if M-mode present.	Configuration, Section 5
4.2	No image from Access or 72X scanhead; EFT and Linear ok	A. Scanhead	1. Try another Access or 72X scanhead.	(1) Replace scanhead.	
		B. Pulse Processor PCB (A5)	1. Verify drive pulses at J2 of Pulse Processor PCB (A5).	(1) Replace Pulse Processor PCB (A5).	Configuration, Section 5
			2. Verify XDCRSEL at P2 pin 1A of Pulse Processor PCB (A5) is less than 0.5 V with Access or 72X scanhead selected.	(1) Replace Pulse Processor (A5).	
		C. Interconnect cable	1. Verify FXDCRSEL at FT5 of receiver is less than 0.5 V.	(1) Repair or replace interconnect cable.	
		D. System Receiver or interconnect cable	1. Verify drive pulses at scanhead BNC connector (use BNC "Tee" connector).	(1) Replace System Receiver or interconnect cable.	Configuration, Section 5
4.3	Artifacts with AA scanhead	A. Scan Converter frame rate not properly set upon initialization if system default set to F3 or F4 smoothing		(1) Configure system default to F1 or F2 smoothing. (2) Cycle through smoothing functions (F1–4) prior to scanning. (3) Press <CTRL-B> twice to reset smoothing function.	

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
4.4	Noisy sector image	A. Cable dressing	1. Route sector motor drive cables behind linear connectors and ECG cables are routed in front.	(1) Route cables properly.	
		B. Pulse Processor PCB (A5)		(1) Replace Pulse Processor PCB (A5).	

MODEL: **UM-4**

PROBLEM CATEGORY: **2D LINEAR IMAGE**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
5.1	No linear image; screen graphics, controls ok	A. Power Supply	1. Verify ±70 V (±80 V for S1) at power supply.	(1) Replace Power Supply.	Configuration, Section 5
		B. Beamformer PCBs (A2,3, 4)	1. Verify Linear M-mode operational.	(1) Replace Beamformer PCBs (A2, 3 or 4).	Configuration, Section 5
		C. Pulse Processor PCB (A5)		(1) Replace Pulse Processor PCB (A5).	Configuration, Section 5
		D. Scan Converter PCBs (A9, 10, 11)	1. Verify 2D Sector mode operational.	(1) Replace Scan Converter PCBs (A9, 10 or 11).	Configuration, Section 5
		E. EFT Panel Assembly	1. Check for broken coax cable at RF connector on Motor Controller PCB.		
			2. Check for broken coax cable at RF connector on the Receiver module.		
			3. Check for defective EFT connector.	(1) Replace EFT Panel Assembly.	Parts, Section 9
5.2	Wide horizontal bars in image	A. Scan Converter PCBs (A9, 10, 11)	1. Verify 2D Sector operational.	(1) Replace Scan Converter PCBs (A9, 10 or 11).	Configuration, Section 5
		B. Beamformer Focus PCB (A3)		(1) Replace Beamformer Focus PCB (A3).	Configuration, Section 5
5.3	Checkerboard pattern, dark bands, "broken" images, dropouts or vertical lines after booting	A. Beamformer Controller PCB (A4)	1. PCB is 7500-0548-08.	(1) Replace with 75001-0548-09, return -08 for rework to -09.	

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PROBLEM CATEGORY: **2D SECTOR AND LINEAR**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
6.1	No sector or linear update, image frozen and random	A. Motor Controller PCB (A8)		(1) Replace Motor Controller PCB (A8).	Configuration, Section 5
6.2	Vertical lines in both sector and linear linear modes	A. Display Controller PCB (A14)		(1) Replace Display Controller PCB (A14).	Configuration, Section 5
6.3	No 2D echoes in either sector or linear, M-mode ok	A. Display Controller PCB (A14)		(1) Replace Display Controller PCB (A14).	Configuration, Section 5

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PROBLEM CATEGORY: **IMAGE QUALITY**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
7.1	Excessive noise in far field (Sector only)	A. Scanhead		(1) Replace scanhead.	
		B. System Receiver		(1) Replace System Receiver.	Configuration, Section 5
		C. Defective grounding		(1) Inspect cables and system grounds.	
7.2	Excessive noise in both Linear and Sector images	A. Scan Converter Interface PCB (A9)		(1) Replace Scan Converter Interface PCB (A9).	Configuration, Section 5
		B. Pulse Processor PCB (A5)		(1) Replace Pulse Processor PCB (A5).	
7.3	Blocky image in both Sector and Linear	A. Scan Converter OAG PCB (A11)		(1) Replace Scan Converter OAG PCB (A11).	Configuration, Section 5
		B. Scan Converter Interface PCB (A9)		(1) Replace Scan Converter Interface PCB (A9).	
		C. Scan Converter Buffer PCB (A10)		(1) Replace Scan Converter Buffer PCB (A10).	
7.4	Radial lines in Sector image and vertical lines in Linear	A. Cable between Scan Converter Interface (A9) and Scan Converter Buffer (A10)		(1) Repair or replace cable.	Configuration, Section 5
7.5	Poor image quality and poor penetration (Sector, AA)	A. Pulse Processor PCB (A5)		(1) Replace Pulse Processor PCB (A5).	Configuration, Section 5
7.6	Poor image quality on S1 system	A. Pulse Processor PCB (A5) or higher.	1. Verify Pulse Processor PCB (A5) is 7500-0313-02	(1) Replace Pulse Processor PCB (A5) with -02 or higher. (**NOTE:** *must have 5X or higher software*).	
7.7	Questionable image quality with Linear/AA scanheads		1. Perform image quality check.		

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
7.8	Far field noise rings in Sector image	A. Unshielded segments on the Front Panel BNC coax cable		(1) Replace the unshielded coax cable with a shielded one (3500-0580). Ensure removal of plastic insulator on BNC connector.	
7.9	Thin horizontal lines in linear echo area with 5 MHz and multiple focal zones.	A. Unknown	1. Uncorrectable	(1) None	
7.10	Vertical jail bars or towers: columns of weaker returning echoes.	A. Loose or broken ground strap	1. Check ground strap on Beamformer Front End, A2.	(1) Replace or repair ground strap.	
		B. Loose PCB shields	2. Check PCB shields.	(2) Resolder contact point between shield and PCB.	
7.11	Intensity flickering or flashing, Aspect High Contrast Monitors; 3500-0764-XX 3500-1087-XX 3500-4094-XX	A. Loose connection	1. Inspect connections. inside UM-4/UM-5 monitor	(1) Insure good connection.	
		B. Loose connection at P2-4, causing high volt-age arcing	1. Inspect connections.	(1) Insure good connection.	
		C. Loose securing nut	1. Inspect T4 for loose nut. over the ferrite core of T4, causing high voltage arcing and a high pitched whine	(1) Tighten nut.	
		D. Poor power fuse (F1)	1. Inspect fuse and holder. fit or dirty fuse holder	(1) Clean fuse holder and reseat fuse.	
		E. Dirty pot (especially Brightness)		(1) Clean pots with freon and verify adjustments.	Adjustments, Section 3

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
7.12	Horizontal Raster fluctuations	A. Poor crimp on E-30 or E-36 on monitor PCB	1. Inspect E-30 and E-36.	(1) Recrimp wires into E-30 and E-36.	
		B. Excessive dirt build-up on R-27 (Horizontal Oscillator adj.)		(1) Free dirt with tweeker (6005-0230-01) and clean pot with freon, then verify adjustments.	Adjustments, Section 3
7.13	Intermittent Far Field Noise	Beamformer Focus PCB (7500-0361-05) oscillation		Replace with 7500-0361-07 PCB (or higher).	
7.14	Checkerboard pattern, dark bands, "broken image", dropouts or vertical lines when system is booting up	7500-0548-07 or -08 in PCB Slot A4	Bus contention problem overheats U148, eventually causing it to fail. (Bus contention only occurs during boot-up).	Replace PCB with -09 upon failure or upon next call basis.	

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PROBLEM CATEGORY: **M-MODE**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
8.1	No M-mode on strip-chart recorder; ok on monitor	A. Interconnect cable		(1) Repair or replace cable.	
		B. TM-Mode PCB (A12) (S1 systems)		(1) Replace TM-Mode PCB (A12).	Configuration, Section 5
		C. TM Auxiliary PCB (A13) (S2 systems)		(1) Replace TM Auxiliary PCB (A13).	Configuration, Section 5
8.2	M-mode will not scroll on monitor; stripchart ok, 2D ok	A. TM-Mode PCB (A12)		(1) Replace TM-Mode PCB (A12).	Configuration, Section 5
	No M-mode or 2D; stripchart ok	B. Display Controller PCB (A14)		(1) Replace Display. Controller PCB (A14).	Configuration, Section 5
8.3	No M-mode graphics	A. TM-Mode PCB (A12)		(1) Replace TM-Mode PCB (A12).	Configuration, Section 5
		B. TM Auxiliary PCB (A13)		(1) Replace TM Auxiliary PCB (A13).	Configuration, Section 5
8.4	No ECG display in M-mode, 2D ok	A. TM-Mode PCB (A12)		(1) Replace TM Auxiliary PCB (A13).	Configuration, Section 5
8.5	No ECG display in any mode	A. ECG Isolation PCB		(1) Replace ECG Isolation PCB.	Configuration, Section 5
		B. TM-Mode PCB (A12)		(1) Replace TM-Mode PCB (A12).	Configuration, Section 5

Fault Isolation   4

MODEL: **UM-4**

PROBLEM CATEGORY: **DOPPLER**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
9.1	No PW Doppler, no Doppler audio; CW ok	A. Doppler Pulser PCB (A1)		(1) Replace Doppler Pulser PCB (A1).	Configuration, Section 5
9.2	No PW Doppler, no Doppler audio, no CW	A. Doppler Acquisition PCB (A6)		(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5
		B. Doppler Pulser PCB (A1)		(1) Replace Doppler Pulser PCB (A1).	Configuration, Section 5
9.3	No Doppler spectral display; audio ok	A. Doppler Processor PCB (A7)		(1) Replace Doppler Processor PCB (A7).	Configuration, Section 5
9.4	Noise bands in Doppler spectral display; audio ok	A. Cable dressing	1. Ensure all A5–A8 coax cables are between A4 and A8, and routed between A5 and A6 ejectors.	(1) Re-dress cables.	
		B. Doppler Processor PCB (A7)		(1) Replace Doppler Processor PCB (A7).	Configuration, Section 5
9.5	Noise bands in Doppler spectral and audio	A. Cable dressing	1. See 9.4 above.	(1) Re-dress cables.	Configuration, Section 5
		B. Doppler Acquisition PCB (A6)		(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5
9.6	Mirroring in Doppler spectral display; audio ok	A. Doppler Processor PCB (A7)		(1) Replace Doppler Processor PCB (A7).	Configuration, Section 5
9.7	Mirroring in Doppler spectral and audio	A. Doppler Acquisition PCB (A6)		(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
9.8	One channel of audio missing; spectral display ok	A. Speaker or interconnect cable	1. Switch cables from Audio Amp to speakers; verify audio channel failure moves to other channel.	(1) Repair or replace speaker or cable.	
		B. Doppler Acquisition PCB (A6)	1. Verify audio output at P1 13B and P1 13C of Doppler Acq PCB (A6).	(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5
		C. EM/AV interconnect cable	1. Verify audio input to A/V Module at P3 Connector D	(1) Repair or replace EM/AV interconnect cable. (P3) pins 34 and 36.	
		D. A/V Module	1. Verify audio output of A/V Module at P10 Connector J (P10) pins 3 and 5.	(1) Troubleshoot and repair or replace A/V Module.	
		E. Audio Amplifier	1. Verify audio output of Audio Amplifier.	(1) Repair or replace Audio Amplifier.	
9.9	No forward flow on spectral display; audio ok	A. Doppler Processor PCB (A7)		(1) Replace Doppler Processor PCB (A7).	Configuration, Section 5
9.10	No forward flow in both spectral and audio	A. Doppler Acquisition PCB (A6)		(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5
9.11	No reverse flow on spectral display; audio ok	A. Doppler Processor PCB (A7)		(1) Replace Doppler Processor PCB (A7).	Configuration, Section 5
9.12	No reverse flow in both spectral and audio	A. Doppler Acquisition PCB (A6)		(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5
9.13	Blotchy spectral image on spectral display, audio sounds ok	A. Doppler Processor PCB (A7)		(1) Replace Doppler Processor PCB (A7).	Configuration, Section 5
9.14	Blotchy spectral image, audio sounds distorted	A. Doppler Acquisition PCB (A6)		(1) Replace Doppler Acquisition PCB (A6).	Configuration, Section 5

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
9.15	Harmonic tones when changing sample volume depth.	A. Application	1. Verify knobology.	(1) Change PRF. (2) Reposition sample volume. (3) Reduce Doppler gain or output.	Configuration, Section 5
9.16	Loud audio feedback noise on power-up	A. System microphone jack connector	1. Check microphone jack.	(1) Add jumper from T/S (tip) to SLV (sleeve) terminals on microphone jack.	
9.17	No pulser output	A. Doppler Pulser PCB (A1)	1. Check Test Point #2 on the front of the Doppler Pulser PCB; it can short to ground.	(1) Clip Test Point #2 as close to the PCB as possible.	
9.18	Loss of spectral display	A. Doppler Processor PCB (A7), 7500-0347-XX, jumpers dislocated	1. Check jumpers JP1 and JP3 on Doppler Processor PCB (A7), 7500-0347-XX.	(1) Hardwire JP1 and JP3 on the Doppler Processor PCB, 7500-0347-XX.	
9.19	Loss of spectral display and loss of scrolling Doppler graphics	A. T-M Mode PCB (A12)		(1) Replace T-M Mode PCB (A12).	Configuration, Section 5
9.20	Audio ringing with Access 10PV scanheads.	A. Inherent reverberation of 10PV and high Doppler sensitivity	1. None	(1) Contact Technical Support.	
		B. Volume control set too high	1. Feedback squeal normal if high volume setting at power up.	(1) Reduce volume until booted.	

MODEL: **UM-4**

PROBLEM CATEGORY: **PERIPHERALS**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
10.1	Peripheral does not respond to PRINT control	A. Peripheral	1. Verify peripheral is operational with control cable from system disconnected.	(1) Repair or replace peripheral.	PER Svc Man'l
		B. Control Module	1. Verify PRINT command input to System Controller PCB (A15) at P1 pin 15B.	(1) Repair or replace Control Module.	Configuration, Section 5
		C. System Controller PCB (A15)	1. Verify PRINT command output of System Controller PCB (A15) at P1 pin 23B for 140 and 170 peripherals; at P1 pin 27B for Photo Module.	(1) Replace System Controller PCB (A15).	Configuration, Section 5
		D. A/V Module	1. Verify input and output of A/V Module.	(1) Repair or replace A/V Module.	Configuration, Section 5
		E. Interconnect cable	1. Check interconnect cable.	(1) Repair or replace interconnect cable.	
10.2	All error messages	A. Peripheral malfunction	1. Verify correct stand-alone operation of peripheral.	(1) Repair or replace peripheral.	
		B. No video to peripheral	1. Verify video to peripheral.	(1) See Fault Isolation Tables,, Section 5 2 (Video, Section 5).	
		C. Interconnect cable	1. Check cable.	(1) Repair or replace cable.	
		D. A/V Module	1. Check A/V Module.	(1) Repair or replace A/V Module.	Configuration, Section 5
		E. System Controller PCB (A15)	1. Check System Controller PCB.	(1) Repair or replace System Controller PCB (A15).	Configuration, Section 5
		F. EM Motherboard	1. Check motherboard.	(1) Repair or replace EM Motherboard.	Configuration, Section 5
		G. Display Controller PCB (A14)	1. Check Display Controller PCB.	(1) Repair or replace Display Controller PCB (A14).	Configuration, Section 5
		H. Rear Panel PCB	1. Check Rear Panel PCB.	(1) Repair or replace Rear Panel PCB.	Configuration, Section 5

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
10.3	Error message: SCR PRINTER BUSY ON ENTRY	A. Recorder printing when PRINT is pressed		(1) Wait for completion of print cycle.	
		B. Interconnect cable	1. Check cable.	(1) Repair or replace cable.	
10.4	Error message: SCR PRINTER BUSY EXIT ERROR	A. Recorder printing when PRINT is pressed		(1) Wait for completion of print cycle.	
		B. No power to recorder	1. Check recorder power.	(1) Apply power to recorder. switch and power cable.	
		C. No power to A/V Module	1. Check power to A/V Module.	(1) Apply power to A/V Module.	
		D. Interconnect cable	1. Check cable.	(1) Repair or replace cable.	
10.5	Error message: MI CAMERA BUSY ON ENTRY ERROR	A. Camera in warm-up cycle		(1) Allow camera to warm up about 1 minute.	
10.6	Error message: MI CAMERA ENTRY ERROR	A. Film cassette not fully inserted	1. Check cassette.	(1) Insert cassette correctly.	
		B. Dark slide in place	1. Check dark slide.	(1) Remove dark slide.	
		C. View Port door open	1. Check view port door.	(1) Close door.	
		D. End of film	1. Check film exposures.	(1) Load new film.	
10.7	Error message: MI CAMERA TIMEOUT ERROR	A. End of film	1. Check film exposures.	(1) Load new film.	
10.8	Error message: PAGE PRINTER ENTRY ERROR	A. No cassette paper	1. Check paper.	(1) Install paper.	
10.9	Error message: PAGE PRINTER BUSY EXIT ERROR	A. No power to page printer	1. Check power.	(1) Apply power.	
		B. Page printer not reset		(1) Reset page printer.	
		C. Copy tray not out		(1) Pull out copy tray.	
10.10	Error message: PAGE PRINTER TIMEOUT ERROR	A. Paper jammed	1. Check paper path.	(1) Clear paper path.	

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
10.11	Noise bars on hard-copy	A. Display Controller PCB (A14)	1. Verify Display Controller PCB is 7500-0300-00/01 Rev "J" or higher.	(1) Replace Display Controller PCB (A14).	Configuration, Section 5
10.12	Peripheral not secured to EM	A. Two locking screws loose or missing	1. Mobile system.	(1) Secure peripheral to EM with two 4-40 x 3/8 inch screws.	
10.13	LS-8 CONTRAST control has no effect on video or stripchart image	A. Jumper J4 on Grid Amp PCB incorrectly installed	1. Check jumper J4 on Grid Amp PCB.	(1) Set J4 on Grid Amp PCB of LS-8 to the top EXT/C position.	Fig 3-16 on pg LS8-03-15 in 4720-0220-01
10.14	Density fluctuations in Multi-Image Camera prints	A. Faulty Data Comm Isolation Transformer	1. Check Camera input power from Data Comm for 110–130 volts AC.	(1) Replace the Data Comm Isolation Transformer (2600-0054).	
		B. Incorrect video levels	1. Check video signal levels to camera: sync tip of .28V; video level of .9V.	(1) Replace Display Controller PCB (A14).	Configuration, Section 5
10.15	Peripheral does not power-up	A. Power Cord	1. No power to EM.	(1) Reseat power cable. (2) Replace power cord bracket (1065-0425).	
		B. Blown fuse	1. Power to EM.	(1) Replace fuse in power distribution box.	

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
11.1	Date and time inaccurate	A. Date/time not reset at beginning of year		(1) Reset date/time.	
		B. System Controller PCB (A15) replaced w/out resetting date/ time		(1) Reset date/time.	
11.2	Date and time inaccurate after system powered down	A. Battery charge circuit	1. Verify voltage across R2 on Motherboard is greater than +4.8 volts.	(1) Repair or replace Motherboard.	
		B. Batteries	1. Verify battery voltage is greater than +4.5 volts with system OFF.	(1) Replace batteries.	
		C. Battery terminals dirty		(1) Clean battery terminals.	
11.3	Double characters on monitor	A. Display Controller PCB (A14)		(1) Replace Display Controller PCB (A14).	Configuration, Section 5
11.4	No annotation on any display mode	A. Display Controller PCB (A14)		(1) Replace Display Controller PCB (A14).	Configuration, Section 5
		B. System Controller PCB (A15)		(1) Replace System Controller PCB (A15).	Configuration, Section 5

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
12.1	Radial lines in sector, vertical lines in linear, with flashing horizontal lines in both	A. Scan Converter Interface PCB (A9)		(1) Replace Scan Converter Interface PCB (A9).	Configuration, Section 5

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
13.1	Error message: PHOTOMODULE BUSY ON ENTRY ERROR	A. Photo Module in warmup mode		(1) Allow 1–2 minutes warmup.	
		B. Interconnect cable	1. Inspect cable.	(1) Repair or replace cable.	
		C. Photo Module		(1) Repair or replace Photo Module.	
		D. Display Controller PCB (A14)	1. Verify a logic transition at A14 U 139 pin 7 after each video field.	(1) Repair or replace Display Controller PCB (A14).	
13.2	Error message: PHOTOMODULE ENTRY ERROR	A. Photo Module not connected to system		(1) Connect Photo Module.	
		B. Interconnect cable	1. Inspect cable.	(1) Repair or replace cable.	
		C. Photo Module		(1) Repair or replace Photo Module.	
13.3	Error message: PHOTOMODULE BUSY EXIT ERROR	A. No film in camera	1. Verify film in camera.	(1) Load film.	
		B. Protective cardboard insert not ejected		(1) Eject cardboard insert.	
		C. Interconnect cable	1. Inspect cable.	(1) Repair or replace cable.	
		D. Photo Module		(1) Repair or replace Photo Module.	
		E. A/V Module fuse F2	1. Inspect fuse.	(1) Replace with P/N 2700-0066.	
13.4	Error message: PHOTOMODULE EXIT ERROR	A. Interconnect cable	1. Inspect cable.	(1) Repair or replace cable.	
		B. Photo Module		(1) Repair or replace Photo Module.	
13.5	Error message: PHOTOMODULE TIMEOUT ERROR	A. Interconnect cable	1. Inspect cable.	(1) Repair or replace cable.	
		B. Photo Module		(1) Repair or replace Photo Module.	

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
14.1	VCR does not respond to system commands	A. No power to VCR	1. Verify VCR power switched ON.	(1) Turn on VCR.	
			2. Verify 12 volts from A/V Module.	(1) Adjust, repair or replace A/V Module.	
		B. Interconnect cable	1. Inspect cable.	(1) Repair or replace cable.	
		C. VCR	1. Verify output of VCR during playback.	(1) Replace VCR.	
		D. A/V Module	1. Verify output of A/V Module.	(1) Repair or replace A/V Module.	Configuration, Section 5
14.2	No video playback	A. See Fault Isolation Tables,, Section 5 2 (Video, Section 5)			
14.3	VCR lock-up	A. VCR time out in PLAY or RECORD if paused over four minutes	1. Verify VCR not timed-out.	(1) Inform customer of time out function.	
14.4	Scrambled video during playback from VCR; tracking adjustment has no effect (AG-6400 or 7400 VCRs)	A. Customer trying to review a tape recorded with a VCR set to LP or EP/SLP.	1. Record and play back video with VCR in SP mode.	(1) Only tapes recorded in standard play (SP) will play back correctly on AG-6400 or AG-7400 VCRs. **NOTE:** *EP/SLP modes result in poor playback image quality.*	

MODEL: **UM-4**

PROBLEM CATEGORY: **INTERMITTENTS**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
15.1	Excessive noise, lock-ups, erratic operation	A. Poor power connections	1. Inspect power plug.	(1) Reassemble power plug.	
		B. Poor AC ground to system		(1) Move system to another power outlet. (2) Ground system to a cold-water pipe with 12 gauge wire.	
		C. Local TV or radio interference, or static on nearby electrical equipment	1. Correlate problem with AM radio.	(1) Move system to another location. (2) Turn off interfering equipment.	
15.2	Intermittent system boot or shutdown	A. Loose screws securing power supply to Main PCB	1. Check screws.	(1) Tighten screws securing power supply to Main PCB.	
		B. ON/OFF switch terminals		(1) Tighten lug connectors. (2) Install strain relief.	
15.3	Keyboard slow to respond during printing with small report printer	A. Normal occurrence with small report printer		(1) Educate operator.	
15.4	Intermittent lock-up				Configuration, Section 5
15.5	Lock-up of keyboard in sector, Linear, or M-mode	A. System Controller PCB, 7500-0312 Rev K	1. Check revision of System Controller PCB (A16).	(1) Replace System Controller PCB (A16).	Configuration, Section 5
15.6	Photo Module intermittently ejects film	A. Photo Module drive motor		(1) Install .1uf-100V capacitor (3725-0331) across drive motor connector.	
15.7	Intermittent lateral shift in sector image with Access scanhead	A. Motor Controller PCB (A8)		(1) Replace Motor Controller PCB PROM, U26. (2) Change depth setting.	Configuration, Section 5

MODEL: **UM-4**

PROBLEM CATEGORY: **MEASUREMENT**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
16.1	Erratic movement of measurement markers	A. Trackball		(1) Replace trackball.	
16.2	System will not go into one or both calculation modes	A. Calc package disabled	1. Verify customer purchased calcs.	(1) Enable calcs.	
16.3	Hardcopy report is printed on only half the page	A. Defaults configured to small printer	1. Check printer configuration.	(1) Reconfigure printer defaults.	
16.4	No EFA (AUA)	A. One or more measure-ments below mini- mum tolerance	1. Check measurements.	(1) Re-measure if necessary.	
16.5	No EFW	A. One or more measure-ments below minimum tolerance	1. Check measurements.	(1) Re-measure if necessary.	
16.6	Unit will not accept LMP	A. System current date in error		(1) Reset current date.	
16.7	Customer believes cal-culations are in error (e.g., constant EFA of 28 weeks) Intermittent lock-up	A. System Controller PCB (A15) changed without resetting CURRENT INVESTIGATORS tables		(1) Reset CURRENT INVESTI-GATORS to customer's pre-ferred default settings.	
		B. System Controller PCB (A15)	1. Verify tables are opera-tional.	(1) Replace System Controller PCB (A15).	Configuration, Section 5
16.8	Intermittent loss of one caliper while in Dual Image	A. Normal occurrence		(1) Inform customer: ensure active caliper is visible when pressing IMAGE SELECT.	
16.9	Inaccurate measure-ments in linear and sector	A. Scan Converter Inter-face PCB (A9)	1. Check for egg-shaped cysts in linear with a phantom.	(1) Replace Scan Converter Interface PCB (A9) .	Configuration, Section 5

MODEL: **UM-4**

PROBLEM CATEGORY: **MECHANICAL**

Index No.	Symptom	Possible Cause	Fault Isolation	Solution	Reference
17.1	Monitor arm will not rise	A. Middle link pin on HFC arm		(1) Replace middle link pin with 1064-0335 Rev B.	
17.2	NV-8420 VCR cassette door is blocked by the A/V Module	A. Unsecured A/V Module mounting plate		(1) Replace the VCR mount- ing plate (1064-0249) with VCR mounting plate (1064-0249 Rev E).	
17.3	Missing locking con- nectors on ribbon cables	A. Incorrect connectors	1. Cables affected: EM to A/V–"D" 2275-0106, EM to A/V–"E01" 2275-0090 EM to DC–"F" 2275-0103	(1) Use care when installing new systems. Verify cables are secure.	
17.4	Inaccessible micro- phone jack when Len- zar camera is mounted on HFC	A. Inadequate clearance between A/V Module and Lenzar camera		(1) Plug in the microphone before installing the Lenzar camera. (2) Install a right angle head- phone adapter (Radio Shack 274-371). (3) Contact Technical Support. A new chassis assembly exists: 4000-0143-12 (Dom) and 4000-0143-13 (Int'l) and higher.	
17.5	Monitor to EM cable breaks internally	A. Frequent Monitor removal	1. Demo or mobile account	(1) Repair cable and provide strain relief.	
17.6	Difficulty in installing the Monitor Module Assembly on UM4A, OB and CV systems	A. Presence of dress plate, which is only compatible with HFC		(1) Remove dress plate, install it on defective monitor assem- bly, and return to the factory. Install dress plate from defective monitor assembly onto the replacement moni- tor assembly.	

4–10   UM-4 KEYBOARD TESTER

NOTE: *For Softkey with slidepot TGC only.*

CAUTION: *Do not remove or connect the tester with the system under power.*

1. With the system OFF, insert and secure the tester in series with the keyboard cable and the keyboard.

2. Turn the system ON.

3. Follow the prompts on the keyboard display. (A test selection menu will be displayed after the initial softkey test. Disregard the HARDKEY selection on this menu.)
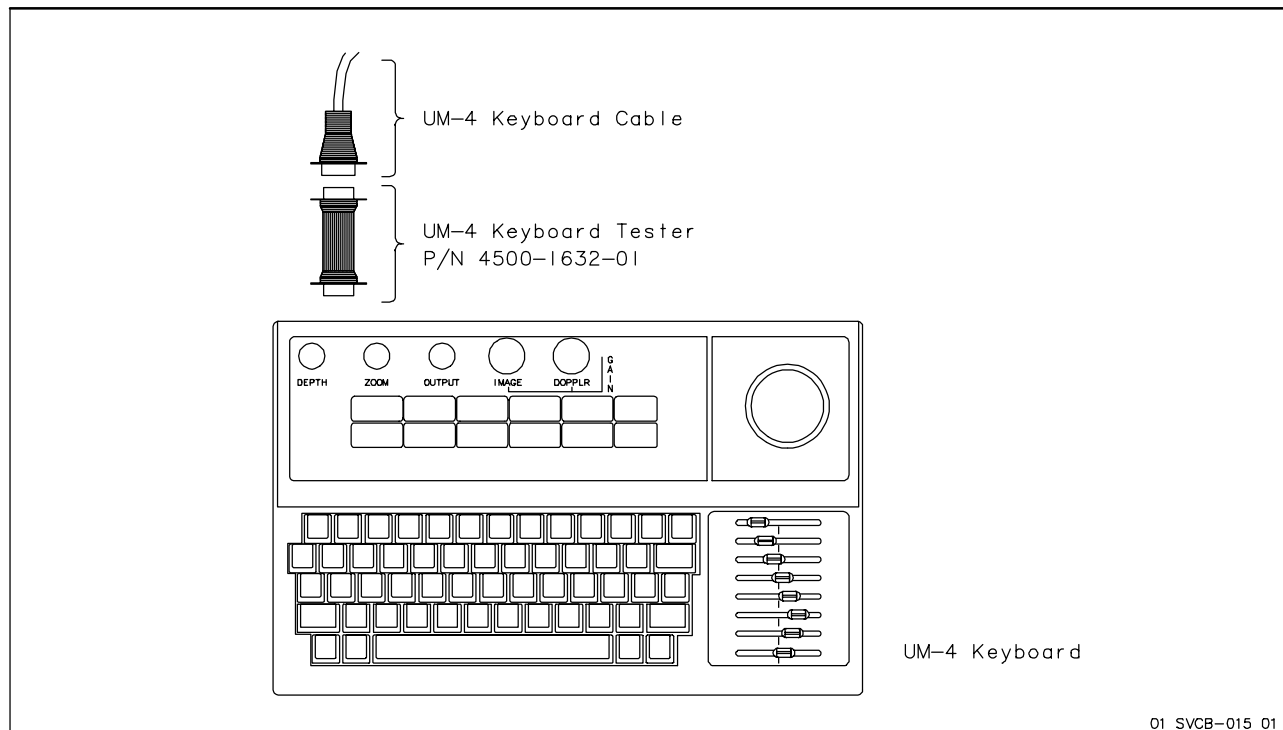

Figure 4–12.   UM-4 Keyboard Tester

4–11 Linear and AA Image Quality Verification (Was S.B. UM4–70)

Some image quality problems may actually be caused by hard failures. For example, penetration or resolution could be reduced or noise introduced without disabling the system. Image quality problems should be first treated as hard failures.

The following tests elaborate on some of the procedures in the Performance Tests section of this manual.

CAUTION: *This equipment contains components which are electro-static sensitive. Proper static procedures, protection and equipment must be used prior to opening, and during handling of of this equipment. Failure to use proper ESD procedures will cause damage to these components. Such damage to components is not covered by ATL warranties. Refer to General Field Service Manual, (P/N 4720-0219-01) for details.*

4–11.1 Tower Test (Linear only)

This test verifies that all elements in the linear scanhead are operational and firing in the correct sequence.

1. Connect a linear scanhead and turn on the system.

2. Select the linear scanhead:

   a. Softkey (SK): press LINEAR, then appropriate scanhead softkey

   b. Hardkey (HK): press SCANHEAD SELECT until correct scanhead ID is displayed on left side of monitor.

3. Repeatedly press FOCUS (SK) or DYNAMIC FOCUS (HK).

   a. Each depression should add another focal zone indicator to each side of the image display.

   b. When five zones are displayed, the next depression should return the image to a single focus zone.

4. Set controls a follows:

POWER OUTPUT	100 percent
REJECT	1 (Special Function O)
EDGE ENHANCEMENT	1
GRAYSCALE	2
SMOOTHING	F1 (<CTRL>-B)
DYNAMIC RANGE	58 dB (47 dB, ≦ 16X)
DEPTH	180 mm (for 3.5 MHz) 160 mm (for 5.0 MHz)
FOCAL ZONES	All 5

NOTE: *With 16X (p21601 or higher) Pulse Processor Software installed, Dynamic Range should be set to 58 dB; for 16X (p21600 or lower), set Dynamic Range to 47 dB. See "Far Field Noise" on page UM4–04–41 for details.*

5. Examine the surface of the scanhead for any physical defects (replace the scanhead if any are found).

6. Lightly coat the surface with acoustic gel.

7. Hold a thin screwdriver perpendicular to the surface of the scanhead and slowly slide it down the scanhead using mimimal pressure on the screwdriver (**Figure 4–13**).

   • The tower-like image should have five separate sections (widths). Only one tower should be displayed.

- There should not be any drop-outs, or duplicate or intermittently duplicated towers, as the tower moves across the display.

8. Select the fifth focal zone by selecting one focal zone and moving the PAN/ZONE indicator down as far as possible.

9. Again, hold a thin screwdriver perpendicular to the surface of the scanhead and slowly slide it down the scanhead.

   - There should be eight sections (representing reception focal zones). Look closely as they can be hard to discern. It may be necessary to adjust the TGC and ZOOM controls for the best image.

   - There should not be any drop-outs, or duplicate or intermittently duplicated towers, as the tower moves across the display.

10. If the system passes the tower test, continue with paragraph 4–11.2, Linear Image Quality Tests.

11. If the system does not pass the tower test, troubleshoot front end cabling.

    a. Inspect Chabin cables:

       - Properly aligned and seated?

    - Connectors not pulling apart?
    - Not frayed or cracked?
    - Stripe is up on outside cables?
    - Stripe is down on inside cables?

    b. Pull and reseat cables on both ends

    c. Swap chabin cables

       - A shift in anomaly position indicates a bad cable
       - Use the AA chabin cable as a substitute

    d. Clean front panel and scanhead connectors with contact cleaner.

    e. Inspect the two ribbon cables that bridge A2 and A3 PCBs .

       - Properly aligned and seated?
       - Connectors not pulling apart?
       - Not frayed or cracked?

12. Perform the tower tests again. If the problem still exists, replace the A2, A3, A4 PCBs:

    a. If a single dropout occurs, the problem is most likely to be a scanhead;
    b. If four dropouts, probably Beamformer Focus PCB (A3);
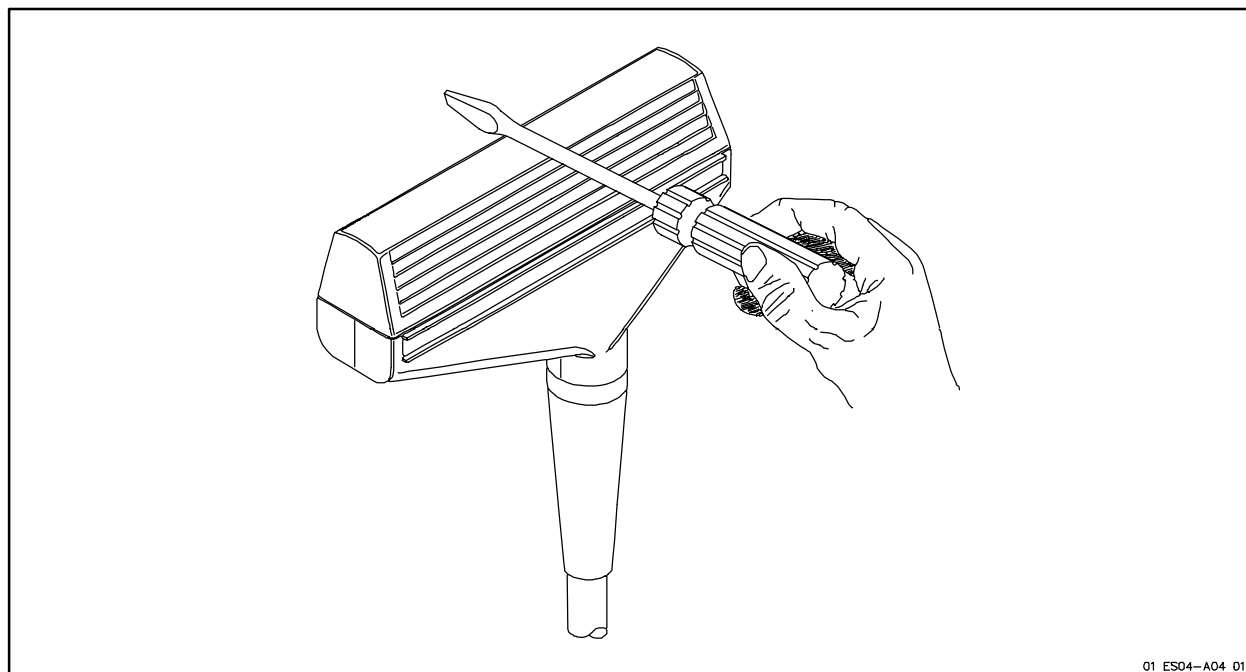   c. If eight dropouts, probably Front End PCB (A2).

01 ES04–A04 01

Figure 4–13.   Tower Test

4–11.2   Linear Image Quality Tests

NOTE: *Always take a phantom on image quality service calls. The phantom should be allowed to come to room temperature before any penetration or resolution measurements are made. The following tests are performed while scanning the phantom.*

1. Set system controls as follows:

POWER OUT-PUT	100 percent
REJECT	1 (Special Function O)
EDGE ENHANCEMENT	1
GRAYSCALE	2
SMOOTHING	F1 (<CTRL>-B)
DYNAMIC RANGE	58 dB (47 dB, ≦ 16X)
DEPTH	180 mm (for 3.5 MHz) 160 mm (for 5.0 MHz)
FOCAL ZONES	All 5

2. Adjust power and TGC controls to obtain a uniform distribution of background texture echoes to the greatest depth possible while maintaining echo-free cysts.

3. These optimum settings should be used for all image quality evaluations except where specifically instructed to make changes.

4. Press FREEZE and evaluate penetration, and lateral and axial resolution.

Penetration

Penetration is the deepest position of the background texture echoes with consistent tissue presentation.

1. Pick a point where density of echoes is definitely diminished.

2. Use the calipers to measure this depth. Remember to add or subtract the correction factor marked on the phantom.

3. The scanhead(s) penetration should meet the specifications listed in the appropriate scanhead table in Section 2C, Performance Tests.

Lateral Resolution

Lateral resolution is the ability of the system to distinguish targets along an imaginary line parallel to the scanhead face (horizontally in the scan plane).

1. Set the single focal zone to the top of the image using the PAN/ZONE control.

2. From the vertical column of pins, determine which displayed line reflector is the narrowest (within the focal zone).

   a. Measure the width with the calipers.
   b. The measured width is the lateral resolution.
   c. The scanhead(s) lateral resolution should meet the specifications listed in the appropriate scanhead table in Section 2C, Performance Tests.

3. Select each focal zone and repeat step 2.

Axial Resolution

Axial resolution is the ability of the system to distinguish targets on an imaginary line perpendicular to the scanhead face (vertically in the scan plane).

1. Measure axial resolution with the pin groups at 3, 7, and 12 cm depths on the phantom (see enlargement in **Figure 4–14**).

   • Optimize the display of each pin group by adjusting image controls and scanhead transmit focal zones.
   • The bottom pins in each set are vertically separated by 0.5 mm. If they can be distinguished from each other, the axial resolution is 0.5 mm.
   • Determine the closest two pins that can be clearly distinguished (separated vertically from other pins in the same group).
   • Determine axial resolution for each depth (3, 7, and 12 cm).

2. The scanhead(s) axial resolutions should meet the specifications listed in the appropriate scanhead table in Section 2C, Performance Tests.

Noise

1. Set system controls as follows:

POWER OUTPUT	100 percent
REJECT	1 (Special Function O)
EDGE ENHANCEMENT	1
GRAYSCALE	2
SMOOTHING	F1 (<CTRL>-B)
DYNAMIC RANGE	58 dB (47 dB, $\leqq$ 16X)

2. Adjust DEPTH control until the maximum depth is displayed.

3. Set TGC for a uniform homogeneous display of the phantom as done in penetration tests.

4. Reduce FAR FIELD GAIN until the far field noise disappears.

5. If penetration specs can still be met under these conditions, the system meets the noise specification.

• The 5 MHz DFT may show faint horizontal lines at the focal zone transitions. These are normal and cannot be eliminated.
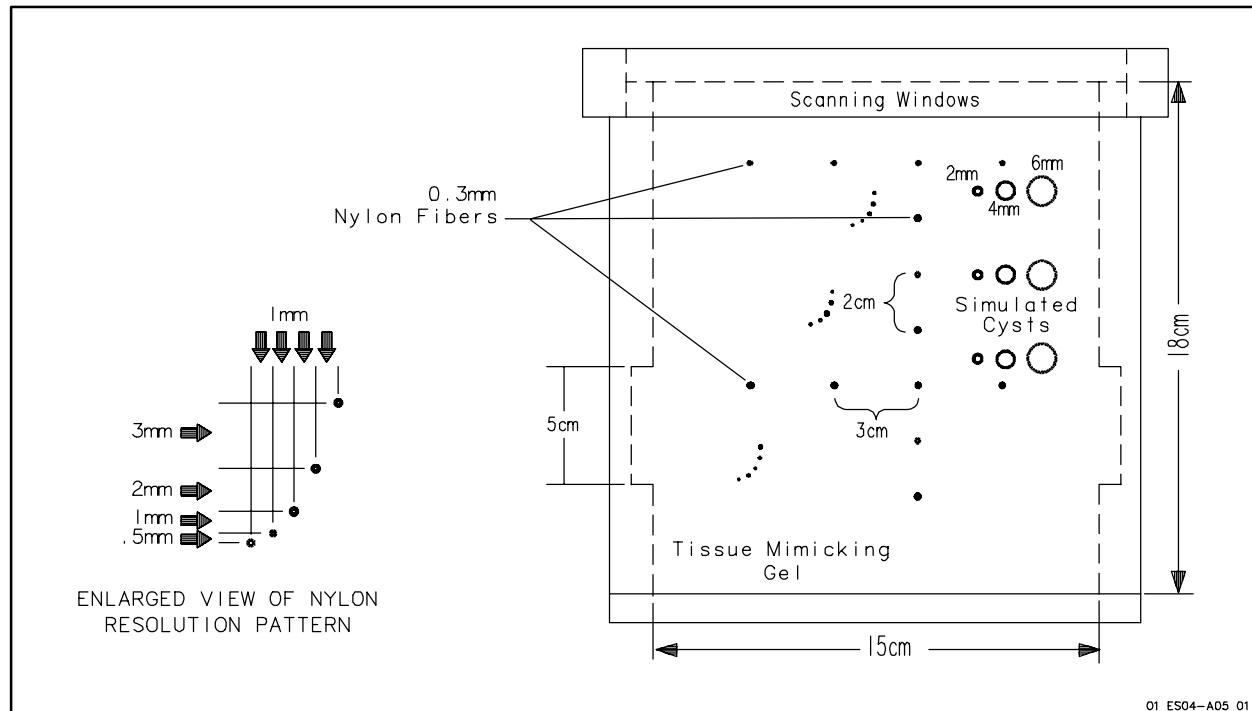

Figure 4–14.   RM 413A Phantom Geometry

Far Field Noise

Older systems (16X and below) configured for annular array scanheads have slightly greater gain than those not configured for AA. This increase in gain does not yield greater penetration, but it may increase noise when the FAR GAIN is near or at maximum. Many times a customer complaint can be alleviated simply by explaining this to them. If not, Pulse Processor PCB software (8000-0177-05) reduces the FAR GAIN so that this noise level cannot be reached. This software should not affect penetration and can only be used with 7500-0370-04/-05 or -08/-09 Pulse Processor PCBs.

All Pulse Processor PCB software above this level (8000-0177-05) incorporates this far gain reduction. An exception are those kits footnoted as "Euro alternate only, w/o Gain Governor" in the replacement matrix in Section 5, Configuration. This was requested by European Sales and is not available for Domestic systems.

NOTE: *16X and 17X system use the same Pusle Processor Software.*

NOTE: *With 23X (p22112 or higher) Pulse Processor Software installed, Dynamic Range should be set to 58 dB; for 16X/17X (p21601 or lower), set Dynamic Range to 47 dB.*

1. Set system controls as follows:

POWER OUTPUT	100 percent
REJECT	1 (Special Function O)
GRAYSCALE	5

SMOOTHING	F1 (<CTRL>-B)
DYNAMIC RANGE	58 dB (47 dB, ≦ 16X)
FOCUS	Zone 1
TGC	Maximum

2. With these settings, there should be no noise.

3. If the system passed all of the above tests, the system is performing to specifications and no repair with respect to linear image quality is required. If these criteria have not been met, refer to the following procedures.

4–11.3   Linear Image Quality Troubleshooting

Penetration

1. The first thing to check when the system does not meet penetration criteria is the Power Supply, especially the ±70/80 Volts and +170 Volt supplies. (+170 Volts used only on sector scanheads.)

2. Then check the linear pulser voltage at TP 22 of the A5 Pulse Processor PCB:

   a. With POWER at minimum 5 VDC.
   b. With POWER at maximum 60 VDC.

3. Replace Pulse Processor PCB if not to these specs.

4. Replace Beamformer PCB set (A2, A3, and A4) if in specs.

DC Output (Volts DC)	Tolerance	Ripple[1] Peak/Peak
+5.25 Volts (Adj.)	± 1% (0.05V)	100 MV P/P
+15 Volts Motor Controller	± 2% (0.3V)	100 MV P/P
−15 Volts Motor Controller	± 2% (0.3V)	100 MV P/P
+24 Volts	± 2% (0.48V)	50 MV P/P
+6 Volts (Adj.)	± 1% (0.06V)	50 MV P/P
+15 Volts Analog (Adj.)	± 1% (0.06V)	50 MV P/P
−15 Volts Analog (Adj.)	± 1% (0.15V)	50 MV P/P
+80 Volts, S1; +70 Volts, S2	± 3% (2.1V)	50 MV P/P
−80 Volts, S1; −70 Volts, S2	± 3% (2.1V)	100 MV P/P
+170 Volts	± 3% (5.1V)	100 MV P/P
+10 Volts (9V on some systems)	± 10% (1.0V)	500 MV P/P

1. Use a 1:1 probe to check Peak/Peak ripple or inaccurate (too high) results occur.

Noise

Noise problems can be caused by a wide variety of possibilities. Do not overlook any of the following items.

1. Make sure the environment is free of electrical noise.

    a. Verify line power to system using the procedures and test equipment specified on Section 3, Power, in the General Field Service Manual, 4720-0219-01.

    b. Temporarily install an approved line conditioner to see if it makes a difference.

    c. Check for defective fluorescent lights or inductive motors, gel warmers, centrifuges, etc., that may be on the line or nearby.

2. Pull all PCBs not required for linear operation or sync (Motor Controller, Doppler and M-mode PCBs).

3. Check cables and cable dress.

    • Noisy cables may not show physical defects.

    • Cable position may induce noise. Moving them may correct problem.

    • Cable tie the EFT/A8 cables above (away from) the A2/A4 cables.

4. Check for loose hardware.

    • Loose screws can cause noise in linear.

    • Power Supply mounting screws are particularly crucial.

    • Screws securing the two-piece shield that isolates the motherboard from the rear panel connectors.

5. Retape the seams on motherboard shield with copper tape.

6. Remove the Pulse Processor and Linear PCBs.

    • Shields should be firmly soldered to PCBs on both sides.

    • Solder connections should not look cold.

    • Screws on Pulse Processor shield should not be loose.

7. When replacing the Pulse Processor and Linear PCBs:

- Examine the ribbon cables. Replace them if they appear damaged.

- Examine the A3/A5 RF coax cable. Replace if frayed or connectors are loose.

8. Check the ground strap attached to the A2 PCB. Make sure it is securely soldered to the PCB, clean and makes good contact to the EM front shield screw.

9. Repeat step 8 for the A4 PCB if it is a -03 and has a similar ground strap.

10. Use contact cleaner on the EM front panel scanhead connectors.

11. If these steps have not resolved the problem, order and install:

    - A2, A3 A4, and A5 PCBs
    - Power Supply
    - A2-to-A4 ribbon cables
    - Chabin cables
    - Linear scanhead connector

4–11.4   AA Image Quality Tests

NOTE: *Perform Linear image quality tests, including Power Supply, before testing AA image quality. AA scanheads share most of the linear front end but also use the Motor Controller PCB. The following tests are performed while scanning the phantom.*

1. Set system controls as follows:

POWER OUTPUT	100 percent
REJECT	1 (Special Function O)
EDGE ENHANCEMENT	1
GRAYSCALE	2
SMOOTHING	F1 (<CTRL>-B)
DEPTH	Maximum
DYNAMIC RANGE	58 dB (47 dB, $\leqq$ 16X)
FOCAL ZONES	6

2. Adjust power and TGC controls to obtain a uniform distribution of background texture echoes to the greatest depth possible while maintaining echo-free cysts.

3. Press FREEZE and evaluate penetration, and lateral and axial resolution.

Penetration

Penetration is the deepest position of the background texture echoes with consistent tissue presentation.

1. Pick a point where density of echoes is definitely diminished.

2. Use the calipers to measure this depth. Remember to add or subtract the correction factor marked on the phantom.

3. The scanhead(s) penetration should meet the specifications listed in the appropriate scanhead table in Section 2C, Performance Tests.

Concentric Ring Artifacts

1. Find the concentric rings at the top of the image while the AA scanhead is positioned on the phantom.

2. Measure the depth of the rings. The rings should not exceed:

   • AA 3.5 MHz 2.2 cm
   • AA 5.0 MHz 1.5 cm

Image Wobble

Wobble is defined as a lateral movement or jerk of the sector; more at the edges than in the center.

1. Test at various depths, minimum to maximum, and at various focal zone settings.

   • Wobble will be most evident in parts of the sector image outside the focal zone.

   • A maximum of four scan lines of wobble is acceptable at the sector edges.

Lateral Resolution

Lateral resolution is the ability of the system to distinguish targets along an imaginary line parallel to the scanhead face (horizontally in the scan plane).

1. Set the focal zone to the top of the image using the FOCUS control.

2. From the vertical column of pins, determine which displayed line reflector is the narrowest (within the focal zone).

   a. Measure the width with the calipers.

   b. The measured width is the lateral resolution.

c. The scanhead(s) lateral resolution should meet the specifications listed in the appropriate scanhead table in Section 2C, Performance Tests.

3. Select each focal zone and repeat step 2.

Axial Resolution

Axial resolution is the ability of the system to distinguish targets on an imaginary line perpendicular to the scanhead face (vertically in the scan plane).

1. Measure axial resolution with the pin groups at 3, 7, and 12 cm depths on the phantom (see enlargement in **Figure 4–14**).

   • Optimize the display of each pin group by adjusting image controls and scanhead transmit focal zones.

   • The bottom pins in each set are vertically separated by 0.5 mm. If they can be distinguished from each other, the axial resolution is 0.5 mm.

   • Determine the closest two pins that can be clearly distinguished (separated vertically from other pins in the same group).

   • Determine axial resolution for each depth (3, 7, and 12 cm).

2. The scanhead(s) axial resolution should meet the specifications listed in the appropriate scanhead table in Section 2C, Performance Tests.

Noise

1. Leave system controls set as for previous AA tests.

2. Adjust DEPTH control until the maximum depth is displayed.

3. Set TGC for a uniform homogeneous display of the phantom as done in penetration tests.

4. Reduce FAR FIELD GAIN until the far field noise disappears.

5. If penetration specs can still be met under these conditions, the system meets the noise specification.

Far Field Noise

Review the discussion of far field noise under linear image quality tests.

4–11.5   AA Image Quality Troubleshooting

Penetration

1. Verify the Power Supply voltages per paragraph 4–11.3. The +170 Volt supply is the primary AA voltage.
   Also verify that there is no ripple on the ±15V.

2. Then check the linear pulser voltage at TP 22 of the A5 Pulse Processor PCB:

   a. With POWER at minimum 5 VDC.

   b. With POWER at maximum 150 VDC.

3. Replace Pulse Processor PCB if not to these specs.

4. Replace Beamformer PCB set (A2, A3, and A4) if in these specs.

Noise

1. Check for environmental noise (see linear procedure).

2. Check AA ribbon cables for loose or frayed lines (noisy cables may not show a physical defect).

   • Verify Cable stripes are down
   • Dress other cables around the AA cable in various ways to see how they affect noise.

3. Check for loose hardware, bad solder joints on shields (see linear procedure).

4. Check linear/AA front end cables and connectors (see linear procedure).

5. Check the linear front end PCBs, shields, ground straps, front panel and scanhead connectors (see linear procedure).

6. If these steps have not resolved the problem, order and install:

   • A2, A3 A4, and A5 PCBs
   • Power Supply
   • A2-to-A4 ribbon cables
   • Chabin cables

Section 5   Configuration, S2 Systems

NOTE: *The following usage rules also apply to S1 systems. See Section 5A for S1 system configuration information.*

5–1   Usage Rules For Section 5

5–1.1   Introduction

The usage rules for the Configuration section explain the contents and how to use the information contained therein. This section contains specific information about the system, including:

- Change Summary
- Feature Set Identification
- Firmware Codes (<CTRL-L>)
- Configuration Instructions
- PCB Replacement Matrix
- Software Replacement Matrix
- PCB Jumper Matrix
- PCB Silhouettes
- Scanhead Compatibility and Replacement
  Matrix
- Software Related Anomalies

5–1.2   Change Summary

The change summary comprises operation, application, and technical issues. It contains a description of recent changes to the system. Included are lists of new features, problems that have been corrected since the last software revision, and existing problems of which you should be aware.

The change summary explains issues that are too involved for explanation in the tables or matrices of this section. For example, replacement levels of PCBs and PROMS for the UM-4 are dependent upon the feature set of the system (Doppler, Duplex CW, CAD, sync/non-sync, etc). Feature identification data is included in the change summary because this information is too lengthy and too complicated for easy explanation in the tables or matrices. Feature identification provides a quick way to confirm a specific feature such as Doppler or Mercury or a system configuration such as an S1 system.

5–1.3   Compatibility

A number of PCBs in the UM-4 require operating software PROMs (firmware). The System Controller PCB software determines the overall system software level (e.g., 17X). The software on other PCBs will never be at a level higher than that of the System Controller and can be at a lower level. Control-L (<CTRL-L) Code Compatibility consists of a matrix that lists the various PCB software releases that may be encountered at each system software level.

NOTE: *If unsure of software or PCB compatibility, refer to the Hardware Configuration instructions and order PCB (and software, if required) that is appropriate for the system software level.*

5–1.4   Control-L Code Table (Figure 5–1)

1. REF: The PCB slot number or abbreviated module name. Listed in the order they appear on the <CTRL-L> display.

2. MODULE: The name of the PCB or module. With the UM-4, different features regularly dictated hardware changes resulting in more than one version of a PCB with specific software. Where the differences are readily discernable, there will be separate line items for each of these cases. For example, there are three electro-mechanical versions of the Motor Controller PCB – "standard", UM-4PV and Mercury – which do not share the same software.

3. <CTRL-L> CODES BY SYSTEM SOFTWARE LEVEL: Under each major system software level are listed all of the PCB software codes that can be encountered at that system level. The PCB software must also be checked in the left-hand column for compatibility with system features. For example, Pulse Processor software displaying "S11100" and should only be found in S1 systems at 17X or below.

5–1.5   Configuration Instructions

Configuration instructions consist of the hidden default lists that require programming upon installation, after upgrades or after major repairs. These defaults activate certain features to allow proper operation.

5–1.6   Software Configuration (Hidden Defaults)

At power-up, the UM-4 (and UM-5) series systems automatically set system controls to pre-defined default values (starting points). These default values can be viewed and changed from a table of system default settings that can be displayed on the system monitor. There are two sets of defaults and menus.

The first set of defaults are user changeable and are covered in the operation manual. The user defaults consist of operating parameters such as initial power, mode and scanhead selection.

The second set of defaults are used for setting system configuration and are available from the hidden default menu. These are not accessible to the customer and are not described in the operation manual. These hidden items are used in the same manner as other default items. Hidden defaults can vary depending on the system software that is installed and the optional features purchased by the customer.

To display the default table and enter the default setup mode, press <CTRL-E>. Although the format of the default table varies somewhat according to the version of system software installed in the system, operation is essentially the same for all formats.

Ref.	Module	<CTRL>-L CODES BY SYSTEM SOFTWARE LEVEL									
		11.X	12.X	16.X	17.X	23.X	25.X	26.X	27.X	28.X	
i	©					¢					

Figure 5–1.   Control-L Code Table

Use the following procedure to change default settings:

1. Select the default by entering the two-character code preceding the default and press ENTER. The current setting and list of available settings are displayed below the default table.

2. Enter the number corresponding to the desired value and press ENTER. Pressing ENTER without entering a number leaves the default setting unchanged.

3. When you have finished, press DEL to enter the new settings into system memory and to exit the table.

5–1.7   Special and Control Functions

Also included here are a synopsis of Special And Control functions, first as a summary of changes by software level and second in tables of functions. These tables are meant for quick reference. The Operation Manual should be consulted for details of operation.

5–1.8   Hardware Configuration

Verification of Existing System

Hardware configuration must be based on the information in three matrices: PCB replacement and PROM matrixes and a jumper matrix. Hardware configuration involves verifying that PCBs, PROMs and jumper positions are compatible in the spe-

cific configuration. It is difficult to document all of the hardware and software combinations possible in UM-4 systems. Fortunately, the question of compatibility normally arises only during or after upgrades or extensive troubleshooting during which a number of PCBs were substituted (shotgunned) and left in the system. In that case it may be necessary to consult with regional or national service support. Only jumpers that may require repositioning will be covered in the Up/Down Rev Instructions (6420-0009-01 Rev G or higher) located in Section 9. Normally all jumpers should be in the configuration listed in the "NORMAL" column of the jumper matrix.

Verifying software with the <CTRL-L> code table is a good place to begin confirming configuration compatibility. Certain hardware can also be verified through this table. For instance, a "BEAMFORMER PB2503" <CTRL-L> code not only indicates that the beamformer software is 25.05 for a 7500-0362-08 beamformer that will support CVLA and AA scanheads, but it is compatible in 25X or higher systems. A physical part number check should confirm that PCB, feature and software.

NOTE: *If the compatibility of a PCB is in question, order a replacement PCB and software listed for the system software level. Refer to Section 5 and Section 5A for more details.*

PCB Replacement Matrix ([Figure 5–2](#))

NOTE: *There are separate matrices for HFC and UM-4A PCBs and modules. For UM-4A^{PLUS} and UM-4A FF (full feature) systems, use the HFC matrix.*

1. PCB REF DES: The reference designator of the PCB is normally printed on the PCB extractors and denotes the card cage slot location.

2. PCB NAME: The common name of the PCB.

3. PCB PART NO.: The base part number of the PCB. Only part numbers stocked and shipped by ATL (Bothell) are included.

4. PCB DASH NO.: The revision number of the PCB. Only revisions stocked and shipped by ATL (Bothell) are included.

5. REPLACEMENT LEVELS: The manufacturing software build identification number. The codes that appear in the rows adjacent to the to the different PROM KIT PART NUMBER relationship between a specific PCB revision and a specific software build. The different codes that can be found here are:

L – Like-for-like

R – recommended replacement

A - functionally equivalent, alternate part which may be shipped instead

P - indicated part must be purged if encountered.

6. FEATURE COMPATIBILITY: System features that may or may not be compatible with a specific PCB revision. The different codes that can be found here are:

Y - yes, feature is compatible with dash level

N – no, feature is not compatible with dash level

7. NOTES: Reserved for additional comments, including information on the following:

   a. PROMs: A footnote in this column indicates that the PCB is stocked "unstuffed" and that PROMs must be ordered separately. Refer to the PROM replacement matrix.

   b. CONVERT: A footnote in this column indicates that the PCB is convertible to other dash levels or must be checked for configuration (for example, for sync or non-sync). Refer to the Up/Down Rev Instructions in Section 9.

¡   ©
A7 DOPPLER PROCESSOR PCB

HFC PCBs   7500-0347-XX; 7500-0390-XX ₵

₵ PCB/ Dash No 7500-	REPLACEMENT LEVEL										FEATURE COMPATIBILITY					
	8X	11X 12X	16X 17X	23X	25X	26X 27X 28X	29	30X			DPLX CW	MERC				Notes
0347--,[4] 01, 02, £					¤							¥				¦

Figure 5–2.   PCB Replacement Matrix

PROM Replacement Matrix
(Figure 5–3)

1. PCB PART NO.: The base part number of the PCB. Only part numbers stocked and shipped by ATL Customer Service are included.

2. PCB DASH NO.: The revision number of the PCB. Only part numbers stocked and shipped by ATL Customer Service are included.

3. PROM KIT PART NO.: The part number of a PROM kit set for a PCB. "INDIVIDUAL" printed in this column indicates that no PROM kit is available, and that the PROMs must be individually ordered. See the INDIVIDUAL PROM column, and order all individual PROMs using the PROM PART NUMBER and DASH NUMBER listed. The PROMs that compose the PROM kit are also listed under INDIVIDUAL PROM.

4. PROM KIT DASH NO.: The revision number of the PROM kit.

5. REPLACEMENT LEVELS: The manufacturing software build identification number. The codes that appear in the rows adjacent to the different

PROM KIT PART NUMBER indicate the relationship between a specific revision PROM kit and a specific software build.

6. INDIVIDUAL PROM REF DES: The reference designator for the individual PROM listed under INDIVIDUAL PROM PART NUMBER. The reference designator corresponds to the location on the PCB in which the individual PROM is installed.

7. INDIVIDUAL PROM PART NO.: The base part number of the individual PROM. The base part number of the individual PROMs that comprise the PROM kit are also listed here.

8. INDIVIDUAL PROM REV. NO.: The revision number of the PROM kit. The revision numbers of the individual PROMs that comprise the PROM kit are also listed here.

9. NOTES or FEATURE COMPATIBILITY: System features that may or may not be compatible with a specific revision PROM. Footnotes at the bottom of the table explain the different codes that can be found here. If no code is entered, that feature does not influence selection of that PCB.

PROMs

PCB/Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL											INDIVIDUAL PROM			Notes
	Part No.	Dash No.	8X	11 X	12 X	16 X	17 X	23 X	25 X	26– 28X	29 X	30 X		Ref. Des.	P/N 4201-	Dash No.	
0347-05	8000-0134	02	Y											U39	0238	02	
¡ ©	¢	£		Y	Y		¤							¥	¦	§	··

Figure 5–3.   PROM Replacement Matrix
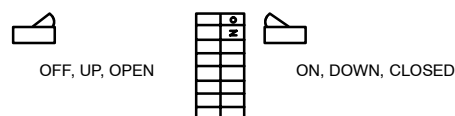
Jumper Matrix ()

1. PCB PART NO.: The base part number of the PCB. Only part numbers stocked and shipped by ATL Customer Service are included.

2. PCB DASH NO.: The revision number of the PCB. Only part numbers stocked and shipped by ATL Customer Service are included.

3. JUMPER REF DES: The reference designator for the jumper or dipswitch. The reference designator corresponds to the location of the jumper or dipswitch on the PCB.

4. JUMPER PINS:

5. JUMPER FUNCTION:

6. JUMPER NORMAL POSITION: Normal position may be different from that required for the function. For example, TM-Combo PCB is manufactured for synced systems. Although JP11 is pro-vided to support "non-sync" systems, its normal position is "open".

7. NOTES:

NOTE: *Jumper position refers to the physical position of the jumper as you look at the component side of the PCB with the connectors down. For example: indicates a jumper in the "1–2" position. Some two-pin jumpers are either installed or left open and still others are hardwired. Jumpers that are installed or open are so noted in the jumper matrix; some jumpers that are hardwired are also included for reference.*

Dipswitch setting refers to the physical position of the individual switch as you look at the component side of the PCB with the card-edge connectors facing down. For example:

OFF, UP, OPEN   ON, DOWN, CLOSED

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0347	ALL	JP1	1–2	Shorted for 8K x 8 RAM	Shorted	
¡	©	¢	£	¤	¥	¦

Figure 5–4.   Jumper Matrix

CAUTION: *There are several types of dip-switches used on PCBs. At least two red variations have been used on PCBs manufactured at Bothell, and a black version was used on UM-4 and UM-5 systems manufactured in Solingen, Germany.*

1. *Do not change switch positions unless specifically directed to do so or you are confident that a switch in the wrong position.*

2. *Write down switch positions before making changes.*

3. *Some switches are labelled CLOSED and others labelled ON; both mean the same thing. Generally, red switches have a "CLOSED" label and black have an "ON" label.*

   • *RED dipswitches are CLOSED (on) when positioned down toward the PCB.*

   • *Black dipswitches are ON (closed) when positioned up away from PCB.*

UM-4 Scanhead Compatibility Matrix (Figure 5–5)

Key

1. TYPE: The type or series of scanhead is listed in bold print at the beginning of each category. Not all scanhead categories may be supported by a specific system. Categories include: static transducers, linear arrays, access, annular arrays, specific applications (TRT, IVT, ICT), and 72X.

2. SCANHEAD NAME: The common name for the scanhead.

3. PART NO: The base part number of the scanhead. Only those part numbers stocked and shipped by ATL Customer Service are included.

4. DASH NO: The current revision number of the scanhead.

5. BKWD COMP: Backward compatibility. This column indicates which previous revision scanheads can be replaced by the current revision.

6. FWD COMP: Forward compatibility. This column indicates if a specific dash level can replace a higher revision scanhead.

7. HARDWARE NOTES: Reserved for additional comments, including detailed backward compatibility information.

8. SYSTEM/SW COMPATIBILITY: These columns indicate compatibility of the various scanheads to the systems listed. The coding in the columns indicate lowest software revision level tested and required. If a block is left blank, the scanhead is NOT compatible to that system.

SCANHEAD TYPE/ SCANHEAD NAME	PART NO.	DASH NO.	BKWD. COMP.	FWD. COMP.	HARDWARE NOTES	UM-4	UM4A OB	UM4A CV/PV	UM-4 CAD	UM-4 PLUS
WOBBLERS										
Annular Array										
©	¢	£	¤	¥	¦			§		

Figure 5–5.   UM-4 Scanhead Compatibility Matrix

How to Interpret Coding in Matrices

In the procedure below, "R" designates the stocked replacement level for PCBs (the PCB to order); "A" designates "Alternate", or functional equivalent (may be sent by factory as a substitute); "L" requires exact replacement due to physical, electrical, feature support or stocking issues. PCBs are reworked and stocked at the highest rev level possible for that "build". Occasionally, PCB builds are rev'd to reduce "cuts and jumps" (a re-layout). The new dash level remains a functional equivalent to the parent PCB and, as such, may be listed in the matrix as"L" or as an alternate ("A"). This revision ("A") is listed only to authenticate compatibility of the PCB in the event one is shipped as a substitute for a listed replacement PCB; it should not be ordered by field personnel unless it is the only replacement based on features and software level.

In the software matrix, "Y" (Yes) and "N" (No) indicate correct replacement level. For PCBs other than the System Controller PCB, the original software may not be at the same level as the system level. Additionally, replacement software may not have the same <CTRL-L> code as the original. For example, the replacement software for the Motor Controller PCB in 12X through 25X systems is software build 24.03 (it has a <CTRL-L> code of "482403"; refer to 5.3, Compatibility).

How to use Matrices

1. Note the configuration, system features and software build.

2. Troubleshoot the system to the PCB or module level.

3. Remove the bad PCB and determine the PCB part and dash numbers.

NOTE: *Do not return suspected bad parts at this time. Retain parts in their original condition for (1) later failure analysis and (2) the possibility that their reinstallation may be necessary for further troubleshooting.*

4. Use the PCB replacement matrix to determine the replacement PCB. The correct replacement level is denoted by an "R" or an "L" in the replacement level column for the software build. Pay special attention to the FEATURES and NOTES columns and their code explanations at the bottom of the table.

5. If PROMs are required, refer to the PROM matrix and order the appropriate firmware for the PCB.

6. If convertability is required, refer to the Up/Down Rev Instructions to verify you have on hand the components required to modify the replacement PCB for the system.

7. When ordering from the PCB and PROM replacement matrices:

   a. Provide the following information to assist the factory if it is necessary for them to substitute and ship a functionally equivalent or alternate part.

      • System type (UM-4, S1 or S2; UM-4A Plus; etc.)

- Product Configuration Code

- Software build (4X; 25X; etc.)

- Replacement PCB P/N from matrix (Specify if a like-for-like ["L"] part is required!)

- Replacement PROM kit or individual PROM P/Ns

- Feature compatibility requirements (Annular Array; Doppler; sync; Duplex CW; Array IVT; etc.)

b. Also report the failure category. This information is used for the dead-on-arrival (DOA) and the early-life-failure (ELF) program. Identify the category of failure as P1, P2 or P3, where:

- A P1 failure applies to any part or assembly that fails within 30 days of being shipped by ATL Manufacturing.

- A P2 failure applies to any part or assembly that fails after 30 days, and that failure results in a "doctor down" condition.

- A P3 failure applies to any part or assembly that fails after 30 days, but that failure does not result in a "doctor down" condition.

8. After receiving the replacement parts, verify that they are the same as those ordered. If an alternate part was received, verify it against the matrices for compatibility with your system. Call Technical Support if compatibility is unclear.

NOTE: *If you ordered and received PROMs and the PCB was received with PROMs installed, verify that the installed PROMs are correct. If not correct, replace them with the separately ordered PROMs. Return all unused PROMs.*

9. Install PROMs in PCB.

CAUTION: *Insure that all PROMs are installed carefully and correctly:*

- *Use the replacement matrix, the PCB silhouettes and **Figure 5–6** for correct sockets and orientation.*

- *Observe anti-static precautions.*

- *Ensure that the IC part number label is properly attached (**Figure 5–6**).*

- *Ensure that pin 1 on the IC matches pin 1 on the socket. Pin 1 is identified by a notch in the body of the IC at the top middle or a dot or dimple adjacent to pin 1.*

- *Ensure that PROM pins are straight, spaced properly, and aligned with the socket prior to insertion into the socket.*

- *After insertion, ensure that all pins are in their sockets and that the IC is fully seated.*

10. If there is a check in the CONVERT column, refer to the Up/Down Rev Instructions and modify the PCB according to the procedures therein.

11. Use the jumper matrix to verify all movable jumper positions.

12. Install the PCB into the correct slot.

13. Verify that the replacement parts correct the system failure.

NOTE: *If the replacement parts DO NOT correct the failure, remove them and reinstall the original parts and reconfirm the failure. Continue troubleshooting with the original configuration. DO NOT leave the new parts installed if they do not correct the failure.*

14. Return all failed, DOA and unused parts with the proper Return Control Authorization (RCA) form, insuring

that the RCA form is for the specific order, the serial number is correct, and that all components included are listed.

NOTE: *If the new parts did not correct the problem and are being returned to the factory, label them "Used for Troubleshooting."*
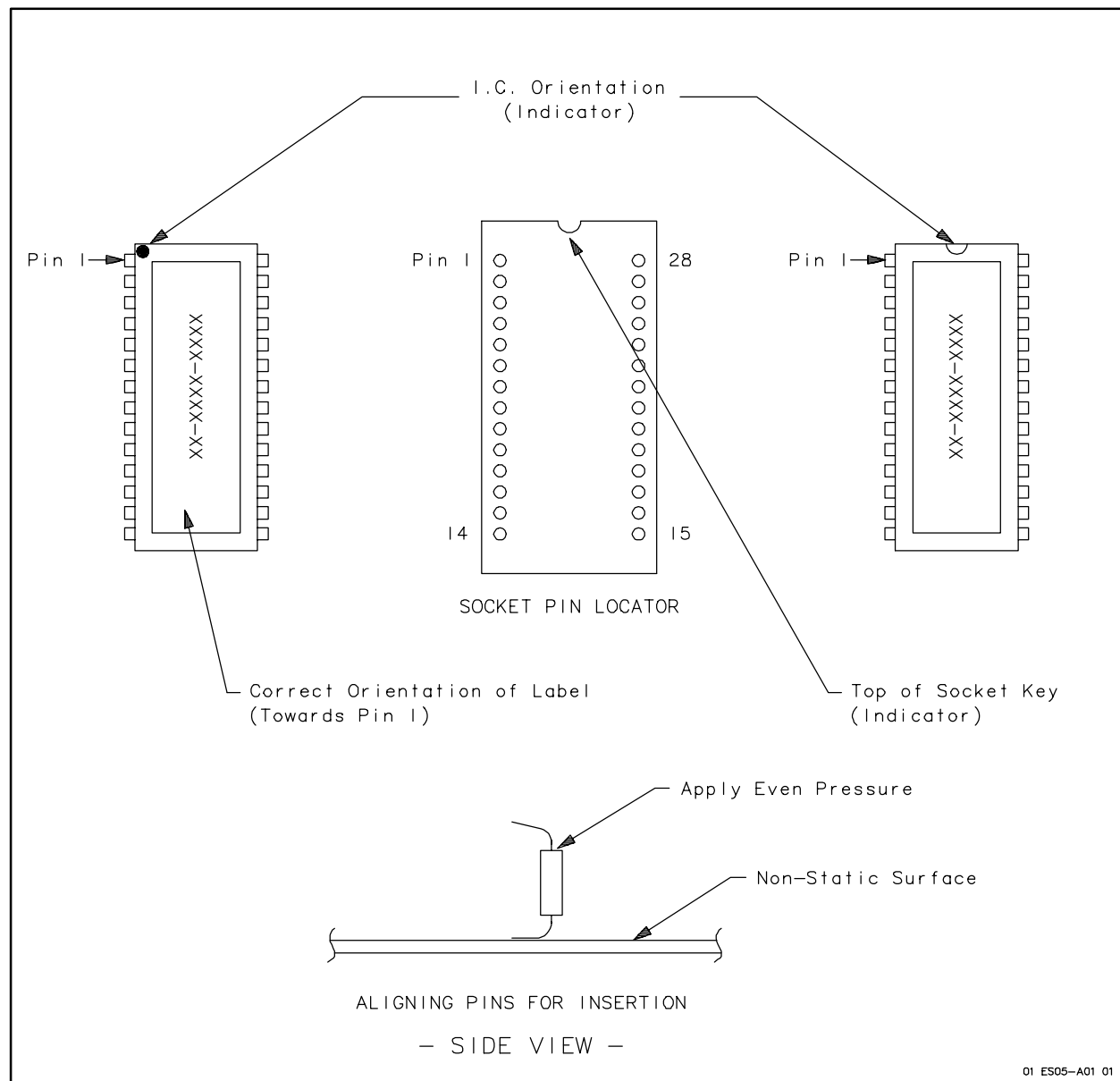

Figure 5–6.   IC Orientation

5–1.9   Software Anomalies

The System Anomaly section consists of software related troubleshooting hints and work-arounds. Only software related items are included here. All other troubleshooting data are included in the fault isolation tables found in Section 4, Fault Isolation.

Specific information is arranged in the form of a table with the following headings (**Figure 5–7**):

1. SOFTWARE RELEASE: The software release of the system.

2. SYMPTOM: A phenomenon or circumstance considered as an indication or characteristic of an inappropriate condition or event.

3. FAULT ISOLATION: A step or procedure that if followed will help determine the cause of the identified symptom.

4. CORRECTIVE ACTION: The action that will correct or "work around" the cause of the symptom.

Software Release	Symptom	Fault Isolation	Corrective Action
①	②	③	④

Figure 5–7.   Fault Isolation Table

5–2   Change Summary

5–2.1   Software Changes

8X

- 8.06 software changed the Doppler acoustic power levels for the following Access scanheads:

  - Access 10PV – 5 short
  - Access C 10 – 5 medium
  - Access B 10 – 5 medium

- Retrofit Kit, 8X Doppler Overpower, 6220-0049-01.

New Features

- Image quality improvement
- The S2 Pulse Processor PCB, 7500-0370, contains a PROM, U70, 4201-0285-01, that increases the 2D power for Access A-3L scanheads. An Access A-3L sector image will have an additional one-half to one centimeter of penetration. This PROM can only be installed in S2 systems.
- The Doppler Processor PCB, 7500-0347-03, contains a PROM, U39, 4201-0238-02, that provides more drive current from the Doppler Processor PCB from the pulser to scanhead. This change provides a better Doppler presentation when the flow is sampled at deeper depths. PROM, U39, 4201-0238-02 will NOT work in a non-DQI Doppler Processor PCB, 7500-0347. The only scanhead that benefits from this change is the Access A-3L.

CAUTION: *DO NOT install the Access A-3L power PROM, 4201-0285-01; or the Doppler power PROM, 4201-0238-02, into any system which is used for fetal Doppler applications.*

- PV Doppler multiple frequency switching

Problems Corrected

- Sample volume cursor graphics disappears in 2D update Doppler when the 2D image is left/right reversed.
- Reduce Doppler output for B10 (5M crystal), C10 (5M crystal), C2.25 and 10 PV (5S crystal) scanheads.
- Sample volume misregistration in 2D update
- Linear smear at zone transition with DFT scanheads
- French screen annotations for caliper measurements
- Unless the pulser is turned off at a mode change from 2D to M-mode, the Access reed switches are damaged.
- Error in velocity measurement on the "m/sec" scale when Doppler sample volume angle is other than zero degrees.

Known Problems

- Field reports contain occasional references to system lockups when depth, zoom, or other keyboard changes occur.
- With the linear scanhead focus set to zone 5, entering M-line automatically moves the skinline off of the video screen, and disables the depth control.
- Image quality of the 2D update during M-mode operation is marginal: radial lines and extreme far field noise remains after zoom and depth have been used.
- Dual-mode images contain noise when SELECT is toggled too quickly.
- If a sector image is inverted up/down and left/right, the Doppler sample volume cursor on the 2D update disappears.

- ECG turned on; M-line activated; exit M-line and the M-mode scale remains on the ECG display. The M-mode scale remains after ECG is turned off. To remove the scale, press <CNTL> P.

11X

The release of 11.02 software introduces a change in the audio data path. The two audio channels are routed from the electronics module through the rear panel connector PCB to the A/V module, and then, under certain conditions, to the VCR. At the A/V module, the system can switch the audio routing, based upon the following conditions:

1. If the system is configured for full feature VCR with a VCR mounted on the cart, the audio is routed through the A/V module to the VCR. At the VCR, the audio is looped back to the A/V module through the audio output jack of the VCR. This audio signal is then amplified at the A/V module for the speakers and headphone audio.

2. If the system is configured for a generic VCR without a VCR in the system, then the audio is routed directly to the audio amplifier circuitry on the A/V module and then to the speakers and headphones.

New Features

- Data Comm disk functions
- VCR status on screen
- Optional: Data Comm RS232 (dual floppy, no modem)
- 5.0 MHz IVT
- TRT

- 5 MHz and 10 MHz CW Doppler
- The <CNTL> L codes are available with 11X System Controller firmware and higher: The <CNTL> L feature allows the user to determine the system configuration by interrogating certain modules to establish their presence in the system. The modules either return a 6-character code or a NOT INSTALLED message. The codes are listed below:

The first two characters denote the module.

BF = Beamformer Controller PCB
48 = Motor Controller, 7500-0348-XX
04 = Motor Controller, 7500-0304-XX
p2 = Pulse Processor S2 system
s1 = Pulse Processor S1 system
dp = Doppler Processor
TA = TM Aux or TM Aux Combo
VCR = Smart A/V Module

The third and fourth characters denote the firmware level.

The last two characters denote the revision level.

Problems Corrected

- Field reports contain occasional references to system lockups when depth, zoom, or other keyboard changes occur.
- With the linear scanhead focus set to zone 5, entering M-line automatically moves the skinline off of the video screen, and disables the depth control.
- Image quality of the 2D update during M-mode operation is marginal: radial lines and extreme far field noise remains after zoom and depth have been used.
- Dual-mode images contain noise when SELECT is toggled too quickly.

- If a sector image is inverted up/down and left/right, the Doppler sample volume cursor on the 2D update disappears.

Known Problems

- Doppler measurement error in acceleration velocity mode.
- Stored image scaling error in which a dual trigger sector image is stored, expand/zoom is changed, and the recalled image does not match the graphics overlay.
- Resolution of the planimetry calculation changed.
- 5 MHz IVT ID changed to prevent lock-ups associated with previous ID.
- Coordinate gain default setting between CW and Pulsed mode change.

12X

New Features

- UM-4A
- Improved DFT image quality

Problems Corrected

- Doppler measurement error in acceleration velocity mode.
- Stored image scaling error in which a dual trigger sector image is stored, expand/zoom is changed, and the recalled image does not match the graphics overlay.
- Resolution of the planimetry calculation changed.
- 5 MHz IVT ID changed to prevent lock-ups associated with previous ID.
- Coordinate gain default setting between CW and Pulsed mode change.

Known Problems

- When a TP-10 Thermal Printer is printing, the keyboard responds slowly. This is normal operation. The data transmission rate of 600 bits per second of the System Controller PCB to the thermal printer causes a delay that ties up the serial bus. Control inputs from the keyboard during this transmission will be delayed. (In 8X software, the keyboard is disabled during printing.)

NOTE: *The three problems listed below are corrected with the Motor Controller adaptive software, which is actually a hardware and firmware change. It consists of the following: U27 PROM change to 4201-0265-07; the addition of a capacitor between U49-6 and 7 on the Motor Controller PCB.*

- IVT wavy image
- IVT lateral jerk

12AA

New Features

- Annular array

Problems Corrected

- N/A

Known Problems

- A double image artifact occurs in annular array when the UM-4 is configured to default smoothing F3 or F4. This occurs under the following conditions: Power-up; press CTRL P; or when the annular array scanhead is selected again. This symptom is most apparent in car-

diac applications with a 3.5 MHz annular array. To prevent this anomaly: configure the system for F1 or F2; cycle through the smoothing options prior to scanning; or press CTRL B twice to put the system into fast smoothing.

16X

Included are the requirements for what is called Feature Set "D". This software comprises the English and German versions that support the UM-4A and the UM-4PV for Medasonics.

New Features

- Frame Grabber
- LA 7.5 HRLA scanhead
- New disk drives
- UM-4CV
- LA 7.5 HRLA scanhead
- Linear up/down function operational
- TRT biopsy guide path

Problems Corrected

- System interrupt when changing from DFT to Access scanhead.
- System interrupt when pressing XDR SELECT on sector only hardkey configured systems.
- Limit annular array M-mode select line angle limit to $\pm$ 38 degrees.
- Caliper error on M-mode or Doppler image recalled from disk drive.
- Enable TRT sector 1/2 frame rate as the default rate.
- On sector only systems the system will not automatically select the Access scanhead unless defaults are set to 7 (Access).

- Press SELECT KEY, while dual triggers are selected, and the Data Comm Disk is disabled.
- Mismatch between Doppler sample volume and sample volume cursor position: Pulsed Doppler, 2.25 MHz scanhead only.
- ECG menu present and active for linear scanheads.
- Biopsy guide paths are not displayed after the following sequence: acquire sector image; press BIOP; press FRZ; press MEAS; press +CAL; press UNFRZ.
- Adds up/down option for linear image-reverses both sector and linear for TRT.

Known Problems

- When a TP-10 Thermal Printer is printing, the keyboard responds slowly. This is normal operation. The data transmission rate of 600 bits per second of the System Controller PCB to the thermal printer causes a delay that ties up the serial bus. Control inputs from the keyboard during this transmission will be delayed. (In 8X software, the keyboard is disabled during printing.)

- Thin black horizontal lines on left dual sector with ECG trigger.
- Thin black horizontal lines on left dual HFLA with ECG trigger.
- When a 2D sector image is stored, VCR play is initiated, then stopped, recalling the image often results in vertical lines through the image.
- In 2D/M-mode, the 2D depth markers and image shift upward slightly when panning to the fifth focal zone-accuracy is unaffected.

- TGC curve and 2D image gain are not aligned-exists with previous releases of DFT scanheads.
- The M-mode sweep is slightly shifted down relative to the 2D image.
- TRT biopsy guide graphics will reappear after leaving dual TRT images. This occurs with a single stored image with biopsy guide active after trackball movement.
- TGC graphics are erased if pan zoom or expand is adjusted.
- Depth graphics extends into ECG field, this anomaly also appears in 12X.
- With a hardkey system, a blank M-mode display results when entering M-mode while in VCR play.
- During disk save and recall of HFLA/ Doppler with ECG, the ECG intermittently changes from black-on-white to white-on-black.
- Improper store and recall using store function: 1) when HFLA 2D with ECG is stored, recalled image is system ECG; 2) some HFLA Duplex data is not stored (i.e., Doppler line, SV, SV depth, SV size, and SV angle annotation).
- Immediately after power-up, the use of print to obtain a Polaroid print sometimes causes a "Photomodule time-out error" message. The photo is made, and the message clears by itself. This anomaly also occurs in 12X.
- In changing from M-line to M-mode, the arrow pointer, graphics location changes. This anomaly also occurs in 12X and 8X.

NOTE: *The three problems listed below are corrected with the Motor Controller adaptive software, which is actually a hardware and firmware change. It consists of*

the following: U27 PROM change to 4201-0265-07; the addition of a capacitor between U49-6 and 7 on the Motor Controller PCB.

- Annular array split image
- IVT wavy image
- IVT lateral jerk

17X

System Controller PCB (A15) software, should be 17.15.06 or higher. 17.15.01 should be purged, and 8000- 0125-25 software kit should be ordered as a replacement.

17.15.01 - Occurred in April of 1988 and addressed the following items:

- A 3 mm lateral sample volume placement error was corrected. The error exhibited itself in the 2D portion of the Doppler mode when using the 10 MHz PV scanhead.
- While in Frame Grab mode, special function "Y" now correctly enables field selection of odd, even, or both fields for viewing.
- The UM-4PV no longer has unique Motor Controller firmware; standard firmware will be used.
- Random graphics occur with successive search operations.
- White bar above gray scale
- Poor sync of remote VCR on UM-4PV and UM-4CV.
- Serial bus errors that resulted in system lockups.
- Horizontal bars in pause with UM-4PV and UM-4CV.
- UM-4PV and UM-4CV recorded tape run out lock-up.

• 17.15.06–System Controller PROM Kit 8000- 0125-25 provides for the following changes:

Doppler over-power correction limits the Doppler acoustic power levels for the following Access scanheads:

Access 10 PV – 5 short
Access C 10 – 5 medium
Access B 10 – 5 medium

NOTE: *This is a mandatory FDA retrofit issue. All UM-4 Doppler systems require modification. Refer to the Doppler Over-power Retrofit Program Overview, 6220-0048-01, for more details on this program. All systems shipped after August 12, 1988 will have 17.15.06 System Controller PROMs and the 7500-0300-12 Display Controller PCB.*

New Features

• German Cardiology Calculations
• French language translations
• Shrinking calipers
• Sony UP811 PRINT support
• Incremental depth EXPAND control

Problems Corrected

• In 2D/M-mode, the 2D depth markers and image shift upward slightly when panning to the fifth focal zone-accuracy is unaffected.
• The M-mode sweep is shifted down slightly relative to the 2D image.
• TRT biopsy guide graphics will reappear after leaving dual TRT images. This occurs with a single stored image with biopsy guide active after trackball movement.
• Doppler audio volume attenuation with dumb AV module.

• Excessive character field blanking when leaving OB calculations-visible at edges with expanded image.
• G2 instead of D2 for OB parameter heading in default menu.
• Select smoothing 3 and enter AA, the frame rate display is not halved.
• Caliper size too large.
• French language translations.
• Support of UP811 remote interface.
• When remote sample volume is selected, both trackball and remote sample volume position controls are active when a scanhead with Doppler remote position arm is used.
• Corrected depth adjustment process to make adjustment smoother.

Known Problems

• Entry into dual linear while frozen causes duplication within the linear image.
• A Doppler reference appears on the help message for 2D/TM key.
• There is a small gap between linear focal zone markers and the 2D image under 5X.
• A blank M-mode display results when selecting M-line from Access 2D and entering M-mode while in VCR play with hardkey.
• On the Calculation menu some character fields have blanking and some do not.
• GREY annotation partly overwritten by VCR search error message.
• Toggling FRZ causes FPS display to vary intermittently when using HFLA 1X magnification and the fifth focal zone.
• Lateral measurements with 10 PV using 5 Short are inaccurate by as much as 7%.

23X

NOTE: *23.14 should be purged; replacement is 23.19 (see replacement matrix).*

• 23.10 software was the sales demonstration version of this software.

CAUTION: *Vascular and cardiac analysis packages, included in 23.10, are incorrect and should not be turned on.*

• 23.14 was the FCD version of this software.
• 23.19 software was released in March, 1989 to correct an OB calc problem and a "CAD Module Fault" error with new CAD CPU. 23.19 will continue to be shipped with non-CAD systems until 25X is released.

• Supports the UM-4HFC and the UM-4A (including the CV and the PV).

New Features

UM-4HFC
• LA 5 HR scanhead
• ICT 7.5 with biopsy guide overlay
• Improved UP811 interface
• Slidepot TGC control
• CAD features for off-line systems
• Annotated hospital ID
• Removable Doppler scale grid
• Improved user default menu and factory settings
• DCE
• Integrated CAD features
• Scanhead time-out for inactivity.

UM-4CV and UM-4PV
• All of the above, except:
• Improved UP811 interface
• CAD

UM-4A
• All of the above, except:
• Improved UP811 interface and CAD
• PV and Cardiac Doppler analysis calculations packages
• Slidepot TGC controls
• CAD

Features Deleted

• Small Printer Support

Problems Corrected

• OB calculations previously referred to both gestational age and to menstrual age. References to gestational age are eliminated and EFA and AUA are now used instead.
• With dual images and TRT biopsy active on the left image, trying to turn off the biopsy guides resulted in the display of biopsy guides on the right image.
• Caliper readout occurred on the left side of the screen when making measurements on a frame-grabbed image, while the normal location for annotation on the right side contained ???.
• Singing IVT after selecting annular from IVT.
• Lateral measurements with 10 PV using 5 short were inaccurate by as much as 7%.
• M-mode focal zone graphics do not match when a focal zone other than the nearest was selected.
• Modified the biopsy guide calibration warning.
• 2D sector displays wedges of both real time and frozen data when 2D update is turned off in M-mode, and M-mode depth is set.

- Graphics problem when recalling a stored image after another scanhead is selected.
- Hitting focus button on hardkey systems while IVT is in use caused system malfunction message.
- Background gray level changes when an image is stored, then going to VCR playback.
- When ECG was enabled, the portion of the CW Doppler graphics that were within the ECG zone were blanked.
- The month was missing one digit if you entered and exited Doppler in the same minute.
- Local/remote user default had no effect.
- Both d-arm and trackball were active at the same time.
- The annular array scanhead did not automatically go to half frame rate when smooth 3 was selected.
- In linear operation, pressing FREEZE, then switching to dual-image, update of the real-time image is not performed on the right side fo the scan plane.
- During VCR search, if an invalid number was entered, "!!" was displayed in the gray bar and could not be erased.

Known Problems

- 4705-0010-02, Ultramark 4CAD Ultrasound System Operating Notes and Errata, lists the known problems with 23.14 software.
- 4705-0001-14, Ultramark 4 Operating Notes and Errata, lists additional known problems with 23.14 software.
- 4705-0010-03, Ultramark 4CAD Ultrasound System Operating Notes and Errata, lists the known problems with 23.19 software.

- 4705-0001-18, Ultramark 4 Operating Notes and Errata, lists additional known problems with 23.19 software.
- 23.14, only: In OB calcs, if LMP or CRL is entered after Average Ultrasound Age has been calculated, the Average Ultrasound Age will be updated with the LMP or CRL value.

24X

- 24.15 software was the FCD version to support Duplex CW.
- Effectivity: 24X was placed on ship hold shortly after its release. 25X replaces all 24X.

New Features

- Duplex CW

Problems Corrected

Setup
- Pressing <CTRL>-E while in Cineloop image capture displays mixed alphanumeric characters on the display.
- Using <CTRL>-Z to set date and time overwrites any annotation and graphics in the region used to display the date/time prompt.

System Controls
- Pressing <CTRL>-O while editing a report in one of the analysis modules blanks the leftmost columns of the report.
- The SET WINDOW key on the CAD/Cine hand controller sets the position of the capture window only temporarily, and the setting is not preserved for subsequent sessions.

Two-Dimensional Acquisition

• Selecting between two images in dual mode, then returning to single mode and inverting the video may cause the gray bar display to be inverted. Reselect B/W Invert to correct.

Doppler Acquisition

• During Doppler acquisition at angles greater than 80 degrees, the Doppler velocity can exceed the capacity of the screen display for Doppler measurements.

Storing and Recalling Ultrasound Images

• The message "CAD module fault" may appear on the monitor display when first pressing the CAD softkey or when other softkeys are pressed rapidly.
• When the ECG signal is removed, the last heart rate reading will remain displayed. The heart rate reading is updated only when heartbeats are detected; when the ECG signal is restored and QRS peaks are detected, the system will resume updating the heart rate display.
• Exiting the CAD mode (pressing RETRN from the CAD softkey panel) without first storing captured images onto the hard disk causes those unstored images to be permanently erased.

Vascular Analysis Module

• Pressing 3 while in the Vascular Analysis menu (called Spectral Trace) displays the Spectral Area menu.
• The spectral window result is labeled as being in units of "m" or meters. The result should have no label of units.

Known Problems

Known problems are identified in the Operating Notes and Errata document, part number 4707-0010-02, 24.17 software (UM-4CAD).

25X

• 25X replaces 24X.
• 25.04 software was the first Demo system version of 25X.
• 25.08 was the FCD version of this software.

New Features

• CVLA 76mm 3.5 MHz scanhead (35CV76).
• M-mode and 2D with the CVA 76 scanhead.
• Changeable scanhead defaults for controls and functions.
• 25X software consolidates the UM-4 product line software to a single baseline for future system deliveries of UM-4s, UM-4CADs, and the Full-Feature UM-4A (formerly UM-4A, CV, and PV).
• 25X also supports those features which were developed for 24X.

Problems Corrected

• 25X problems TBA

Known Problems

Known problems are identified in the Operating Notes documents, part numbers 4707-0010-03 (UM-4CAD) and 4707-0001-02 (UM-4).

26X

26.07 software was the FCD version supporting the 240V/CCIR UM-4CAD † .

New Features

The major features of the International version of the UM-4CAD are similar to those of the UM-4 and UM-4CV systems, with the following additional features:

- Operator interface
  Special English, French or German CAD (softkey) panels
  Improved TGC controls (slide pots)
  Parallel printer port
  Hand-held remote controller

- Data acquisition
  Synchronized frame rates for Access and AA scanhead
  Interface to external ECG option

- Display-Time alignment
  ECG trace time-aligned with 2D display
  ECG detect time-aligned with 2D display

- Cineloop‾ image capture and review
- CAD Stress echo image capture and review
- System-integrated CAD analysis package
- Qualitative regional wall motion analysis
- Report generation capabilities

NOTE: *Keyboard Inactivity Time-out must be set to zero (0) to prevent lockups.*

27X

- 27.08 software was the FCD version supporting the UM-4PLUS (UM-4+).
- 27.10 software was the FCD version supporting the Mercury scanheads (Duplex CW).

NOTE: *27.10 replaced 27.08 with the release of Mercury scanheads.*

New Features

- Software biopsy guide overlays for all supported scanheads
- M-mode and 2D with the CVA 3.5 MHz scanhead (CVA 3.5 76mm)
- M-mode and 2D with the CVA 3.5 40R and CVA 5.0 40R scanheads
- M-mode and 2D with the IVT 5.0 11R
- Field-of-View Control [STEER] (Includes an on-screen graphic of sector position, for three 90-degree sectors of the IVT 5.0 11R, and biopsy guide integration for this IVT array scanhead.)
- Up to 13 receive zones for array scanheads (up from nine)
- User-settable preset defaults of some 2D imaging parameters for each scanhead, user changeable
- Openline Access (Data Comm RS232 communication to PC) (NPB-47)

Features Deleted

- AA Scanheads (UM-4+)

Known Problems

- Known problems for 27.08 are identified in the Operating Notes document, part number 4707-0001-03.

28X

- 28.03 software was the FCD version first supporting Dual Linear for the UM-4PLUS.

NOTE: *28.03 supports "International" CAD and all features introduced by 27X software. It replaces 26.X and 27.X software on the manufacturing line and becomes their field replacement.*

- 28.04 software was released November 28, 1990. Corrected array scanhead identification problem.

New Features

• Dual Linear for UM-4PLUS systems.

Known Problems

• Known problems are identified in the Operating Notes document, part number 4707-0001-05, Rev C.

29X

• 29.11 software was the FCD version introducing English and French GYN/FERT Calcs.

New Features

• Improved OB Calcs
• GYN/FERT Calcs
• CVA 76 Biopsy Guide

Known Problems

• Possible double-spaced reports (reconfigure printer "no line feed")
• Refer to Operating Notes 4707-0001-07.

30X

• 30.05 software was the FCD version introducing the Multi-Frequency Intravaginal Transducer (MFI). 30.05 can be remain on *non-MFI* systems only.

• 30.08 or higher software with new MFI Doppler power tables replaced 30.05. MFI requires 30.08 or higher system software and a minimum of 8000-0177-12/13 or 8000-0570-04 ((P22405, P22502, or P22707) Pulse Processor software.

• 30.10 software was the FCD version that provided the German of GYN/FERT

calcs (English and French introduced with 29X)

New Features 30.05/30.08

• Multi-Frequency Intravaginal Transducer (MFI)
• Intravaginal 2D imaging with MFI
• Fetal M-mode and 2D imaging with MFI

New Features 30.10

• German GYN/FERT calcs
• Minor changes to OB calcs (e.g., Fetal Heart Rate control relocated)

Known Problems/Operating Idiosyncrasies

• Refer to Operating Notes 4707-0001-08, 4707-0001-09, and 4707-0001-10.
• MFI frequency switching time is approximately one second in real-time 2D. Switching time will be 5 to 15 seconds in other modes.
• If frequency switch is changed and immediately returned to original setting, NOXDR will be displayed and MFI scanhead will have to be reselected from the keyboard to recover normal operation.
• 29X and above software now have a line feed in printed reports. Configure printers for "Line Feed OFF".

31X

• 31.07 software was the NRR/Beta/FCD version of Cineloopr Review.

New Features
• Cineloopr Review

Features Deleted
• CAD support

Known Problems

- Refer to Operating Notes 4707-0001-12, Rev B.

32X

MANDATORY: *Beginning with 32X, only PCBs tested with 32X (or higher) software are allowed to be installed with that software. Therefore, only those PCBs listed in the 32X column of the UM-4 Replacement Matrices are allowed to be installed in 32X systems.*

While there are no specific hardware changes associated with 32X, upgrading a system to 32X will require that hardware replacements conform to a list of approved PCB assemblies. This is due to the formal definition of compatible hardware that will be released with 32.04. A total system hardware field baseline is not required; however, all *replacement* PCBs (upgrade or repair) installed in a 32X system must be on the authorized list (refer to the appropriate replacement matrix).

- 32.04 software was the Beta/Demo and FCD version. 32X incorporated a number of minor user interface changes. Refer to Operating Notes 4707-0001-12 (summarized below).

New Features

- All features supported by 31X

Softkey changes (4705-0001-36, Rev A):

- Vascular ratios can now be calculated from measurements made in velocity mode.

- Several softkeys have been moved for ease of use.

- The + caliper is automatically displayed upon pressing the MEAS softkey.

- For M-mode operation in the OB calcs module, the Fetal Heart Rate menu is now the default menu.

- Turning on OB calcs by pressing CALC now displays the default menu, not the last menu displayed.

Hardkey changes (4705-0004-12, Rev A):

- For M-mode operation in the OB calcs module, the Fetal Heart Rate menu is now the default menu.

- The EFT default setting label under Transducer Type in the User Default Menu was changed to IVT to better reflect the scanheads currently in use.

- Turning on OB calcs by pressing CALC now displays the default menu, not the last menu displayed.

- Minor errors in the manual have been corrected.

Features Deleted

- No features have been deleted

Hardware Issues (Feature Compatibility)

- 32X will support Duplex CW/Merc if configured with 7500-0511-04 or lower System Receiver and 0517-XX Motor Controller PCB.

- AA is supported with appropriate Beamformer Controller and Motor Controller PCBs (refer to matrix). Non-AA Motor Controllers are the default replacement PCB to reduce service calls to non-AA systems.

Known Problems

• Refer to Operating Notes 4707-0001-12.

5–2.2   UM-4 Systems and Features

The replacement levels of PCBs and PROMs for the UM-4 are dependent upon the features of the system. Listed below are short descriptions of physical features that can be used to quickly verify the presence of a configuration or feature.

System   Definition and Physical Attributes

UM-4   A full-featured, multi-purpose system manufactured in two configurations—the human factors cart (HFC) and the full peripheral cart (FPC, out of production since 1986). Beamformer Controller 7500-0362-04 or higher supports AA scanheads but not array IVT.

UM-4 S1   The Pulse Processor PCB (A5) is a 7500-0313 and there is *no* System Receiver (neither 3500-0581-XX nor 3500-1016-XX). Software levels are 3X to 6X, and 17X.

UM-4 S2   S2 replaced S1 in 1985. The Pulse Processor PCB (A5) is a 7500-0370 -XX, and there is a System Receiver (either 3500-0581-XX or 3500-1016-XX). Software levels are 17X and higher.

UM-4A   A small cart OB system. UM-4A does
(UM-4OB   not have speakers and does not in-

or "OB") clude the Human Factors Module with adjustable monitor and control module arms and doesn't support all the features of the HFC. Replaced in manufacturing by UM-4AFF (UM-4A PLUS).

UM-4PV   A small cart peripheral vascular system manufactured for Medasonics (out of production). Similar to the UM-4A with speakers and brown trim. Replaced in manufacturing by UM-4AFF.

UM-4CV   A small cart cardiovascular (Doppler) system similar to the UM-4A with speakers and blue trim. Replaced in manufacturing by UM-4AFF.

UM-4AFF   A "full feature" small cart system consolidating OB, PV and CV into one system as of early 1990. Available in both softkey and hardkey versions. System features are configured to meet the application requirements. A "full feature" UM-4AFF is a "UM-4 small cart" (without Human Factors Module). UM-4AFF style system was the only low-cost version manufactured in Solingen.

UM-4 PLUS A UM-4 S2 HFC configured with new analog Beamformers and baselined at 27X software (see paragraph 27X). The UM-4 PLUS replaced the UM-4 S2 on the manufacturing production line as of April 1990. Hardkey or Softkey, HFC or full-feature small cart. Beamformer Controller 7500-0548-XX supports IVT array scanheads, but not AA.

Feature   Definition and Physical Attributes

DOP   Doppler systems have a CW Doppler scanhead connector on the electronics module front panel and speakers.

SYNC   A Beamformer Controller PCB (A4), 7500-0362-01 or higher; or a Motor Controller PCB (A8), 7500-0348-04, -05, -06, -08, or higher, configured for sync as described in service bulletin UM4-55.

AA   Annular array scanhead and front panel connector.

Duplex   System Receiver is 3500-1016-XX

CW   with cables from "AA1" and "AA2" to AA connector (see **Figure 1A-5**, Duplex CW System Receiver Block Diagram).

CADr   A UM-4 enhanced with built-in hardware and software for video Cineloopr Image Review and Coronary Artery Disease stress echocardiography applications. A CAD module is mounted in the OEM, no Data Comm Module.

Merc   Another Duplex CW scanhead. Motor Controller is 7500-0517-XX (does not support AA or MFI scanheads).

5–3   Compatibility

5–3.1   Determining Software Level

Systems at 8X or Below

During boot-up, the software level appears briefly at the bottom left of the screen. Repeatedly pressing <CTRL>-P will repeat the display if it is missed the first time.

Systems at 12X or Above

<CTRL>-L codes (Table 5-1) are available with 12X System Controller firmware and higher: The <CTRL>-L feature allows the user to determine the system configuration by interrogating certain modules to establish their presence in the system. The modules either return a 6-character code or a NOT INSTALLED message:

XX . YY . ZZ
            ─── software revision level
            ─── software (firmware) level
            ─── PCB, Module or System type
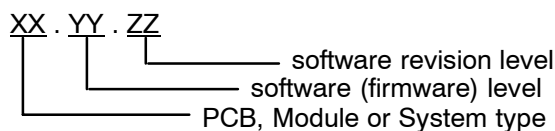
Codes for First Two Characters (XX)

BF   =   Beamformer   Controller, 7500-0362-XX

PB   =   Beamformer   Controller, 7500-0548-XX

48 = Motor Controller, 7500-0348-XX

04 = Motor Controller, 7500-0304-XX

17 = Motor Conroller, 7500-0517-XX

p2 = Pulse Processor S2 system

S1 = Pulse Processor S1 system

dp = Doppler Processor

TA = TM Aux or TM Aux Combo

VCR = Smart A/V Module

System Controller only:
41 = UM-4A English
42 = UM-4A German
81 = UM-4 English
82 = UM-4 German
83 = UM-4 French

Codes for Third and Fourth Characters (YY)

These are always numbers and represent the software level, e.g., 12X, 28X. They are used in the replacement matrices "Replacement Levels" columns.

Codes for Last Two Characters (ZZ)

Codes for last two characters (ZZ). These indicate the revision level of the software. Minor changes or improvements will roll these numbers. The replacement part numbers in the PROM matrix will always be for the PROM or PROM kit of the highest revision level of that software.

Table 5–1. UM-4 Firmware Compatibility Matrix
<CTRL>-L Codes by System Software Level

Ref.	Module	11.X	12.X	16.X	17.X	23.X	25.X	26.X	27.X	28.X	29.X	30.X	31.X	32.X
A4	BEAMFORMER 0362-04 and below)	BF1100	BF1206 BF1207	BF1611 BF1614	BF1713	BF1717	BF1717	BF1717						
	7500-0362-05 & up						PB2503	PB2503	PB2503	PB2503	PB2503	PB2503	PB2503	PB2503
	7500-0548-XX								PB2703	PB2703	PB2703	PB2703	PB2703	PB2703
A8	MOTOR CNTRLR	481006	481203 481206 481214 482107 482402 482403	481206 481214 482107 482402 482403	481206 481214 482107 482402 482403	482107 482402 482403	482403	482404	482404	482404	482404	482406[3]	482406	482407
	(7500-0304 for UM-4PV)	041208[1]	041208[1] 48P002	041208										
	(Mercury 7500-0517)							172604	172614	172614	MC172614	MC172614	MC172614	MC172614
A5	PULSE PROCESSOR	p21008 p21105	p21205 p21210	p21600 p21601	p21600 p21601	p22401	p22402	p22402 p22403	p22703 p22404	p22404 p22501	p22404 P22501	P22404 P22405[3] P22501 P22502[3]	P22405 P22502	P22405 P22502
	(7500-0370-24/25 & 3500-1261/62-XX)		p22705	p22705	p22705	p22705	p22705	p22705	p22705	p22705	p22705	P22705[4] P22707[3]	P22707	P22707
	(for S1 systems)		s11100[1]	s11100	s11100									
A7	DOPP PROCESSOR	db1006!	db1006[1]	db1609	db1609	db1614	db2406	db2406[2] db2408	db2406[2] db2408	db2408	db2408	DP2408	DP2408	DP2408
A13	TM AUX/ TM COMBO	TA1008	TA1008	TA1008	TA1008	TA1012	TA2401	TA2401	TA2401 TA2402	TA2402	TA2402	TA2402	TA2402	TA2402
A/V	VCR STATUS	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004	VCR004
	CONTROL MOD[5]		NA	NA	NA	NA	V20008 V20009	V20008 V20009	V20008 V20009	V20008 V20009	V20008 V20009	V20008 V20009	V20008 V20009	V20008 V20009

1. Should be purged if encountered.
2. If encountered at this software, replace with software listed in PROM matrix.
3. Minimum required for MFI.
4. *DO NOT use with MFI scanheads.*
5. The Control Mod firmware code is blank for Control Modules which do not include TGC slidepots.

Table 5–1.   UM-4 Firmware Compatibility Matrix
<CTRL>-L Codes by System Software Level (Cont'd)

Ref.	Module	11.X	12.X	16.X	17.X	23.X	25.X	26.X	27.X	28.X	29.X	30.X	31.X	32.X
A15	SYSTEM CNTRLR (UM-4A OB only)		41.12.06[1] 41.12.07	41.16.10	41.17.15.06									
	(UM-4 HFC and UM-4 FPC)[2]	81.11.02	81.12.06 81.12.07	81.16.10 81.16.11	81.17.15 81.17.15.01 81.17.15.06 82.17.15.08 83.17.15.08	81.23.14 81.23.19 82.23.20 83.23.20	81.25.08 82.25.09 83.25.09	8n.26.07	8n.27.06 8n.27.08	8n.28.03 8n.28.04	8n.29.11	8n.30.05 8n.30.08[3] 8n.30.10	8n.31.06	8n.32.04
	(UM-4AFF and UM-4PLUS)[2]								8n.27.06 8n.27.08 8n.27.10	8n.28.03 8n.28.04	8n.29.11	8n.30.05 8n.30.08[3] 8n.30.10	8n.31.06	8n.32.04
	CAD Mod SW (DOM) CAD Mod SW (INTL)							— NV110	— NV110 NV111	NV0046 NV110 NV111	NV0046 NV110 NV111	NV0046 NV110 NV111		

1. Should be purged if encountered.
2. 8n: Where n = 1-English, 2- -German, 3-French
3. Minimum required for MFI.

5–4 Configuration Instrument

5–4.1 Hidden Default Configuration

User defaults for transducer type are changed on the A1 defaults menu. The following are the hardkey selection sequence:

1 TRT/Linear
2 Linear
3 IVT
4 TRT/Sector
5 EFT
6 Annular
7 Access

The following lists the hidden defaults starting with **16X**. Press CTRL E, and then I1 to gain access to the hidden defaults.

To configure the system, refer to the COA and use the keyboard to enter the correct codes (Y/N, 0/1) as indicated by the prompt on the video screen. To verify the hidden default configuration, press I2.

After setting the desired defaults, press the DEL key to save the settings and exit the Default Menu.

Default Name	Setting	Note
1. Full Feature VCR? (Smart AV)	(Y/N)	
2. Small VCR HFC?	(Y/N)	
3. M-Mode Present?	(Y/N)	
4. Doppler Present?	(Y/N)	
5. ECG Present?	(Y/N)	
6. Redig Enable?	(Y/N)	(Frame Grab)

7. Data Comm (Y/N) (Disk Drive) Enabled?

8. 2 Disk Drives? (Y/N)

9. TRT Biopsy (Y/N) Enabled?

10. HRLA Present? (Y/N) (5.0 HRLA 7.5 MHz HFLA)

Press H1 for OB CALCS: 1 = enabled
0 = disabled

Press H2 for CARD CALCS:
1 = enabled
0 = disabled

23X deleted TRT Biopsy and added;

9. CAD Mode (Y/N) Enabled?

10. CAD Unit Present? [Y/N]

11. ADMS Enable? [Y/N] (never released)

12. HFLA Present? [Y/N] (5.0 HRLA or 7.5 MHz HFLA)

13. Updated Doppler Board? (CW Duplex?) [Y/N] Yes = -0511-04 or lower receiver No = 0511–05 higher receiver)

Press H3 for PV CALCS: 1 = enabled
0 = disabled

Press H4 for CARD DOP CALCS:
1 = enabled
0 = disabled

Press H5 for OB DOP CALCS:
1 = enabled
0 = disabled

25X deleted ADMS and added:

11 DB Test Pattern Enable[Y/N]

28X added:

14. Dual Access Connections
[Y/N]

15. Dual Linear Connections?
[Y/N]

Press H6 for OB CALCS II: 1 = enabled
(GYN/FERT Calcs)   0 = disabled

31X

Deleted: CAD Unit Present?
Added: Cineloop?
Changed: CAD   Module   Enabled?   to
CARD Mode?   (No change to
feature function)

5–4.2   UM-4 Special and Control
Functions (4X through 12X)

Table 5–2 and **Table 5–3** summarize the
special function (SFUNC) and the control
function (CTRL) keys for software releases
4X through 12X.

In **Table 5–2** and **Table 5–3**, an "H" as the
first letter indicates that a help message
exists; an "N" indicates that a help mes-
sage does not exist.

If the second letter is an "F", then that
SFUNC or CTRL function key works. If the
function is also available on the softkey
panel, the softkey message is in brackets
directly below the letters.

Some CTRL selections have two func-
tions—one when the keyboard is in the
ALPHA mode, another when the keyboard
is in the SFUNC mode. These are noted
after the description. If a note is not
included, then the selection operates the
same in either mode.

5–4.3   UM-4 Special and Control
Functions (17X)

Information about the special function and
control function keys for software release
17X is also contained in the Ultramark 4
(Softkey   Version)   Operation   Manual,
4701-0001-03.

5–4.4   UM-4 Special and Control
Functions (23X)

• "Help" or "H" is not available with soft-
ware above 17X.

Information about the special function and
control function keys for software release
23X is also contained in the Ultramark 4
(Softkey   Version)   Operation   Manual,
4701-0001-04 and the UM-4CAD Opera-
tion Manual, 4701-0010-01.

5–4.5   25X Special Functions

Information about the special function and
control function keys for software release
25X is also contained in the Operating
Notes   and   Errata   document,   P/N
4707-0010-03   (UM-4CAD)   and
4707-0001-02 (UM-4).

2D image processing defaults may be
saved for each scanhead. This feature
replaces the TGC default special function.

• Hardkey Control Modules: While in 2D
mode, set image processing parameters
(power,g gain, reject, etc); press Special
Function U and Y to SAVE XDR
PARAMETERS [Y/N].

• Softkey Control Modules: While in 2D
mode, set image processing parameters
(power, gain, reject, etc); press XDRSAV
on the lower right on the softkey touch
panel.

• XDRSAV replaces TGCDEL function. Upon power-up, the System Controller recognizes the TGC controls or slidepots and sets TGC to those values.

5–4.6   UM-4 and UM-4CAD Special Functions (26X)

There are no special and control function changes from those available with 23X software.

5–4.7   27X & Up Special Functions

Hardkey:
• <CTRL>-M steers the Array IVT sector

(27X only).

• <SFUNC>, <ENTER> and <SFUNC>-M also steer the Array IVT sector (27X and higher).

Softkey:
• STEER softkey controls Array AVT sector orientation.

• XDRSAV softkey deleted.

• <CTRL>-U saves transducer parameters presets.

Table 5–2.   UM-4 S2 Special Functions

DESCRIPTION		Software Level			
		8X, 12X, 17X	23X, 25X, 26X	27X	28X & Up
SFUNC <ENTER>	:Array IVT steering	N N	N N	N F (STEER)	N F (STEER)
SFUNC A	:T UPDATE....Trigger update	H F (TGC UP)	N F (TGC UP)	N F (TGC UP)	N F (TGC UP)
SFUNC C	:Move Doppler Zero Line	N N (ZERO)	N F (ZERO)	N F (ZERO)	NF (ZERO)
SFUNC D	:2D ALT....Alternate Frame Rate	N F	N F	N F	N F
SFUNC E	:B/W.....Video invert	H F (B/W)	N F (B/W)	N F (B/W)	N F (B/W)
SFUNC G	:PT POS....Patient Position	H F (PT-POS)	N F (PT-POS)	N F (PT-POS)	N F (PT-POS)
SFUNC H	:SCHDP....Scanhead Position	H F (XDRPOS)	N F (XDRPOS)	N F (XDRPOS)	N F (XDRPOS)
SFUNC I	:TGC SET	H F (TGC SET)	N F (TGC SET)	N F (TGC SET)	N F (TGC SET)
SFUNC J	:ARROW	H F (ARROW)	N F (ARROW)	N F (ARROW)	N F (ARROW)
SFUNC K	:BIOPSY	H F (BIOP)	N F (BIOP)	N F (BIOP)	N F (BIOP)
SFUNC M	:Steered IVT	N N	N N	N F	N F
SFUNC N	:Doppler Wall Filter	N N (W FIL)	N F (W FIL)	N F (W FIL)	N F (W FIL)
SFUNC O	:Reject....Low level signal reject	H F (REJ)	N F (REJ)	N F (REJ)	N F (REJ)
SFUNC Q	:HELP	N F	N F	N N	N N
SFUNC R	:SMOOTH....Set smooth from 1 to 4	H F (SMOOTH)	N F (SMOOTH)	N F (SMOOTH)	N F (SMOOTH)
SFUNC S	:ECG Trigger Tone ON/OFF	H F (TONE)	N F (TONE)	N F (TONE)	N F (TONE)
SFUNC U	:TGC DEL....TGC Delete	HF (TGC DEL)	N F (TGC DEL)	N N (TGC DEL)	NN (TGC DEL)
SFUNC V	:DEL UP/DEL 2D	H F (DELUP)	N F (DELUP)	N F (DELUP)	N F (DELUP)
SFUNC W	:UP DN....Up Down	H F (UP/DN)	N F (UP/DN)	N F (UP/DN)	N F (UP/DN)
SFUNC X	:Doppler Reject	N N (REJECT)	N F (REJECT)	N F (REJECT)	N F (REJECT)
SFUNC Y	:FIELD....Sector Angle	H F	N F	N F	NF
SFUNC Z	:Doppler Invert	H F	N F	N F	N F
SFUNC ;	Activates calc software	Refer to appropriate operation manual section.			
SFUNC ← →	Doppler angle left/right	Refer to appropriate operation manual section.			
SFUNC ↑ ↓	Doppler Sample volume Incr/decr	Refer to appropriate operation manual section.			

First Letter: H = Help Message   Second Letter: F = Feature is functional
                      N = No Help Message   N = Not functional for that software version

NOTE: There are no SFUNC functions for B, F, P, T.

Table 5–3.   UM-4 S2 Control Functions

DESCRIPTION		Software Level			
		8X, 12X, 17X	23X, 25X, 26X	27X	28X & Up
CTRL A	:Disk Storage	H N	N N	N N	N N
CTRL B	:Fast Smoothing	H F	N F	N F	N F
CTRL C	:Image Swap	N N	N F	N F	NF
CTRL E	:Default Menu	H F	N F	N F	N F
CTRL H	:Doppler Sample Angle Rotation (LEFT) SFUNC :Cursor Left ALPHA	H F (ANG LT) N F	N F (ANG LT) N F	N F (ANG LT) N F	N F (ANG LT) N F
CTRL I	:Doppler Sample Angle Rotation (RIGHT) SFUNC :Cursor Right ALPHA	N F (ANG RT) N F	N F (ANG RT) N F	N F (ANG RT) N F	N F (ANG RT) N F
CTRL J	:Doppler Sample Volume Incr/ Decr (DECR) SFUNC :Cursor Down ALPHA	H F (SV DEC) N F	N F (SV DEC) N F	N F (SV DEC) N F	N F (SV DEC) N F
CTRL K	:Doppler Sample Volume Increase SFUNC :Cursor Up ALPHA	N F (SV INC) N F	N F (SV INC) N F	N F (SV INC) N F	N F (SV INC) N F
CTRL L	:Software	N N	N F	N F	N F
CTRL M	:Array IVT Steer SFUNC :CR, LF ALPHA	N N N F	N N N F	N F (STEER) N F	N N
CTRL N	:Annotation Background Inverse	N F	N F	N F	N F
CTRL O	:Hide....Annotation ON/OFF	H F	N F	N F	N F
CTRL P	:NEW PATIENT	H F	N F	N F	N F
CTRL Q	:HELP....Toggle, help for CTRL	N F	N F	N F	N F
CTRL S	:Store Image Direct .	N N	N F	N F	N F
CTRL U	:TGC Default, Save TGC	H F	N F	N F	N F
CTRL X	:Reset VCR Counter SFUNC	N N	N F	N F	N F
CTRL Y	:Doppler Arm Local/ Remote	H F (LCL RMT)	N F (LCL RMT)	N(LCL RMT) F (LCL RMT)	N F (LCL RMT)
CTRL Z	:Clock/Calendar Set	H F	NF	N F	N F
SFUCT/CTRL U	:Doppler Grid ON/OFF	Refer to appropriate operation manual section.			

First Letter: H = Help Message   Second Letter: F = Feature is functional
                 N = No Help Message   N = Not functional for that software version

NOTE: There are no CTRL functions for D, F, G, R, T, V.

5–5   Ultramark 4 Hardware Configuration

See the following PCB, PROM, and Jumper Matrices.

All system configuration, electronic equipment or replaceable parts descriptions will include line voltage and video format when applicable. If only one dash level is listed for a software/feature, then that dash is acceptable to both video formats or line voltages.

For example:

PCB/PART NAME	PART NUMBER	DASH NO.	NOTES
Display Controller	7500-0300	16 17	EIA CCIR
Power Supply	1700-0010 1700-0011	02 02	120V 240V
Delay Controller	7500-4031	02	

Definitions:

"EIA" is the 525-line video format standard of which "NTSC" is the color subset.

"CCIR" is the 625-line video format standard of which "PAL" is the color subset.

Some countries apply different safety requirements than those generally encountered in the United States. Where applicable, the safety agency will appear in the Notes column. For example:

UL   Underwriters Laboratories (USA)
TUV   Technischer Uberwachungs––Verein
            Rheinland
CSA   Canadian Standards Association

"International" and "Domestic" (Int'l and Dom) will only be used to define geographic services areas; Domestic for the United States and Canada, and International for the rest of the World. When referring to areas serviced or supplied by Solingen (Europe, Africa, Russia) the designation is "Europe (EURO)". The Europe designation is necessary to differentiate between Mid-Range systems and parts manufactured or serviced by Solingen and Bothell (primarily when dealing with the UM-4, UM-4DBF and UM-5).

5–5.1   Replacement Matrices

All PCB and PROM replacement data and PCB silhouettes have been compiled to a single location. Generally, the replacement matrices for UM-4 HCF/UM-4APLUS and UM-4A (OB, PV, CV) PCBs and PROMS will be located on a right facing page with the corresponding jumper matrix and PCB silhouettes on the following facing pages. Several PCBs have all data presented on two facing pages; several without jumpers or PROMs require only a single page.

To determine S2 Replacement PCB or Module:

CAUTION: *Do not arbitrarily order the highest dash level listed; it may not be compatible with the system, or if an alternate is then shipped, it may not be compatible. This will result in either a call-back after reordering parts or place the system in a configuration that will be incompatible with future upgrades.*

1. Use UM-4 PCB Replacement Matrix for all UM-4, UM-4AFF (UM-4 small cart), UM-4PLUS UM-4APLUS, UM-4CAD and all Solingen manufactured systems.

2. Use UM-4A PCB Replacement Matrix only for UM-4A OB, PV and CV systems.

3. Use the S1 matrices for S1 systems.

4. Compare part number and dash level of defective PCB or module to replacement matrix.

   a. If exact part number and dash level is listed, order that PCB or module.

   b. If exact replacement is not listed, order the next higher dash level PCB that matches the system configuration in the FEATURES columns (DOP, AIVT, SYNC, etc.).

NOTE: *If a column is blank, that feature is not a determining factor for that PCB and does not need to be considered.*

NOTE: *While a PCB might support a feature, there may be software levels for that PCB which do not support the feature. Compare feature compatibilities of the PCB matrix to those of the PROM matrix.*

NOTE: *The PCB and PROM matrices are compiled to provide support for all existing systems with the least number of dash levels. PCBs not included in these matrices will be reworked at the factory to the highest possible level as they cycle through the supply system.*

5–5.2   Jumper Matrix

If there isn't a jumper matrix included for a PCB, it does not have configurable jumpers (i.e., no movable jumpers).

On PCB silhouettes, switches, jumpers and I.C. locations are shown for configuration requirements and firmware listed in the various matrices.

5–5.3   Scanhead Compatibility Matrix

Compatibility is indicated by the lowest software level required for operation.

A1   Doppler Pulser PCB

HFC/4A_{PLUS} PCBs   7500-0369-XX; 7500-0525-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL						FEATURE COMPATIBILITY		
	8X	11X 12X	16X 17X	23X	25X to 31X	32X		DPLX CW	Notes
0369--	R	R	R	R	R			N	No PROMs required for Doppler Pulser PCB.
0525-01					L	L		Y	

UM-4A PCBs (OB; CV; PV only)
7500-0370-XX

PCB	OB	PV	CV		Notes
0369--	N	R	R		No Feature determination required.
0525-01	N	A	A		

NOTE: *There are no PROMs for the Doppler Pulser PCB.*

NOTE: *There are no jumpers or switches on 7500-0525-XX PCBs.*
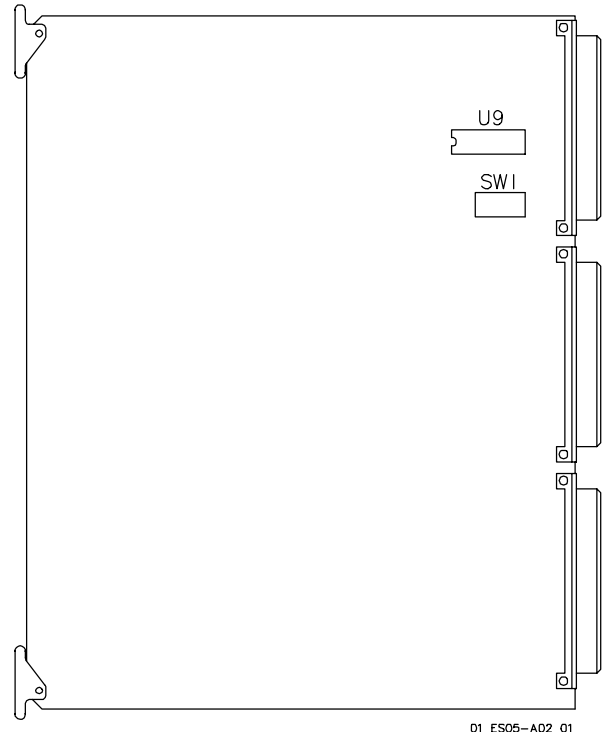
Doppler Pulser (A1)
7500-0369-XX

Jumpers

PCB			JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes	
7500-0369	--	SW1	CWXMTB	Test signal to CW Input	Open		
			CWXMTA	Test signal to CW Input	Open		
			PULSRB	Test signal to Pulsed Input	Open		
			PULSRA	Test signal to Pulsed Input	Open		
			ENABLE	Test Oscillators Enable	Open		
			CW	CW/Pulsed Test Oscillaor	Open		
			HI PWR	Selects Hi Power Mode for Doppler Pulse Amplifier	Open		
			MEDLVL	Sets VPWR to Medium Value for Mid-Range Pulse Output Level	Open		

A2   Beamformer Front End PCB

HFC/4APLUS **PCBs   7500-0288-XX**

PCB/ Dash No. 7500-	REPLACEMENT LEVEL				FEATURE COMPATIBILITY					
	8X to 31X	32X			HRLA	AA	76mm CVA	40mm CVA AIVT		Notes
0288-61	R	R			Y	Y	Y	Y		
62	L	L			Y	Y	Y	Y		
60	L	L			Y	Y	Y	Y		

UM-4A PCBs   (OB; CV; PV only) 7500-0288-XX

PCB	OB	PV	CV		HRLA		CVA			Notes
0288-60	R	R	R		Y		Y			

NOTE: *There are no PROMs or Jumpers for Beamformer Front End PCB.*

A3   Beamformer Focus PCB

HFC/4APLUS PCBs   7500-0361-XX; 7500-0549-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL						FEATURE COMPATIBILITY			
	8X to 25X	26X to 31X	32X				AA	40mm CVA AIVT	76mm CVA	Notes
0361-07	R	R					Y	N	Y	
10	L	L	L				Y	N	Y	
0549-03		L	R				N	Y	Y	1

UM-4A PCBs (OB; CV; PV only)
7500-0361-XX

PCB	OB	PV	CV		Notes
0361-07	R	R	R		
10	A	A	A		

1. 7500-0548-XX, -0549-XX, and -0370-24/25 are UM-4PLUS PCBs. The -0548 and -0549 PCBs must be used together.

NOTE: *There are no PROMs for Beamformer Focus PCB.*

NOTE: *There are no jumpers on 7500-0549-XX.*

01 ES05–A03
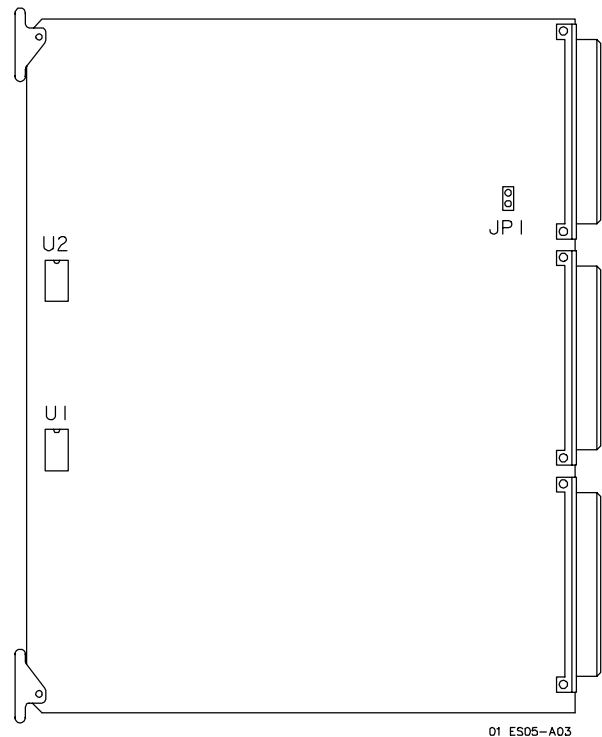
**BEAMFORMER FOCUS (A3)
7500-0320-XX; 7500-0361-XX**

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0361	ALL	JP1	1-2	S2 system	Shorted	

A4   Beamformer Controller PCB

HFC/4A~PLUS~ PCBs   7500-0362-XX; 7500-0548-XX[4]

PCB/ Dash No. 7500-	REPLACEMENT LEVEL								FEATURE COMPATIBILITY							
	8X	11X 12X	16X 17X	23X	25X	26X to 31X	32X		HRLA	AA	NON-SYNC	NON-DOP SYNC	DOP SYNC	76mm CVA	40mm CVA AIVT	Notes
0362-02	R	R	A	A	A	A			N	N	Y	Y	Y	N	N	1, 2
04		A (12X)	R	R	R	R			Y	Y	Y	Y	Y	N	N	1, 2
09					L	L	L		Y	Y	Y	Y	Y	Y	N	1, 2
0548-06						A	A		Y	N	N	Y	Y	Y	Y	1, 3
10[5]						R	R		Y	N	N	Y	Y	Y	Y	1, 3

UM-4A PCBs   (OB; CV; PV only)   7500-0362-XX

PCB	OB	PV	CV			HRLA	AA			76mm CVA		Notes
0362-02	R		R			N	N			N		1, 2,
04	A	R	A			Y	Y			N		1, 2,
09	L	L	L			Y	Y			Y		1

1. PROMs required.
2. Convertible, refer to Up/Down Rev Instructions.
3. 7500-0548-XX, -0549-XX, and -0370-24/25 are UM-4~PLUS~ PCBs. The -0548 and -0549 PCBs must be used together.
4. **CAUTION:** *Do not swap -0548 and -0362 PCBs. The first does not support AA scanheads and the second does not support AIVT scanheads. There are also sync differences; refer to matrix.*
5. Replace -0548-07/08 PCBs with -10 on next call basis.

PROMs

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL									INDIVIDUAL PROM			FEATURE COMPATIBILITY		
	Part No.	Dash No.	8X	11X	12X	16X	17X	23X	25X	26X to 31X	32X	Ref. Des.	P/N 4201-	Dash No.	HRLA	AA	DPLX CW/ CVA
0362-02	Individual			Y								U50	0236	D	N	N	N
	8000-0178	02			Y									02	N	N	N
		06			Y	Y								06	N	N	N
		07					Y							07	N	N	N
		08						Y						08	N	N	N
04	8000-0178	06			Y	Y								06	Y	Y	N
		07					Y							07	Y	Y	N
		08							Y	Y	Y		0236	08	Y	Y	N
09	8000-0507	02							Y	Y	Y	U50	0802	02	Y	Y	Y[1]
0548-06	8000-0579	02								Y	Y	U71	0892	02	Y	N/A	Y
10	8000-0579	02								Y	Y						

1. 76mm CVA only.

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0362	ALL	D	1-2	Test	Shorted	
		E	1-2	Test	Shorted	
		F	1-2	Test	Shorted	
		G	1-2	Test	Shorted	
	01 and above	JPH	1-2	Non-Sync	Open	Sync/Non-Sync conversion requires more than JP-H change, refer to Up/ Down Rev Instructions.
			2-3	Sync	Shorted	
		All others			Open	
7500-0548[1]	06 and below	JPI	1-2	Write to PROM	Open	
			2-3	Read PROM	Shorted	
		JPH	1-2	Internal clock	Open	Non-Sync
			2-3	External clock	Shorted	Sync
		JPJ	1-2	N/A	Open	

1. 7500-0548-07 and above: No field configurable jumpers.
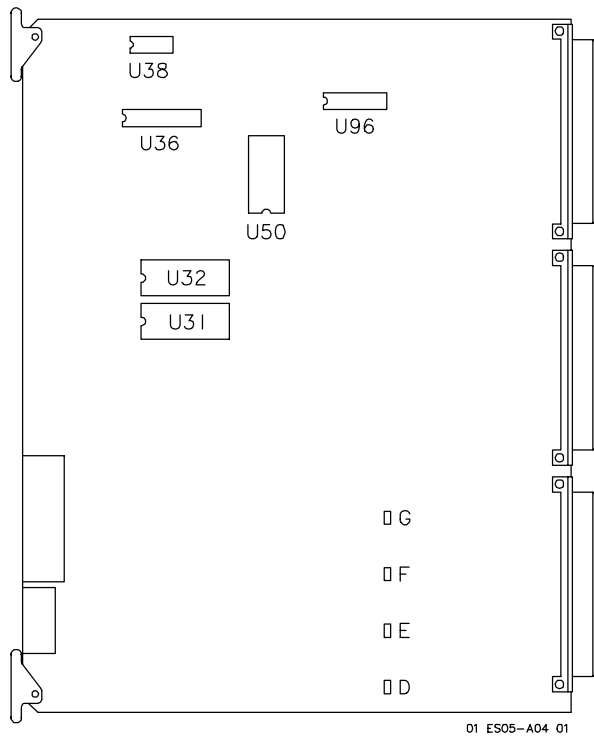
BEAMFORMER CONTROLLER (A4)
7500-0324-XX (S1 ONLY)
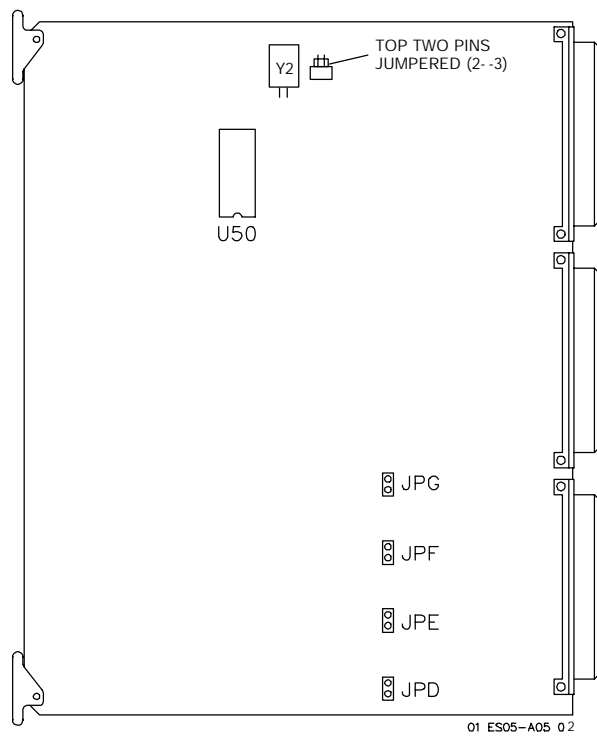
BEAMFORMER CONTROLLER (A4)
7500-0362-04 & Lower
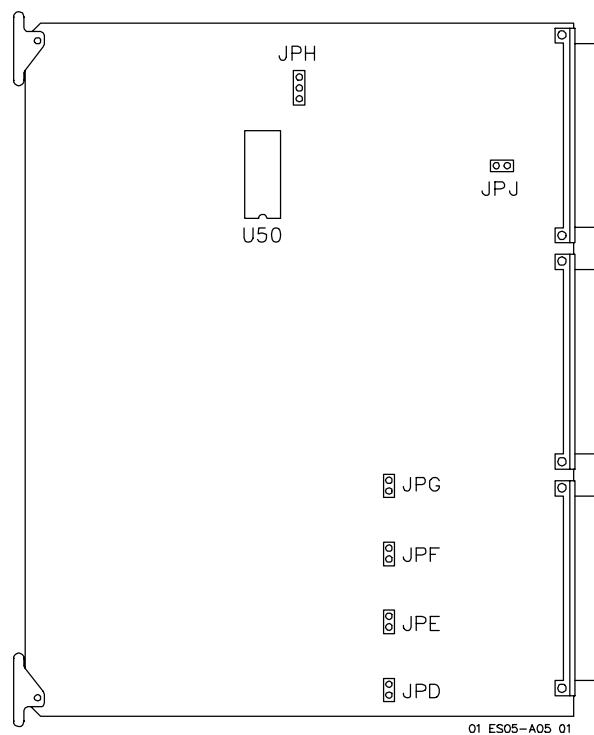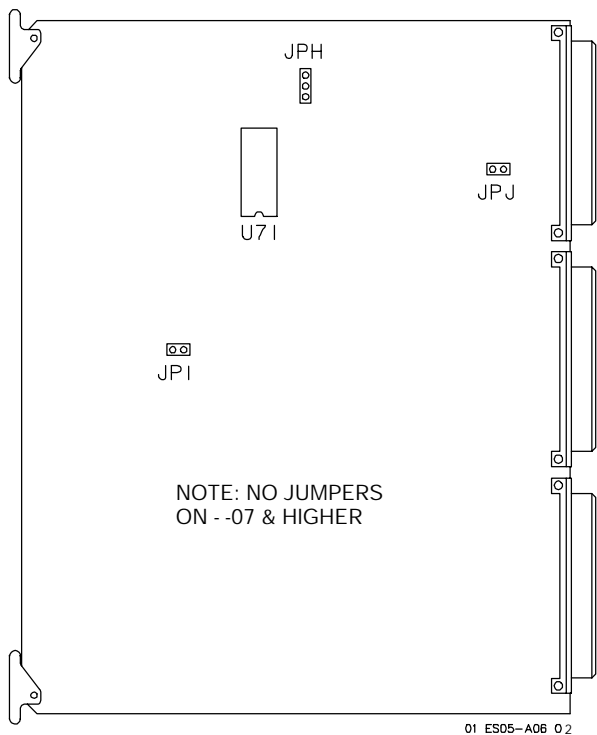

BEAMFORMER CONTROLLER (A4)
7500-0362-05 & higher

BEAMFORMER CONTROLLER (A4)
7500-0548-XX

A5   Pulse Processor PCB

HFC/4APLUS PCBs   7500-0370-XX; 3500-1261/62 (3500s are not to be reconfigured in the field)

PCB/ Dash No. 3/7500-	REPLACEMENT LEVEL									FEATURE COMPATIBILITY						
	8X	11X 12X	16X 17X	23X	25X	26X	27X to 31X	32X		DOP w/DOP sync	NON-DOP SYNC		40mm CVA AIVT			Notes
0370-08	R	L	L	L	L	A	A	A		N	Y		N			1, 2, 5
09	A	R	R	R	R	A	A	A		Y	N		N			1, 2, 5
24		A	A	A	A	A	R	R		N	Y		Y			1, 2, 3
25		A	A	A	A	A	R	R		Y	N		Y			1, 2, 3
26		A	A	A	A	A	A	A		N	Y		Y			1, 2, 3
27		A	A	A	A	A	A	A		Y	N		Y			1, 2, 3
1261-01		L	L	L	L	L	L	L		Y	N		Y			1, 4
1262-01		L	L	L	L	L	L	L		N	Y		Y			1, 4

UM-4A PCBs   (OB; CV; PV only) 7500-0370-XX

PCB	OB	PV	CV		Notes
0370-09	R	R	R		1, 2, -05 rolled to -09

1. PROMs required.
2. Convertible, refer to Up/Down Rev Instructions.
3. 7500-0548-XX, -0549-XX, and -0370-24/25 are UM-4PLUS PCBs. The -0548 and -0549 PCBs must be used together. -0370-24/25s are backward compatible to 12X when configured with 8000-0570-XX software.
4. 3500-1261/62s are relayout of 7500-0370-24/25; they are backward compatible to 12X when configured with 8000-0570-XX or higher software. *Do not order 7500-0561-XX generic PCB.*
5. 7500-0370-08/09 PCBs support MFI with 30.08 (8000-0177-12/13) or higher software.

PROMs

PCB/ Dash No. 7500- or 3500	PROM KIT		REPLACEMENT LEVEL										INDIVIDUAL PROM			FEATURE COMPATIBILITY		
	Part No.	Dash No.	8X	11 X	12 X	16/ 17X	23 X	25 X	26– 28X	29 X	30/ 31X	32 X	Ref. Des.	P/N 4201-	Dash No.	AA	HR LA	MFI
0370-08 09	6220-0013	01	Y										U70	0285	01	N	N	N
	8000-0177	01		Y	Y	Y									02	N	N	N
		02			Y	Y	Y								03	N	N	N
		03			Y	Y									04	Y	N	N
		05[1]				Y									06	Y	Y	N
		07					Y								08	Y	Y	N
		08						Y	Y						09	Y	Y	N
		10							Y	Y		Y		0285	11	Y	Y	N
		11[2]							Y	Y		Y		0913	01[2]	Y	Y	N
		12									Y	Y		0285	12	Y	Y	Y
		13[2]									Y	Y		0913	02[2]	Y	Y	Y
24, 26	8000-0570	04			3	3	3	3	3	3	Y	Y		0887	04	Y	Y	Y
25, 27	8000-0570	04			3	3	3	3	3	3	Y	Y		0887	04	Y	Y	Y
1261-01	8000-0570	04			3	3	3	3	3	3	Y	Y	U67	0887	04	Y	Y	Y
1262-01	8000-0570	04			3	3	3	3	3	3	Y	Y		0887	04	Y	Y	Y

1. Linear noise fix.
2. Euro alternate only, w/o Gain governor.

3. 3500-1261/62s are relayout of 7500-0370-24/25; they are backward compatible to 12X when configured with 8000-0570-XX or higher software

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Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0370	ALL	JP1	1-2	N/A	Shorted	
		JP2	1-2	N/A	Shorted	
		JP3	1-2	N/A	Shorted	
	XX	JP4	1-2	N/A	Shorted	
		JP5	1-2	N/A	Shorted	
7500-0370	ALL	JP6	1-2	N/A	Shorted	
		CAL	1-2	N/A	Shorted	
		JP7	1-2	Shorted for Doppler Sync; Open for Non-Doppler Sync; Open for Non-Sync, Non-Doppler	Hardware dependent	Refer to Up/Down Rev Instructions
		JP8	1-2	Open for Doppler Sync; Shorted for Non-Doppler Sync; Open for Non-Sync, Non-Doppler	Hardware dependent	Refer to Up/Down Rev Instructions
3500-1261-01 (Dop)[1] 3500-1262-01 (Non-Dop)[1]	ALL	JP1-JP 13	1-2		Shorted	
		JP-14	1-2	Doppler Non-Doppler	Open Shorted	Sync configuration
		JP-15	1-2	Doppler Non-Doppler	Shorted Open	Sync configuration
		CAL	2-3		Shorted	

1. Do not order the generic 7500-0561-XX PCB. It requires certain jumper and crystal configurations and is not to be reconfigured in the field. Order appropriate 3500 PCB from Replacement Matrix.

01 ES05–A08 01
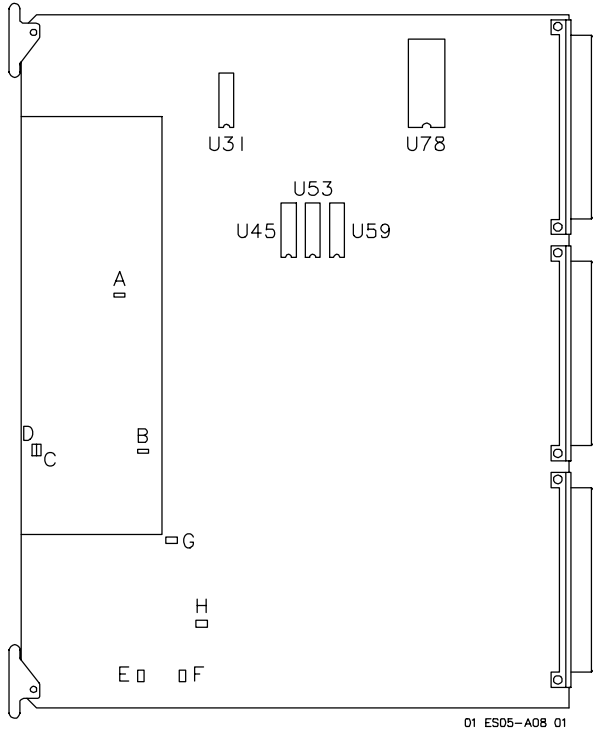
PULSE PROCESSOR (A5)
7500-0313 (S1 ONLY)

01 ES05–A09 01

PULSE PROCESSOR (A5)
7500-0370

01 ES05–A10 02
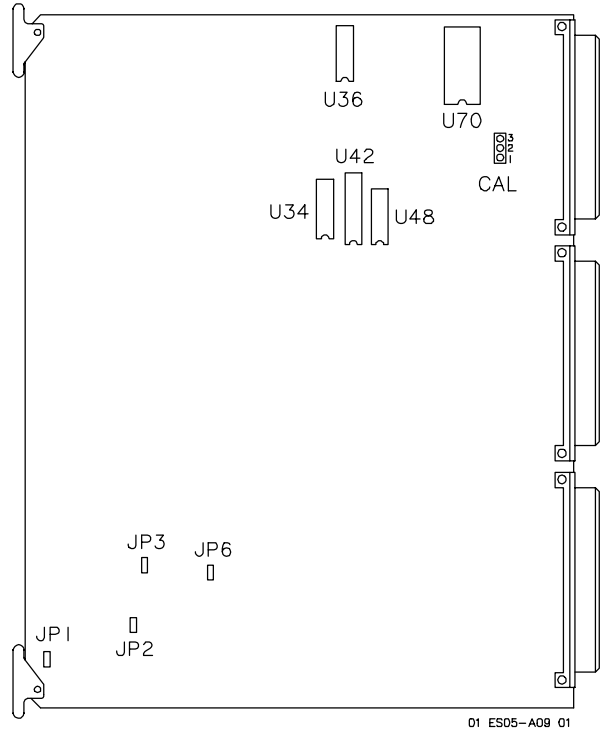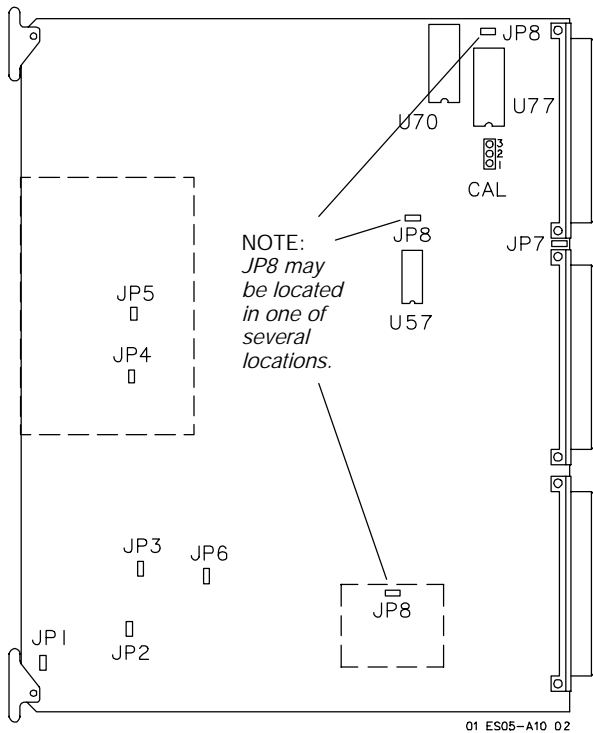
PULSE PROCESSOR (A5)
7500-0370-XX

01 ES05–A11 01
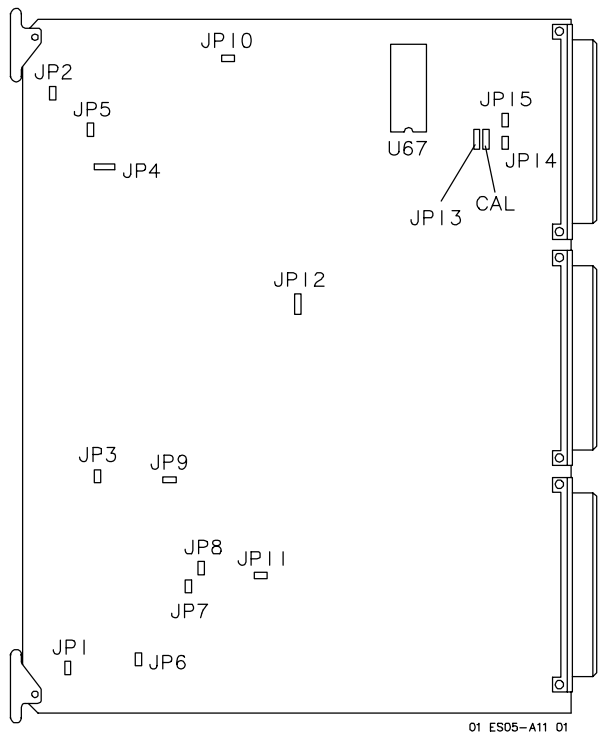
PULSE PROCESSOR (A5)
3500-1261/62-XX
(7500-0561-XX Plus Configuration)

A6 Doppler Acquisition PCB

HFC/4A~PLUS~ **PCBs**   7500-0346-XX; 7500-0394-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL								FEATURE COMPATIBILITY			
	8X	11X 12X	16X 17X	23X	25X to 31X	32X			DPLX CW	MERC		Notes
0346--	P[1]	P	P	P								
01	L	L	L	L	L				N	N		2
02	L	L	L	L	L				N	N		2, 4
0394-04	L	L	L	L	L				N	N		2, 3, 4
05	L	L	L	L	L	R			Y	Y		2
07	L	L	L	L	L	A			Y	Y		2

UM-4A **PCBs**   (OB; CV; PV only)[5] 7500-0346-XX; 7500-0394-XX

PCB	OB	PV	CV		Notes
0346-01		L	L		4
02		L	L		4
0394-04		L	L		3, 6
05		L	L		
07		L	L		

1. P - Purge.
2. Convertible, refer to Up/Down Rev Instructions.
3. -04 should be used to replace all -02 and -03 PCBs.
4. 7500-0346-02 is functionally equivalent to 7500-0394-04, but neither is functionally equivalent to the 7500-0346-01 version.
5. For UM-4APlus or UM-4A FF systems, refer to the HFC/4A~PLUS~ Matrix.
6. Conversion is not required for 23X or higher systems.

NOTE: *There are no PROMs for the Doppler Acquisition PCB.*
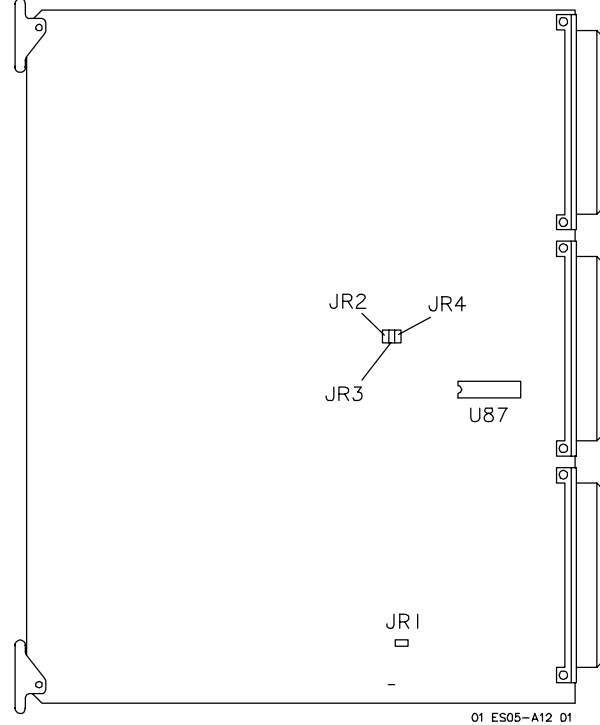
DOPPLER ACQUISITION PCB (A6) 7500-0346-XX

NOTE: *There are no field configurable jumpers on 7500-0394-XX*

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0346	ALL	JR1	1-2	Maximum Gain Test Mode	Open	Short 1-2
			2-3	Normal Gain Control	Shorted	
		JR2	1-2	Hardware Identification	Open	
		JR3	1-2	Hardware Identification	Open	
		JR4	1-2	Hardware Identification	Open	
7500-0394	All	JP1	1-2	Test Mode	Shorted	Hardwired at factory
		JP2	1-2	Board I.D.	Open	
		JP3	1-2	Board I.D.	Open	
		JP4	1-2	Board I.D.	Open	

A7   Doppler Processor PCB

HFC/4A_{PLUS} PCBs   7500-0347-XX; 7500-0390-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL					FEATURE COMPATIBILITY				
	8X to 23X	25X to 31X	32X			DPLX CW	MERC			Notes
0347--,[4] 01, 02,	**P**[5]									
0347-05[4]	R	R				N	N			1, 2, 6
0390-01	A	A				N	N			1, 6
03	A	A				N	N			1, 6
07		L	L			Y	Y			1, 3

UM-4A PCBs   (OB; CV; PV only) 7500-0347-XX; 7500-0390-XX

| PCB	OB	PV	CV		Notes
0347-05		A	A		1, 6
0390-01		R	R		1, 6
03		A	A		1, 6
07		L	L		1, 3

1. PROMs required.
2. 7500-0347-05 and 7500-0390-01 & -03 are not compatible with 7500-0370-02, -04, -08, or -10 (may create a noise problem. -0347 has cables attached, -0390 has card edge connectors.
3. 7500-0394-05 and 7500-0390-07 are backward compatible as a pair (they do not need to be "matched").
4. 7500-0347-XX can only be used with 7500-0346-XX.
5. P - Purge.
6. Functional equivalents.

### PROMs

PCB/ Dash No. 7500-	PROM KIT Part No.	PROM KIT Dash No.	8X	11X	12X	16X	17X	23X	25X	26X to 31X	32X			Ref. Des.	P/N 4201-	Dash No.	Notes
0347-05	8000-0134	02	Y											U39	0238	02	
		03		Y	Y											03	
		04				Y	Y									04	
		05						Y								05	
		06							Y							06	
		08								Y						08	
0390-01 03, 07	8000-0134	02	Y											U108	0238	02	
		03		Y	Y											03	
		04				Y	Y									04	
		05						Y								05	
		06							Y							06	
		08								Y	Y					08	

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0347	ALL	JP1	1-2	Shorted for 8K x 8 RAM	Shorted	
		JP2	1-2	Shorted for 32K x 8 RAM	Open	
		JP3	1-2	Shorted for 16K x 8 RAM	Shorted	
		JP4	1-2	Shorted for 16K x 8 RAM	Open	
		JP5-JP14	1-2	Not used	Open	Not illustrated because not movable.
		SW1	1	Not used	N/A	
			2	Not used	N/A	
			3	Not used	N/A	
			4	Not used	N/A	
7500-0390	ALL	JP1	1-2	Test	Shorted	
		JP2	1-2	Memory expand	Open	
		JP3	1-2	Disable Sync clock	Shorted	
		JP4	1-2	Memory expand	Open	
		JP5	1-2	Memory expand	Shorted	
		SW1	1	Not used	N/A	
			2	Not used	N/A	
			3	Not used	N/A	
			4	Not used	N/A	
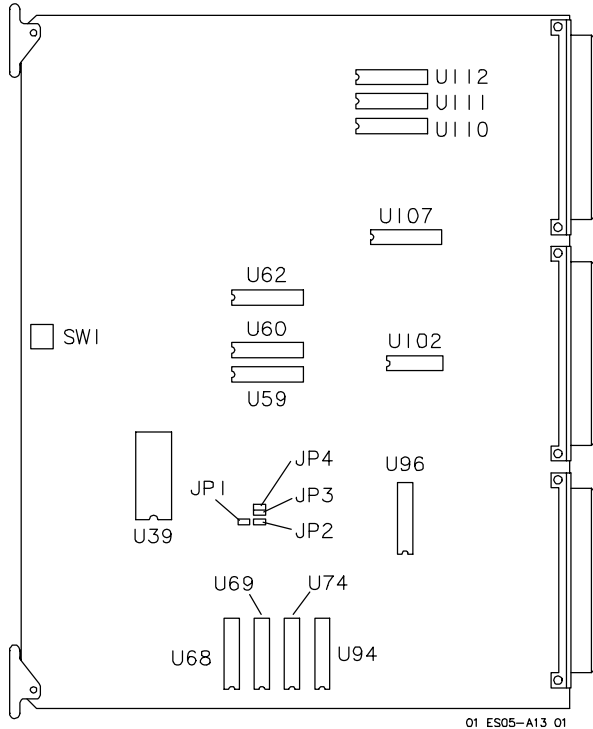
DOPPLER PROCESSOR (A7)
7500-0347-XX
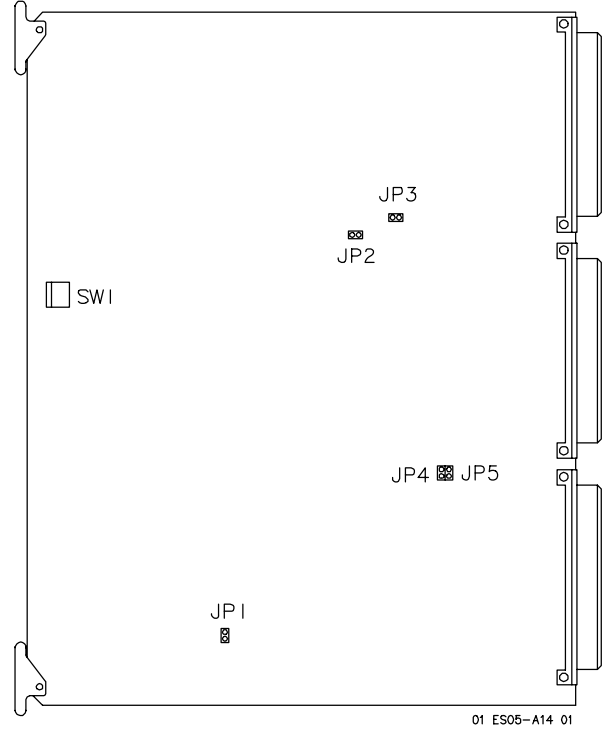
DOPPLER PROCESSOR (A7)
7500-0390-XX

A8   Motor Controller PCB

HFC/4APLUS PCBs   7500-0304[5]; 7500-0348-XX; 7500-0517-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL					FEATURE COMPATIBILITY								Notes
	8X	11X to 26X	27X to 31X	32X		AA	NON-SYNC	NON-DOP SYNC	DOP SYNC	CAD	MERC	MFI		
0348-64	R	R	R	A		Y	Y	Y	Y	Y	N	Y		1, 2; Order only for AA
10, 11	A	A	A	A		Y	Y	Y	Y	Y	N	Y		1; Order only for AA
65	A	A	A	A		N	Y	Y	Y	Y	N	Y		1, 4
61	A	A	A	A		N	Y	Y	Y	Y	N	Y		1, 4
62	R	R	R	R		N	Y	Y	Y	Y	N	Y		1, 4
0348-12	L	L	L	L		N	N	Y	Y	N	N	Y		1, 4
0517-03			L	L		N	N	Y	Y	Y	Y	N		1, 3

UM-4A PCBs   (OB; CV; PV only) 7500-0348-XX

PCB	OB	PV	CV		Notes
0348-64	A	A	A		1
11	R	R	R		1

1. PROMs required.
2. Convertible, refer to Up/Down Rev Instructions in Section 9.
3. Software supporting 7500-0517-XX does not support MFI; refer to PROM matrix for correct 7500-0348-XX and software choice.
4. Non-AA versions recommended for non-AA systems, due to increased reliability.
5. 7500-0304 may be stocked by International dealers, order like-for-like from them only for International service. If not available, order appropriate 7500-0348-XX.

PROMs 11X-25X

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL							INDIVIDUAL PROM			FEATURE COMPATIBILITY				
	Part No.	Dash No.	8X	11X	12X	16X	17X	23X	25X	Ref. Des.	P/N 4201-	Dash No.	AA	PV	MERC	DPLX CW/ CVA	MFI
0348-10, 11, 12, 61, 62, 64, 65	8000-0133	02	Y							U26 or	0265	02	N	N	N	N	N
		03		Y						U33		03	N	N	N	N	N
		12			Y	Y	Y	Y	Y	Note1		12	Y	Y	N	Y	N
	8000-0235	01			Y	Y	Y			U33	0396	01	N	Y	N	N	N

PROMS 26X and up

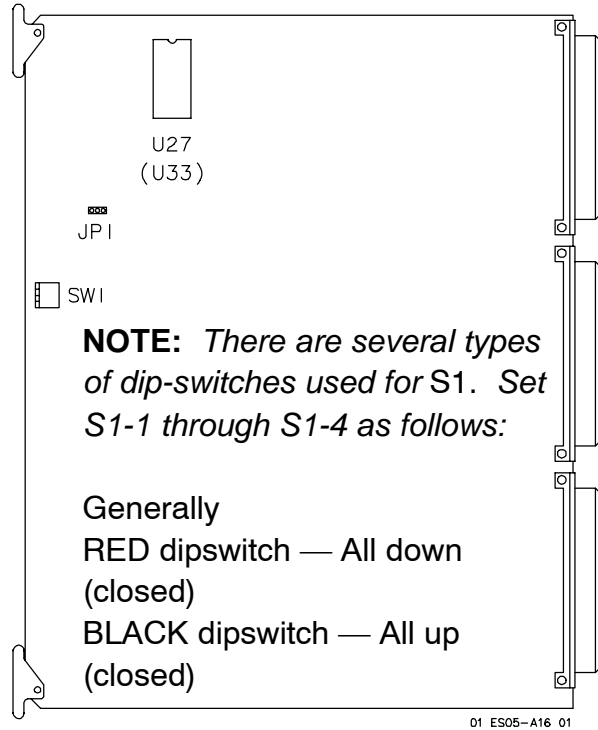| 7500-	PROM KIT		REPLACEMENT LEVEL							INDIVIDUAL PROM			FEATURE COMPATIBILITY				
	Part No.	Dash No.	26/ 28X	29X	30X to 31X	32X				Ref. Des.	P/N 4201-	Dash No.	AA	PV	MERC	DPLX CW/ CVA	MFI
0348-10, 11, 12, 61, 62, 64, 65	8000-0133	13	Y	Y	Y					U33	0265	13	Y	Y	N	Y	N
		14			Y							14	Y	N	Y	Y	Y
		15				Y						15	Y	N	N	N/Y[2]	Y
0517-03	8000-0480	05	Y	Y	Y	Y				U57 U58	0775 0776	05 05	N N	N N	Y Y	Y Y	N N

1. Board re-layout renumbered IC U27 to U33 on 7500-0348-08 and -10 and higher dash level PCBs.
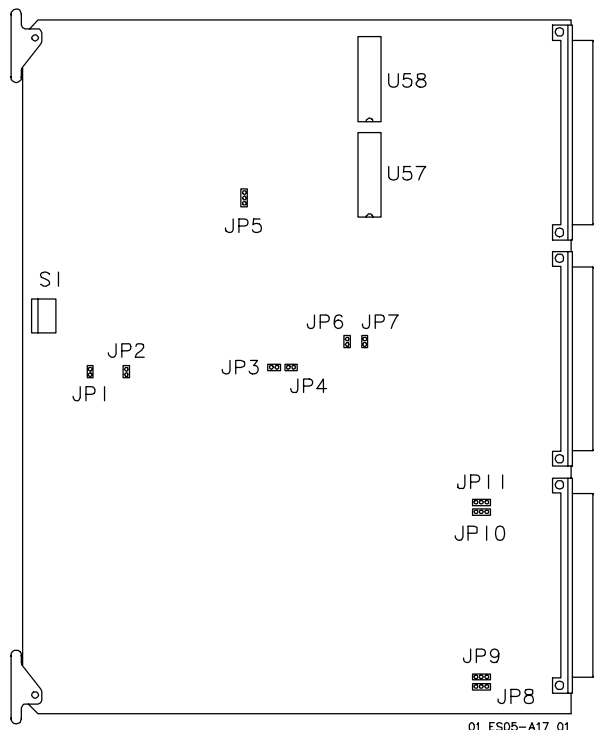2. DPLX CW — No, CVA — Yes

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0304	ALL	S1-1		N/A	Closed	S1 is not for field use
		S1-2		N/A	Closed	
		S1-3		N/A	Closed	There are several types of dips-witches used for S1.
		S1-2		N/A	Closed	Generally, set as follows: RED — All *DOWN* (CLOSED)
7500-0348	ALL	S1-1		N/A	Closed	BLACK - All *UP* (ON)
		S1-2		N/A	Closed	Always refer to jumper tables for correct switch settings and verify labelling on switch before changing switch positions.
		S1-3		N/A	Closed	
		S1-4		N/A	Closed	
	04-06, 08-11	JP1	1-2	Non-Sync	Open	Conversion between sync and non-sync requires more than JP1 change, refer to Up/Down Rev Instructions.
			2-3	Sync	Shorted	
7500-0517	03	JP1	1-2	Connects analog and digital grnd	Shorted	
		JP2	1-2	Connects analog and digital grnd	Shorted	
		JP3	1-2	Factory test only	Shorted	
		JP4	1-2	Factory test only	Shorted	
		JP5	1-2	Selects RAM memory	Open	
			2-3	Selects ROM memory	Shorted	
		JP6	1-2	Connects analog and digital grnd	Shorted	
		JP7	1-2	Connects analog and digital grnd	Shorted	
		JP8	1-2	Internal power supply	Shorted	
			2-3	External power supply	Open	
		JP9	1-2	Internal power supply	Shorted	
			2-3	External power supply	Open	
		JP10	1-2	Internal power supply	Shorted	
			2-3	External power supply	Open	
		JP11	1-2	Internal power supply	Shorted	
			2-3	External power supply	Open	
		S1-1		N/A	Closed	
		S1-2		N/A	Closed	
		S1-3		N/A	Closed	
		S1-4		N/A	Closed	

MOTOR CONTROLLER PCB (A8)
7500-0304

NOTE: *There are several types of dip-switches used for* S1. *Set S1-1 through S1-4 as follows:*

Generally
RED dipswitch — All down (closed)
BLACK dipswitch — All up (closed)

MOTOR CONTROLLER PCB (A8)
7500-0348-XX

MOTOR CONTROLLER PCB (A8)
7500-0517-XX

A9   Scan Converter Interface, Combo[1, 4] and Cine[4] PCBs

HFC/4APLUS **PCBs**   7500-0273-XX; 3500-1413/14-XX[1, 3]; 3500-1425/26-XX[4]

PCB/ Dash No. 7500- or 3500-	REPLACEMENT LEVEL							FEATURE COMPATIBILITY					
	8X to 25X	26X to 29X	30X	31X	32X			CAD	Cine-loop	525-Line Video	625-Line-Video		Notes
0273-06	R	A	A					N	N	Y	N		
07	R	A	A					N	N	N	Y		
08	A	A	A					N	N	Y	N		
09	A	A	A					N	N	N	Y		
60	L	L	L		R			Y	N	Y	N		2
61	L	L	L		R			Y	N	N	Y		2
22	L	L	L		L			Y	N	Y	N		2
23	L	L	L		L			Y	N	N	Y		2
3500-1413-01/02			L	L	L			Y	N	Y	N		3
3500-1414-01/02			L	L	L			Y	N	N	Y		3
3500-1425-01/02				L	L			Y	Y	Y	N		4
3500-1426-01/02				L	L			Y	Y	N	Y		4

UM-4A PCBs   (OB; CV; PV only) 7500-0273-XX

PCB	OB	PV	CV		Notes
0273-06	R	R	R		
08	A	A	A		
60	L	L	L		2
22	L	L	L		2

1. Combines functions of Scan Converter Interface and Buffer PCBs.
2. Convertible, refer to Up/Down Rev Instructions.
3. 3500-1413/1414-XX consist of Generic Scan Converter Combo PCB (7500-0778) with a specific jumper and crystal configuration (-1415 & -1416 are UM-5 equivalents). *Do not order 7500-0778-XX generic PCB.*
4. 3500-1425/1426-XX consist of Generic Scan Converter Combo w/Cine PCB (7500-0798) with a specific jumper and crystal configuration (-1427 & -1428 are the UM-5 equivalents). *Do not order 7500-0798-XX generic PCB.*

NOTE: *There are no PROMs required for the Scan Converter Interface, Combo, or Cine PCBs.*
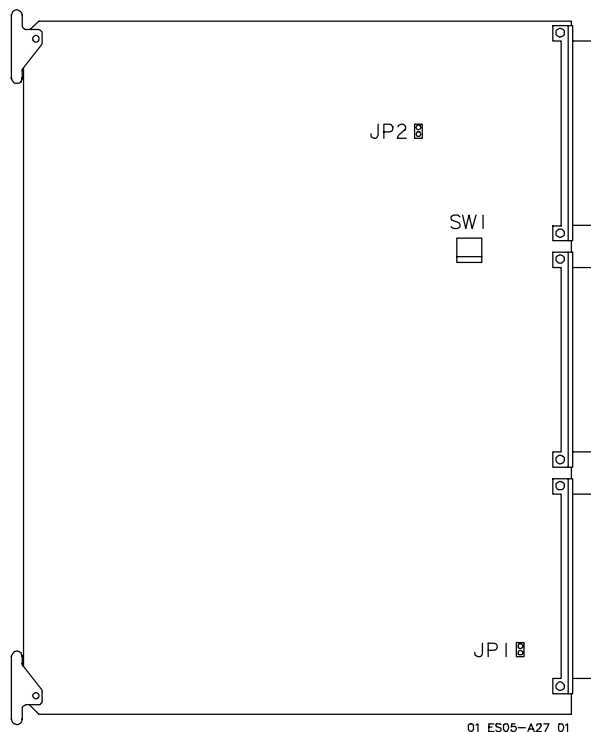
NOTE: *S.C. Combo and S.C. Cine PCBs must be used without a S.C. Buffer PCB. If you are shipped either of these to replace a S.C. Converter Interface PCB (-0273-XX), be sure to remove the -0315 PCB.*

NOTE: *Do not order 7500-0778 or 7500-0798 PCBs. Jumper information is for configuration reference only. Order the appropriate 3500 assembly to assure receiving a PCB properly configured and adjusted for the specific application.*

NOTE: *Either of two types of dip-switches may be installed*:

RED dipswitch — Down is closed
BLACK dipswitch — Up is closed (ON)

Refer to matrix to confirm correct settings

01 ES05−A18 01
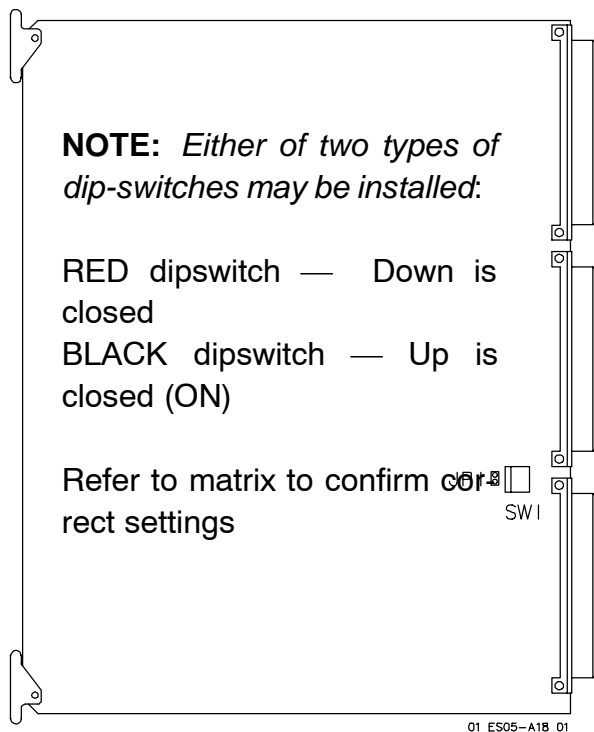
Scan Converter Interface PCB (A9)
7500-0273-XX
Jumpers

JP2

SW I

JP I

01 ES05−A27 01

S. C. Combo and Cine PCBs (A9)
7500-0778-XX; 7500-0798-XX

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0273	00-09	S1	1	Not used	Open	
			2	Not used	Open	
			3	Used	Closed	
			4	Used	Open	
	10-23, 60, 61	S1	1	Not used	Open	
			2	Not used	Open	
			3	SMPL CLK for CAD	23X and up — Closed 17X and down — Open	
			4	Not used	Open	
	ALL	JP1	1-2	Video select	525-lines — Open 625-lines — Closed	
7500-0778[1] and 7500-0798[1] See footnote 1	01/02 01/02	JP1	1-2	Video select	525-lines — Open 625-lines — Closed	UM4 = 3500-1413-XX or 3500-1425 UM4 = 3500-1414-XX 0r 3500-1426
		JP2	1-2	System select	UM4 — Open	= 3500-1413/14-XX or 3500-1425/26
					(UM5 — Shorted)	= 3500-1415/16-XX or 3500-1427/28
		S1	1, 2, 3, 4	Not used	open	

1 Do not order 7500-0778 or 7500-0798 PCBs. Jumper information is for configuration reference only, order the appropriate 3500 assembly to assure receiving a PCB properly configured and adjusted for the specific application.

A10   Scan Converter Buffer PCB[1]

HFC PCBs   7500-0315-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL				FEATURE COMPATIBILITY					
	8X to 29X	30X & 31X	32X							Notes
0315-	R	R	R							

UM-4A PCBs   (OB; CV; PV only) 7500-0315-XX

PCB	OB	PV	CV		Notes
0315--	R	R	R		
01	A	A	A		

1. This PCB must be used with 7500-0273-XX. It must be removed if you are shipped either a S.C. Combo or a S.C. Cine PCB.

NOTE: *There are no PROM or jumpers required for the Scan Converter Buffer PCB.*

A11   Scan Converter OAG PCB

HFC PCBs   7500-0314-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL					FEATURE COMPATIBILITY	
	8X to 31X	32X					Notes
0314-00	R	R				No Feature determination required.	

UM-4A PCBs   (OB; CV; PV only) 7500-0314-XX

PCB	OB	PV	CV		Notes
0314-00	R	R	R		

NOTE: *There are no PROMs required for the Scan Converter Output Address Generator PCB.*

JP I
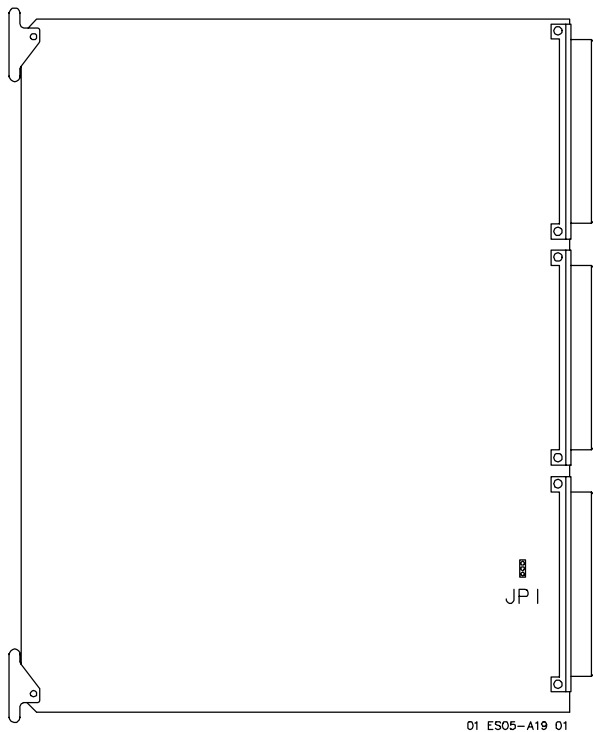
SCAN CONVERTER OAG PCB (A11)
7500-0314-XX

01 ES05−A19 01

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0314	00	JP1	A-B	Normal operation	Shorted	
			B-C	Test	Open	

A12 TM-Mode PCB[1]

HFC PCBs   7500-0322-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL					FEATURE COMPATIBILITY			
	8X to 17X	25X to 31X	32X			CAD			Notes
0322-02	R	A				N			2
07	A	A				N			2
08	A	R	R			Y			2, 3

UM-4A PCBs (OB; CV; PV only) 7500-0322-XX

PCB	OB	PV	CV	Notes
0322-02		R		
04	R			
06	A			
07		A	R	3
08		A	A	4

1. Requires TM-mode Auxiliary PCB.
2. Functional equivalents.
3. -05 was rolled to -07
4. Convertible, refer to Up/Down Rev Instructions.

PROMs

NOTE: *Refer to TM Aux PCB for TM-Mode PCB PROMs for 25X and above systems when these PCBs are substituted for the TM Combo PCB.*
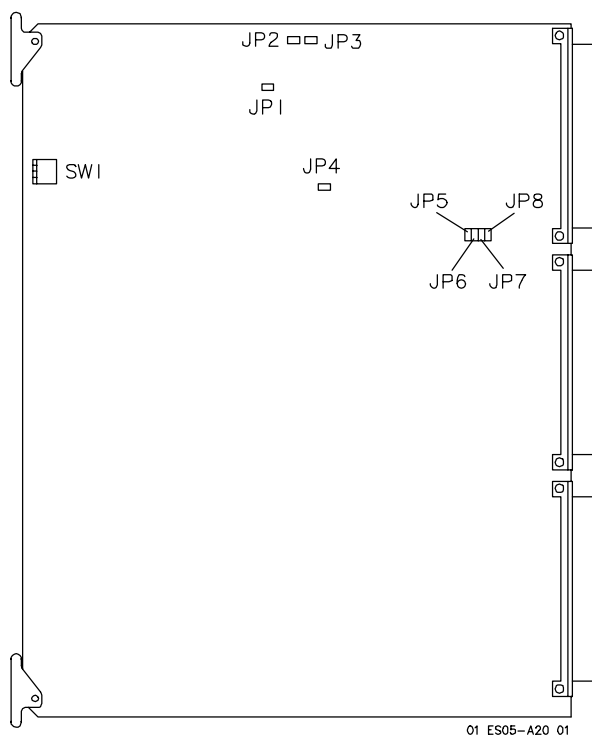
**TM-MODE PCB (A12)
7500-0322-XX**

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0322	00, 02, 03, 05, 07, 08	JP1	1-2	Not for Field use	Open	
		JP2	1-2	Not used	Open	
		JP3	1-2	Not used	Shorted	
		JP4	1-2	Not for Field use	Open	
	03, 05, 07, 08	JP5	1-2	Board ID	Open	
		JP6	1-2	Board ID	Shorted	
		JP7	1-2	Board ID	Open	
		JP8	1-2	Board ID	Open	
	00, 02, 03, 05, 07, 08	SW1	SW1-1	ECG	Closed[1]	Diagonal ECG pattern when open
			SW1-2 (T1)	ECG	Closed[1]	ECG data ON/OFF
			SW1-3 (T2)	M-mode test	Open	Vertical gray scale when closed
			SW1-4 (T3)	M-mode test	Open	Horizontal gray scale when closed
	00, 02, 04, 06	JP5	1-2	Board ID	Shorted	
		JP6	1-2	Board ID	Open	
		JP7	1-2	Board ID	Open	
		JP8	1-2	Board ID	Open	
	04, 06 only	SW1	T1	Not used on UM-4A (OB)	Closed	
			T2	Not used on UM-4A (OB)	Closed	
			T3	M-mode test	Open	Vertical gray scale when closed
			T4	M-mode test	Open	Horizontal gray scale when closed

1. Both S1-1 and S1-2 must be closed and ECG turned ON on Control Panel:
   S1-1-closed, S1-2-open = ECG trace w/o data or noise
   S1-1-closed, S1-2-closed = ECG trace w/data or noise
   S1-1-open,   S1-2-closed = scrolling diagonal ECG test pattern.

A12   TM-Mode Combination PCB

HFC PCBs   7500-0411-XX

PCB/ Dash No. 7500-	REPLACEMENT LEVEL								FEATURE COMPATIBILITY			
	8X	11X 12X	16X to 31X	32X					Notes			
0411-07			L	A					1, 2, 3, 4			
08			A	A					1, 2, 3, 4			
09/11, 12			A	R					1, 2, 3, 4			

UM-4A PCBs   (OB; CV; PV only) 7500-0411-XX

PCB	OB	PV	CV		Notes
0411-07		L	L		1, 2, 3, 4
08		A	A		1, 2, 3, 4
09/11		A	A		1, 2, 3, 4

1. PROMs required.
2. Convertible, refer to Up/Down Rev Instructions.
3. Does not require TM Aux PCB.

4. These TM Combo PCBs are externally clocked.
   Conversion not required if 7500-0373-05 or
   higher motherboard is present.

PROMs

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL										INDIVIDUAL PROM			FEATURE COMPATIBILITY		
	Part No.	Dash No.	8X	11 X	12 X	16 X	17 X	23 X	25 X	26X to 31X	32 X		Ref. Des.	P/N 4201-	Dash No.	MER		
0411-07, 08	8000-0270	01					Y						U26	0444	01			
													U48	0225	--			
		02						Y					U26	0444	02			
													U48	0225	--			
		05							Y	Y			U26	0444	03	N		
													U48	0225	02			
		06								Y	Y		U26	0444	04	Y		
													U48	0225	02			
0411-09, 11, 12	8000-0270	01					Y						U20	0444	01			
													U41	0225	--			
		02						Y					U20	0444	02			
													U41	0225	--			
		05							Y	Y			U20	0444	03	N		
													U41	0225	02			
		06								Y	Y		U20	0444	04	Y		
													U41	0225	02			

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0411	08 and below	JP1	1-2	Not for Field Use	Open	
		JP2	1-2	Test	Open	
		JP3	1-2	Test	Shorted	
		JP4	1-2	Not for Field use	Open	
		JP5	1-2	PCB ID	Open	
		JP6	1-2	PCB ID	Open	
		JP7	1-2	PCB ID	Shorted	
		JP8	1-2	PCB ID	Open	
	07, 08	JP10	1-2	Non-Sync	Open	Refer to Up/Down Rev Instructions
			2-3	Sync	Shorted	Refer to Up/Down Rev Instructions
	08 and below	JP11	1-2	Non-Sync	Open	Refer to Up/Down Rev Instructions
	09 & up	JP1	1-2	Non-Sync	Open	Refer to Up/Down Rev Instructions
			2-3	Sync	Shorted	Refer to Up/Down Rev Instructions
		JP2	1-2	Non-Sync	Open	Refer to Up/Down Rev Instructions
		JP6	1-2	N/A	Shorted	
		JP9	1-2	N/A	Shorted	
	ALL	SW1	SW1-1	ECG data	Closed[1]	ECG data ON/OFF
	ALL		SW1-2	(T1) ECG test	Closed[1]	Diagonal ECG gray scale when open
			SW1-3	(T2) M-mode test	Open	Vertical gray scale when closed
			SW1-4	(T3) M-mode test	Open	Horizontal gray scale when closed
		SW2	SW2-1	Scrolling ATL logo	Closed	Scrolling ATL logo when closed
			SW2-2	N/A	Open	
			SW2-3	N/A	Open	
			SW2-4	N/A	Open	

1. Both SW1-1 and SW1-2 must be closed and ECG turned on Control Panel:
   1-closed, 2-open = ECG trace w/o data or noise
   1-closed, 2-closed = ECG trace w/data or noise
   1-open, 2-closed = scrolling diagonal ECG test pattern
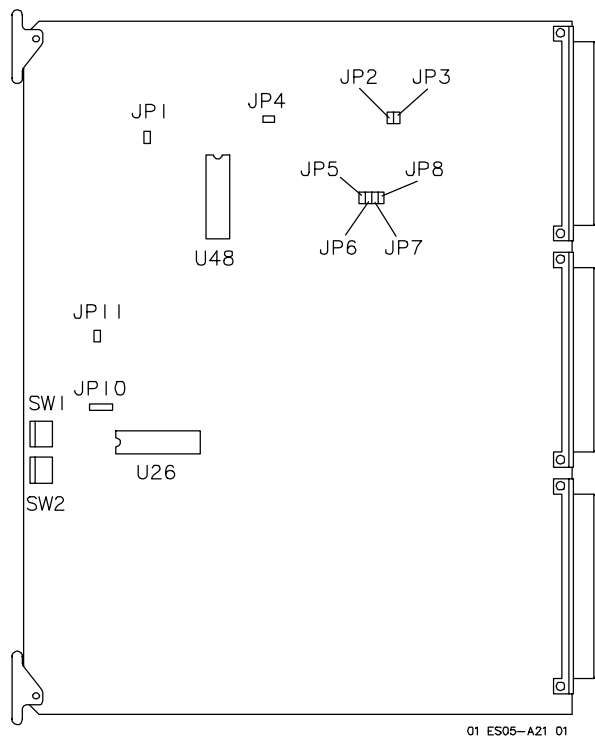
TM-MODE COMBO PCB (A12)
7500-0411-08 and below
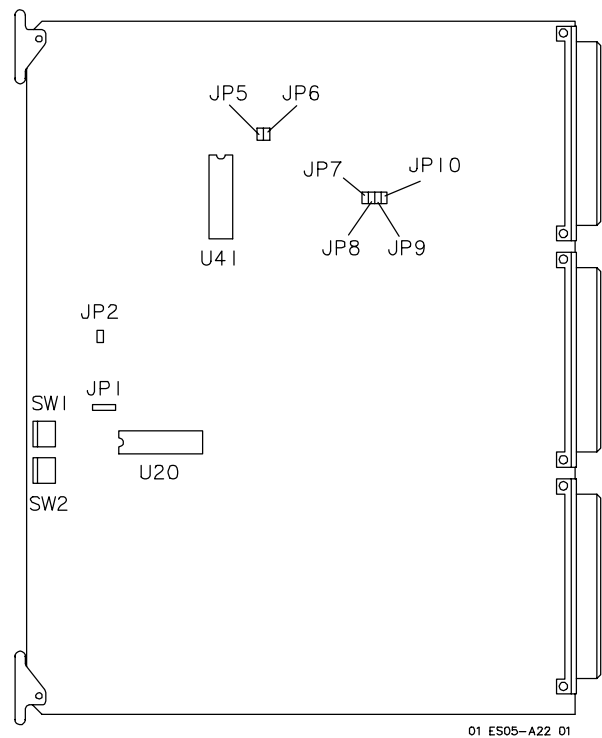
TM-MODE COMBO PCB (A12)
7500-0411-09 and up

A13   TM-Mode Auxiliary PCB

HFC PCBs   7500-0374-XX[1]

PCB/ Dash No. 7500-	REPLACEMENT LEVEL							FEATURE COMPATIBILITY		
	8X	11X to 31X	32X					Notes		
0374-01	R							2		
02		R	R					2, 3		

UM-4A PCBs   (OB; CV; PV only) 7500-0374-XX

PCB	OB	PV	CV		Notes
0374-02		R	R		2, 3

1. Requires TM-Mode PCB.
2. PROMs required.
3. Convertible, refer to Up/Down Rev Instructions following these tables.

PROMs[1]

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL								INDIVIDUAL PROM			FEATURE COMPATIBILITY	
	Part No.	Dash No.	8X	11X to 17X	23 X	25 X	26X to 31X	32 X			Ref. Des.	P/N 4201-	Dash No.	PV	
0374-01	8000-0139	01	Y								U26	0283	02	N	
02		02		Y									03	Y	
		03			Y							0444	02	Y	
	8000-0270[1]	04				Y					U26	0444	03	Y	
											U14[2]	0225	--		
		05					Y				U26	0444	03	Y	
											U14[2]	0225	02		
		06					Y	Y			U26	0444	04	Y	
											U14[2]	0225	02		

1. 8000-0270 is a TM Combo software kit and must be used if substituting a TM-Mode/TM Aux pair for the TM Combo. One PROM is then installed on the TM Aux PCB and the other on the TM-Mode PCB.
2. U14 is located on TM-Mode PCB (7500-0322-XX).

NOTE: *4201-0225-02 is a TM-Mode PCB PROM.*
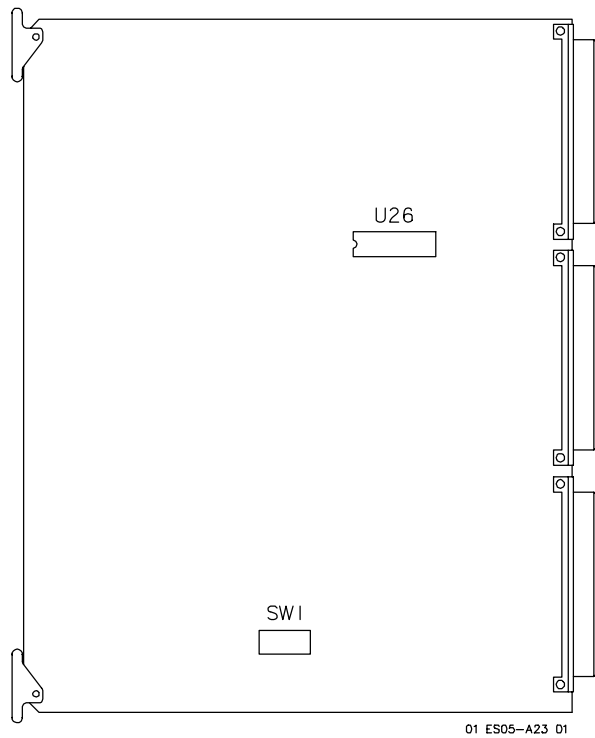
TM-MODE AUXILIARY (A13)
7500-0374-XX

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	**Dash No.**	**Ref. Des.**	**Pins**	**Function**	**Normal Position**	**Notes**
7500-0374	--, 01	SW1	1-8	Not used	OFF	
	--, 02	SW1	1	Scrolling ATL logo	ON	Scrolling logo when OFF
			2-8	Not used	OFF	

A14   Display Controller PCB

HFC PCBs   7500-0300-XX, 3500-1409/1410-XX, 3500-1480/81-XX

PCB/ Dash. No 7500- or 3500-	REPLACEMENT LEVEL					FEATURE COMPATIBILITY				
	8X	11X to 23X	25X to 31X	32X		FRM GRB		525-Lines	625-Lines	Notes
0300-04	A	A	A			N		Y	N	
05	A	A	A			N		N	Y	
06	R	R	A			N		Y	N	
07	R	R	A			N		N	Y	
24	L	L	L	R		Y		Y	N	
25	L	L	L	R		Y		N	Y	
28	L	L	L	A		Y		Y	N	
29	L	L	L	A		Y		N	Y	
3500-1409-01/02 /03	L	L	L	L		Y		Y	N	1, 3
3500-1410-01/02 /03	L	L	L	L		Y		N	Y	1, 3
3500-1480-02	L	L	L	L		Y		Y	N	2, 3
3500-1481-02	L	L	L	L		Y		N	Y	2, 3

1. 3500-1409/1410-XX consist of Generic Display Controller 7500-0300-30 with correct crystals and calibration.
2. 3500-1480/1481-XX consist of Generic Display Controller 7500-0827-XX with correct crystals and calibration.
3. Do not order 7500-0300-30 or higher PCBs or 7500-0827-XX PCBs. Jumper information is for configuration reference only, order the appropriate 3500 assembly to assure receiving a PCB properly configured and adjusted for the specific application.

UM-4A PCBs   (OB; CV; PV only)   7500-0300-XX

PCB	OB	PV	CV	Notes
0300-04	A	A	A	
06	R	R	R	
24	L	L	L	
28	L	L	L	

PROMs

NOTE: *There are no PROMs required for the Display Controller PCB.*

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	**Dash No.**	**Ref. Des.**	**Pins**	**Function**	**Normal Position**	**Notes**
7500-0300[1]	00-07	SW1	T1	Test	Open	See Section 4, Fault Isolation.
			DOM	Video Select	525-lines - Open 625-lines - Closed	EIA/NTSC CCIR/PAL
			S1	Not used	Open	
			S2	Not used	Open	
			S3	Not used	Open	
			S4	Not used	Open	
			S5	Not used	Open	
	10 & up	SW1	1	Not used	Open	
			2	Test	Open	See Section 4, Fault Isolation.
			3	Video Select	525-lines - Open 625-lines - Closed	EIA/NTSC CCIR/PAL
			4	Not used	Open	
			5	Not used	Open	
			6	Not used	Open	
			7	Not used	Open	
			8	Not used	Open	
		JP1	1-2		Shorted	
		JP2	1-2		Shorted	
		JP3	1-2 2-3	Internal clock External clock	2-3	Two pins closest to card edge
3500-1409 3500-1410	01 & up	SW1	1	Not used	Open	
			2	Test	Open	See Section 4, Fault Isolation.
			3	Video Select	525-lines - Open 625-lines - Closed	EIA/NTSC CCIR/PAL
			4	Not used	Open	
			5	Not used	Open	
			6	Not used	Open	
			7	Not used	Open	
			8	Not used	Open	
		JP1	1-2		Shorted	
		JP2	1-2		Shorted	
		JP3	1-2 2-3	Internal clock External clock	2-3	Two pins closest to card edge
3500-1480 3500-1481 (7500-0827 -XX)	02	JP1	1-2	Test	Open	CAUTION: *Do not change.*
			2-3		Closed	
		JP2	1-2	EXTCHn	Open	
		JP3	1-2	DOM	Open 525-lines Closed 625-lines	

1. Do not order 7500-0300-30 or higher PCBs or 7500-0827-XX PCBs. Jumper information is for configuration reference only, order the appropriate 3500 assembly to assure receiving a PCB properly configured and adjusted for the specific application.

01 ES05—A24 01
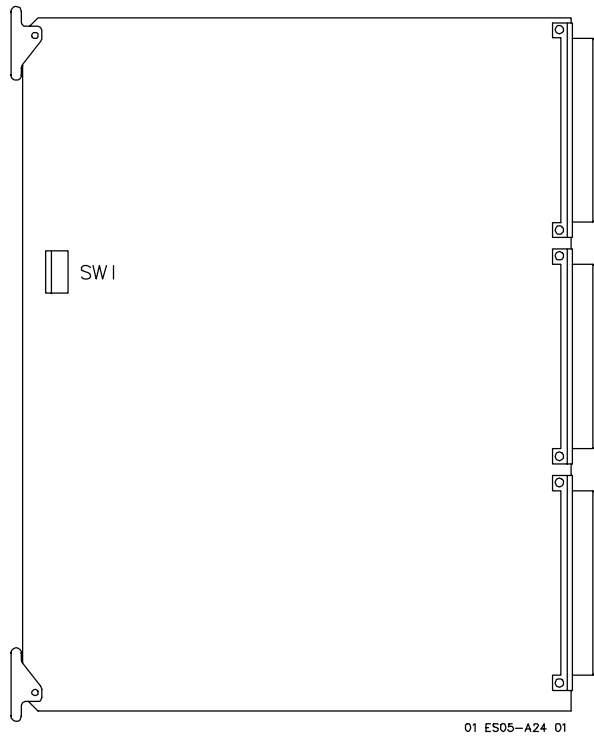
DISPLAY CONTROLLER PCB (A14)
7500-0300-06/07

01 ES05—A25 01
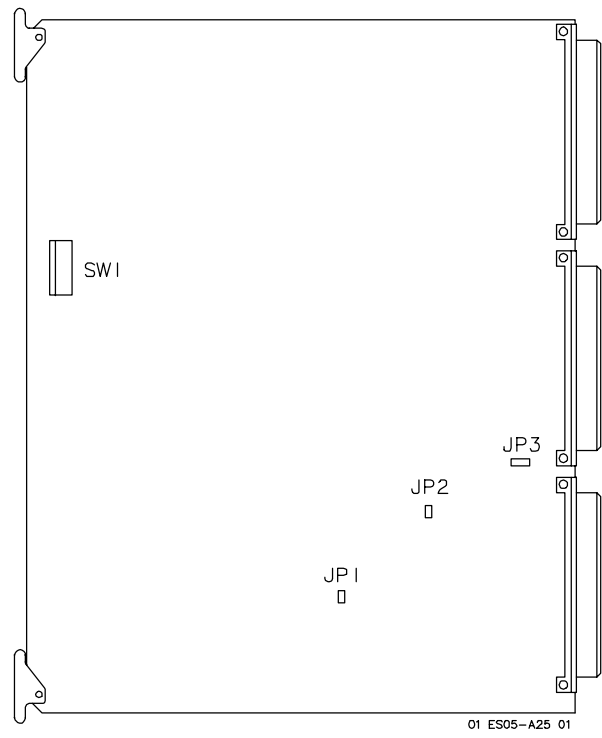
DISPLAY CONTROLLER PCB (A14)
7500-0300-10 through 29

01 ES05—A28 01
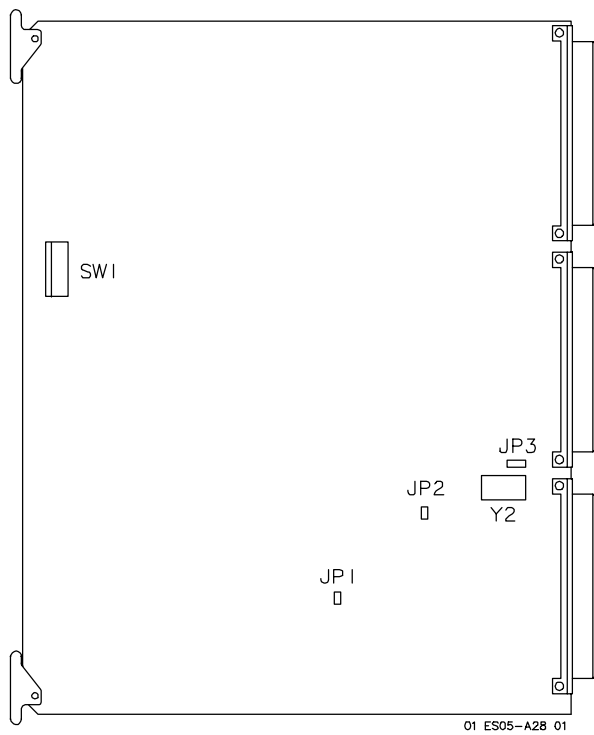
DISPLAY CONTROLLER PCB (A14)
7500-0300-30 & up
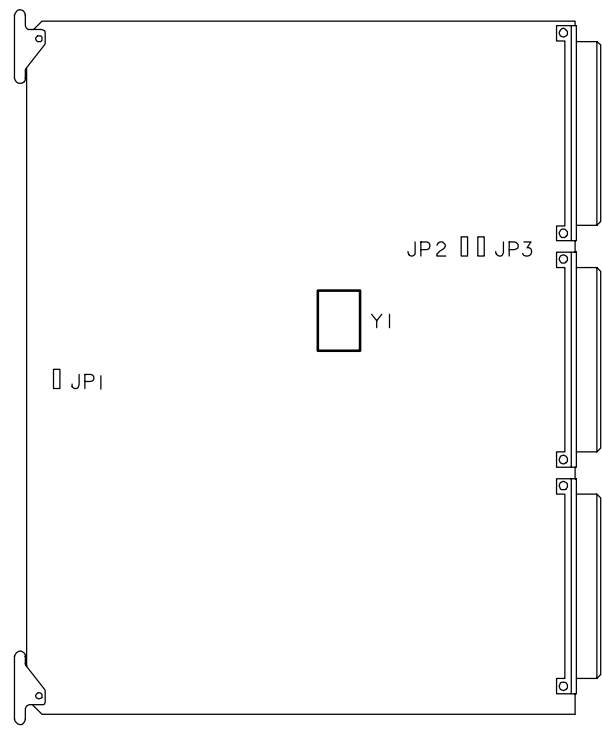
DISPLAY CONTROLLER PCB (A14)
3500- 1480/81-XX & up

A15   System Controller PCB

HFC PCBs   **7500-0312-XX**

PCB/ Dash No. 7500-	REPLACEMENT LEVEL				FEATURE COMPATIBILITY					
	8X	11X to 31X	32X							Notes
0312-65	R									1
64		R	R							1
12		L	L							1
66		A	L							1

UM-4A PCBs   **(OB; CV; PV only)** **7500-0312-XX**

PCB	OB	PV	CV		Notes
0312-64	R	R	R		1
12	L	L	L		1
66	A	A	A		1

1. PROMs required.
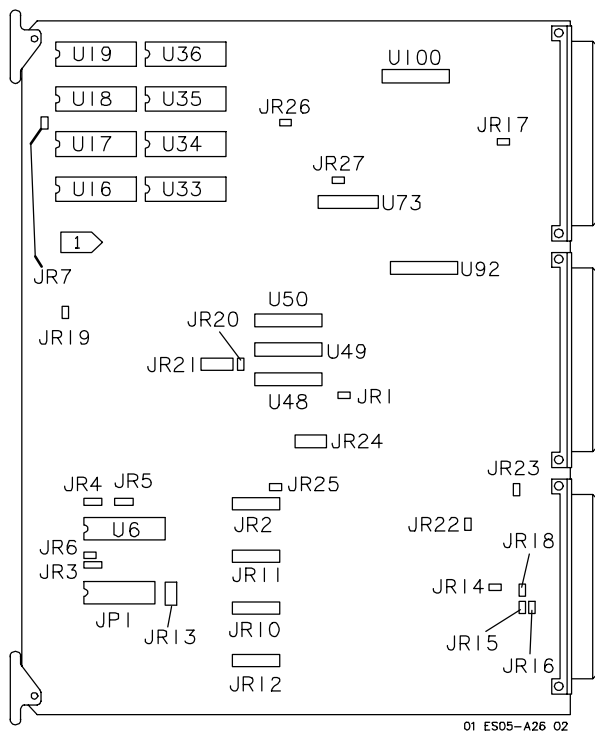
SYSTEM CONTROLLER PCB (A15)
7500-0312-XX

PROMs System Controller

PCB/ Dash No. 7500-	PROM KIT Part No.	Dash No.	8X	11X	12X	16X	17X	23X	25X		Ref. Des.	P/N 4201-	Dash No.	PV	OB
					REPLACEMENT LEVEL[1]							INDIVIDUAL PROM		FEATURE COMPATIBILITY		
0312-65	6220-0049	02	Y								U16/17 U18 U19	0268/9 0270 0271	10 08 10		
											U33/34 U35 U36	0272/3 0274 0275	10 08 10		
12, 64, 66	8000-0125 (12.06 software)	13		Y							U16/ U19	0301-0304	04		
											U33/ U36	0305-0308	04		
	8000-0125 (12.07 & up software)	17			Y						U16/ U19	0301-0304	05	Y	N
											U33/ U36	0305-0308	05		
		19				Y					U16/ U19	0301-0304	06	Y	N
											U33/ U36	0305-0308	06		
		25					SE				U16/ U19	0301-0304	11	Y	N
											U33/ U36	0305-0308	11		
		28					SG				U16/ U19	0309-0312	07		
											U33/ U36	0313-0316	07		
	8000-0356	02					SF				U16/ U19	0528-0531	02		
											U33/ U36	0532-0535	02		
	8000-0125	29						Y			U16/ U19	0301-0304	14	Y	Y
											U33/ U36	0305-0308	14		
		35							Y		U16/ U19	0301-0304	21	Y	Y
											U33/ U36	0305-0308	21		
	8000-0226[2]	03			Y						U16/ U19	0379-0382	02	N	Y
											U33/ U36	0383-0386	02		
		05				Y					U16/ U19	0379-0382	03	N	Y
											U33/ U36	0383-0386	03		
		06					Y				U16/ U19	0379-0382	21	N	Y
											U33/ U36	0383-0386	21		

1. S(n), where E = English, F = French, G = German.
2. 8000-0226-XX is for 12X, 16X, and 17X UM-4A OB systems. Higher level UM-4A OB systems use UM-4 HFC software.

PROMs System Controller

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL[1]						INDIVIDUAL PROM		
	Part No.	Dash No.	26–28X	29X[2]	30X	31X			Ref.D es.	P/N 4201-	Dash No.
0312-12, 64, 66	8000-0598	04	SE						U16/U 19	0937-0940	04
									U33/U 36	0941-0944	04
	8000-0599	04	SF						U16/U 19	0945-0948	04
									U33/U 36	0949-0952	04
	8000-0600	04	SG						U16/U 19	0953-0956	04
									U33/U 36	0957-0960	04
	8000-0598	07		SE					U16/U 19	0937-0940	07
									U33/U 36	0941-0944	07
	8000-0599	07		SF					U16/U 19	0945-0948	07
									U33/U 36	0949-0952	07
	8000-0598	14			SE				U16/U 19	0937-0940	14
									U33/U 36	0941-0944	14
	8000-0599	14			SF				U16/U 19	0945-0948	14
									U33/U 36	0949-0952	14
	8000-0600	14			SG				U16/U 19	0953-0956	14
									U33/U 36	0957-0960	14
	8000-0598	17				SE			U16/U 19	0937-0940	17
									U33/U 36	0941-0944	17
	8000-0599	17				SF			U16/U 19	0945-0948	17
									U33/U 36	0949-0952	17
	8000-0600	17				SG			U16/U 19	0953-0956	17
									U33/U 36	0957-0960	17

1. S(n), where E = English, F = French, G = German.
2. There is no 29X German version software.

PROMs System Controller

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL[1]			INDIVIDUAL PROM		
	Part No.	Dash No.	32X			Ref.Des.	P/N 4201-	Dash No.
0312-12, 64, 66	8000-0598	19	SE			U16/U19	0937-0940	18
						U33/U36	0941-0944	18
	8000-0599	19	SF			U16/U19	0945-0948	18
						U33/U36	0949-0952	18
	8000-0600	19	SG			U16/U19	0953-0956	18
						U33/U36	0957-0960	18

1. S(n), where E = English, F = French, G = German.

Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0312	ALL	JR1	1-2		Shorted	JR1 - JR27 do not require field configuration. These jumpers should be in the Normal Position configuration.
		JR2			Hardwired	
		JR3	2-3		Shorted	
		JR4	1-2		Open	
		JR5	1-2-3		Open	
		JR6	1-2		Open	
		JR7	1-2		Shorted	
		JR8		Deleted		
		JR9		Deleted		
	A-D	JR10			Hardwired	
		JR11			Hardwired	
		JR12			Hardwired	
	E & above	JR10		Deleted		
		JR11		Deleted		
		JR12		Deleted		
		JR13			Factory configured	Note: *Some older PCB may have movable jumpers on J13.* J13: 1-2 and 3-4 Open 5-6 and 7-8 Shorted
		JR14	1-2		Open	
		JR15	1-2		Open	
		JR16	1-2		Open	
		JR17	1-2		Open	
		JR18	1-2		Open	
	All except 07, 09, 10, 11, 63	JR19	1-2	Open if U14 and U25 are P/N 2054-0001; Shorted if 2070-0226-01	FactoryConfigured	
	All	JR20	1-2		Open	
		JR21	1-2 3-4 5-6 7-8 9-10		Open Shorted Shorted Open Shorted	
		JR22	1-2		Factory Configured	
		JR23	1-2		Shorted	
		JR24	1-12		Factory Configured	Note: *Some older PCB may have movable jumpers on J24.* J24: 1-2, 7-8, and 11-12 Open 3-4, 5-6, and 9-10 Shorted
		JR25	1-2		Open	
		JR26	1-2		Shorted	
	G	JR27	1-2		Shorted	

HFC and UM-4APLUS Components

HFC Components

Name	Part No.	Dash No.	8X	11X 12X	16X 17X	23X	25X	26X to 31X	32X		Dplx CW	Merc	CAD	Dop	Disk Drv	Notes
			REPLACEMENT LEVEL								FEATURE COMPATIBILITY					
System Receiver	3500-0581	02	R	R	R	R					N	N				
		04	L	L	L	L	L				N	N				1
		05	L	L	L	L	L				N	N				
	7500-0511	03/04					L	L	L		Y	Y				
		05														7
Rear Panel	7500-0318	07	L	L	L	L	L	L	L				N		Y	
		06/11	L	L	L	L	L	L	L				Y		Y	2
		12	L	L	L	L	L	L	L				N		Y	2, 3
		13/14						L	L		N		N		N	2, 6
ECG Module	3500-0518	––	R	R	R	R	R	R	R							
		01	L	L	L	L	L	L	L							
Power Supply	1700-0002[4]	11	L	L	L	L	L	L	L							120V
		12	L	L	L	L	L	L	L							240V
	1700-0032[4]	01	L	L	L	L	L	L	L							120V[5]
Hardkey Control Module	4000-0154 (TB, S/L)	21/26/31/36/41	L	L	L	L	L	L	L					N		
	(TB, S/LM)	22/27/32/37/42	L	L	L	L	L	L	L					N		
	(TB, S/LC)	23/28/33/38/43	L	L	L	L	L	L	L					N		
UM4APLUS	TB, S/L	34/39/44					L	L						N		
UM4APLUS	TB, S/LM	35/40/45					L	L						N		
Softkey Control Module	4000-0156	18	A	A	A	A	A	A	A						Y	
		20/24	R	R	R	R	R	R	R						Y	
TGC Slidepot Control Module	4000-0214	05				R	R	R	A						Y	
		06/07/08/09/10/60				A	A	A	R						Y	
	4000-0222	08/09/10/11/60	L	L	L	L	L	L	L						Y	Int'l symbols

1. 3500-0581-04 is alternate for -03 only.
2. Requires 7500-0373-04 or higher rev motherboard. 7500-0318-06 and -11 are functional equivalents.
3. Requires 3500-0915-02 cable for CAD.
4. 1700-0032-01 is backward compatible.
5. UL approved.
6. No support for CAD, Data Comm or LS-8.
7. UM-5 only.

HFC Components (cont'd)

Name	Part No.	Dash No.	8X	11X 12X	16X 17X	23X	25X	26X to 30X	31X and up	32X			VCR Status	Notes
						REPLACEMENT LEVEL								
A/V Module	4000-0143	06/62	L										N	120V
		07/61	L										N	240V
		10/64	L	L	L	L	L	L	L	L			Y	120V[5]
		11/63	L	L	L	L	L	L	L	L			Y	240V[5]
		12/16/ 18/66	L	L	L	L	L	L	L	L			Y	120V
		14/17	L	L	L	L	L	L	L	L			Y	240V
		60	L	L	L	L	L	L	L	L			Y	240V
Monitor Module	3500-0426	00/01, 60/61	L	L	L	L	L	L	L	L				4
	3500-0764	02/60, 03/61, 04/62/ 05/06	L	L	L	L	L	L	L	L				
	3500-1087	01/60, 02, 03/61, 04/05/ 61	L	L	L	L	L	L	L	L				4
	3500-0501	––		L	L	L								FPC
Data Comm	4000-0158	01	L	L	L	L	L	L	L	N				120V[1]
		19/23		L	L	L	L	L	L	N				120V[1]
		21		L	A	A	A	A	A	N				120V[2]
		22/24			R	R	R	R	R	N				120V[3]
	4000-0159	01	L	L	L	L	L	L	L	N				240V[1]
		19		L	L	L	L	L	L	N				240V[1]
		21		L	A	A	A	A	A	N				240V[2]
		22			R	R	R	R	R	N				240V[3]
CAD Modules												**CAD Program Disk**		
CAD Module	4000-0225	60				R	R	R	N	N			= 17X - 4252-0486-02 ≧ 23X - 4252-0486-05	EIA
		04					A	A	N	N			4252-0486-05	EIA
		05					A	A	N	N			4252-0486-05	EIA
	4000-0227	02						L	N	N			4252-0486-05	CCIR
	4000-0228	02						L	N	N			4252-0503-05	CCIR

1. RS 232 only.
2. RS 232 plus two disk drives.
3. Requires 16X or higher software.
4. When installing the 3500-0426 Monitor Module Assembly on a UM-4A OB or CV, exchange the dress plates between the defective and replacement monitors.
5. "Smart" A/V for VCR status.

UM-4A Components

UM-4A (OB, CV, PV only) Components

Name	Part No.	Dash No.	REPLACEMENT LEVEL				FEATURE COMPATIBILITY			
			OB	PV	CV		Dop			Notes
System Receiver	3500-0581	04	L	L	L					
		05								UM-5 only
Rear Panel	7500-0318	07	R	R	R					
		11	L	L	L					Requires 7500-0373-04 or higher motherboard
		12	L	L	L					
ECG Module	3500-0518	--			R					
		01			L					
Power Supply	1700-0002	11	L	L	L					120V
		12	L	L	L					240V
	1700-0032	01	L	L	L					120V (UL approved; backward compatible)
Hardkey Control Module	4000-0155 (JS, S/L)	20/25	L				N			
	(JS, S/LM)	21/26	L				N			
	4000-0154 (TB, S/L)	24/29/ 34/39/ 44	L				N			
	(TB, S/LM)	25/30/ 35/40/ 45	L				N			
Softkey Control Module	4000-0156	20/24			R		Y			
		18			A		Y			
		21		R			Y			
		19		A			Y			
Monitor Module	3500-0426	00/01 60/61	L		L					1
	3500-0764	02 03 04/62/ 05/06	L		L					
	3500-1087	01 02/60 03/61	L		L					1
	3500-0696	01/02/ 60/61		L						
	3500-0908	02/60 03/61/ 04/05		L						

1. When installing a 3500-0426 or a 3500-1087 Monitor Module Assembly on a UM-4A OB or CV, exchange the dress plates between the defective and replacement monitors.

System Receiver PCB

System Receiver Jumpers

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0511 (3500-1016)	03, 04	JP8	1-2	Software/Feature configuration	Shorted for Doppler at 25X or higher. Open for non-Doppler at 25X or higher. Open for Doppler and non-Doppler at 23X and below.	
			3-4	*Not-functional storage pins.*	Not functional. These are dummy pins provided to store the jumper when not required to be installed on pins 1-2.	

Rear Panel PCB

Rear Panel Jumpers (Figure 1C-1)

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0318	06	JR1	1-2	Mechanically bypasses CAD	Open	
			2-3	Normal configuration	Shorted	
		JR2	1-2	Software configuration	Shorted for 23X software and above.	
			2-3	Software configuration	Shorted for 17X software and below.	
	10 and up	J1	1-2	Software configuration	Shorted for 23X software and above.	Was JR2 on 06/07 PCB
			2-3	Software configuration	Shorted for 17X software and below.	
	07					No jumpers, no CAD

Video Interface PCB   7500-0472-01

Video Interface Jumpers   7500-0472-01

PCB		JUMPER OR SWITCH				
Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
7500-0472	01	JP1	2-3	Remote video printing	Shorted	

Table 5–4.   UM-4 CAD Module Jumper Matrix

PCB				JUMPER OR SWITCH				
Ref. Des.	Name	ATL Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A2	CINE	7500-7701	XX	TB1	2–3		shorted	
				TB2	2–3		shorted	
				TB3	1–2		shorted	
				TB4	2–3		shorted	
				TB5	1–2		shorted	
				TB6	1–2		shorted	With 7500-7704-XX AGO board
					2–3		shorted	Without 7500-7704-XX AGO board
		7500-7715	XX	TB2	2–3		shorted	
				TB3	1–2		shorted	
				TB5	1–2		shorted	
				TB6	1–2		shorted	With 7500-7704-XX AGO board
					2–3		shorted	Without 7500-7704-XX AGO board
A5	Color I/O	7500-7710	XX	TB1	2–3		shorted	
				TB2	2–3		shorted	
				TB3	2–3		shorted	
				TB4	1–2		shorted	
				TB5	1–2		shorted	
				TB6	1–2–3		open	
A7	CPU	(CAT 902A)	XX	E1	1–2		shorted	See Figure 5–13
				E2	1–2		shorted	
				E3	1–2		shorted	
				E4	1–2		open	
				E5	1–2		shorted	
				E6	2–3		shorted	
				E7	2–3		shorted	
				E8	2–3		shorted	
				J9			out	
				P22			high	
				COM1			enabled	
				COM2			enabled	

Table 5–4.   UM-4 CAD Module Jumper Matrix (Cont'd)

PCB				JUMPER OR SWITCH			
Ref. Des.	Name	ATL Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A7	CPU (cont'd)	(CAT902A)	XX	SW1	1		open	
					2		open	
					3		closed	
					4		open	
					5		open	
					6		open	
					7		closed	
					8		closed	
					9		closed	
					10		closed	
				SW2	1		closed	
					2		closed	
					3		closed	
					4		open	
					5		open	
					6		closed	
					7		open	
					8		open	
					9		closed	
					10		open	
		2100-0527	01	J1	1–2		shorted	
				J2	2–3		shorted	
				J3	1–2–3		open	
				J6	1–2		shorted	
				J7	1–2		shorted	
				J8	1–2		shorted	
				J9	2–3		shorted	
				J10	1–2		open	
				J11	1–2		open	
				J12	1–2		open	
				J13	1–2		open	
				J14	1–2		open	
				J15	1–2		open	
				J16	1–2		open	
				J17	1–2		shorted	
				J18	1–2		shorted	
				J19	1–2		shorted	
				J20	1–2		shorted	
				J21	2–3		shorted	
				J22	2–3		shorted	

Table 5–4.   UM-4 CAD Module Jumper Matrix (Cont'd)

PCB				JUMPER OR SWITCH				
Ref. Des.	Name	ATL Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A7	CPU (cont'd)	2100-0527		J24	1–2		open	
				J25	1–2		open	
				J26	1–2		open	
				J27	1–2–3		open	
				J28	1–2		open	
				J29	1–2		open	
				J30	1–2		open	
				J31	1–2		open	
				J32	1–2		open	
				J33	1–2		open	
				J34	ALL		open	
				J35	2–3		shorted	
				J36	2–3		shorted	
				J37	1–2		shorted	
				J38	1–2		shorted	
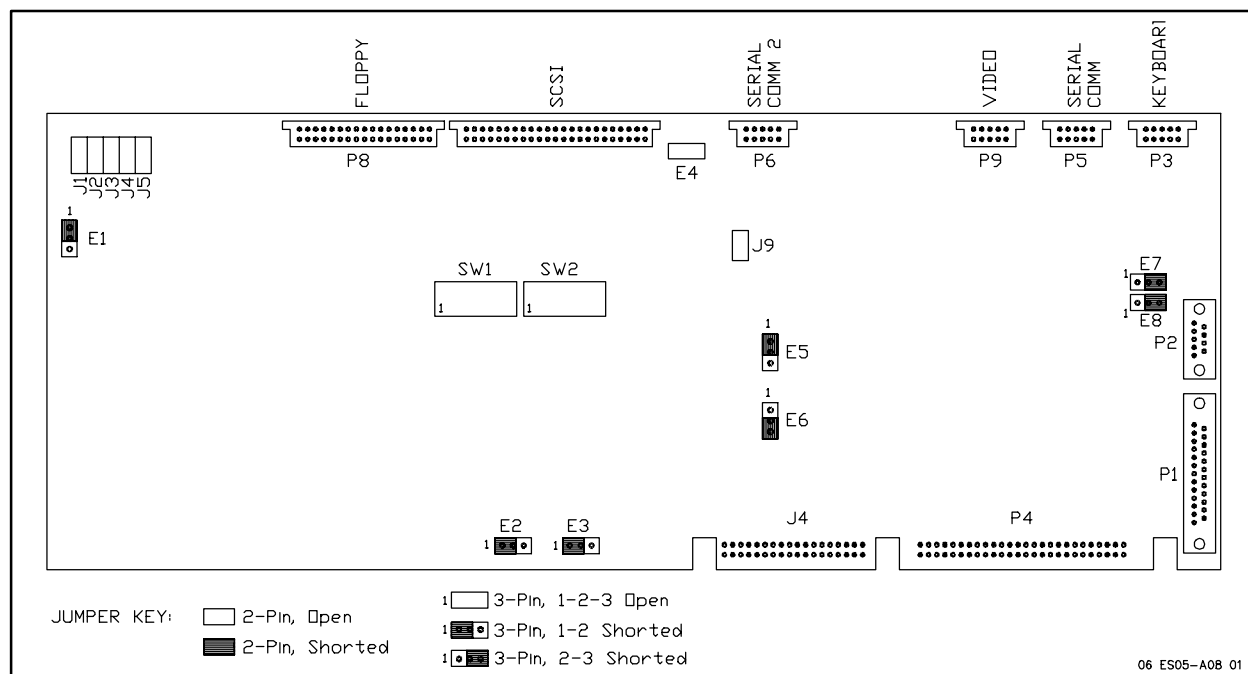
Figure 5–8.   CAT902A Single Board CPU (CAD Module)
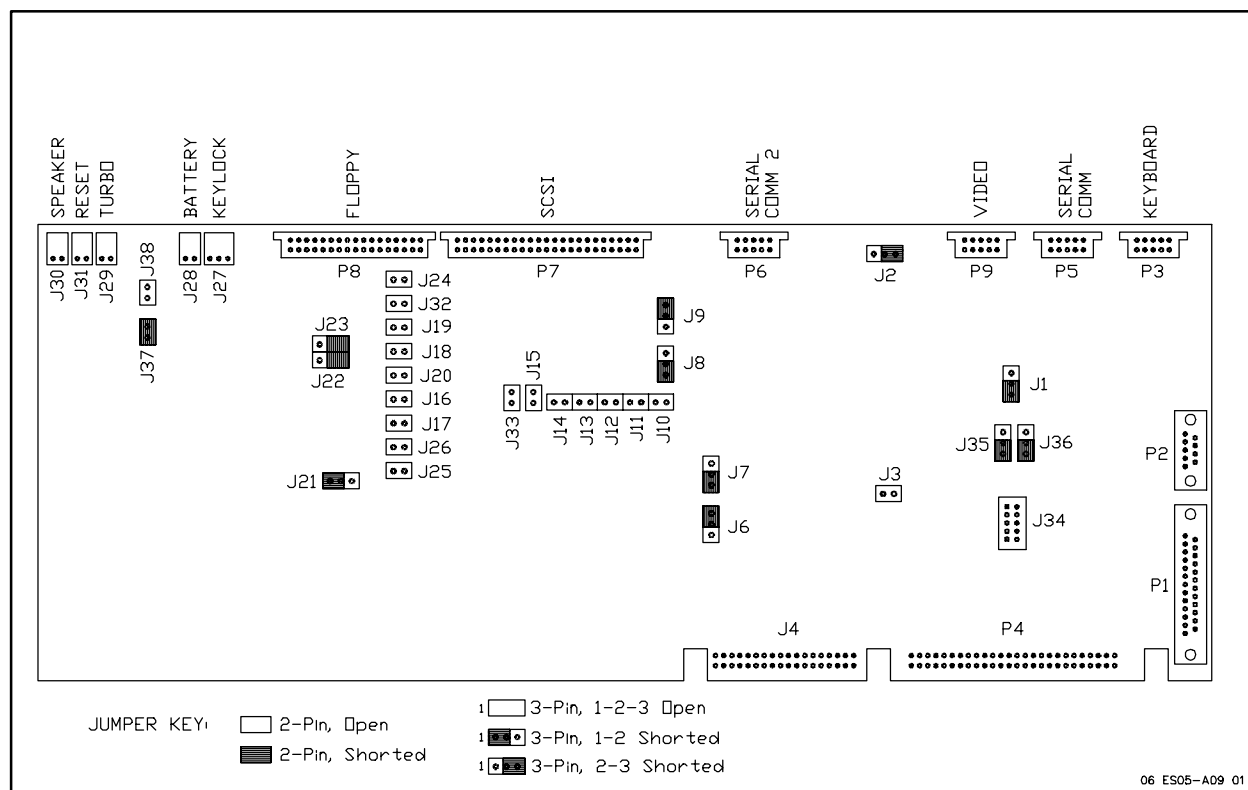
Figure 5–9.   CAT902 Single Board CPU (CAD Module)

5–6   UM-4 Scanhead Compatibility Matrix

5–6.1   Key

SCANHEAD TYPE: The type or series of scanhead is listed in bold print at the beginning of each category. Not all scanhead categories may be supported by a specific system. UM-4 categories include: static transducers, linear arrays, access, annular arrays, specific applications (TRT, IVT, ICT), some 72X and veterinary.

SCANHEAD NAME: The common name for the scanhead.

PART NO: The base part number of the scanhead. Only those part numbers stocked and shipped by ATL Customer Service are included.

DASH NO: The current revision number of the scanhead.

BKWD COMP: Backward compatibility. This column indicates which previous revision scanheads can be replaced by the current revision.

FWD COMP: Forward compatibility. This column indicates if a specific dash level can replace a higher revision scanhead.

HARDWARE NOTES: Reserved for additional comments, including detailed backward compatibility information.

UM4, OB, CV/PV, CAD, UM4PLUS: These columns indicate compatibility of the various scanheads to the systems listed. The coding in the columns indicate lowest software revision level tested and required. If a block is left blank, the scanhead is NOT compatible to that system.

Table 5–5.   UM-4 Scanhead Labels

Access A	
3.0 MHz Medium Focus	A 3M
3.0 MHz Long Focus	A 3L
5.0 MHz Medium Focus	A 5M
5.0 MHz Med/L Focus	A 5ML
3/5/7.5 Multi-Frequency	A 3S, A 5M, A 7.5S
5/5/7.5 Multi-Frequency	A 5S, A 5M, A 7.5S
Access B	
3/5/7.5 Multi-Frequency	3M, 5M, 7.5S
5/7.5/10 Multi-Freq	5ML, 7.5S, 10S
Access C	
2.25 MHz	2.25M
3.0 MHz	3M
5.0 MHz Medium Focus	5M
5.0 MHz Med/L Focus	5ML
7.5 MHz Short Focus	7.5S
5/7.5/10 Multi-Freq	5M, 7.5S, 10S
5/7.5/10 PV Multi-Freq	5S, 7.5S, 10S
Linear Arrays	
3.5 MHz DFT	DF 3.5
5.0 MHz DFT	DF 5.0
5.0 MHz HRLA	LA 5.0
7.5 MHz HRLA	LA 7.5
Convex Arrays	
3.5 MHz 40mm Radius!	35CV40
5.0 MHz 40mm Radius!	50CV40
3.5 MHz 76mm Radius	35CV76
Mercury	
2.25 MHz	DD2.25
3.0 MHz	DD 3.0
Static Transducers	
2.25 MHz	CW2.25
5.0 MHz	CW 5.0
10.0 MHz	CW10.0
Duplex CW Scanhead	
3.0 MHz/2.0 MHz	D/D 3M
Specialty Scanheads	
IVT 5.0 MHz (mech'l)	IVT 5
MFI 5.0/7.5 MHz	5.0MFI, 7.5MFI
IVT 5.0 MHz 11mm Radius (Array IVT)!	IVT 5.0
ICT 7.5 MHz	ICT 7.5
TRT 5.0 MHz linear	TRT L5
TRT 5.5 MHz sector	TRT S5

1. Not available on Ultramark 4A systems.

Table 5–6.   UM-4 Scanhead Compatibility Matrix

SCANHEAD TYPE/ SCANHEAD NAME	PART NO.	DASH NO.	BKWD COMP.	FWD COMP.	HARDWARE NOTES	UM-4	OB	CV/ PV	CAD	UM-4 PLUS
STATIC TRANSDUCERS										
PRB 2.25 MHz CW Dop	126-26900	09				8X			23X	27X
PRB 5.0 MHz CW Dop	126-26900	10				12X		12X	23X	27X
PRB 10.0 MHz CW Dop	126-26900	11				12X		12X	23X	27X
LINEAR ARRAYS										
DFT 3.5 Ziff Conn.	4000-0162	03	01		New Conn. UM-4/8	4X	12X	12X	23X	27X
DFT 5.0 Ziff Conn.	4000-0163	03	01		New Conn. UM-4/8	4X	12X	12X	23X	27X
LA 7.5 HR	4000-0179	02				16X	23X	16X	23X	27X
LA 5.0 HR	4000-0187	03	02			23X	23X	23X	23X	27X
ACCESS										
Access A 3L (733)	101-24900	66	01		01, 06, 12, 18, 24, 30, 36, 42, 48, 54, 60	4X	12X	12X	23X	27X
Access A 3M (733)	101-24900	61	02		02, 07, 13, 19, 25, 31, 37, 43, 49, 55	4X	12X	12X	23X	27X
Access A 5ML (733)	101-24900	67	03		03, 08, 14, 20, 26, 32, 38, 44, 50, 56, 62	4X	12X	12X	23X	27X
Access A 5M (733)	101-24900	63	04		04, 09, 15, 21, 27, 33, 39, 45, 51, 57	4X	12X	12X	23X	27X
Access A 3 Multi (734A)	101-24900	64	05		05, 10, 16, 22, 28, 34, 40, 46, 52, 58	4X	23X	12X	23X	27X
Access A 5 Multi (734AD)	101-24900	65	11		11, 17, 23, 29, 35, 41, 47, 53, 59	5X	23X	12X	23X	27X
Access B 3 Multi	101-25910	10	01		01, 02, 04, 06, 08, 10, 12	4X	23X	12X	23X	27X
Access B 5 Multi, B10 Multi	101-25910	09	03		03, 05, 07, 11, 13, 14	4X	23X	12X	23X	27X
Access C 2.25	101-25909	83	01		01, 11, 21, 31, 41, 51,61, 71	4X	23X	12X	23X	27X
Access C 3M	101-25909	88	02		02, 12, 22, 32, 42, 52, 62, 72, 84	4X	12X	12X	23X	27X
Access C 5 ML	101-25909	91	03		03, 13, 23, 33, 43, 53, 63, 73, 85	5X	12X	12X	23X	27X
Access C 5M	101-25909	86	04		04, 14, 24, 34, 44, 54, 64, 74	8X	12X	12X	23X	27X
Access C 7.5	101-25909	87	05		05, 15, 25, 35, 45, 55, 65, 75	4X	23X	12X	23X	27X
Access 2.25 W/Dop!	101-25909	76	06		06, 16, 26, 36, 46, 56, 66	4X	23X	12X	23X	27X
Access C 3M w/Dop!	101-25909	77	07		07, 17, 27, 37, 47, 57, 67	4X	23X	12X	23X	27X
Access C 5M w/Dop!	101-25909	78	08		08, 18, 28, 38, 48, 58, 68	4X	23X	12X	23X	27X
Access C 10 Multi	101-25909	89	09		09, 19, 29, 39, 49, 59, 69, 79, 81	4X	23X	12X	23X	27X
Access C 10 PV	101-25909	90	10		10, 20, 30, 40, 50, 60, 70, 80, 82	5X	12X	12X	23X	27X

1. No new sales

Table 5–6.   UM-4 Scanhead Compatibility Matrix (Cont'd)

SCANHEAD TYPE/ SCANHEAD NAME	PART NO.	DASH NO.	BKWD COMP.	FWD COMP.	HARDWARE NOTES	UM-4	OB	CV/ PV	CAD	UM-4 PLUS
WOBBLERS **Annular Array**[6]										
AA 3.5M w/Brake	101-25900 [!]				05, 09, 11 w/Brake	12X			23X	27X
AA 5M w/Brake	101-25900 [@]				06, 10, 12 w/Brake	12X			23X	27X
AA 3.5 DBF	4000-0188 [%]	03	02		Replace 101-25900-05/ 09/11	12X			23X	27X
AA 5.0 DBF	4000-0189 [%]	03	02		Replace 101-25900-06/ 10/12	12X			23X	27X
End-Fire Transducer										
EFT 13mm ADR	4000-0068 [#]					4X	12X			
EFT 17mm ADR	4000-0069 [$]					4X	12X			
EFT 13mm	4000-0109		4000-0068			4X	12X			
EFT 17mm	4000-0110		4000-0069			4X	12X			
BFT 3	4000-0123					4X	12X			
SPECIAL APPLICATIONS										
AA 3.0/2.0 CW Duplex	4000-0236	03	01			24X			24X	
ACS DD 2.25	2100-0621	01			Mercury S/H (Duplex)				27.09	27.09
ACS DD 3.0	2100-0596	01			Mercury S/H (Duplex)				27.09	27.09
TRT	4000-0173	05	01		01, 02, 03, 04 Sec/ Lin	12X	12X		23X	27X
IVT 3.0	4000-0171	09	01		Note [9]	6X	12X		23X	27X
IVT 5.0	4000-0172	09	01		Note [9]	12X	12X	12X	23X	27X
IVT Array (11 mm)	4000-0238	08	01							27X
MFI 5.0/7.5	4000-0271	04	01							30.08
CVA 3.5 40 mm	4000-0176	02	01		Note [7]					27X
CVA 5.0 40 mm	4000-0174	02	01		Note [7]					27X
CVA 3.5 76 mm	4000-0231	05	01			25X	25X			27X
ICT 7.5	4000-0230	09	03		Note [9]	23X	23X			27X
72X SERIES										
724B/5 (GGK)[*]	101-24488	02		04			23X	12X	23X	
724B/5 (GGK)[*]	101-24488	04	02			8X	23X	12X	23X	

NOTES:

1. Replace with 4000-0188-XX.
2. Replace with 4000-0189-XX.
3. Replace with 4000-0109.
4. Replace with 4000-0110.
5. -02 and -03 are functional equivalents and inter- changeable.

6. Use of Mercury Motor Controller or UM-4PLUS beam- former renders UM-4 system incapable of supporting AA scanheads.
7. Also compatible with UM-4DBF (Int'l only).
8. Refer to Scanhead Cap Code table.
9. Dash levels –07 and below *do not* have fill ports.

Table 5–7.   Scanhead Cap Codes

Code	First Letter	Second Letter	Third Letter	
	Frequency (MHz)	Transducer Diameter (mm)	Focal Point (cm)	Focal Zone (cm)
B	3	6	2	1–4
C	5	9.5	4	2–8
D	7.5	13	5	3–8
F	3, 5, 7.5		5	3.3–9
K		13, 9.5, 6	4, 2, 2	2–6, 1–4, 1–4
G	5, 5, 7.5	9.5, 6, 6	5, 4, 2	3–8, 2–6, 1–4
H	2.25		3.5	2–7

(The duplex CW Doppler frequency is for both the AA & CW portions of the scanhead.)

Table 5–8.   Pulsed Doppler Operating Frequencies (UM-4, 25.XX and above)

Scanhead Type	Pulsed Doppler Frequency
Access A 3M	2.31 MHz
Access A 3L	2.31 MHz
Access A 5M	3.75 MHz
Access A 5ML	3.75 MHz
Access A 3M, 5M, 7.5S	2.31, 3.75, 3.75 MHz
Access A 5M, 5S, 7.5S	3.75, 5.0, 5.0 MHz
Access B 3, 5, 7.5	2.31, 3.75, 3.75 MHz
Access B 5, 7.5, 10	3.75, 3.75, 3.75 MHz
Access C 2.25	2.0 MHz
Access C 3M	2.31 MHz
Access C 5M	3.75 MHz
Access C 5ML	3.75 MHz
Duplex CW	2.31 MHz

(The duplex CW Doppler frequency is for both the AA & CW portions of the scanhead.)

Table 5–9.   Software Related Anomalies

Software Release	Symptom	Fault Isolation	Corrective Action
11X and higher	Intermittent lateral shift or jerk in sector, depth dependent, Access scanhead.	Verify Motor Controller software at 8000-0133-08 per PROM Replacement Matrix.	Install PROM kit 8000-0133-08, if not present.
11X and higher	A system lockup occurs when changing from an annular array scanhead to an IVT.	Verify Motor Controller software at 8000-0133-08 per PROM Replacement Matrix.	Install PROM kit 8000-0133-08, if not present.
UM4A, OB, CV	Difficulty installing Monitor module, 3500-0426-00.	Check for presence of dress plate (used only on UM-4 HFC).	Remove dress plate before installation, and return it with the defective monitor module assembly.
UM4A, CV, and PV	Overheating of the isolation transformer.	Fuse in Power Distribution module too high in value. Should be 3.0V (120V) or 1.5V (240V).	Troubleshoot cause of overload; then replace external fuse, or Power Distribution module (internal fuse).
12X, 16X, and 17X	Loss of M-mode TGC overlay when changing M-mode depth.	Identify symptom.	Select FREEZE and then unfreeze to recover.
12X, 16X, and 17X	ECG stops scrolling in 2D mode. The sector image splits at the center with one half live, the other frozen or random data.	Reduced 2D sector overlay on the top-left corner of the scrolling mode is turned off.	From 2D/ECG mode, press RETURN twice.
12X and 16X	Annular array – split image; IVT – wavy image; IVT – lateral jerk.	Identify symptoms.	Install Motor Controller adaptive software kit, 8000-0313-01.
12X and 16X with TP-10 Thermal Printer installed	Delay in keyboard response.	This delay is normal.	None.
12X and 16X (UM-4 with annular array)	Double image artifact with annular array configured to default to smoothing F3 or F4.	Identify symptoms.	1) Configure the system default to F1 or F2; 2) Press CTRL B twice.

Table 5–9.   Software Related Anomalies (Cont'd)

Software Release	Symptom	Fault Isolation	Corrective Action
UM-4 with Access 10PV	Audio ringing with concomitant Doppler noise bands present.	None.	None. Notify area supervisor.
11X and higher	Random lock-ups in various modes with random error messages displayed on the screen.	Identify symptoms.	Order and replace the smart A/V module (7500-0143-10).
11X and 12X	Loss of audio.	1. Check VCR power switch.	1) Turn VCR power switch ON.
		2. Verify the VCR cabling: A/V to VCR; and the audio cable from the EM to the A/V.	1) Correct the VCR cabling: A/V to VCR; and the audio cable EM to the A/V.
17X	Improper initialization: system message "NO XDR" and the sector image area has a checkerboard pattern.	The IVT is the only scanhead connected, or the IVT is the default scanhead.	Select the IVT scanhead from the Control Module.
12X and above	Erratic EFT, IVT, and Access scanhead operation.	Use CTRL L to list the system firmware. Defective PROMs are identified by the Motor Controller code 481212.	Remove the defective PROM and replace it with a good PROM, 4201-0265-07.
All CAD systems	System does not boot.	Problem may be with CAD Module	Disconnect CAD Module and reboot to isolate CAD Module problems; if system still does not boot, troubleshoot system.
All CAD systems	"CAD MODULE INCOMPATIBLE" OR "CAD MODULE REBOOTING" message soon after power-up or <CTRL-P>.	This is normal, CAD Module runs a 2–3 minute self-test after hard or warm boot.	After power-up or <CTRL-P>, wait 2 to 3 minutes for CAD Module to complete self-test.
All CAD systems	CAD Module intermittently drops out; "CAD FAULT, TYPE CONTROL P" message.	CAD Module Power Supply +5 Vdc out of tolerance—5.0 ($\pm$.01) Vdc.	Refer to SB UM4-104 and adjust CAD P.S. **CAUTION:** *Voltage too high will damage CAD disk drives.*

Table 5–9.   Software Related Anomalies (Cont'd)

Software Release	Symptom	Fault Isolation	Corrective Action
All CAD systems	During exam, "CAD FAULT ERROR HIT CONTROL P" message appears.	DO NOT hit <CTRL-P>, patient exam information will be lost.	Power down system, power up, and re-enter CAD mode and "CONTINUE LAST STUDY." Refer to SB UM4-103.
CAD	Trouble acquiring frames.	Verify correct system setup.	Both CAD defaults must be ON; Data Comm Default must be OFF; "TR OFF" must be flashing.
All CAD	No CAD graphics.	1. Defective Rear Panel PCB (-0318) Jumpers JR1 or JR2 (if present) in wrong position.	1) Jumper JR1-2 and JR1-3; if present, Jumper JR2-1 and JR2-2.
		2. K1 of K2 on -0318 PCB defective.	1) Replace -0318 PCB per Matrix in Configuration Supplement.
		3. CAD Graphics (CGA) Overlay PCB.	1) Replace CAD Module.
Duplex CW: new system or new upgrade	AA scanhead does not work; blank sector on screen.	Verify system configuration with <CTRL-L>: 1. Bmfmr – not installed.	1) System is Sector-only, no AA (S/H conn. is AA/CW Duplex).
		2. Bmfmr – installed.	1) Troubleshoot Bmfmr front end.
All CAD	System locks up between pre-stress and post-stress.	Keyboard Activity Timeout not set to 0:00 (off).	1) Set keyboard Activity Timeout to 00.
23.X and 24.X UM-4CAD only	Image quality problems	N/A	No solution at present; existing CAD Modules will be replaced with modified CAD units.
24.14 for CAD	Video drops out completely; may or may not recover by pressing STOP or other softkeys.	Rapidly pressing PAUSE and PLAY when reviewing tape causes lock-up.	S/W release 24.15 provides recovery by pressing STOP or any other softkey.

Table 5–9.   Software Related Anomalies (Cont'd)

Software Release	Symptom	Fault Isolation	Corrective Action
25.X with Duplex CW	No US info through Duplex CW S/H; AA S/H works OK.	System Receiver jumper JR8 on pins 2 and 3.	1) Verify JR8 is on pins 1 and 2. 2) Verify cables from Sys Rcvr to AA1 and AA2 connectors.
23.X	Penetration approximately 1 cm less than 17.X systems.	Pulse width has been changed to improve resolution.	No solution at present.
All levels	Line noise on "dedicated line."	Line enclosed in grounded conduit (standard electrical procedure)	Request a "Single Branch Circuit, 20 Amp, 120 Vac with an Isolated/Insulated Ground Wire."
New system or System Controller PCB	System won't boot.	Switches on front of PCB stuck.	Note switch settings. Free them by spraying contact cleaner into switches and working them.
17.15.06	ECG trace disappears when mode switched to CW Doppler.	No ECG in CW mode if system ECG default is set to OFF at power up.	1) Set ECG default to ON, cycle system power.
All	Data Comm will not retrieve files six through ten.	High density disk installed.	1) Use DSDD disks in Data Comm (2HD disks are for CAD units).

Section 5A   Configuration, S1 Systems

5A–1   Usage Rules for Section 5A

Usage rules for S1 systems are the same as those for S2 systems. Refer to "Usage Rules for Section 5" on page UM4–05–1.

5A–2   Change Summary

5A–2.1   Software Changes

NOTE: *Only 3X, 4X, 5X, 6.06 and 6.15 software are found in International (Solingen manufactured) UM-4 S1 systems. Refer to the UM-4 S2 Configuration Supplement for other software level replaceable parts of software for international S2 systems.*

3X

New Features
• OB Calcs

Problems Corrected
N/A

Known Problems
N/A

4X

• Accompanying the installation of 4X, was a revision of the Motor Controller PCB. An "M-Mode lock-up from 2D to M-Mode" problem was corrected with jumper modifications and an EPROM change. The Motor Controller PCB is backward compatible to 3X.

New Features
• CARD Calcs
• Data Comm Support

Problems Corrected
• Sample timing
• M-Mode lock-up from 2D to M-Mode

Known Problems
• TGC alignment
• Turn-on problem associated with the VCR real-time relay on the Stereo Interface PCB

5X

• S1 Plus Pulse Processor PCB, 7500-0313-02, upgrade makes this version of the Pulse Processor PCB the only one available for the S1 system. The S1 Plus improves and stabilizes the dynamic range curve of the linear image of the UM-4 S1 system; this version of the Pulse Processor PCB cannot be used in the S2 system. The S1 Plus version works with 5X and 6X software.

• With S1 Plus there is a noticeable change in the appearance of the linear image when stepping through the dynamic range and grayscale settings. At the 58 dB dynamic range setting, the image appears smoother with softer gray scale assignment. Dot size also appears to be smaller which contributes to smoother appearance of the S1 Plus image.

• Reject was moved from special function C to special function O.

New Features

• Softkey Support

Problems Corrected

• TGC alignment

• Improved serial communications

• TGC operation: Near field will not go above far field and far field will not go below near field as with 4X and earlier software versions.

• TGC control: If the TGC controls are spun instead of rotated smoothly, this will cause the TGC display to jump around or not respond at all; also note that the image will correspond with the TGC displays.

Known Problems

• EFT streaking

• 25-frames/second Motor Controller PCB anomaly

• EFT to Access or Access to EFT scanhead change results in frozen image. To prevent this situation, upon installation of 5X, ensure that the transducer power-up default is set for an Access scanhead.

6X

New Features

• 3 MHz IVT scanhead
• 3 weeks added to OB Calcs tables (now 40 weeks)

Problems Corrected

• EFT streaking

• 25-frames/second Motor Controller PCB anomaly

• Help function updates softkey panel pointers for Freeze/Unfreeze, but does not process keys or change panels. Does not allow softkey panel changes in Help mode.

• Linear smear at zone transition with DFT scanheads

• French screen annotations for caliper measurements

• Unless the pulser is turned off at a mode change from 2D to M-Mode, the Access reed switches are damaged.

• ECG turned on; M-line activated; exit M-line and the M-Mode scale remains on the ECG display. The M-Mode scale remains after ECG is turned off. To remove the scale, press <CNTRL> P.

12X

NOTE: *While there are no S1 systems configured with 12X, the following 12X data apply to 17X S1 systems.*

• The release of 12X software introduces a change in the audio data path to S1 systems. The two audio channels are routed from the electronics module through the rear panel connector PCB to the A/V module, and then, under certain conditions, to the VCR. At the A/V module, the system can switch the audio routing, based upon the following conditions:

1. If the system is configured for full feature VCR with a VCR mounted on the cart, the audio is routed through the A/V module to the VCR. At the VCR, the audio is looped back to the A/V

module through the audio output jack of the VCR. This audio signal is then amplified at the A/V module for the speakers and headphone audio.

2. If the system is configured for a generic VCR without a VCR in the system, then the audio is routed directly to the audio amplifier circuitry on the A/V module and then to the speakers and head-phones.

New Features
- Data Comm disk functions

- VCR status on screen

- Optional: Data Comm RS232 (dual floppy, no modem)

- The <CNTL> L codes are available with 12X System Controller firmware and higher: The <CNTL> L feature allows the user to determine the system configuration by interrogating certain modules to establish their presence in the system. The modules either return a 6-character code or a NOT INSTALLED message. The codes are listed below:

3. The first two characters denote the module.

    BF = Beamformer Controller PCB
    48 = Motor Controller, 7500-0348-XX
    04 = Motor Controller, 7500-0304-XX
    p2 = Pulse Processor S2 system
    s1 = Pulse Processor S1 system
    dp = Doppler Processor

4. VCR = Smart A/V Module

The third and fourth characters denote the firmware level.

The last two characters denote the revision level.

Problems Corrected
- Field reports contain occasional references to system lockups when depth, zoom, or other keyboard changes occur.

- With the linear scanhead focus set to zone 5, entering M-line automatically moves the skinline off of the video screen, and disables the depth control.

- Image quality of the 2D update during M-Mode operation is marginal: radial lines and extreme far field noise remains after zoom and depth have been used.

- Dual-mode images contain noise when SELECT is toggled too quickly.

- Stored image scaling error in which a dual trigger sector image is stored, expand/zoom is changed, and the recalled image does not match the graphics overlay.

- Resolution of the planimetry calculation changed.

- 5 MHz IVT ID changed to prevent lock-ups associated with previous ID.

Known Problems
- When a TP-10 Thermal Printer is printing, the keyboard responds slowly. This is normal operation. The data transmission rate of 600 bits per second of the System Controller PCB to the thermal printer causes a delay that ties up the serial bus. Control inputs from the keyboard during this transmission will be delayed. (In 8X software, the keyboard is disabled during printing.)

• Depth graphics extends into ECG field.

• Immediately after power-up, the use of print to obtain a Polaroid print sometimes causes a "Photomodule time-out error" message. The photo is made, and the message clears by itself.

• In changing from M-line to M-mode, the arrow pointer, graphics location changes. This anomaly also occurs in 8X.

NOTE: *The problems listed below are corrected with the Motor Controller adaptive software, which is actually a hardware and firmware change. It consists of the following: U27 PROM change to 4201-0265-07; the addition of a capacitor between U49-6 and 7 on the Motor Controller PCB. The kit number for this modification is 8000-0313-01.*

• IVT wavy image
• IVT lateral jerk

17X

System Controller PCB (A15) software should be 17.15.01 or higher. 17.15 should be purged, and 8000-0125-25 software kit should be ordered as a replacement.

17.15.01 – Released in April of 1988 and addressed the following items:

• While in Frame Grab mode, special function "Y" now correctly enables field selection of odd, even, or both fields for viewing.

• If not in Frame Grab, special function "Y" changes sector width on display.

• Random graphics occur with successive search operations.

• White bar above gray scale.

• Serial bus errors that resulted in system lockups.

17.15.06 – System Controller PROM Kit 8000-0125-25 provides for the following changes:

New Features
• German Cardiology calculations
• French language translations
• Shrinking calipers
• Sony UP811 PRINT support
• Incremental depth EXPAND control

Problems Corrected
• In 2D/M-Mode, the 2D depth markers and image shift upward slightly when panning to the fifth focal zone—accuracy is unaffected.

• The M-mode sweep is shifted down slightly relative to the 2D image.

• TRT biopsy guide graphics will reappear after leaving dual TRT images. This occurs with a single stored image with biopsy guide active after trackball movement.

• Excessive character field blanking when leaving OB calculations-visible at edges with expanded image.

• G2 instead of D2 for OB parameter heading in default menu.

• Select smoothing 3, enter AA; the frame rate display is not halved.

• Caliper size too large.

- French language translations.

- Support of UP811 remote interface.

- Corrected depth adjustment process to make adjustment smoother.

Known Problems

- Entry into dual linear while frozen causes duplication within the linear image.

- A Doppler reference appears on the help message for 2D/TM key.

- There is a small gap between linear focal zone markers and the 2D image under 5X.

- Frame rate is increased by a reduction of the scan angle.

- Radial lines superimposed on 2D image at low TGC setting.

- Lack of penetration with Access C 5 MHz scanhead.

- Poor M-mode penetration with most scanheads, even at maximum TGC.

- Near field (0 to 4 cm) has too little gain with all array scanheads–too much near field suppression.

- Reduced 2D penetration when using either 3.5 or 5.0 MHz annular array scanheads.

- A blank M-mode display results when selecting M-line from Access 2D and entering M-mode while in VCR play with hardkey.

- On the Calculation menu some character fields have blanking and some do not.

- GREY annotation partly overwritten by VCR search error message.

- Toggling FRZ causes FPS display to vary intermittently when using HFLA 1X magnification and the fifth focal zone.

- Trying to "SELECT" a "STORED" inverted video image causes distortion.

5A–2.2   UM-4 Features

The replacement levels of PCBs and PROMs for the UM-4 are dependent upon the features of the system. The UM-4 features are defined below.

Feature   Definition

S1   The Pulse Processor PCB (A5) is a 7500-0313, and there is no System Receiver PCB (3500-0581).

S2   The Pulse Processor PCB (A5) is a 7500-0370–XX, and there is a System Receiver PCB (3500-0581-XX).

NOTE: *Only the S1 variation of the UM-4 is covered in this document. For the S2 and its permutations, refer to Section 5, Configuration, S2 Systems.*

5A–3   Compatibility

5A–3.1   Determining Software Level

During boot-up, the System Controller software level appears briefly at the lower right of the screen. Repeatedly pressing <CTRL>-P will repeat the display if it is missed during boot-up.

NOTE: *<CTRL>-L codes are found only on 12X or higher systems. Refer to 5–3, "Compatibility" for 17X, S1 Systems <CTRL>-L codes.*

5A–4   Configuration Instructions

5A–4.1   Hidden Default Configuration

New defaults defined or changed by 17X, Feature Set "D":

User defaults for transducer type changed under the A1 defaults menu. The following are defined as the default transducer:

1. TRT/Linear
2. Linear
3. IVT
4. TRT/Sector
5. EFT
6. Annular
7. Access

The following is a list of the hidden defaults for Feature Set "D". Press CTRL E, and then I1 to gain access to the hidden defaults.

Default Name	Setting	Note
1. Full Feature VCR? (Smart AV)	(Y/N)	
2. Small VCR HFC?	(Y/N)	
3. M–Mode Present?	(Y/N)	
4. Doppler Present?	(Y/N)	
5. ECG Present?	(Y/N)	
6. Redig Enable?	(Y/N)	(Frame Grab)
7. Data Comm Enabled?	(Y/N)	(Disk Drive)
8. 2 Disk Drives?	(Y/N)	
9. TRT Biopsy Enabled?	(Y/N)	
10. HFLA Present?	(Y/N)	(7.5 MHz DFT)

Press H1 for OB CALCS: 1=enabled 0=disabled.

Press H2 for CARD CALCS: 1=enabled 0=disabled.

To verify the hidden default configuration press I2.

5A–4.2   UM–4 Special and Control Functions (4X through 6X)

Table 3–1 and Table 3–2 summarize the special function (SFUNC) and the control function (CTRL) keys for software releases 4X through 6X.

In Table 3–1 and Table 3–2, an "H" in the first column indicates that a help message exists; an "N" indicates that a help message does not exist.

If the second letter of the column is an "F", then that SFUNC or CTRL function key works. If the function is also available on the softkey panel, the softkey message is in brackets directly below the letters.

Some CTRL selections have two functions–one when the keyboard is in the ALPHA mode, another when the keyboard is in the SFUNC mode. These are noted after the description. If a note is not included, then the selection operates the same in either mode.

5A–4.3   UM-4 Special and Control Functions (17X)

Information about the special function and control function keys for software release 17X is also contained in the Ultramark 4 (Softkey Version) Operation Manual, 4701–0001–03 or higher.

Table 5A–1.   UM-4 S1 Special Functions

: DESCRIPTION		SOFTWARE LEVEL					
		: 3.X	: 4.X	: 5.X	: 6.X	: 17.X :	
SFUNC A	:T UPDATE....Trigger update	.	HF (TGC UP)	HF (TGC UP)	HF (TGC UP)	HF (TGC UP)	
SFUNC B	:	.	N N	N N	N N	N N	
SFUNC C	:REJECT	.	H F	N N	N N	N N	
SFUNC D	:2D ALT....Alternate Frame Rate	.	N F	N F	N F	N F	
SFUNC E	:B/W.....Video invert	.	H F (B/W)	H F (B/W)	H F (B/W)	H F (B/W)	
SFUNC F	:	.	N N	N N	N N	N N	
SFUNC G	:PT POS....Patient Position	.	H F (PT-POS)	H F (PT-POS)	H F (PT-POS)	H F (PT-POS)	
SFUNC H	:SCHDP....Scanhead Position	.	H F (XDRPOS)	H F (XDRPOS)	H F (XDRPOS)	H F (XDRPOS)	
SFUNC I	:TGC SET	.	H F (TGC SET)	H F (TGC SET)	H F (TGC SET)	H F (TGC SET)	
SFUNC J	:ARROW	.	H F	H F	H F	H F	
SFUNC K	:BIOPSY	.	H F (BIOP)	H F (BIOP)	H F (BIOP)	H F (BIOP)	
SFUNC L	:	.	N N	N N	N N	N N	
SFUNC O	:Reject....Low level signal reject	.	H F (REJ)	H F (REJ)	H F (REJ)	H F (REJ)	
SFUNC P	:NEW PATIENT	.	N N	N N	N N	NN	
SFUNC Q	:HELP	.	N F	N F	N F	N F	
SFUNC R	:SMOOTH Set smooth from 1 to 4	.	H F (SMOOTH)	H F (SMOOTH)	H F (SMOOTH)	H F (SMOOTH)	
SFUNC S	:ECG Trigger Tone ON/OFF	.	H F (TONE)	H F (TONE)	H F (TONE)	H F (TONE)	
SFUNC T	:LINE	.	N N	N N	N N	N N	
SFUNC U	:TGC DEL....TGC Delete	.	H F (TGC DEL)	H F (TGC DEL)	H F (TGC DEL)	H F (TGC DEL)	
SFUNC V	:DEL UP/DEL 2D	.	H F (DELUP	H F (DELUP	H F (DELUP	H F (DELUP	
SFUNC W	:UP DN....Up Down	.	H F (UP/DN)	H F (UP/DN)	H F (UP/DN)	H F (UP/DN)	
SFUNC Y	:FIELD....Sector Angle	.	H F	H F	H F	H F	

First Letter: H = Help Message   Second Letter: F = Feature is functional
                 N = No Help Message   N = Not functional for that version software

Table 5A–2.   UM-4 S1 Control Functions

: DESCRIPTION		SOFTWARE LEVEL					
		: 3.X	: 4.X	: 5.X	: 6.X	: 17.X :	
CTRL A	:Disk Storage	.	H N	H N	H N	N N	
CTRL B	:Fast Smoothing	.	H F	H F	H F	H F	
CTRL C	:Image Swap	.	N N	N N	N N	H F	
CTRL D	:Alternate Frame Rate	.	N N	N N	N N	N N	
CTRL E	:Default Menu	.	H F	H F	H F	H F	
CTRL F	:	.	N N	N N	N N	N N	
CTRL G	:ECG Tone ON/OFF	.	N N	N N	N N	N N	
CTRL H	:Cursor Left ALPHA	.	N F	N F	N F	N F	
CTRL I	:Cursor Right ALPHA	.	N F	N F	N F	N F	
CTRL J	:Cursor Down ALPHA	.	N F	N F	N F	N F	
CTRL K	:Cursor Up ALPHA		N F	N F	N F	N F	
CTRL L	:Software	.	N N	N N	N N	N F	
CTRL M	:Carriage Return Line Feed ALPHA	.	N F	N F	N F	N F	
CTRL N	:Background	.	N N	N N	N N	N N	
CTRL O	:Hide....Annotation ON/OFF	.	H F	H F	H F	H F	
CTRL P	:NEW PATIENT	.	H F	H F	H F	H F	
CTRL Q	:HELP....Toggle, help for CTRL	.	N F	N F	N F	N F	
CTRL R	:	.	N N	N N	N N	N N	
CTRL S	:Store Image Direct	.	N N	N N	N N	H F	
CTRL T	:	.	N N	N N	N N	N N	
CTRL U	:TGC Default, Save TGC	.	H F	H F	H F	H F	
CTRL V	:	.	N N	N N	N N	N N	
CTRL W	:	.	N N	N N	N N	N N	
CTRL Y	:Doppler Arm Local/Remote	.	N N	N N	H N	H F (LCL RMT)	
CTRL Z	:Clock/Calendar Set	.	H F	H F	H F	H F	

5A–5   Ultramark 4 Hardware Configuration

See the following PCB, PROM, and Jumper Matrices.

All system configuration, electronic equipment or replaceable parts descriptions will include line voltage and video format when applicable. If only one dash level is listed for a software/feature, then that dash is acceptable to both video formats or line voltages.

For example:

PCB/PART NAME	PART NUMBER	DASH NO.		NOTES
Display Controller	7500-0300	16 17		EIA CCIR
Power Supply	1700-0010 1700-0011	02 02		120V 240V
Delay Controller	7500-4031	02		

Definitions:

"EIA" is the 525-line video format standard of which "NTSC" is the color subset.

"CCIR" is the 625-line video format standard of which "PAL" is the color subset.

Some countries apply different safety requirements than those generally encountered in the United States. Where applicable, the safety agency will appear in the Notes column. For example:

UL	Underwriters Laboratories (USA)
TUV	Technischer Uberwachungs––
	Verein Rheinland
CSA	Canadian Standards Association

"International" and "Domestic" (Int'l and Dom) will only be used to define geographic services areas; Domestic for the United States and Canada, and International for the rest of the World. When referring to areas serviced or supplied by Solingen (Europe, Africa, Russia) the designation is "Europe (EURO)". The Europe designation is necessary to differentiate between Mid-Range systems and parts manufactured or serviced by Solingen and Bothell (primarily when dealing with the UM-4, UM-4DBF and UM-5).

**Replacement Matrices
(Table 5–3 PCB Replacement Matrix and Table 5–4 PROM Replacement Matrix)**

To determine S1 Replacement PCB or Module:

CAUTION: *Do not arbitrarily order the highest dash level listed; it may not be compatible with the system, or if an alternate is then shipped, it may not be compatible. This will result in either a call-back after reordering parts or place the system in a configuration that will be incompatible with future upgrades.*

Compare part number and dash level of defective PCB or module to replacement matrix.

1. If exact part number and dash level is listed, order that PCB or module.

2. If exact replacement is not listed, order the next higher dash level PCB that matches the system configuration in the FEATURES columns (SYNC, NON-SYNC, etc.)

NOTE: *If a column is blank, that feature is not a determining factor for that PCB and does not need to be considered.*

NOTE: *The PCB and PROM matrices are compiled to provide support for all existing systems with the least number of dash levels. PCBs not included in these matrices will be reworked at the factory to the highest possible level as they cycle through the supply system.*

If a PCB is not listed in this table, it does not have configurable jumpers (i.e., no movable jumpers).

PCB Silhouettes (S2 Figure 5–7); switches, jumpers and I.C. locations are shown for configuration requirements and firmware listed in the various matrices.

Scanhead Compatibility Matrix

Compatibility is indicated by the lowest software level required for operation. See S2, Section 5–6 for Scanhead Matrix.

Table 5A–3.   UM-4, S1 PCB Replacement Matrix

Ref. Des.	PCB Name	PCB Part No.	Dash No.	3X/4X	5X	6X	17X	Frame Grab	Notes	PROMs	Con-vert
A1	RF Select	7500-0317	––	R	R	R	R				
A2	Bmfrmr Front End	7500-0288	01 03	R A	R A	R A	R A		FE FE		
A3	Bmfrmr Focus	7500-0320 7500-0361	00 07 10	R A A	R A A	R A A	R A A		FE FE FE		
A4	Bmfrmr Controller	7500-0324 7500-0362	–– 04	R A	R A	R A	R A			n n	n
A5	Pulse Processor	7500-0313	–– 02 03		R	R	R		Note 1		n n
A8	Motor Controller	7500-0304 7500-0348	03 09 10	R	R	R A A	A A R			n n n	n n
A9	S.C. Interface	7500-0273	06 07 08 09 60 61 22 23	R R A A A A A A	R R A A A A A A	R R A A A A A A	R R A A A A A A		EIA CCIR EIA CCIR EIA CCIR EIA CCIR		n n n
A10	S.C. Buffer	7500-0315	–– 01 02	R A A	R A A	R A A	R A A				
A11	S.C. Output Add Gen	7500-0314	00	R	R	R	R				
A12	T-M Mode	7500-0322	00	R	R	R	R				

CODING:

R = Recommended replacement order level.
A = Alternate acceptable replacement level.
C = PCB compatible with software, but no longer is stocked.
L = Order like for like.
P = Purge PCB.
Y = Yes, compatible with feature.

N = Not compatible with feature or software build.
FE = Functionally equivalent.
n = See additional PROM or jumper tables, or convertIbility documentation for additional details.

NOTES:

1. When replacing A5 PCB on 3X/4X systems, order -02 Pulse Processor and upgrade system to 6X.

Table 5A–3.   UM-4, S1 PCB Replacement Matrix (Cont'd)

Ref. Des.	PCB Name	PCB Part No.	Dash No.	REPLACEMENT LEVELS				FEATURE COMPATIBILITY	Notes	PROMs	Con-vert
				4X	5X	6X	17X	Frame Grab			
A14	Display Controller	7500-0300	04	A	A	A	A	N	EIA		
			05	A	A	A	A	N	CCIR		
			06	R	R	R	R	N	EIA		
			07	R	R	R	R	N	CCIR		
			24	A	A	A	A	Y	EIA		
			25	A	A	A	A	Y	CCIR		
			26	A	A	A	A	Y	EIA		
			27	A	A	A	A	Y	CCIR		
A15	System Controller	7500-0312	65	R	R	R	R			n	
	Power Supply	1700-0002	11	L	L	L	L		120V		
			12	L	L	L	L		240V		
		1700-0032	01	L	L	L	L		120V[1]		
	Rear Panel	7500-0318	07	R	R	R	R				
	ECG Module	3500-0518	––	R	R	R	R				
	A/V Module [2]	4000-0143	06	R	R	R	R		120V		
			07	R	R	R	R		240V		
			10				R		120V		
			11				R		240V		
	Data Comm	4000-0158	01	L	L	L	L		120V[3]		
			19				L		120V[3]		
			21				A		120V[4]		
			22				R		120V[5]		
		4000-0159	01	L	L	L	L		240V[3]		
			19				L		240V[3]		
			21				A		240V[4]		
			22				R		240V[5]		

CODING:

R = Recommended replacement order level.
A = Alternate acceptable replacement level.
C = PCB compatible with software, but no longer is stocked.
L = Order like for like.
P = Purge PCB.
Y = Yes, compatible with feature.

N = Not compatible with feature or software build.
FE = Functionally equivalent.
n = See additional PROM or jumper tables, or convertIbility documentation for additional details.

NOTES:

1. UL approved.
2. The transition of 4000-0143-06/07 to -08/09 represents a change to incorporate the smart A/V module feature. DO NOT upgrade or downgrade this feature.
3. RS 232 only.
4. RS 232 plus two disk drives.
5. Requires 16X or higher software.

5A   Configuration, S1 Systems

Table 5A–3.   UM-4, S1 PCB Replacement Matrix (Cont'd)

Ref. Des.	PCB Name	PCB Part No.	Dash No.	3X 4X	5X	6X	17X					Frame Grab						Notes	PROMs	Con-vert
				REPLACEMENT LEVELS								**FEATURE COMPATIBILITY**								
	Hardkey Control Mod (TB, S/L) (TB, S/LM) (TB, S/LC)	4000-0154	26/31 21/26/31 22/27/32 23/28/33															1 1 1		
	Softkey Control Mod	4000-0156	20 18	R A	R A	R A	R A													
	Monitor Module	3500-0426 3500-0764 3500-0501	00 02 03 ––	L L L L	L L L L	L L L L	L L L L											FPC		

CODING:

R =   Recommended replacement order level.
A =   Alternate acceptable replacement level.
C =   PCB compatible with software, but no longer is stocked.
L =   Order like for like.
P =   Purge PCB.
Y =   Yes, compatible with feature.

N =   Not compatible with feature or software build.
FE =   Functionally equivalent.
∩ =   See additional PROM or jumper tables, or convertIbility documentation for additional details.
FPC =   Full Peripheral Cart

NOTES:
1. See S.B. No. UM4-93, Rev C.

Table 5A–4. UM-4, S1 PROM Replacement Matrix

Ref. Des.	PCB Name	PCB Part No.	Dash No.	PROM Kit Part No.	Dash No.	4X	5X	6X	17X				Ref. Des.	PROM Part No.	Dash No.	Frm Grb			
				PCB → **PROM KIT** → **REPLACEMENT LEVELS** → **INDIVIDUAL PROM** → **FEATURE COMPATIBILITY**															
A4	Bmfrmer Controller	7500-0324	00	INDIVIDUAL 8000-0178	07	Y	Y	Y	Y				U50 U50	4201-0236 4201-0236	D 07				
		7500-0362	02	INDIVIDUAL 8000-0178	07	Y	Y	Y	Y				U50 U50	4201-0236 4201-0236	D 07				
A8	Motor Controller			INDIVIDUAL INDIVIDUAL		Y	Y						U27 U27	4201-0172 4201-0172	E G				
		7500-0304	03	8000-0132	01			Y					U27	4201-0172	01				
				8000-0132	04								U27	4201-0395	01				
		7500-0348	09	8000-0133	01			Y					U27	4201-0265	01				
			10		12				Y				U33[1]	4201-0265	12				
A15	System Controller	7500-0312	65	6220-0012[2]	01	Y	Y						U16 U17 U18 U19 U33 U34 U35 U36	4201-0268 4201-0269 4201-0270 4201-0271 4201-0272 4201-0273 4201-0274 4201-0275	D D D D D D D D	N			
				8000-0125	01		Y						U16 U17 U18 U19 U33 U34 U35 U36	4201-0268 4201-0269 4201-0270 4201-0271 4201-0272 4201-0273 4201-0274 4201-0275	01 01 01 01 01 01 01 01	N			
					25				Y				U16 U17 U18 U19 U33 U34 U35 U36	4201-0301 4201-0302 4201-0303 4201-0304 4201-0305 4201-0306 4201-0307 4201-0308	11 11 11 11 11 11 11 11	Y			

NOTES:

1. Board relay-out relocated IC U27 on 7500-0348-08 to U33 on -10 rev level.

2. If this kit is being ordered to replace 4X software, PROM P/N 4201-0172 G for Motor Controller must also be ordered.

5A   Configuration, S1 Systems

Table 5A–5.   Jumper Matrix

PCB				JUMPER OR SWITCH				
Ref. Des.	PCB Name	PCB Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A3	Beamformer Focus	7500-0320 or 7500-0361	ALL	JP1	1–2	S1 System	open	
A4	Beamformer Controller	7500-0324	–	A	–	N/A	N/A	
				B	–	N/A	N/A	
				C	–	N/A	N/A	
				D	1–2	Test	shorted	
				E	1–2	Test	shorted	
				F	1–2	Test	shorted	
				G	1–2	Test	shorted	
		7500-0362	ALL	A	–	N/A	N/A	Deleted
				B	–	N/A	N/A	Deleted
				C	–	N/A	N/A	Deleted
				D	1–2	Test	shorted	
				E	1–2	Test	shorted	
				F	1–2	Test	shorted	
				G	1–2	Test	shorted	
			01 and beyond	H	1–2	Non-Sync	open	
A5	Pulse Processor	7500-0313	ALL	A	1–2	Test	shorted	A–D located beneath shield and are hardwired.
				B	1–2	Test	shorted	
				C	1–2	Test	shorted	
				D	1–2	Test	shorted	
				E	1–2	Test	shorted	
				F	1–2	Test	shorted	
				G	1–2	Test	shorted	
				H	1–2	Test	shorted	
				SWI	1	Test	open	
				SWI	2	Test	opne	
				SWI	3	Test	open	
				SWI	4	Test	open	
				SWI	5	Test	open	
				SWI	6	Test	open	
				SWI	7	Test	open	
				SWI	8	Test	open	

Table 5A–5. Jumper Matrix (Cont'd)

PCB				JUMPER OR SWITCH				
Ref. Des.	PCB Name	PCB Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A8	Motor Controller	7500-0304	ALL	S1 S1 S1 S1	1 2 3 4	N/A N/A N/A N/A	closed closed closed closed	S1 is not for field use.
		7500-0348	ALL	S1 S1 S1 S1	1 2 3 4	N/A N/A N/A N/A	closed closed closed closed	S1 is not for field use.
			04–06 08–10	JP1	1–2	Non-sync	open	
A9	2D Scan Converter Interface	7500-0273	00–09	S1 S1 S1 S1	1 2 3 4	Not Used Not Used Used Not Used	open open closed open	
			10–23 60,61, 62	S1 S1 S1 S1	1 2 3 4	Not Used Not Used SMPL CLK for CAD Not Used	open open 17X and down–open open	
			00–23 60,61, 62	JP1	1–2	Video Select	60 Hz–open 50 Hz–closed	Domestic International
A11	2D Scan Converter OAG	7500-0314	00	JP1	A–B B–C	Normal Operation Test	shorted open	

Table 5A–5.   Jumper Matrix (Cont'd)

PCB				JUMPER OR SWITCH				
Ref. Des.	PCB Name	PCB Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A8	Motor Controller	7500-0304	ALL	S1 S1 S1 S1	1 2 3 4	N/A N/A N/A N/A	closed closed closed closed	S1 is not for field use.
		7500-0348	ALL	S1 S1 S1 S1	1 2 3 4	N/A N/A N/A N/A	closed closed closed closed	S1 is not for field use.
			04–06 08–10	JP1	1–2	Non-sync	open	
A9	2D Scan Converter Interface	7500-0273	00–09	S1 S1 S1 S1	1 2 3 4	Not Used Not Used Used Not Used	open open closed open	
			10–23 60,61, 62	S1 S1 S1 S1	1 2 3 4	Not Used Not Used SMPL CLK for CAD Not Used	open open 17X and down–open open	
			00–23 60,61, 62	JP1	1–2	Video Select	60 Hz–open 50 Hz–closed	Domestic International
A11	2D Scan Converter OAG	7500-0314	00	JP1	A–B B–C	Normal Operation Test	shorted open	

Table 5A–5. Jumper Matrix (Cont'd)

PCB				JUMPER OR SWITCH				
Ref. Des.	PCB Name	PCB Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A15	System Controller	7500-0312	ALL	JR1	1–2	Disables Address and Command Lines when Open. Hardwired	shorted	
				JR2				
				JR3	1–2	Shorted if U6 is P/N 2058- or -0001 or 2070-0007-01.	shorted	
					2–3	Shorted for 64K and above EEPROMs. Open if U6 is P/N 2058-0001 or 2070-0007-01.	open	
				JR4	1–2	Shorted for 16K EEPROM (24 Pin only). Open if U6 is P/N 2058-0001 or 2070-0007-01.	open	
					2–3	Shorted for 64K and above EEPROMs. Open if U6 is P/N 2058-0001 or 2070-0007-01.	open	
				JR5	1–2	Shorted for 64K and above EEPROMs.	open	
					2–3	Shorted for 16K EEPROM (24 Pin only). Open if U6 is P/N 2058-0001 or 2070-0007-01.	open	
				JR6	1–2	Shorted for 64K and above.	open	
				JR7	1–2	Open if U16–19 and U33–36 are P/N 2057-0006. Shorted if U16–19 and U33–36 are P/N 2057-0008 or 2057-0017.	shorted	
				JR8		Deleted		
				JR9		Deleted		
			A–D E	JR10		Hardwired Deleted		
			A–D E	JR11		Hardwired Deleted		
			A–D E	JR12		Hardwired Deleted		
			A–H	JR13	1–2	Shorted for Test Mode.	open	
					3–4	Shorted for 64K x 1 RAMS. Open for 32K x 8 EPROMs.	shorted	
					5–6	Shorted for 16K x 8 EPROMs. Open for 256K x 1 RAMs.	open	
					7–8	Spare	open	

5A Configuration, S1 Systems

Table 5A–5. Jumper Matrix (Cont'd)

PCB				JUMPER OR SWITCH				
Ref. Des.	PCB Name	PCB Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A15	System Controller (Cont'd)	7500-0312	1–11	JR13	1–2	Shorted for Test Mode.	open	
					3–4	Shorted for 16K x 8 EPROMS. Open for 32K x 8 EPROMS.	open	
					5–6	Shorted for 64K x 1 RAMs.	shorted for all except -07,–09,–10,–11,63	
						Open for 256K x 1 RAMs.	open for -07, -09, -10,–11,63	
			-03 and beyond –02 or earlier		7–8	Shorted for 64K x 8 EPROMs.	shorted -03 and higher but not -60	
						Open for 32K x 8 EPROMs.	open for -60 and -02 and below	
				JR14	1–2	Shorted to Connect External Serial Port TXDE to RXDE for testing.	open	
				JR15	1–2	Shorted to Connect External Serial Port DTR to DSR for testing.	open	
				JR16	1–2	Shorted to Connect External Serial Port RTS to CTS for testing.	open	
				JR17	1–2	Shorted to Connect External Serial Port TXD to RXD for testing.	open	
				JR18	1–2	Shorted to Connect Control Module. Serial Port TXDFP to RXDFP for testing.	open	
			ALL except 07,09, 10,11, 63	JR19	1–2	Open if U7–14 and U25–32 are P/N 2054-0001.	hardware dependent	
			07,09, 10,11, 63			Shorted if U7–14 and U25–32 are 2070-0226-01.	hardware dependent	
			ALL	JR20	1–2	Programs Dyn. RAM Cont.*	open	*Dynamic RAM Controller
				JR21	1–2	Programs Dyn. RAM Cont.	open	
					3–4	Programs Dyn. RAM Cont.	shorted	
					5–6	Programs Dyn. RAM Cont.	shorted	
					7–8	Programs Dyn. RAM Cont.	open	
					9–10	Programs Dyn. RAM Cont.	shorted	
				JR22	1–2	Shorted to Provide DISK READY for testing.	open	
				JR23	1–2	Open for Single-Sided Disk Drive. Shorted for Double-Sided Disk Drive.	shorted shorted	

PCB				JUMPER OR SWITCH				
Ref. Des.	PCB Name	PCB Part No.	Dash No.	Ref. Des.	Pins	Function	Normal Position	Notes
A15	System Controller (Cont'd)	7500-0312	ALL	JR24	1–2	Selects amount of Precom-pensation applied to Disk-Write data. sation applied to Disk-Write data.	open	
					3–4	Selects amount of Precom-pensation applied to Disk-Write data.	shorted	
					5–6	Selects amount of Precom-pensation applied to Disk-Write data.	shorted	
					7–8	Selects amount of Precom-pensation applied to Disk-Write data.	open	
					9–10	Selects amount of Precom-pensation applied to Disk-Write data.	shorted	
					11–12	Selects amount of Precom-pensation applied to Disk-Write data.	open	
				JR25	1–2	Open for Disk Transfer Rate of 250K bits/sec. Shorted for Disk Transfer Rate to 500K bits/sec.	open open	
			G	JR26 JR27	1–2 1–2	Open if U53 and U54 Installed. Open if U53 and U54 Installed.	shorted shorted	
	Rear Panel	7500-0318	06/07	JR1 JR2	2–3 2–3	N/A Shorted for 17X Software and Below.	shorted shorted	

5A−6   Software Related Anomalies

Software Release	Symptom	Fault Isoaltion	Corrective Action
12X and higher	Intermittent lateral shift or jerk in sector, depth dependent, Access scanhead.	Identify symptom.	Install PROM kit 8000-0133-08.
12X and higher	A system lockup occurs when changing from an annular array scanhead to an IVT.	Identify symptom.	Install PROM kit 8000-0133-08.
12X, 17X	Loss of M-mode TGC overlay when changing M-mode depth.	Identify symptom.	Select FREEZE and then unfreeze to recover.
12X, 17X	ECG stops scrolling in 2D mode. The sector image splits at the center-one half live, the other memorex or random data.	Reduced 2D sector overlay on the top-left corner of the scrolling mode is turned off.	From 2D/ECG mode, press RETURN twice.
12X	Annular array – split image; IVT – wavy image; IVT – lateral jerk.	Identify symptoms.	Install Motor Controller adaptive software kit, 8000-0313-01.
12X with TP-10 Thermal Printer installed	Delay in keyboard response.	This delay is normal.	None.
12X and higher	Random lock-ups in various modes with random error messages displayed on the screen.	Identify symptoms.	Order and replace the smart A/V module (7500-0143-10).
12X	Loss of audio.	1. Check VCR power switch. 2. Verify the VCR cabling: A/V to VCR; and the audio cable from the E/M to the A/V.	1. Turn VCR power switch ON. 2. Correct the VCR cabling: A/V to VCR; and the audio cable from the E/M to the A/V.
17X	Improper initialization: system message "NO XDR" and the sector image area has a checkerboard pattern.	The IVT is the only scanhead connected, or the IVT is the default scanhead.	Select the IVT scanhead from the Control Module.

Section 6   Operating Notes

Operating Notes Start on the next page

OPERATING NOTES

Software Build: 27.08   **Rev B June 3, 1991**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

- When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

- Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

- Once the Smoothing settings 2 or 4 have been saved as a scanhead default (<CTRL>–U), the smoothing settings 1 and 3 cannot be saved as scanhead defaults. The system automatically increases these default values to 2 or 4, respectively. In this situation, you must use special function–SMOOTH to change from the default setting to the desired setting.

- Scanhead defaults are erroneously included in Table 3–2 in the operation manual. These scanhead defaults do not appear in the user default menu. To change scanhead defaults, see "Setting Scanhead Defaults" on page 3–13 of the operation manual.

2–D Acquisition

- Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a FROZEN image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE while the system is in 2–D mode and position the cursor at the desired target area.

M-mode Acquisition

- Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

- If depth and zoom are adjusted while scrolling is active in linear M–mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

- The reduced 2–D image on the M–Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M–Mode to the M–Line display, and then return to M–Mode.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function–arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To adjust the Doppler angle without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>–P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory. Instead, turn off the power, wait about 30 seconds, then turn power on again.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2–D update. Doppler acquisition resumes when the next 2–D update occurs.

Storing and Recalling Ultrasound Images

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetery measurements and annotations are not stored onto disks along with images.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

OPERATING NOTES

Software Build: 27.10   **Rev B   June 3, 1991**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

¯ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

¯ Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

¯ Scanhead defaults are erroneously included in Table 3–2 in the operation manual. These scanhead defaults do not appear in the user default menu. To change scanhead defaults, see "Setting Scanhead Defaults" on page 3–13 of the operation manual.

2-D Acquisition

¯ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a FROZEN image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE while the system is in 2-D mode and position the cursor at the desired target area.

¯ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

¯ When using an IVT 5.0 MHz (mechanical) scanhead, pressing <CTRL>-A displays the annotation for double line density (‖) while the system is operating in normal line density. Pressing CTRL>-A again will not erase the annotation. To erase the annotation, reselect the scanhead. If you press XDRSAV or <CTRL>-U while the erroneous annotation is displayed, you will not be able to erase it.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

˜ If depth and zoom are adjusted while scrolling is active in linear M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

˜ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

˜ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

˜ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

˜ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

˜ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

˜ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

˜ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To adjust the Doppler angle without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory. Instead, turn off the power, wait about 30 seconds, then turn power on again.

˜ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

˜ Exiting from CW Doppler mode to 2-D and then selecting pulsed Doppler mode may result in the display of a noise band across the Doppler trace, accompanied by an audible tone. To resume normal operation, change the PRF rate using the velocity or sample volume depth or size controls.

Storing and Recalling Ultrasound Images

˜ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

˜ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

˜ Planimetery measurements and annotations are not stored onto disks along with images.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

¯ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

OPERATING NOTES

Software Build: 28.03 and 28.04   **Rev C June 3, 1991**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

⁻ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

⁻ Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

2-D Acquisition

⁻ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

⁻ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

⁻ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

⁻ If depth and zoom are adjusted while scrolling is active in linear M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

⁻ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

⁻ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetery measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

‾ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

‾ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

German Software only

‾ When you first select *UNGUELT.TASTE while in Kalk, the system displays an invalid response. To get the desired response, press *UNGUELT.TASTE again.

OPERATING NOTES

Software Build: 29.11   **Rev A   November 4, 1991**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

‾ On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

‾ On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

‾ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

‾ Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

‾ On dual–Access hardkey systems only, selecting an array scanhead after using a 5.0, 7.5, or 10.0 MHz Access scanhead connected to the right receptacle causes loss of transducer identification and control of TGC and depth. Resetting the system restores normal operation. To prevent this situation, connect Access scanheads that have a frequency of 5.0 MHz or greater only to the left Access receptacle.

2-D Acquisition

‾ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

‾ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetery measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

¯ When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

¯ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

German Software only

¯ When you first select *UNGUELT.TASTE while in Kalk, the system displays an invalid response. To get the desired response, press *UNGUELT.TASTE again.

OPERATING NOTES

Software Build: 29.12   **November 20, 1991**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

‾ On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

‾ On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

‾ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

‾ Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

2-D Acquisition

‾ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

‾ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

‾ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

‾ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetery measurements and annotations are not stored onto disks along with images.

- Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

- When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

Analysis

- Openline Access does not generate a line feed after each carriage return as stated in the manual.

- An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

- While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

- The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

German Software only

- When you first select *UNGUELT.TASTE while in Kalk, the system displays an invalid response. To get the desired response, press *UNGUELT.TASTE again.

OPERATING NOTES

Software Build: 30.05   **January 24, 1992**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

‾ On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

‾ On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

‾ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

‾ Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

‾ The PV setup (G6) area of the user default menu includes the following line: **Averaging mode (no)**. Because averaging is not an option in the PV calculation mode, this line is accurate, although its inclusion in the user default menu may give the erroneous impression that averaging is an option.

2-D Acquisition

‾ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

‾ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

‾ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetery measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

¯ When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

¯ When printing multiple reports, some reports may not start at the top of a page. Before printing a report, press the form feed button on the printer to ensure that each report starts at the top of a new page.

¯ After completing a planimetry measurement, the pan/zone function can be activated, causing the image to move sideways without the cursor tracing. The scale does not change.

¯ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

German Software only

¯ When you first select *UNGUELT.TASTE while in Kalk, the system displays an invalid response. To get the desired response, press *UNGUELT.TASTE again.

OPERATING NOTES

Software Build: 30.08   **July 16, 1992**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

- On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

- On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

- When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

- Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

- The PV setup (G6) area of the user default menu includes the following line: **Averaging mode (no)**. Because averaging is not an option in the PV calculation mode, this line is accurate, although its inclusion in the user default menu may give the erroneous impression that averaging is an option.

- If you change the frequency of the MFI scanhead after the system has timed out due to inactivity, the system is unable to recognize the new frequency. Before changing scanhead frequency, take the system out of the time-out mode by pressing any key, as instructed by the message displayed on the screen.

- If both MFI and 10PV scanheads are connected to your system, using the MFI after the 10PV will cause erratic operation. To avoid this condition, do not use these scanheads on the system at the same time.

2-D Acquisition

- Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

¯ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetery measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

¯ When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

¯ When printing multiple reports, some reports may not start at the top of a page. Before printing a report, press the form feed button on the printer to ensure that each report starts at the top of a new page.

¯ After completing a planimetry measurement, the pan/zone function can be activated, causing the image to move sideways without the cursor tracing. The scale does not change.

¯ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

German Software only

¯ When you first select *UNGUELT.TASTE while in Kalk, the system displays an invalid response. To get the desired response, press *UNGUELT.TASTE again.

OPERATING NOTES

Software Build: 30.10   **Rev A   March 21, 1994**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

- On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

- On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

- When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

- Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

- The PV setup (G6) area of the user default menu includes the following line: **Averaging mode (no)**. Because averaging is not an option in the PV calculation mode, this line is accurate, although its inclusion in the user default menu may give the erroneous impression that averaging is an option.

- If you change the frequency of the MFI scanhead after the system has timed out due to inactivity, the system is unable to recognize the new frequency. Before changing scanhead frequency, take the system out of the time-out mode by pressing any key, as instructed by the message displayed on the screen.

- If both MFI and 10PV scanheads are connected to your system, using the MFI after the 10PV will cause erratic operation. To avoid this condition, do not use these scanheads on the system at the same time.

2-D Acquisition

- Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

- When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetry measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

‾ When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

Analysis

‾ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

‾ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

‾ When printing multiple reports, some reports may not start at the top of a page. Before printing a report, press the form feed button on the printer to ensure that each report starts at the top of a new page.

‾ After completing a planimetry measurement, the pan/zone function can be activated, causing the image to move sideways without the cursor tracing. The scale does not change.

‾ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

‾ The fetal heart rate is not removed from system memory when <CTRL>–P is pressed while in 2-D mode. The previous patient's heart rate is not added to the OB/Gyn report for the new patient, but it is displayed on the screen until it is overwritten by new data. To remove the fetal heart rate and all other data when you have finished an exam, press <CTRL>–P while in M-mode.

OPERATING NOTES

Software Build: 31.07   Rev C   March 21, 1994

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

⁻ On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

⁻ On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

⁻ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

⁻ Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

⁻ The PV setup (G6) area of the user default menu includes the following line: **Averaging mode (no)**. Because averaging is not an option in the PV calculation mode, this line is accurate, although its inclusion in the user default menu may give the erroneous impression that averaging is an option.

⁻ If you change the frequency of the MFI scanhead after the system has timed out due to inactivity, the system is unable to recognize the new frequency. Before changing scanhead frequency, take the system out of the time-out mode by pressing any key, as instructed by the message displayed on the screen.

⁻ If both MFI and 10PV scanheads are connected to your system, using the MFI after the 10PV will cause erratic operation. To avoid this condition, do not use these scanheads on the system at the same time.

2-D Acquisition

⁻ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

⁻ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

⁻ When you freeze the system while in ECG trigger mode and then press SELECT (on softkey systems) or IMAGE SELECT (on hardkey systems), the ECG trace on the stored image jitters.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetry measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

‾ When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

General Analysis

‾ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

‾ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

‾ When printing multiple reports, some reports may not start at the top of a page. Before printing a report, press the form feed button on the printer to ensure that each report starts at the top of a new page.

‾ After completing a planimetry measurement, the pan/zone function can be activated, causing the image to move sideways without the cursor tracing. The scale does not change.

OB/GYN/Fertility Analysis

‾ The system calculates HC/AC normal range from AUA, not from LMP as described in the referenced source article. The displayed range will not vary significantly from the range listed in the article, and diagnostic capability is not compromised by this deviation.

‾ The fetal heart rate is not removed from system memory when <CTRL>–P is pressed while in 2-D mode. The previous patient's heart rate is not added to the OB/Gyn report for the new patient, but it is displayed on the screen until it is overwritten by new data. To remove the fetal heart rate and all other data when you have finished an exam, press <CTRL>–P while in M-mode.

Vascular Analysis

‾ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

OPERATING NOTES

Software Version: 32.04   **Rev D   February 1, 1994**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

- On hardkey and softkey systems, a transducer must be active prior to using the remainder of the system controls.

- On hardkey and softkey systems with dual linear, when the user power up default is set to linear, the scanhead select must be pressed twice to select the right array scanhead. After selecting it once, the scanhead select works normally.

- Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

- The PV setup (G6) area of the user default menu includes the following line: **Averaging mode (no)**. Because averaging is not an option in the PV calculation mode, this line is accurate, although its inclusion in the user default menu may give the erroneous impression that averaging is an option.

- If you change the frequency of the MFI scanhead after the system has timed out due to inactivity, the system is unable to recognize the new frequency. Before changing scanhead frequency, take the system out of the time-out mode by pressing any key, as instructed by the message displayed on the screen.

- On hardkey systems only, waiting one minute or more between pressing FRZ and selecting dual-image mode causes the live image to be blank. To recover from this situation, change the OUTPUT POWER control setting. To avoid this situation, do not enter dual-image mode while the system is in freeze mode.

2-D Acquisition

- Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a frozen image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE and position the cursor at the desired target area.

- When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

- When you freeze the system while in ECG trigger mode and then press SELECT (on softkey systems) or IMAGE SELECT (on hardkey systems), the ECG trace on the stored image jitters.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth or zoom are adjusted while scrolling is active in linear or sector M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Storing and Recalling Ultrasound Images

¯ The calc measurement cursors will not attach to the trackball on a frame-grabbed image unless there was an active scanhead running prior to entering VCR playback.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

¯ Planimetry measurements and annotations are not stored onto disks along with images.

¯ Attempting to store one patient's images on another patient's disk that is not write–protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write–protect position when you have finished storing data on it.

‾ When recalling an image previously stored with ECG data via data comm, the ECG data will either be missing or incorrect.

General Analysis

‾ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

‾ When printing multiple reports, some reports may not start at the top of a page. Before printing a report, press the form feed button on the printer to ensure that each report starts at the top of a new page.

‾ After completing a planimetry measurement, the pan/zone function can be activated, causing the image to move sideways without the cursor tracing. The scale does not change.

Obstetrical Calculations

‾ Because of differences in HC/AC ratio calculations between version 32.X software and earlier versions, confusion may exist at multiple-system sites using more than one version of system software. In systems with software prior to 32.X, the normal range offered for an HC/AC ratio is based on the Average Ultrasound Age (AUA) instead of gestational age calculated from the Last Menstrual Period (LMP). See manual change 4705-0001-37 for more information on HC/AC ratios in systems with software prior to 32.X. In systems with 32.X software, the normal range offered for an HC/AC ratio is based on gestational age calculated from the Last Menstrual Period (LMP). To prevent confusion at multiple-system sites where more than one version of system software may exist, be sure to identify the software version of the system on which you are working by observing the system software label. This label is located in the upper left corner of the lower front panel on the system. Labels that read "Software Level 32" indicate version 32.X software. Systems without such a software label contain a previous software version.

‾ Any age or estimated date of delivery (EDD) determined by last menstrual period (LMP) occurring in a leap year (1992, 1996...) may be inaccurate by a day. For exams occurring March 1 through December 31 of a leap year, add one day to the calculated EDD.

Vascular Analysis

‾ Because of differences in vascular ratio calculations between version 32.X software and earlier versions, confusion may exist at multiple-system sites using more than one version of system software. In systems with software prior to 32.X, the ratio calculation does not take into account an angle correction factor. If the angle correction factor was different between the two measured vessels, the ratio must be calculated by hand. See manual change 4705-0001-35 for more information on vascular ratios in systems with software prior to 32.X. In systems with 32.X software, the ratio calculation does take into account an angle correction factor. To prevent confusion at multiple-system sites where more than one version of system software may exist, be sure to identify the software version of the system on which you are working by observing the system software label. This label is located in the upper left corner of the lower front panel on the system. Labels that read "Software Level 32" indicate version 32.X software. Systems without such a software label contain a previous software version.

‾ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

Operating Notes Start on the next page

OPERATING NOTES AND ERRATA

Software Build: 23.19   **March 23, 1989**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

Setup

˜ When <CTRL>-E is pressed and the default menu is displayed, and then <DEL> is pressed to exit the default table, all patient data including data on the hard disk is erased. <CTRL>-E, as part of its operation, assumes a New Patient command (<CTRL>-P). Store any files you wish to save on the floppy disk before using <CTRL>-E.

˜ Pressing <CTRL>-E while in Cineloop R image capture displays mixed alphanumeric characters on the display. Do *not* use <CTRL>-E while in CAD mode.

˜ Using <CTRL>-Z to set date and time overwrites any annotation and graphics in the region used to display the date/time prompt. Set the system date and time before adding annotation to the screen.

˜ The System Activity Timeout function is not activated when in CAD mode operation in the Cine softkey panel and below. When leaving the system for an extended period of time, exit the Cine panel first, then freeze the system (press FRZ) to minimize wear on the scanhead.

˜ Freeze the system (press FRZ) before using the calculations/analysis modules to prevent the timeout display prompt from overwriting the display (hardkey systems).

System Controls

˜ Pressing <CTRL>-O while editing a report in one of the analysis modules blanks the leftmost columns of the report. Do not use <CTRL>-O while editing a report.

˜ GREY (Gray Scale Set) also functions to optimize the match between the gray scale of the VCR playback images and Cineloop images. To use the function, press GREY on the Setup softkey panel, then press the PLAY button on the front of the VCR. Press any key on the keyboard to complete the process. In some cases, the process may fail to produce an acceptable match, requiring the user to repeat the grayscale setup.

˜ The SET WINDOW key on the CAD/Cine hand controller sets the position of the capture window only temporarily, and the setting is not preserved for subsequent sessions. To permanently set the window position, do so before beginning a capture from the Setup softkey panel using the WINDOW softkey.

˜ The CI STR softkey stores a Cineloop image onto the hard disk if one is present in video memory, though the descriptive title is not used. An easier method of storing Cineloop images is to use the rightmost footswitch after acquiring the images.

Display Modes

⁻ When no scanhead or transducer is connected, the system may function erratically. The system should never be operated without a scanhead or transducer connected and selected.

⁻ The M-line can be moved outside the image sector for sectors less than 90_   using the remote M-line positioning control on the scanhead.

⁻ Enabling the remote M-line positioning control if no remote control is present may produce unpredictable results. Do not attempt to enable the remote M-line positioning control if none is present.

Two-Dimensional Acquisition

⁻ Selecting between two images in dual mode, then returning to single mode and inverting the video may cause the gray bar display to be inverted. Reselect B/W Invert to correct.

M-mode Acquisition

⁻ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

Doppler Acquisition

⁻ When in CW mode, activating VCR framegrabber, then returning to CW causes a change in the frequency or velocity scale. Remember to reset scaling after VCR playback.

⁻ During Doppler acquisition at angles greater than 80 degrees, the Doppler velocity can exceed the capacity of the screen display for Doppler measurements. We recommend only using angles less than 80 degrees to minimize the chance of non-diagnostic data acquisition.

Storing and Recalling Ultrasound Images

⁻ Images stored using the STORE softkey are erased when VCR playback is activated. To prevent erasure, use the Page Capture function described in "Capturing Single-Frame Images."

⁻ The message "CAD module fault" may appear on the monitor display when first pressing the CAD softkey or when other softkeys are pressed rapidly. To prevent this from occurring, wait for about 35 to 40 seconds after switching power on before pressing the CAD softkey. Once in CAD mode, always wait for the new softkey panel to be presented before selecting the next function.

⁻ In rare occasions, the CAD functions may appear to lock up, and a "Press control-P" message may be presented. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again. Then, pressing the CAD softkey will permit you to access the images that were on the hard disk at the time of the fault.

⁻ In some cases, with the initial delay set to zero the system will capture images before the ECG R wave begins. This happens because the initial delay of zero is calibrated to permit synchronized capture with a variety of "host" ECG machine inputs with varying propagation delays. Setting the initial delay between 50 and 100 ms is recommended as a trial starting value, to be adjusted to meet the specific timing requirements of each host ECG machine.

⁻ If the heart rate at the time of image capture reads 0 (i.e., if there is no ECG input), the heart rate reading will not appear on the captured image when it is recalled from disk, even if the heart rate display was enabled during capture.

⁻ When the ECG signal is removed, the last heart rate reading will remain displayed. The heart rate reading is updated only when heartbeats are detected; when the ECG signal is restored and QRS peaks are detected, the system will resume updating the heart rate display.

Storing and Recalling Ultrasound Images (continued)

˜ If the real-time image is frozen while the system is armed for capture, the heart rate displayed is the real-time rate, not the rate at the time the image was frozen. The heart rate should not be used to assist in diagnosis of the frozen image. However, this does not apply to captured images subsequently played back frame-by-frame.

˜ In certain instances, the gray scale on the captured image may not match the gray scale during real time scanning. Use the GREY softkey on the Setup panel to calibrate the gray scale to the real-time image before performing an image capture.

˜ On an image captured from the VCR, the image brightness and contrast may differ from the VCR image. Re-calibrate the gray scale while in VCR playback. Tapes vary greatly in playback quality, and may require re-calibration even on the same recording, since changes in brightness may occur during a passage.

˜ Exiting the CAD mode (pressing RETRN from the CAD softkey panel) without first storing captured images onto the hard disk causes those unstored images to be permanently erased. To prevent this, be sure to store captured images onto the hard disk or floppy disk before exiting the CAD mode.

˜ During image capture, when the hard disk is full a message "Press any key" is displayed, but pressing the keyboard has no effect. Press any softkey to resume operation.

˜ When recalling exercise images, the recall menu may read "exercise, 08F, page 256x120." The menu should read "exercise, 08F, *quad* 256x120."

˜ The recall menu displays "Press page button" to display the next page of the menu if more images are available, but no PAGE button is shown. Press the MORE softkey to display the next page of the menu.

˜ In some cases, the system will not capture VCR images synchronized with the ECG R-wave trigger. If this occurs, re-calibrate the gray scale on the VCR playback image to maximize the chances of a properly synchronized capture.

˜ When storing to or recalling from floppy disk, once the process is initiated it cannot be interrupted or aborted. Do not press any keys—simply wait for the process to end before beginning another process.

˜ When recalling images from a floppy disk (RECALL ! FL DSK), if the name **and** identification fields do not **exactly** match the name and ID currently entered on the system, the user is prompted for an action: ADD, REPLACE, or ABORT.

  – ADD adds the images from the floppy onto the hard disk, and the images now take on the patient information currently on the hard disk. This is useful if the patient name or ID was entered slightly differently the last time (e.g., Robert Smith vs. Smith, Robert).

  – REPLACE removes the images and patient information from the hard disk and replaces it with the images and information from the floppy. The net effect is the same as if the user had pressed <CTRL>-P before recalling images from the floppy.

  – ABORT permits the user to cancel the recall operation. The data on the hard disk remains untouched.

˜ During playback of captured images, some vertical shifting may be apparent on successive images.

˜ Enter the patient name and I.D. before entering the Cine softkey panel. Otherwise, the patient name and I.D. will not appear on the wall motion analysis report.

Ultramark⌐4 CAD Ultrasound System   **4707-0010-01**

OPERATING NOTES

Software Build: 24.15   **June 20, 1989   Rev B**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls
‾ The CI STR softkey stores a Cineloop image onto the hard disk if one is present in video memory, though the descriptive title is not used. An easier method of storing Cineloop images is to use the rightmost footswitch after acquiring the images.

M-mode Acquisition
‾ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

Doppler Acquisition
‾ When in CW mode, activating VCR framegrabber, then returning to CW causes a change in the frequency or velocity scale. Remember to reset scaling after VCR playback.

‾ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

‾ Upon returning from a framegrab operation, the Doppler M-line and sample volume controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

‾ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

‾ Inappropriate sample volume and Doppler angle annotation may appear on the screen when returning from the calcs menu and entering CW Doppler. To clear the annotation, press RETRN, then CW DOP to resume CW Doppler operation.

‾ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

Storing and Recalling Ultrasound Images

‾ Images stored using the STORE softkey are erased when VCR playback is activated. To prevent erasure, use the Page Capture function described in "Capturing Single-Frame Images."

‾ When capturing images from the VCR, the ECG trigger threshold can only be set with the CAD/Cine Hand Controller arrow keys—not with the trackball. Use the hand controller arrow keys if you want to set the threshold when capturing VCR images.

‾ When the system is armed for capture of VCR images, pressing the softkeys on the VCR softkey panel or VCR front panel controls may intermittently cause the display monitor to blank. If this occurs, press STOP and then PLAY to resume operation.

‾ Do not capture images when the system is in Dual image mode and the ECG trigger is on.

‾ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

‾ In rare occasions, the CAD functions may appear to lock up, and a "Press control-P" message may be presented. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again. Then, pressing the CAD softkey will permit you access to the images that were on the hard disk at the time of the fault.

‾ Capturing a static CW Doppler spectral display as the first image captured since power-up may result in an abnormal image or display mode. If this occurs, capture a 2-D image first, then return to static CW Doppler to capture the Doppler spectral display.

‾ During image capture, when the hard disk is full a message "Press any key" is displayed, but pressing the keyboard has no effect. Press any softkey to resume operation.

‾ When recalling exercise images, the recall menu may read "exercise, 08F, page 256x120." The menu should read "exercise, 08F, *quad* 256x120."

‾ The recall menu displays "Press page button" to display the next page of the menu if more images are available, but no PAGE button is shown. Press the MORE softkey to display the next page of the menu.

‾ When storing to or recalling from floppy disk, once the process is initiated it cannot be interrupted or aborted. Do not press any keys—simply wait for the process to end before beginning another process.

‾ During playback of captured images, some vertical shifting may be apparent on successive images.

‾ The message, "Establishing CAD Module Communication" may appear on the monitor when selecting the CAD softkey too soon after initial power-up. To prevent this from occurring, wait for about 15 seconds after switching power on before pressing the CAD softkey.

‾ Distorted or blank images may be captured and stored if a Page capture is attempted with a frozen image. Use Page capture with real time images only.

‾ Images captured using linear scanheads will not be synchronized to the video rate, and may appear distorted or contain blank video frames when replayed.

‾ GREY on the Setup softkey panel optimizes the match between the gray scale of the captured images and system real-time images. This function is not fully implemented for matching the gray scale of captured images and VCR images; its use with VCR images is not recommended.

Ultramark⌐ 4 CAD Ultrasound System   **4707-0010-02**

OPERATING NOTES

Software Build: 24.17   **July 6, 1989   Rev A**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls
‾ The CI STR softkey stores a Cineloop image onto the hard disk if one is present in video memory, though the descriptive title is not used. An easier method of storing Cineloop images is to use the rightmost footswitch after acquiring the images.

M-mode Acquisition
‾ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

Doppler Acquisition
‾ When in CW mode, activating VCR framegrabber, then returning to CW causes a change in the frequency or velocity scale. Remember to reset scaling after VCR playback.

‾ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

‾ Upon returning from a framegrab operation, the Doppler M-line and sample volume controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

‾ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

‾ Inappropriate sample volume and Doppler angle annotation may appear on the screen when returning from the calcs menu and entering CW Doppler. To clear the annotation, press RETRN, then CW DOP to resume CW Doppler operation.

‾ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

Storing and Recalling Ultrasound Images

‾ Images stored using the STORE softkey are erased when VCR playback is activated. To prevent erasure, use the Page Capture function described in "Capturing Single-Frame Images."

‾ When capturing images from the VCR, the ECG trigger threshold can only be set with the CAD/Cine Hand Controller arrow keys—not with the trackball. Use the hand controller arrow keys if you want to set the threshold when capturing VCR images.

‾ Do not capture images when the system is in Dual image mode and the ECG trigger is on.

‾ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

‾ In rare occasions, the CAD functions may appear to lock up, and a "Press control-P" message may be presented. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again. Then, pressing the CAD softkey will permit you access to the images that were on the hard disk at the time of the fault.

‾ Capturing a static CW Doppler spectral display as the first image captured since power-up may result in an abnormal image or display mode. If this occurs, capture a 2-D image first, then return to static CW Doppler to capture the Doppler spectral display.

‾ During image capture, when the hard disk is full a message "Press any key" is displayed, but pressing the keyboard has no effect. Press any softkey to resume operation.

‾ When recalling exercise images, the recall menu may read "exercise, 08F, page 256x120." The menu should read "exercise, 08F, *quad* 256x120."

‾ The recall menu displays "Press page button" to display the next page of the menu if more images are available, but no PAGE button is shown. Press the MORE softkey to display the next page of the menu.

‾ When storing to or recalling from floppy disk, once the process is initiated it cannot be interrupted or aborted. Do not press any keys—simply wait for the process to end before beginning another process.

‾ During playback of captured images, some vertical shifting may be apparent on successive images.

‾ The message, "Establishing CAD Module Communication" may appear on the monitor when selecting the CAD softkey too soon after initial power-up. To prevent this from occurring, wait for about 15 seconds after switching power on before pressing the CAD softkey.

‾ Distorted or blank images may be captured and stored if a Page capture is attempted with a frozen image. Use Page capture with real time images only.

‾ Images captured using linear scanheads will not be synchronized to the video rate, and may appear distorted or contain blank video frames when replayed.

OPERATING NOTES

Software Build: 25.08   **August 11, 1989**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

‾ The CI STR softkey stores a Cineloop image onto the hard disk if one is present in video memory, though the descriptive title is not used. An easier method of storing Cineloop images is to use the rightmost footswitch after acquiring the images.

‾ When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

‾ The keyboard supports special functions that are not documented in the operating instructions. The following keys are active on both hardkey and softkey control modules.

Special Function

Keys	Function
A	Trigger update on/off
C	Move Doppler zero line
D	Select/deselect alternate frame rate
E	Video invert
G	Display and select patient position display
H	Transducer/scanhead position
I	TGC preset
J	Select/deselect annotation arrow
K	Select/deselect biopsy guide
M	Select velocity/frequency
N	Select wall filters
R	Select variable persistence level
U	Enable/disable TGC display
V	Enable/disable 2–D update
W	Select up/down orientation of the image
X	Select Doppler reject level
Y	Change the sector angle/field of view

Z	Doppler invert
, or <	Increase velocity range
;	Enable calculations and tables
" or [	Increase sample volume
# or]	Decrease sample volume
. or >	Decrease velocity range

Special Function Keys	**Function**
' or "	Enable/disable Datacomm menu
{	Move Doppler angle left
}	Move Doppler angle right

Control and the Following Keys (Special Function Disabled)	**Function**
B	Enable/disable fast variable persistence
C	Swap images/toggle datacomm
G	Enable/disable Doppler grid
N	Enable/disable blank background around text
O	Enable/disable left column annotations
P	New patent
Q	Help
S	Storage image on disk
U	Save system parameters
V	Synchronize/de–synchronize scanhead to monitor frame rate
Z	Set the clock/calendar

Special Function, Control and the Following Keys	**Function**
z or H	Move Doppler angle to the left
! or I	Move Doppler angle to the right
# or J	Decrease the sample volume size
" or K	Increase the sample volume size

M-mode Acquisition

⁻ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth and zoom are adjusted while scrolling is active in linear M–mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ Inappropriate sample volume and Doppler angle annotation may appear on the screen when returning from the calcs menu and entering CW Doppler. To clear the annotation, press RETRN, then CW DOP to resume CW Doppler operation.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function–arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To adjust the Doppler angle without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>–P. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2–D update. Doppler acquisition resumes when the next 2–D update occurs.

Storing and Recalling Ultrasound Images

¯ Images stored using the STORE softkey are erased when VCR playback is activated. To prevent erasure, use the Page Capture function described in "Capturing Single-Frame Images."

¯ When capturing images from the VCR, the ECG trigger threshold can only be set with the CAD/Cine Hand Controller arrow keys—not with the trackball. Use the hand controller arrow keys if you want to set the threshold when capturing VCR images.

¯ Do not capture images when the system is in Dual image mode and the ECG trigger is on.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ In rare occasions, the CAD functions may appear to lock up, and a "Press control-P" message may be presented. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again. Then, pressing the CAD softkey will permit you access to the images that were on the hard disk at the time of the fault.

¯ Capturing a static CW Doppler spectral display as the first image captured since power-up may result in an abnormal image or display mode. If this occurs, capture a 2-D image first, then return to static CW Doppler to capture the Doppler spectral display.

¯ During image capture, when the hard disk is full a message "Press any key" is displayed, but pressing the keyboard has no effect. Press any softkey to resume operation.

Storing and Recalling Ultrasound Images (continued)

¯ When recalling exercise images, the recall menu may read "exercise, 08F, page 256x120." The menu should read "exercise, 08F, *quad* 256x120."

¯ The recall menu displays "Press page button" to display the next page of the menu if more images are available, but no PAGE button is shown. Press the MORE softkey to display the next page of the menu.

¯ When storing to or recalling from floppy disk, once the process is initiated it cannot be interrupted or aborted. Do not press any keys—simply wait for the process to end before beginning another process.

¯ During playback of captured images, some vertical shifting may be apparent on successive images.

¯ The message, "Establishing CAD Module Communication" may appear on the monitor when selecting the CAD softkey too soon after initial power-up. To prevent this from occurring, wait for about 15 seconds after switching power on before pressing the CAD softkey.

¯ Distorted or blank images may be captured and stored if a Page capture is attempted with a frozen image. Use Page capture with real time images only.

¯ Images captured using linear scanheads will not be synchronized to the video rate, and may appear distorted or contain blank video frames when replayed.

OPERATING NOTES

Software Build: 27.10   **June 18, 1990**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

- When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

- Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

- The CI STR softkey stores a Cineloop image onto the hard disk if one is present in video memory, though the descriptive title is not used. An easier method of storing Cineloop images is to use the rightmost footswitch after acquiring the images.

- The keyboard supports special functions that are not documented in the operating instructions. The following keys are active on both hardkey and softkey control modules.

Special Function Keys   **Function**

A	Trigger update on/off
C	Move Doppler zero line
D	Select/deselect alternate frame rate
E	Video invert
G	Display and select patient position display
H	Transducer/scanhead position
I	TGC preset
J	Select/deselect annotation arrow
K	Select/deselect biopsy guide
M	Select velocity/frequency
N	Select wall filters
R	Select variable persistence level
U	Enable/disable TGC display
V	Enable/disable 2–D update
W	Select up/down orientation of the image
X	Select Doppler reject level

Y	Change the sector angle/field of view
Z	Doppler invert
, or <	Increase velocity range
;	Enable calculations and tables
" or [	Increase sample volume
# or]	Decrease sample volume
. or >	Decrease velocity range

Special Function Keys	**Function**
' or "	Enable/disable Datacomm menu
{	Move Doppler angle left
}	Move Doppler angle right

Control and the Following Keys (Special Function Disabled)	**Function**
B	Enable/disable fast variable persistence
C	Swap images/toggle datacomm
G	Enable/disable Doppler grid
N	Enable/disable blank background around text
O	Enable/disable left column annotations
P	New patent
Q	Help
S	Storage image on disk
U	Save system parameters
V	Synchronize/de–synchronize scanhead to monitor frame rate
Z	Set the clock/calendar

Special Function, Control and the Following Keys	**Function**
z or H	Move Doppler angle to the left
! or I	Move Doppler angle to the right
# or J	Decrease the sample volume size
" or K	Increase the sample volume size

2-D Acquisition

¯ Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a FROZEN image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE while the system is in 2-D mode and position the cursor at the desired target area.

¯ When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

¯ When using an IVT 5.0 MHz (mechanical) scanhead, pressing <CTRL>-A displays the annotation for double line density (‖) while the system is operating in normal line density. Pressing CTRL>-A again will not erase the annotation. To erase the annotation, reselect the scanhead. If you press XDRSAV or <CTRL>-U while the erroneous annotation is displayed, you will not be able to erase it.

M-mode Acquisition

¯ Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

¯ If depth and zoom are adjusted while scrolling is active in linear M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

¯ The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode to the M-Line display, and then return to M-Mode.

¯ When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume remote controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction –– notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To adjust the Doppler angle without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory. Instead, turn off the power, wait about 30 seconds, then turn power on again.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

¯ Exiting from CW Doppler mode to 2-D and then selecting pulsed Doppler mode may result in the display of a noise band across the Doppler trace, accompanied by an audible tone. To resume normal operation, change the PRF rate using the velocity or sample volume depth or size controls.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

Storing and Recalling Ultrasound Images

¯ Images stored using the STORE softkey are erased when VCR playback is activated. To prevent erasure, use the Page Capture function described in "Capturing Single-Frame Images."

¯ When capturing images from the VCR, the ECG trigger threshold can only be set with the CAD/Cine Hand Controller arrow keys—not with the trackball. Use the hand controller arrow keys if you want to set the threshold when capturing VCR images.

¯ Do not capture images when the system is in Dual image mode and the ECG trigger is on.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

¯ In rare occasions, the CAD functions may appear to lock up, and a "Press control-P" message may be presented. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again. Then, pressing the CAD softkey will permit you access to the images that were on the hard disk at the time of the fault.

¯ Capturing a static CW Doppler spectral display as the first image captured since power-up may result in an abnormal image or display mode. If this occurs, capture a 2-D image first, then return to static CW Doppler to capture the Doppler spectral display.

¯ During image capture, when the hard disk is full a message "Press any key" is displayed, but pressing the keyboard has no effect. Press any softkey to resume operation.

¯ When recalling exercise images, the recall menu may read "exercise, 08F, page 256x120." The menu should read "exercise, 08F, *quad* 256x120."

¯ The recall menu displays "Press page button" to display the next page of the menu if more images are available, but no PAGE button is shown. Press the MORE softkey to display the next page of the menu.

¯ When storing to or recalling from floppy disk, once the process is initiated it cannot be interrupted or aborted. Do not press any keys—simply wait for the process to end before beginning another process.

¯ During playback of captured images, some vertical shifting may be apparent on successive images.

¯ The message, "Establishing CAD Module Communication" may appear on the monitor when selecting the CAD softkey too soon after initial power-up. To prevent this from occurring, wait for about 15 seconds after switching power on before pressing the CAD softkey.

¯ Distorted or blank images may be captured and stored if a Page capture is attempted with a frozen image. Use Page capture with real time images only.

¯ Images captured using linear scanheads will not be synchronized to the video rate, and may appear distorted or contain blank video frames when replayed.

Ultramark℞ 4CAD Ultrasound System   4707-0010-05

OPERATING NOTES

Software Build: 28.03 and 28.04   **Rev C   June 3, 1991**

The purpose of these Operating Notes is to identify for users any known anomalies or ambiguities relating to system functionality and behavior and to provide, wherever appropriate, explanation and suggestions.

The following information is arranged according to the sections in the Operations Manual that are affected by the described phenomenon. These notes are informational; they are included here to clarify certain system responses that might be erroneous or otherwise cause operator misunderstanding or difficulty.

System Controls

- When printing an image, the measurement cursors are not always printed. This occurs because the cursors blink and the print control was pressed while the cursors were off. Press the print control only when the cursors are shown on the screen.

- Although the Q key on the system keyboard is labeled HELP, pressing <CTRL>-Q or Special Function-Q has no effect on the system because no help function is implemented.

- The CI STR softkey stores a Cineloop image onto the hard disk if one is present in video memory, though the descriptive title is not used. An easier method of storing Cineloop images is to use the rightmost footswitch after acquiring the images.

2-D Acquisition

- Image positioning may seem erratic when changing the image size using the DEPTH control, panning in a FROZEN image, or selecting different focal zones. This happens because the Pan/Zone cursor is moved when you use the trackball even if the Pan/Zone cursor is not displayed. To prevent this situation, enable the Pan/Zone cursor by pressing PAN/ZONE while the system is in 2-D mode and position the cursor at the desired target area.

- When the Mercury scanhead is selected but is not coupled to a patient, artifacts may be visible in the image, particularly at high output power settings. This is caused by acoustic energy being reflected inside the scanhead when there is no tissue present to absorb the energy, and does not indicate a defective scanhead. These artifacts are not present when the scanhead is coupled to a patient.

M-mode Acquisition

- Changing the depth in M-mode with 2D Update enabled may cause discontinuities in the 2D updated image.

- If depth and zoom are adjusted while scrolling is active in linear M-mode, the TGC graphics are removed. Freezing the image restores the TGC graphics.

- The reduced 2-D image on the M-Mode display may stop updating following operation of the ZOOM control. To restore normal operation in this situation, exit M-Mode on the M-Line display, and then return to M-Mode.

- When using the CW Duplex scanhead, the M-mode or Doppler display may stop scrolling at the end of a 2-D update cycle. Normal operation resumes at the end of the next 2-D update cycle. Alternately, you can freeze and unfreeze the image to restore normal operation.

Doppler Acquisition

¯ Under certain conditions with the Duplex CW scanhead selected, the Doppler spectra may disappear when switching between CW and Pulsed Doppler. If this occurs, press RETRN and then reselect the desired mode to clear.

¯ Upon returning from a framegrab operation, the Doppler M-line and sample volume controls may appear non-functional. Reselect the LCLRMT softkey to enable movement of the Doppler M-line and sample volume controls if this occurs.

¯ If the VPM feature is enabled and the Duplex CW scanhead is selected, the CW DOP softkey will be disabled. To re-enable the CW DOP softkey, turn off VPM.

¯ When 'ECG Display ON/OFF' in the user default (<CTRL>-E) menu is set ON, the ECG trace cannot be removed in static CW Doppler mode. To remove the ECG trace in this mode, set ECG Display ON/OFF to OFF.

¯ If the Doppler angle is adjusted during Doppler scrolling by pressing and holding the special function-arrow keys for a long period of time (about 5 sec or more), and the scaling is set to m/sec, the error message "system malfunction—notify customer service" is erroneously displayed on the screen. This condition does not affect proper operation of the system. To use the special function-arrow keys without invoking the error message, exit from Doppler mode before making the adjustment. To remove the error message, press <CTRL>-P. If you are using the analysis module and have not documented all data, DO NOT press <CTRL>-P, which will clear all patient data and calculations from system memory.

¯ While using a Duplex CW scanhead in CW Doppler mode, Doppler acquisition is halted temporarily if Freeze is activated during 2-D update. Doppler acquisition resumes when the next 2-D update occurs.

Analysis

¯ Openline Access does not generate a line feed after each carriage return as stated in the manual.

¯ An analysis report may be inadvertently printed to the report printer even though the report menu is not displayed. When the analysis module is active, pressing the letter o on the keyboard will send an Openline Access report to the printer. This is normal operation.

¯ While in any analysis module, pressing 2 (Print Report) three or more times in succession during printing or while the printer is not connected or not ready may cause the analysis module to lock up. To recover, press <CTRL>-P to reset the system.

¯ The pulsatility index may give erroneous results if calculated after changing frequency scaling. To ensure correct results, do not change frequency scaling.

Storing and Recalling Ultrasound Images

¯ Images stored using the STORE softkey are erased when VCR playback is activated. To prevent erasure, use the Page Capture function described in "Capturing Single-Frame Images."

¯ When capturing images from the VCR, the ECG trigger threshold can only be set with the CAD/Cine Hand Controller arrow keys—not with the trackball. Use the hand controller arrow keys if you want to set the threshold when capturing VCR images.

¯ Do not capture images when the system is in Dual image mode and the ECG trigger is on.

¯ If an image displayed on the monitor in an inverted, black-on-white format is stored using the STORE softkey, that image will always be white-on-black when recalled.

⁻ In rare occasions, the CAD functions may appear to lock up, and a "Press control-P" message may be presented. If unsaved images are on the hard disk, DO NOT press <CTRL>-P, which is a command to clear all images off the hard disk. Instead, turn off the power, wait about 30 seconds, then turn power on again. Then, pressing the CAD softkey will permit you access to the images that were on the hard disk at the time of the fault.

⁻ Capturing a static CW Doppler spectral display as the first image captured since power-up may result in an abnormal image or display mode. If this occurs, capture a 2-D image first, then return to static CW Doppler to capture the Doppler spectral display.

⁻ During image capture, when the hard disk is full, a message "Press any key" is displayed, but pressing the keyboard has no effect. Press any softkey to resume operation.

⁻ When recalling exercise images, the recall menu may read "exercise, 08F, page 256x120." The menu should read "exercise, 08F, *quad* 256x120."

⁻ The recall menu displays "Press page button" to display the next page of the menu if more images are available, but no PAGE button is shown. Press the MORE softkey to display the next page of the menu.

⁻ When storing to or recalling from floppy disk, once the process is initiated, it cannot be interrupted or aborted. Do not press any keys—simply wait for the process to end before beginning another process.

⁻ During playback of captured images, some vertical shifting may be apparent on successive images.

⁻ The message, "Establishing CAD Module Communication" may appear on the monitor when selecting the CAD softkey too soon after initial power-up. To prevent this from occurring, wait for about 15 seconds after switching power on before pressing the CAD softkey.

⁻ Distorted or blank images may be captured and stored if a Page capture is attempted with a frozen image. Use Page capture with real time images only.

⁻ Images captured using linear scanheads will not be synchronized to the video rate, and may appear distorted or contain blank video frames when replayed.

⁻ Recalling a dual image from a disk created on a system with an earlier software version may cause a line to be displayed over the right image. The line does not obscure the image or prevent normal operation.

⁻ Planimetry measurements and annotations are not stored onto disks along with images.

⁻ Attempting to store one patient's images on another patient's disk that is not write-protected results in the disk becoming unreadable, making it impossible to recall files from it. To prevent this situation, always move the tab on the disk to the write-protect position when you have finished storing data on it.

Service Bulletins Start on the next page

SERVICE BULLETIN

PAGE ___1___ OF __2___

DATE: April 5, 1988	S.B. NO. INFO–53 Rev A
TO: All Field Service Personnel	E.C.N. NO.
AUTHOR: David D. Vega	

UM-4, UM-8, and 4000 Power Plugs

This Service Bulletin supersedes S.B. # Info–53.

PROBLEM: The 'strip length' on the power cord may be too short on some systems. The cables with short conductors allowed the wire to be pushed into the Hospital Grade plug far enough to get the insulator in the way of the screw clamp. A good connection may have been made at the time of assembly and testing, but through stress and/or shrinkage the insulation could pull out of the clamp leaving a loose connection.

EFFECTIVITY: Any system currently in the field could have this problem. No safety hazard is involved but it may cause some system performance malfunctions.

SOLUTION: It is advised that you check the plugs on a next call basis and to include this check as part of a normal service call.

PROCEDURE: 1.   Disassemble the plug and verify that the conductor length is approximately 5/16".

The plug should have a gauge molded into it that you can use as a guide.

2.   Slip a 1/2" piece of yellow heatshrink onto the cable. This will provide an external indication that the cable has been checked.

3.   Reinsert the wires into their appropriate holes. Do not tin the wires.

   a.   The ground lead is green and should go to the green screw.

   b.   The neutral lead will be either blue or white and should go to the nickel colored screw.

   c.   The hot lead will be either black or brown and should go to the copper or brass colored screw.

Tighten the screws securely and visually verify that the insulation is free of the clamps.

4.   Reassemble the plug and tighten the strain relief assembly onto the outer covering of cable.

5.   Position the heatshrink to within ten inches of the now inspected plug and shrink it.

6.   Indicate in the comments section of the FSR that S.B. Info–53 Rev A has been accomplished.

Approximately one foot of yellow heatshrink has been provided with this bulletin. If and when you run out, reorder using ATL P/N 198–12342–02. Be advised that the unit of issue is in inches.

Example – If you want 12" of heatshrink tubing, then order 198–12342–02, quantity 12.

If you determine from your inspection that the plug needs to be replaced. P/Ns are provided below for the two types that ATL uses. Both are Hospital Grade Plugs and can be used but the preferred practice is to replace like for like.

Housing Color	Part Number
Black	3100–0714
Gray	3100–0933

SUGGESTION: Advise your customers and sales personnel that regardless of how tight the strain relief is on the power plug, they are not to pull the plug out of a receptacle by the cable. Always grasp the plug itself when removing it from the wall.

SERVICE BULLETIN

DATE: March 7, 1988
TO: All Field Service Personnel
AUTHOR: Tony Hartford/Barry Bernard

S.B. NO. INFO – 59
E.C.N. NO.

2D/RFI and Doppler Noise Caused by ECG

PROBLEM: System picks up heavy RFI noise when ECG is hooked up and the scanhead is touching the patient. May be intermittent. Manifested in the following display:

2D/RT Wavy concentric rings or "Snake Noise" possibly accompanied by random,   bright white dots.

ECG   Broad, noisy and erratic

DOPPLER Noise bands that cycle from low frequency or velocity to high frequency or velocity and back accompanied by a correlative audio sound.

POSSIBLE CAUSES:
1.   Defective or poor quality ECG pads or electrodes.
2.   Patient cable or leads twisted or routed too close to an RFI generating device.
3.   Loose or dry electrodes.
4.   Electronic failure. Though mentioned here, internal equipment problems will not be addressed in this bulletin.

SOLUTIONS:
1.   Replace with a fresh set of electrodes. If possible, try another type or vendor. Any electrode used should have SILVER/SILVER CHLORIDE.
2.   Reroute the cables for the ECG and the scanhead(s). Try another set of cables.
3.   Check for proper skin preparation and electrode placement.

PROPER PAD AND PATIENT PREPARATION

1.   Use alcohol to break down surface oils. A tincture of Benzoin is recommended in severe cases to aid in electrode adhesion.

2.   Dry the skin well and rub it with a gauze pad to redden the skin (this brings the blood closer to the surface providing a better signal) before applying the electrodes.

3.   Attach the monitor leads to the pad before applying them to the patient.

4.   Ensure that the gel on the pad is moist.

5.   Apply the electrodes to the chosen sites using a circular rubbing motion for good adherence. The pad site should not be over a muscular area nor on the extremities. The recommended sites are just   under each clavicle and the lower left side of the rib cage.

ACKNOWLEDGMENT

Appreciation is expressed to John Pucek of Spacelabs and Warren Barney of ATL for their assistance in the writing of this bulletin.

FOR YOUR INFORMATION

Spacelabs does sell electrodes that we could use under the following part numbers:

Description	Spacelabs P/N
General purpose, foam electrode, pregelled, disposable.	369061–001
Adult, Resting electrode,snap–less with polymer pad	369008–010

To order call 1 (800) 223–6467

FEEDBACK INFORMATION REQUEST

The above problem was first isolated on a UM8 with a package of pads labeled "STRESS TEST V LEAD ELEC-TRODES [small size]" manufactured by Vermont Medical or VER MED. Changing the pads to a different size and manufacturer cleared up the problem. If you run into this problem and clear it by changing the pads, please send TSG* the following information:

1. The manufacturer of both the good and suspect pad.

2. The make up or material of the pad.

3. Any other information that you may feel is pertinent.

4. If possible, a sample of the two pads.

* If International, send the above information to Mike Condon at International Customer Service in Bothell.

WITH ATTACHMENTS: YES ☐ NO ☐
WITH PARTS: YES ☐ NO ☐

SERVICE BULLETIN

PAGE __1__ OF __2__

DATE: October 27,1988
TO: All Field Service Personnel
AUTHOR: Bob Morrisson

S.B. NO.   INFO–67
E.C.N. NO.

Slow PROMs, Potential Cause of Lock-ups

NOTE: *This service bulletin does not address software or firmware compatibility. Use the Replacement Matrix for compatibility issues.*

Manufacturing has informed us that some of the UM-4 and UM-8 PCBs being returned from the field have 8K x 8, 450-nanosecond PROMs installed in them. Manufacturing has also identified these 8K x 8, 450-nanosecond PROMs as the cause of intermittent lock-ups and erratic operation of the UM-4 and UM-8 based systems.

If you are having intermittent or erratic operation of a UM-4 or UM-8, it would be worthwhile to check for 8K x 8, 450-nanosecond PROMs.

On the UM-4, check the manufacturing part numbers of the following PROMs:

LOC	PCB	PCB Part No.	Ref	Programmed PROM P/N
A4 (S1)	Beamformer Controller	7500-0324-XX	U31	All
			U32	All
A4 (S2)	Beamformer Controller	7500-0362-XX	U33	All
			U34	All
A5 (S1)	Pulse Processor	7500-0313-XX	U78	4201-0214-00/01/02
A5 (S2)	Pulse Processor	7500-0370-XX	U70	4201-0285-01/02/03/04/06
A7	Doppler Processor	7500-0347-XX	U39	4201-0238 – All
A7	Doppler Processor	7500-0390-XX	U108	4201-0238 – All
A8 (S1)	Motor Controller	7500-0305-XX	U27	4201-0172 – All
A12	T.M. Mode	7500-0322-XX	U14	4201-0225 – All
A12	T.M. Combination	7500-0411-XX	U48	4201-0225 – All
	Keyboard Ctr	7500-0283-XX	U10	4201-0130 – All
A/V Mod	VCR Interface	7500-0395-XX	U5	4201-0295 – All

On the UM-8 check the manufacturing part numbers of the following PROMs:

LOC	PCB	PCB Part No.	Ref	Programmed PROM P/N
A5	CPU	112-25319-XX	U66	All
A7	Hardcopy PCB	112-25309-03/06	U3	121-26817-00 to 06
A8/A9	Graphics PCB	112-25326-XX	U123	All
A15	VTR Interface	112-25825-13/14/15/16	U37	121-22825-05/07/08/09

You may have to peel back the PROM identification label to see the manufacturer's part number.

Acceptable PROMs:

ATL P/N 2057-0004 EPROM, 200ns, 2764-2, 28 PIN

Mfgr Name	Mfgr Part Number
Advanced Micro Devices	AM2764-2
Intel Corp	2764-2
SEEQ Tech. Inc.	PQ5133-2

ATL P/N 2057-0005 EPROM, 8K X 8, 250ns, 2764, 28 PIN DIP

Mfgr Name	Mfgr Part Number
Advanced Micro Devices	AM2764DC
Intel Corp	D2764

ATL P/N 2057-0009 PROM, UV Erasable, 8K X 8, 250ns, 2764A

Mfgr Name	Mfgr Part Number
Advanced Micro Devices	AM2764ADC
Intel Corp	2764A

Unacceptable PROMs:

ATL P/N 2056-0007 PROM, 2764, 8K x 8, Erasable, 28 PIN

Mfgr Name	Mfgr Part Number
Advanced Micro Devices	AM2764-4DC
Frequency Sources Inc.	MBM27C64-30
Fujitsu	MBM2C64-30Z
Hitachi	HN482764G-4
Intel Corp	2764-4
Texas Instruments, Inc.	TMS2764-45JL

ATL P/N 2057-0007 EPROM, 8K x 8, 450ns, P2764A-4

Mfgr Name	Mfgr Part Number
Advanced Micro Devices	AM2764A-4DC
Intel Corp	D2764A-4P

WITH ATTACHMENTS: YES ☐   NO ☐
WITH PARTS: YES ☐   NO ☐

SERVICE BULLETIN

PAGE ___1___ OF ___1___

DATE: January 25, 1989	S.B. NO. INFO–70
TO: All Field Service Personnel	
AUTHOR: Darrell Jacoway / Bruce Bury	E.C.N. NO.

Field Correctable Monitor Problems

PROBLEM: The following problems have been observed on the Aspect Monitors P/N (2100-0478-XX) used on all Ultramark Products and may be correctable at the field level:

Problem	Cause	Solution
Intensity Flickering or Flashing	A. Loose video connection inside monitor, see Fig. 1 UM-4 only.	A. Ensure good connection.
	B. A loose connection at P2-4, causing high voltage arcing.	B. Ensure good connection.
	C. A loose securement nut over the ferrite core of T4, causing high voltage arcing and a high pitch whine.	C. Tighten nut.
	D. A poor power fuse (F1) fit or dirty fuse holder.	D. Clean fuse holder or reseat.
Horizontal Raster Fluctuations	A. A poor crimp of E-30 or E-36.	A. Recrimp E-30 or E-36.
	B. Excessive dirt build-up on R-27, the horizontal oscillator pot.	B. Free dirt with tweeker supplied in S.B. #92 and use freon spray to clean R-27.

NOTES:

If parts replacement appears necessary, replace the monitor.

Write any defects and any corrective action attempted on the RCA. Help us help you.

Service Bulletin

PAGE 1 OF 2

Date: June 24, 1991	S.B. No.: Info–78 Rev: A
Date: All Field Service Personnel	E.C.N. No.:
To: David D. Vega	

Ultramark 4, 6 and 7 Systems with CAD ECG Adapter Cables

This Service Bulletin supercedes Service Bulletins UM7–01, UM4–101 and Info–78.

PURPOSE: To define ATL ECG adapters for customer-supplied ECG equipment.

PARTS REQUIRED: Refer to the figure below for a general cabling diagram to connect the various ECG instruments to an ULTRAMARK system with CAD. Parts are available ONLY for the following manufacturers: Quinton, Hewlett Packard, Marquette and Cambridge.

Figure Adapter Item Ref. Number	Description	ECG Manufacturer	Mating ATL Part
⚠ 01	UM-4 & UM-7 Adapter	All above-named	3500-0981-
⚠ 01	UM-6 Adapter	All above-named	3500-1090-
⚠@ 01	BNC to BNC Cable	All above-named	2265-0041-
⚠# 01	ECG Adapter	Quinton	3100-1731-
		Hewlett Packard	3100-1733-
01		Marquette	None
required		Cambridge	None
required			

A kit for the UM-6 is also available under the Sales part number 8000-0516-01, consisting of the following:

Adapter, ECG interface   3500-1090-01
BNC cable, male to male   2265-0041-01
Connector, adapter   3100-1731-01
Connector, adapter   3100-1733-01

The above-named ECG manufacturers are the only ones we provide adapters for. In addition, a BNC female to BNC female adapter (P/N 3100-1732-01) is available to connect two BNC cables together.

NOTE: *Cable lengths no greater than 50 feet (using RG-714 thin coax) are recommended.*
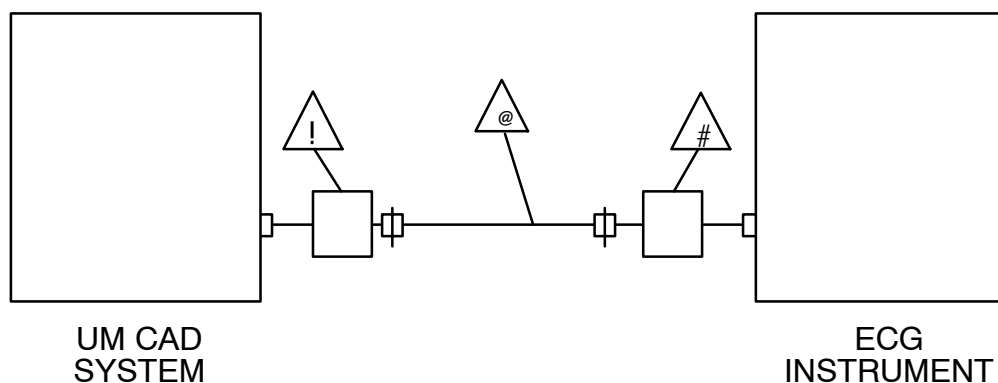
UM CAD
SYSTEM

ECG
INSTRUMENT

ATL

Service Bulletin

Date:	August 16, 1993	S.B. No.: Info–94	Rev: A
To:	All Field Service Personnel	E.C.N. No.:	
Author:	Paul Peterson		

Purpose of Replacement Matrices

This service bulletin supercedes service bulletin Info–94.

EFFECTIVITY: All systems

PROBLEM: CSRs and Support personnel trying to use replacement matrices to resolve compatibility issues.

CAUSE: Confusion over intended use of matrices. Replacement matrices, especially the UM-4, are designed to provide *replacement* parts ordering information based on factory Customer Service spare parts inventory.

SOLUTION:
1. CSRs must follow usage instructions for replacement matrices which are detailed in the Configuration section of each service manual. To resolve a compatibility issue, have a Field Support Specialist or the Product Support Center check the issue in their copy of the appropriate Master Compatibility Matrix.

2. Shop and support personnel should use both replacement matrices, master compatibility matrices (e.g., 9015-0145 for UM-4),and other documentation as necessary to evaluate compatibility issues.

BACKGROUND:

Replacement matrices are not intended to be used as compatibility matrices. Replacement matrices originated as "Configuration Supplements" which summarized the Master Compatibility Matrices for field use when *ordering* parts. For cost-savings when the PCB Shop and Service Operations merged, replacement levels were selected to provide the least number of parts to support all existing systems. PCBs and modules are now reworked to the highest level while maintaining functional equivalency.

Compatibility issues will be minimal if replacements are made per the procedures detailed in the Configuration section of each service manual. Do not arbitrarily order the highest dash level listed because it may not be compatible with the system. Or, if you order the highest dash level and an alternate is shipped by the factory, it may not be compatible. Either condition will result in a callback after reordering correct parts. Even if a "wrong" PCB works in a system, it could place the system in a configuration that will be incompatible with future upgrades.

NOTE: *A number of new PCBs are also being "depopulated" as a cost-reduction measure (circuitry for features no longer offered for sale is being removed). Therefore, pay particular attention to the "FEATURES" columns in replacement matrices when selecting PCBs to ensure correct operation after PCB replacement.*

WITH ATTACHMENTS: YES ☐   NO ■
WITH PARTS: YES ☐   NO ■

Service Bulletin

PAGE 1 OF 4

Date: June 3, 1991	S.B. No.: UM4–60 Rev: D
To: All Field Service Personnel	E.C.N. No.:
Author: Dennis Kracht	

Identification of Human Factors Module and OEMs

This bulletin supersedes UM4-60 Rev C.

There are presently six versions of the Human Factors Modules in the field. This service bulletin will help you identify the correct part number needed when ordering a replacement. Remember that each level is an improvement from the one above it. Also refer of the chart for its compatibility.

4000-0144 (no dash level)
This is the oldest version and can be identified by the aluminum plates with three captive screws that secure it to the OEM module. (See Figure 1, Item 33.) On the no dash level module, the cable length for the monitor and keyboard is short and extender cables are needed so it will mate with the EM. Part numbers for the extenders are:

       MONITOR –   2275-0064
       KEYBOARD – 2251-0004

4000-0144-06
This version is similar to the no dash level module, except that the cables which extend from the monitor and the keyboard are long enough to reach the EM. Extender cables are not needed and the aluminum plates will be replaced with the stronger angle brackets. These bracket part numbers are:

       LEFT SIDE – 1065-0687-01
       RIGHT SIDE –   1065-0686-01

4000-0144-01
This is the first of the Human Factors Modules that will only fit on a new OEM Module (3000-0112-01). It will not fit on the older OEM Module (3000-0112). To assemble this to the newer OEM, blocks are used to attach it instead of the aluminum bars. (See Figure 1, Item 34.) This also uses the shorter cables from the monitor and keyboard which need the extender cables to reach the EM. The Extender cable part numbers are:

MONITOR –   2275-0064
KEYBOARD   2251-0004

4000-0144-02

This version is the same as the 4000-0144-01, except that this will support the Lenzar camera. Holes were drilled in front so that a support bracket can be installed.

4000-0144-03

This version of the Human Factors Module incorporated the longer cables for the monitor and the keyboard to reach the EM. The extender cables are not needed. It still mates to the OEM the same as the 4000-0144-01.

4000-0144-04

In this version of the Human Factors Module, improvements were made to the tilt operation. Also added were rubber bumpers to the assembly to prevent it from squealing.

4000-0144-05

This version changed the mounting process back to that used in the no dash assembly. Stronger angle brackets were used instead of the aluminum bars. These bars are gold in color and are made out of steel. Part numbers are:

LEFT SIDE – 1065-0687-01
RIGHT SIDE –   1065-0686-01

NOTE: *These brackets can be used on the 4000-0144 no dash, in place of the aluminum bars. (See Figure 1, Item 33.)*

4000-0144-07

On this version of the Human Factors Module, the CAD changes were incorporated. These changes consist of holes drilled and tapped for a hand-held CAD controller holder on the right side of the keyboard support.

4000-0144-08

This change added a notch to the monitor swivel platform for screwdriver access. Longer screws were added for better support.

4000-0144-09

This change called for two holes to be drilled on either side arm of the keyboard support. (For holding the CAD hand controller.)

4000-0144-10

This change applied to process/hardware changes that improved the HFM manufacturing process.

OEM MODULES

3000-0112   SMALL CART

This is the first level of OEM Modules and will fit the no dash level Human Factors Modules. This module will support the Photo Module, AV Module, VCR (Panasonic 8420 or Cannon VCR), and Data Comm.

3000-0112-01   SMALL CART

This level OEM Module will fit the 4000-0144-01, which uses the blocks (P/N 1064-0506-01) instead of the aluminum bars. This also supports the same modules listed in 3000-0112.

3000-0112-02   SMALL CART

This OEM Module has the same feature as the 3000-0112-01, except that the bracket that holds the cables from the monitor and the keyboard is deleted. The longer cables are used to reach the EM Module.

3000-0231-01   HUMAN FACTORS CART

This is the newest version of the OEM Modules and is referred to as the Extended OEM Module. The main difference in the module is that the VCR portion is changed to fit a Panasonic 6400. This is a stereo VCR and replaces the Cannon VCR. This OEM will also support the Photo Module, AV Module, Data Comm and CAD Module. This OEM measures approximately 19 inches from front to back with covers. All previous OEM's measured approximately 16 inches.

3000-0249-01   HUMAN FACTORS CART

This is the Universal OEM. It is similar to the Extended OEM except that mounting has been provided for various VCR's in addition to the Panasonic 6400. It measures the same as the Extended OEM but the front aluminum mounting bracket has been eliminated. The part numbers for the new install kits for the VCRs are:

Interface panel	– 8000-0076-09
NV180 VCR – 8000-0076-10	
6400 VCR – 8000-0076-11	
8420 VCR – 8000-0076-14	

If you have any other questions about the Human Factor Modules, please call TSG.

COMPATIBILITY CHART FOR THE HUMAN FACTORS AND OEMs

	HFC CART (LBRKT)	HFC CART (BLOCK)	HFC CART (BLOCK)	EXT. MOD. CART (BLOCK)	UNIV. MOD. CART (LBRKT)
	3000-0112	3000-0112-01	3000-0112-02	3000-0231-01	3000-0249-01
4000-0144	L				
4000-0144-06 *	L				
4000-0144-01		B	B	B	
4000-0144-02		B	B	B	

4000-0144-03 *		B	B	B	
4000-0144-04 *		B	B	B	
4000-0144-05 *	L				L
4000-0144-**07** *	L				L
4000-0144-**08** *	L				L
4000-0144-**09** *	L				L
4000-0144-**10** *	L				L

L = "L" bracket. Defines attachment procedure for the HFC and OEM modules.

B = Blocks

* = Defines the HFC with longer cables for the monitor and the keyboard. This will allow the cables to reach the EM.
      The others require the extension cables

BOLD PRINT = Defines compatibility for CAD hand controller.

Screws for both parts are 8–32 x 7/16, KH Screw (P/N 1517-0093-01).
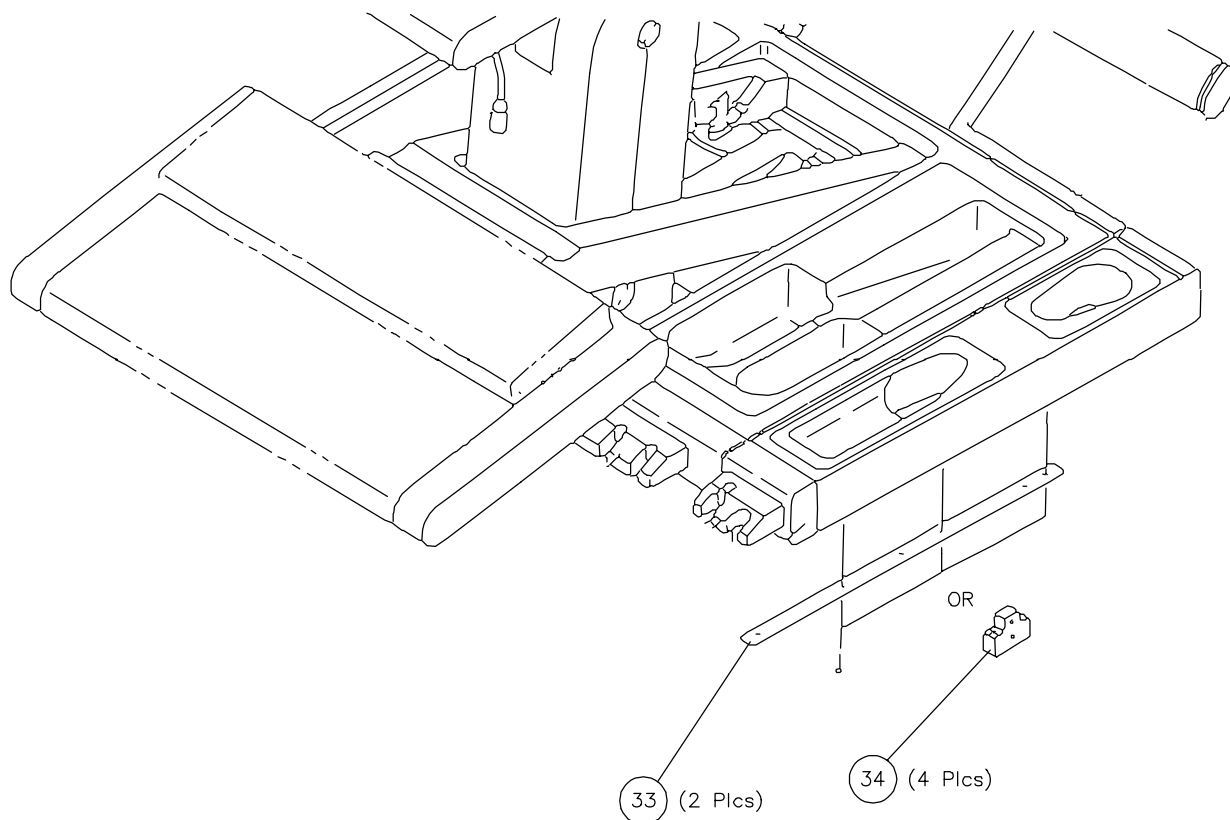
OR

33 (2 Plcs)   34 (4 Plcs)

01 SVCB−047 01

Figure 1

Service Bulletin

Date: November 30, 1987	S.B. No.: UM4–63 Rev:
To: All Domestic Service Personnel	E.C.N. No.: E-1266 AND E-1256
Author: Steve Carter	

UM-4 HFC Tracking and Lenzar Mounting Problems

PROBLEM #1:   The UM-4 HFC with a Lenzar Camera will not track straight when pushed.

CAUSE: When you install a Lenzar Camera, you remove the footswitch tray. This is the support for the front of the rails. With the added weight of the Lenzar on the front , the rails are tilted at angles causing the cart to track to one side.

SOLUTION: Order and install the following:

Qty	Part Number	Description
1	1065-0646-01	Rail Strap
6	1516-0167	6-32 x 1/4" Screw
1	1065-0520-02	Lenzar Tray (see note)

NOTE: *Order only if a drill and 3/16" bit are not available.*

PROCEDURE: Refer to Figures #1 and #2.

1. Remove the camera.
2. Install the rail strap using four 6-32 x 1/4" screws.
3. Mark the two holes from the bottom for the Lenzar tray. Go to step #5 if your ordered a new tray.
4. Remove the tray and drill the holes using a 3/16" bit. Re-mark the part as a -02.
5. Install the tray and the last two screws.
6. Re-install the camera and check functionality.

PROBLEM #2:   Lenzar Camera blocks AA transducer connector on UM-4 systems when an Annular Array upgrade is performed.

EFFECTIVITY: UM-4 systems or Lenzar upgrades shipped prior to 8/17/87.

CAUSE: Incorrect Lenzar Mounting Plate.

SOLUTION: Lenzar installation kit has been changed to move camera one inch to the left.

If you are preparing to do an AA upgrade on a UM-4 with a Lenzar installed prior to 8/17/87 or if an existing system has this problem, order the following parts before going on site.

Item	Part Number
Lower Bezel Bracket	1065-0520-03
Upper Mounting Bracket	1065-0522-02
Lenzar Mounting Bracket	1065-0525-02

RAIL ASSEMBLY

MOUNTING HOLES FOR FOOTSWITCH TRAY (6 Plcs)

MARK HOLE HERE AND AT SAME POSITION
ON THE OTHER END OF RAIL STRAP.

RAIL STRAP

ALIGN THE TWO OFF-SET HOLES OF THE STRAP WITH
THE TWO CENTER HOLES FOR THE FOOTSWITCH TRAY.

FRONT
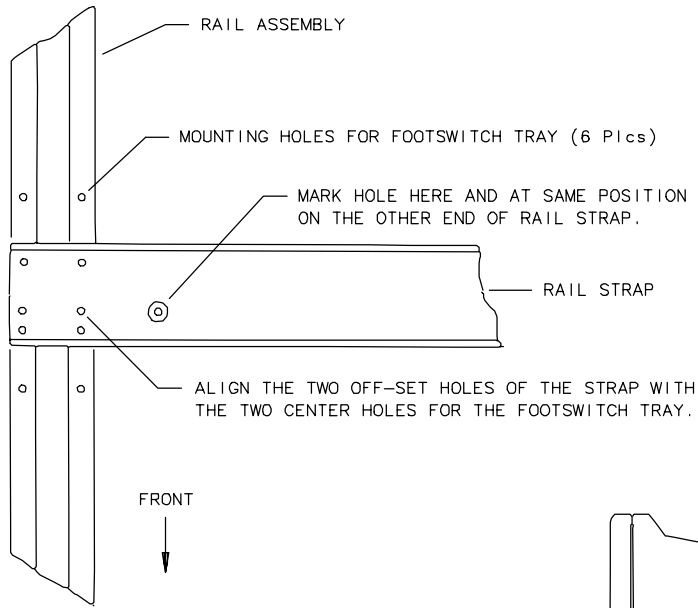
Figure 1. Bottom View of HFC

LENZAR CAMERA

LENZAR TRAY

RAIL STRAP

SCREW (4 Plcs)
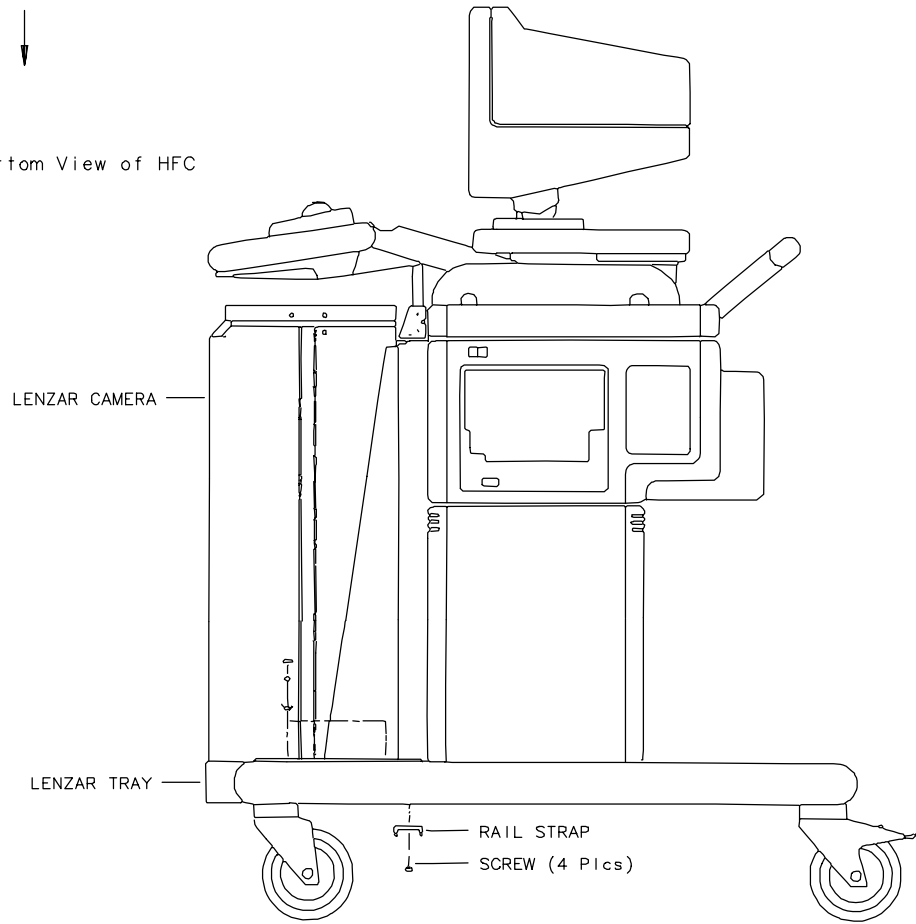
Figure 2. Side View of HFC

01 SVCB-049 01

Service Bulletin

PAGE <u>1</u> OF <u>2</u>

Date: December 18, 1987	S.B. No.: UM4–69 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Phu Nguyen	

Use of the Microphone on the UM-4A, CV and PV with AG-6400 VCR

PROBLEM: This Service Bulletin provides instruction on how to use the microphone input on the UM-4A, CV and PV systems with the AG-6400 VCR.

Audio dubbing can be accomplished by performing the following set up.

1. **VCR switch setting: Refer to illustration for switches location.**
   - Set the HD Audio Input select switch to LINE.
   - The NORM Audio Input Select switch must be toggled from LINE to MIC per the following:
     – Set to LINE for Doppler audio input from the UM-4 system.
     – Set to MIC for audio input from the microphone
   - Set the Audio Selector switch to NORMAL when playing back the audio dubbed onto channel 2 along with audio recorded onto channel 1, such as Doppler audio. When Audio Selector switch is set to HD, only audio recorded (Doppler audio) is played back.

2. **Microphone**
   - If you connect only one microphone to either CH1 or CH2 MIC input jacks of the VCR, you will record on both channels.
   - For audio dubbing, use CH2 MIC input.

SIDE PANEL

CH1   CH2
MICROPHONE
JACKS

AUDIO IN
SELECT

NORM   HD

CAMERA   CAMERA
MIC   MIC
LINE   LINE
            OFF

SET TO LINE

TOGGLE FROM
LINE TO MIC

AUDIO SELECTOR SWITCH

FRONT PANEL

AG-**6400**

HD
NORMAL
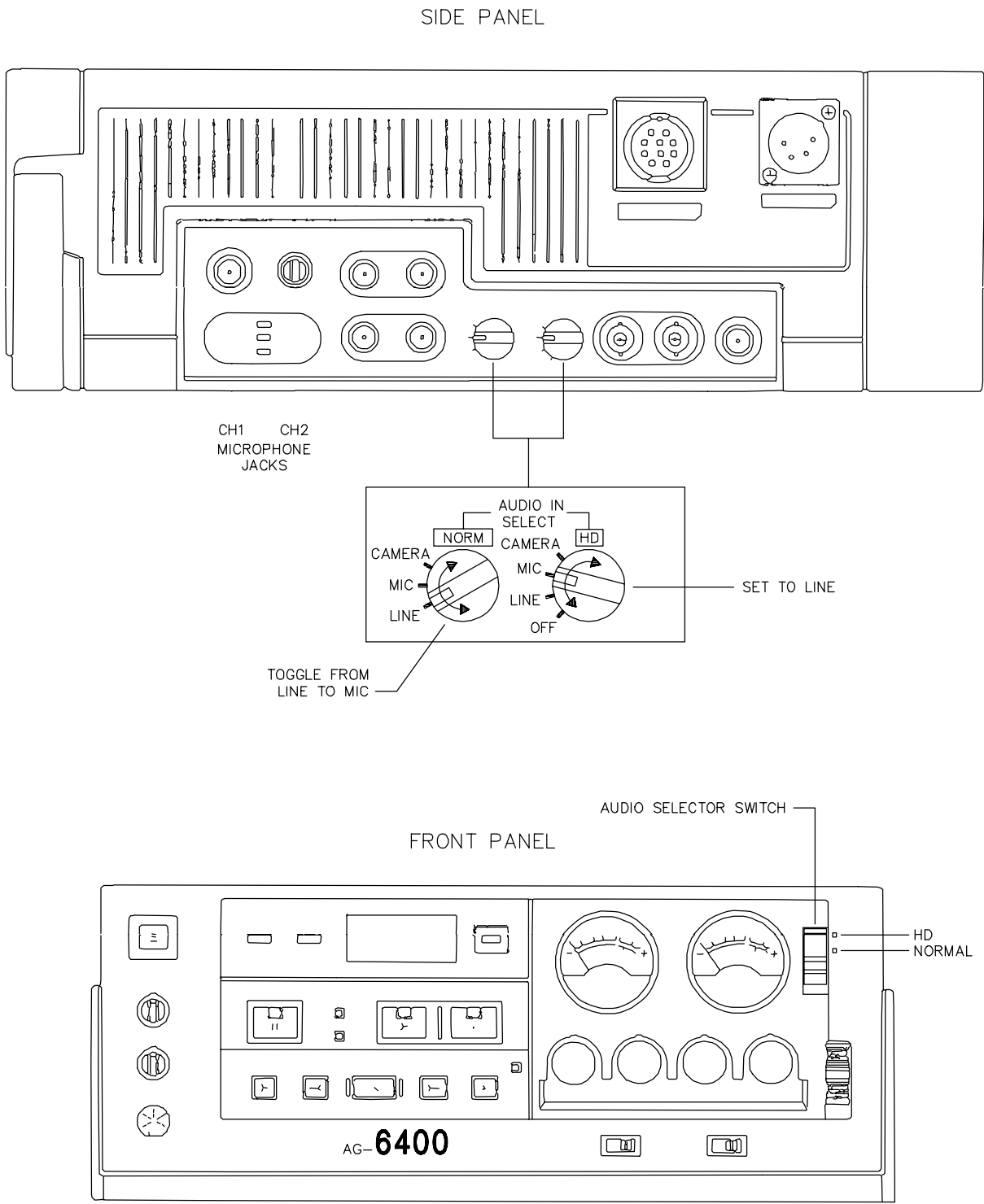
01 SVCB−052 01

Figure 1.

Service Bulletin

PAGE _1_ OF _5_

Date: March 6, 1990	S.B. No.: UM4–91 Rev: A
To: All Field Service Personnel	E.C.N. No.:
Author: Dennis Kracht	

UM-4 Chassis Subassemblies and Their Compatibility

PROBLEM: Confusion in identifying different levels of chassis assemblies.

CAUSE: There are so many different levels of chassis assemblies, it is hard to identify the correct part for each assembly.

SOLUTION: Provide a table that will describe the different levels of chassis and their major components.

NOTE: The following items in bold print are the chassis levels that FG stores will be stocking. This means that you will order the chassis that is closest to the one you want.

For International systems, contct your regional office.

These are the first line of EM's. They are for the S1 systems only. ECO-963

DOMESTIC		**INTERNATIONAL**
3500-0454-00		3500-0454-01
7500-0344	MOTHERBOARD	7500-0344
1064-0244	CARD CAGE	1064-0244
3500-0431	FAN ASSEMBLY	3500-0431
7500-0318	EM REAR PANEL	7500-0318
1700-0002-04	POWER SUPPLY	1700-0002-05

These were the first of the S2 EM's with a system receiver. Notice that the motherboard changed. ECO-1057

3500-0454-02		3500-0454-03
7500-0373	MOTHERBOARD	7500-0373
1064-0244	CARD CAGE	1064-0244
3500-0431	FAN ASSEMBLY	3500-0431
7500-0318	EM REAR PANEL	7500-0318
3500-0581	SYSTEM RECEIVER	3500-0581
1700-0002-04	POWER SUPPLY	1700-0002-05

SOLUTION (Cont'd)

This chassis was rolled because the Power Supply was made to fit COLA requirements (also notice the quiet fans are only on the International system). ECO-1103

3500-0454-11		3500-0454-12
7500-0373-01	MOTHERBOARD	7500-0373-01
1064-0244	CARD CAGE	1064-0244
3500-0431	FAN ASSEMBLY	3500-0614-01
7500-0318	EM REAR PANEL	7500-0318
3500-0581	SYSTEM RECEIVER	3500-0581
1700-0002-09	POWER SUPPLY	1700-0002-10

With this level, the Power Supply was improved for noise reduction. The Receiver was upgraded for noise problem in Doppler (noise bands). ECO-1159

3500-0454-13		3500-0454-14
7500-0373-01	MOTHERBOARD	7500-0373-01
1064-0244	CARD CAGE	1064-0244
3500-0431	FAN ASSEMBLY	3500-0614-01
7500-0318	EM REAR PANEL	7500-0318
3500-0581-01	SYSTEM RECEIVER	3500-0581-01
1700-0002-11	POWER SUPPLY	1700-0002-12

The EM Rear Panel assembly was modified to support extra video out for the (Sony) printer on the UM-4A systems. Also notice that the Power Supply was modified for UL approval. ECO-1196

3500-0454-15		3500-0454-16
7500-0373-01	MOTHERBOARD	7500-0373-01
1064-0244	CARD CAGE	1064-0244
3500-0431	FAN ASSEMBLY	3500-0614-01
7500-0318-02	EM REAR PANEL	7500-0318-01
3500-0581-01	SYSTEM RECEIVER	3500-0581-01
1700-0032-01	POWER SUPPLY	1700-0002-12

This chassis was modified so that dual access connector will fit. The Receiver was modified so the dual access connector cable won't be in the way of the screw that holds the Receiver to the Card Cage. The Motherboard was modified for the dual access compatibility. ECO 4004

3500-0454-17		3500-0454-18
7500-0373-02	MOTHERBOARD	7500-0373-02
1064-0244-01	CARD CAGE	1064-0244-01
3500-0431	FAN ASSEMBLY	3500-0614-01
7500-0318-01	EM REAR PANEL	7500-0318-01
3500-0581-02	SYSTEM RECEIVER	3500-0581-02
1700-0032-01	POWER SUPPLY	1700-0002-12

**SOLUTION
(Cont'd)**

This change incorporates deep abdominal Doppler (DADA). This was done in the System Receiver. ECO-1197

3500-0454-19		3500-0454-20
7500-0373-02	MOTHERBOARD	7500-0373-02
1064-0244-01	CARD CAGE	1064-0244-01
3500-0431	FAN ASSEMBLY	3500-0614-01
7500-0318-01	EM REAR PANEL	7500-0318-01
3500-0581-03	SYSTEM RECEIVER	3500-0581-03
1700-0032-01	POWER SUPPLY	1700-0002-12

The fan board was moved around and changed to improve the speed sensor circuit. The chassis was also strengthened. ECO-1146

3500-0454-21		3500-0454-22
7500-0373-02	MOTHERBOARD	7500-0373-02
1064-0552-01	CARD CAGE	1064-0552-01
3500-0431-01	FAN ASSEMBLY	3500-0614-01
7500-0318-01	EM REAR PANEL	7500-0318-01
3500-0581-03	SYSTEM RECEIVER	3500-0581-03
1700-0032-01	POWER SUPPLY	1700-0002-12

This rev. put the HFLA fix to the Motherboard. ECO-1260

3500-0454-23		3500-0454-24
7500-0373-03	MOTHERBOARD	7500-0373-03
1064-0552-01	CARD CAGE	1064-0552-01
3500-0431-01	FAN ASSEMBLY	3500-0614-01
7500-0318-01	EM REAR PANEL	7500-0318-01
3500-0581-03	SYSTEM RECEIVER	3500-0581-03
1700-0032-01	POWER SUPPLY	1700-0002-12

This chassis has the quiet fan fix for both domestic and International systems. Coax wires were added in the Receiver for noise purposes. ECO-1265

3500-0454-25		3500-0454-26
7500-0373-03	MOTHERBOARD	7500-0373-03
1064-0552-01	CARD CAGE	1064-0552-01
3500-0738-01	FAN ASSEMBLY	3500-0738-01
7500-0318-01	EM REAR PANEL	7500-0318-01
3500-0581-04	SYSTEM RECEIVER	3500-0581-04
1700-0032-01	POWER SUPPLY	1700-0002-12

SOLUTION (Cont'd)

The EM Rear Panel modified to support the high contrast monitor. ECO-1481

3500-0454-27		3500-0454-28
7500-0373-03	MOTHERBOARD	7500-0373-03
1064-0552-01	CARD CAGE	1064-0552-01
3500-0738-01	FAN ASSEMBLY	3500-0738-01
7500-0318-02	EM REAR PANEL	7500-0318-02
3500-0581-04	SYSTEM RECEIVER	3500-0581-04
1700-0032-01	POWER SUPPLY	1700-0002-12

These changes support the CAD system. ECO-1488

3500-0454-29		3500-0454-30
7500-0373-04	MOTHERBOARD	7500-0373-04
1064-0552-01	CARD CAGE	1064-0552-01
3500-0738-01	FAN ASSEMBLY	3500-0738-01
7500-0318-03	EM REAR PANEL	7500-0318-03
3500-0581-04	SYSTEM RECEIVER	3500-0581-04
1700-0032-01	POWER SUPPLY	1700-0032-01

3500-0454-31		3500-0454-32
7500-0373-04	MOTHERBOARD	7500-0373-04
1064-0552-03	CARD CAGE	1064-0552-03
3500-0738-01	FAN ASSEMBLY	3500-0738-01
7500-0318-06	EM REAR PANEL	7500-0318-06
3500-0581-04	SYSTEM RECEIVER	3500-0581-04
1700-0032-01	POWER SUPPLY	1700-0002-12

This will correct Lenzar image problems. ECO-1600A

3500-0454-33		3500-0454-34
7500-0373-04	MOTHERBOARD	7500-0373-04
1064-0552-03	CARD CAGE	1064-0552-03
3500-0738-01	FAN ASSEMBLY	3500-0738-01
7500-0318-06	EM REAR PANEL	7500-0318-06
3500-1016-01	SYSTEM RECEIVER	3500-1016-01
1700-0032-01	POWER SUPPLY	1700-0002-12

This change will introduce the CW Duplex scanhead. The System Receiver has completely changed. ECO-1769

3500-0454-35		3500-0454-36
7500-0373-04	MOTHERBOARD	7500-0373-04
1064-0552-03	CARD CAGE	1064-0552-03
500-0738-02	FAN ASSEMBLY	3500-0738-02
7500-0318-10	EM REAR PANEL	7500-0318-10
3500-1016-01	SYSTEM RECEIVER	3500-1016-01
1700-0032-01	POWER SUPPLY	1700-0002-12

A binding post was added for a better ground. Also, the EM Rear Panel was relayed out to incorporate all the changes. ECO-1897

SOLUTION **(Cont'd)**	Remember that TSG approval is required to order the following parts: 3500-0454-XX Chassis Assembly 7500-0344-XX Motherboard 7500-0373-XX Motherboard 1064-0244-XX Card Cage 1064-0552-XX Card Cage If there are any other questions about the compatibility of UM-4 chassis, please call TSG.

TROUBLESHOOTING HINTS:

Here are some situations that you might find.

If you experience problems with the Motherboard, you might see:

1. Battery charge circuit is not working
2. Batteries won't hold a charge
2. Battery holders broken
3. Intermittent signal lines

If you experience problems with the Card Cage, you might see:

1. That it is cracked
2. Rail bolts pulled out
3. A mobile account system

If you experience problems with the Fan Assembly is bad, you might see:

1. Fan Board won't run the fans
2. One fan won't run at the right speed
3. Footswitch cable is intermittent

If you experience problems with the Rear Panel, you might see:

1. Video going to all OEM devices is bad (Video Amp)
2. Video return from VCR missing (pushed in RF Connector or open coax)
3. Controls to the OEMs are shorted

If you experience problems with the Receiver, you might see:

1. Streaks or spikes in the Access or EFT image
2. Noise in the Doppler signal
3. 5 volt power line pulled down
4. No TGC control

If you experience problems with the Power Supply, you might see:

1. No power to system
2. No 70 volts for linear
3. Noisy linear
4. Loose bolts on the 5 volt bars causing Power Supply to over heat and shut down

SERVICE BULLETIN

PAGE ___1___ OF ___2___

DATE: November 28, 1988	S.B. NO. UM4–96
TO: All Field Service Personnel	E.C.N. NO.
AUTHOR: Steve Moen/Robert Lundquist	

UM-4 EFT Panel Failures

PART: EFT Panel Assembly, 3500-0445-06/07

PROBLEM: Above average failure rate on noted part. No EFT Scanhead echo returns. No EFT Scanhead rotation.

CAUSE: The failure usually occurs in one of three areas.

1. Broken coax cable at the RF connector which plugs into the Motor Controller PCB (typically the threaded connector). (See Figure A.)

2. Broken coax cable at the RF connector which plugs into the Receiver module.

3. Defective EFT connector, typically a workmanship problem on the white jumper block.

   1. and 2.

   Some EFT Panel Assemblies missed a step in the assembly phase. The mini RF connectors were not crimped around the coax cable.

   A close inspection of those crimped is also needed. Some cable assemblies use RF connectors which are too large for the type of coax cable used, therefore, when they are crimped, they don't make contact with the cable (see detail A).

   Problem has been corrected in Manufacturing, Systems floor has been purged.

   NOTE: *This connector sleeve, when crimped properly and of the correct size, is what provides the strain relief for the cable.*

   3.

   Under investigation (lease significant of three problems).

SOLUTION: Replace assembly with the appropriate revision. Return old assembly for evaluation/repair, per normal procedures, like any class A part.

   NOTE: *Recommend replacement of any connector assembly which has one or more connectors not crimped.*

CHECK HERE FOR CRIMP ON SLEEVE

RF CONNECTOR SLEEVE

COAX CABLE
(SOME CONNECTORS ARE TOO LARGE
AS SHOWN HERE, AND EVEN WHEN
THESE ARE CRIMPED IT IS INEFFECTIVE.)

— DETAIL A —
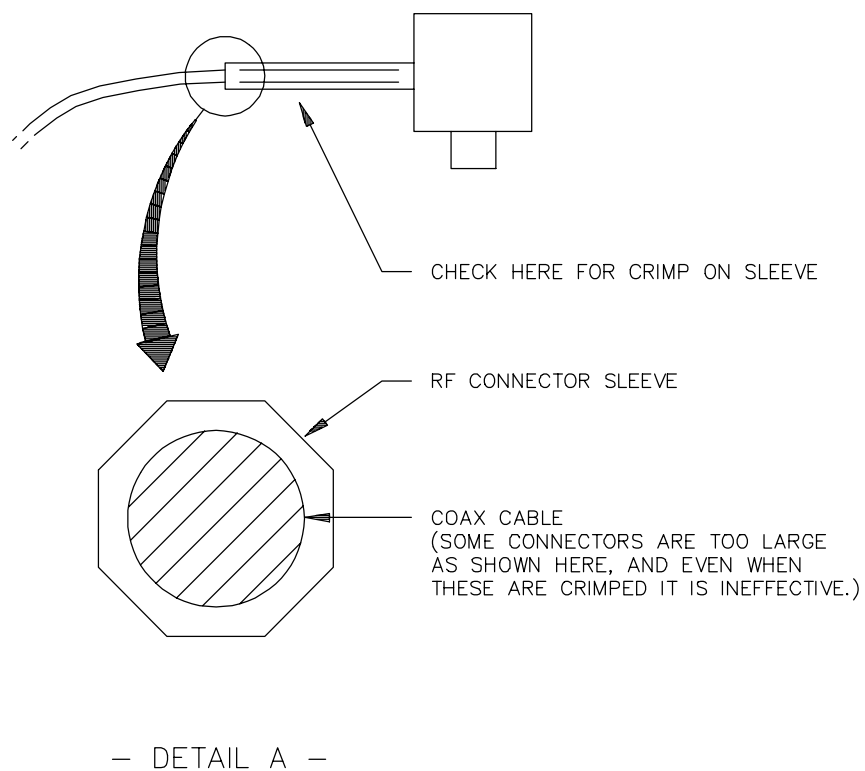
01 SVCB–048 01

Figure 1

WITH ATTACHMENTS: YES ■ NO □
WITH PARTS: YES □ NO ■

SERVICE BULLETIN

PAGE __1__ OF __2__

DATE: January 16, 1989
TO: All Field Service Personnel
AUTHOR: Tony Bills

S.B. NO.   UM4–98
E.C.N. NO.

Rear Mount of UM-4 Utility Tray

PROBLEM: Unhappy UM-4/Lenzar Customers

CAUSE: Lenzar systems cannot have the utility tray mounted on the front of the system. Many customers find the lack of the utility tray unacceptable.

SOLUTION: This Service Bulletin provides templates for drilling holes in the EM Rear Bezel so that the utility tray can be mounted at the rear of the EM.

NOTE: Order the following parts ONLY if your customer specifically complains about the lack of a storage tray. Do not initiate this order on your own. The purpose of this bulletin is to provide a solution for dissatisfied customers; not to generate parts orders. These items will be expensed.

ALL ORDERS MUST BE APPROVED BY YOUR AREA MANAGER.

PARTS: Order the following parts: (In a Lenzar upgrade situation, the Storage Tray will already be on site. Use this tray instead of ordering a new one.)

PART NUMBER	DESCRIPTION	QTY
1064-0369-01	Mtg Brackets for Front Storage Bin	2
1516-0005	Phillips Screws #6	4
1560-0017	Washer, #6	4
1066-0176-01	Storage (Utility) Tray	1

SPECIAL EQUIPMENT: Drill with 9/64" bit

INSTRUCTIONS:

1. Remove the Rear Bezel of the UM-4 EM (retain hardware).

2. Carefully cut the drill templates from the attached sheet.

3. Apply the drill templates as shown in the figure on the following page. They fit between the support ribs on the inside of the EM Rear Bezel. Note from the templates that they should be LEFT and TOP JUSTIFIED.

4. Using a punch or nail, punch locating holes in the inside of the Rear Bezel as indicated on the templates.

5. Drill a total of four 9/64" holes in the Rear Bezel.

6. Secure the Utility Tray Brackets (Qty 2, 1064-0369-01) to the Rear EM Bezel with the phillips screws (Qty 4, 1516-0005) and washers (Qty 4, 1560-0017).

7. Reinstall the Rear EM Bezel

8. Install the Storage (Utility) Tray on the EM rear Panel.

TOP

LEFT

PLACE
LARGE TEMPLATE
HERE

LEFT

PLACE
SMALL
TEMPLATE
HERE

BOTTOM
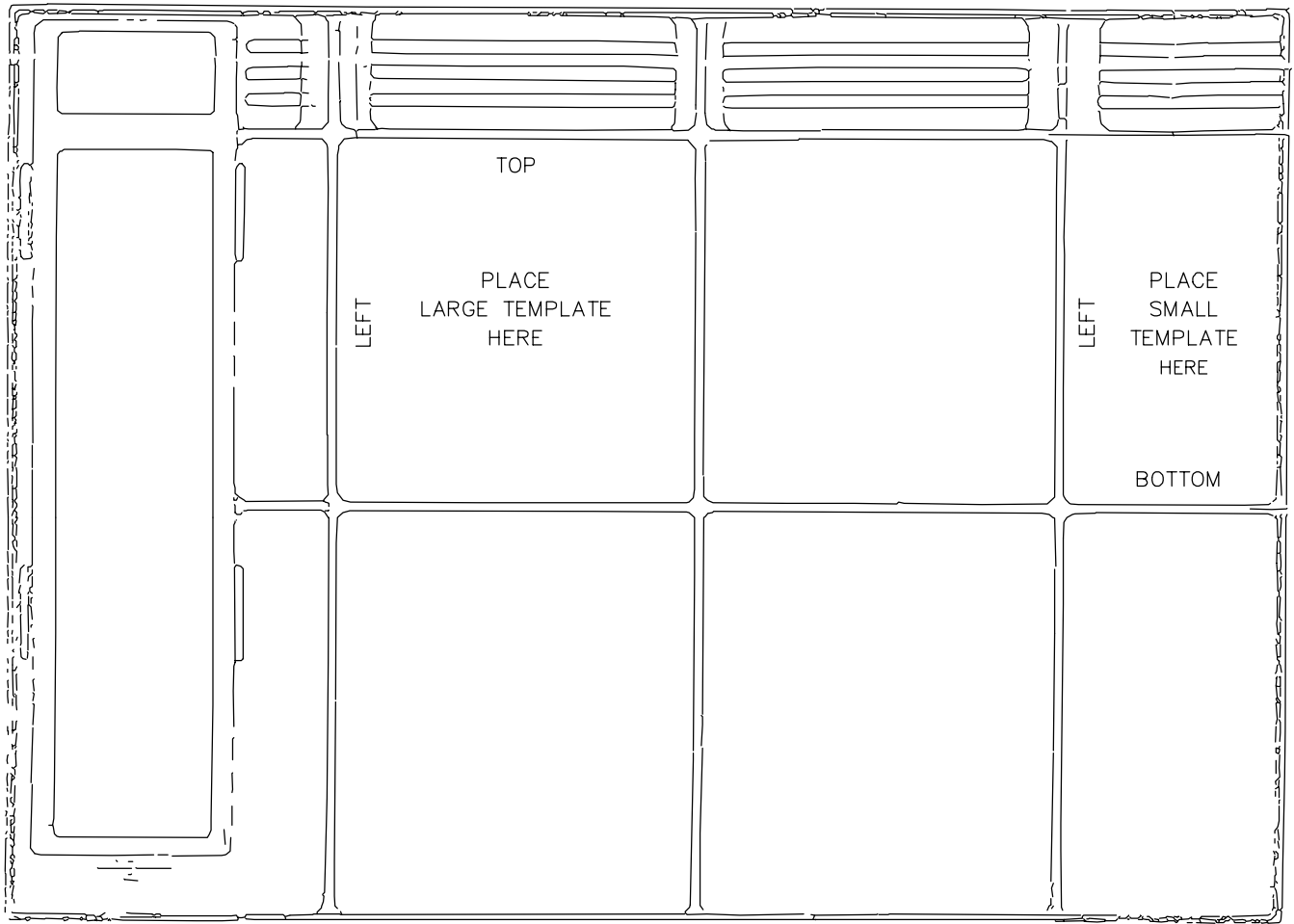
01 SVCB–050 01

INSIDE EM REAR BEZEL

CUT-OUT

BEZEL DRILL TEMPLATE

TOP JUSTIFY

DRILL HOLES (2)
9/64 IN. (1.40)

LEFT JUSTIFY

CUT-OUT

DRILL HOLES (2)
9/64 IN. (1.40)

BOTTOM JUSTIFY

LEFT JUSTIFY

BEZEL DRILL TEMPLATE
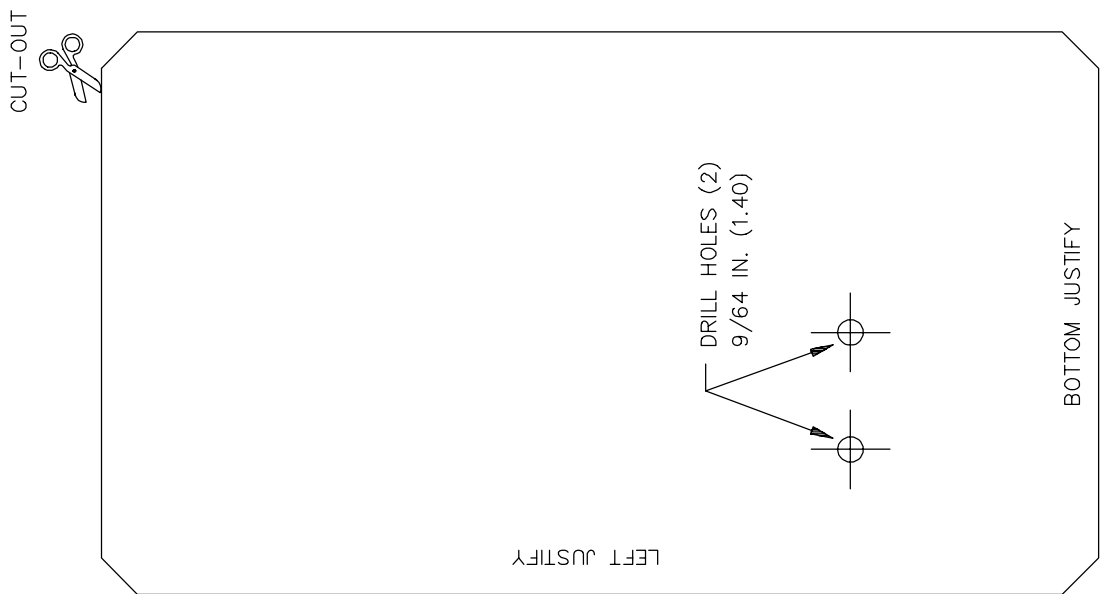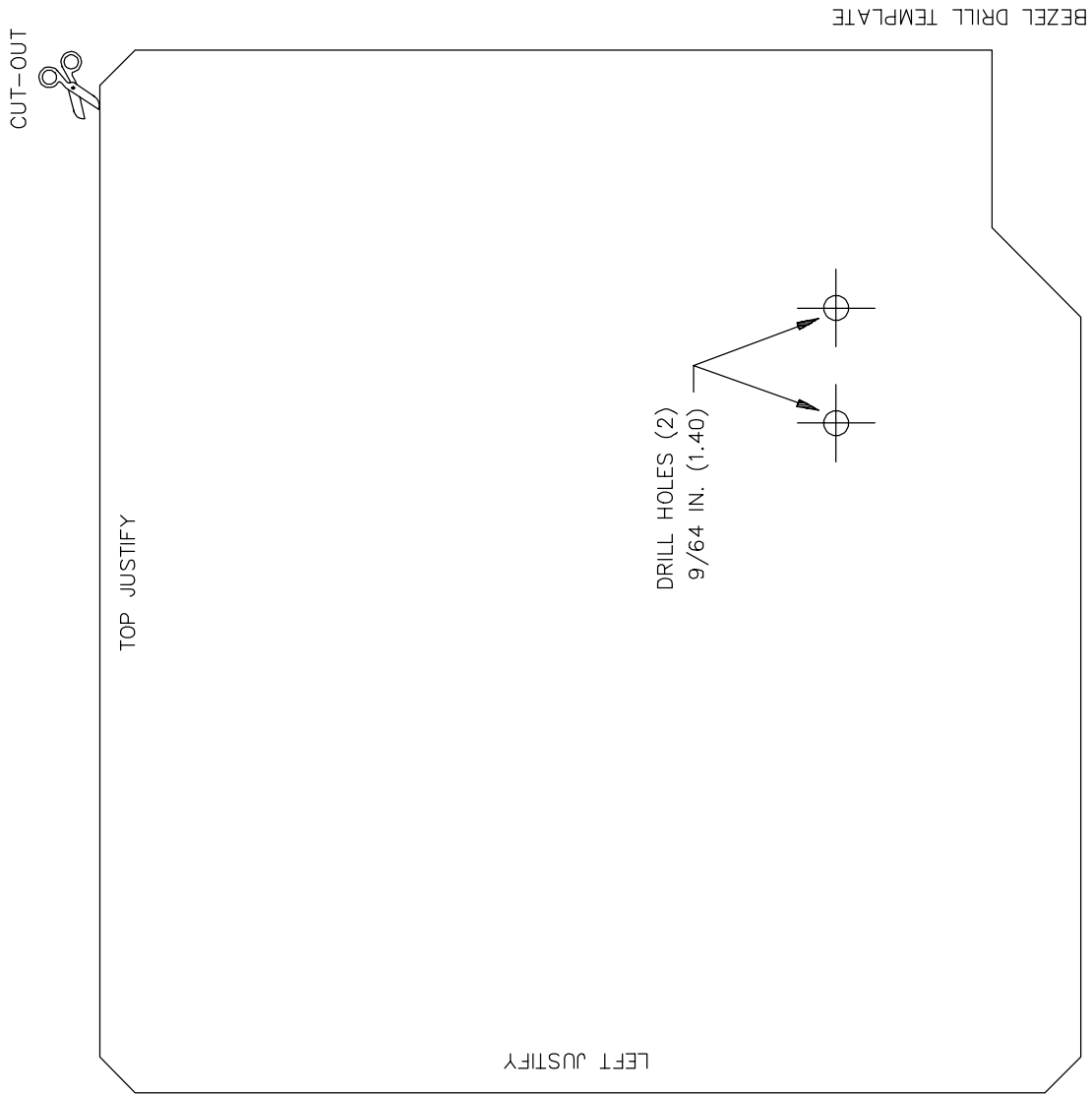
01 SVCB-051 01

Service Bulletin

Date: January 9, 1991	S.B. No.: UM4–100 Rev: A
To: All Domestic Field Service Personnel	E.C.N. No.:
Author: David D. Vega	

Electronics Module (EM) Part Numbers for UM-4 Based Systems

This service bulletin supercedes S.B. UM4–100.

INTRODUCTION: This Service Bulletin will help you determine which EM part numbers to order for the different system types and configurations available. For more information, refer to the Product Configuration Matrix code and Service Bulletin UM4–117 or call the Technical Support Group for assistance in determining the correct type and configuration of the system.

Once the type and configuration of the system has been determined, refer to the corresponding section of this bulletin:

Section 1 – UM-4PLUS and UM-4APLUS (aka UM-4AFF)
Section 2 – UM-4S2 and UM-4A, CV, PV, and NR-UM-4
Section 3 – UM-4S1

NOTES:

1. UM-4AFF denotes a full-feature UM-4A. This type of UM-4A can have all the features of an HFC UM-4 minus the HFC. The UM-4A is sometimes called the "small cart".

2. NR-UM-4 is a stand-alone configuration used with Northgate Research lithotripsy equipment. This UM–4 is no longer being manufactured.

3. A stand-alone system can have all the hardware and software features (except for Doppler) of a UM-4S2 system, minus the cart (caster/rail assembly, Original Equipment Manufacturer products module [OEM module], and the HFC module).

4. A system is considered to be Sector/Linear based on the fact that the Access connector and/or the EFT/IVT connector AND the linear connector are present; not by whether or not the customer has a linear scanhead.

SECTION 1:
PLUS SYSTEMS

To order an EM, the core part number as well as the feature part numbers must be listed on the order. There should be a total of two part numbers for linear-only systems without Frame Grabber; three part numbers of linear-only systems with Frame Grabber; four part numbers of sector/linear systems without Frame Grabber or five part numbers for sector/linear systems with Frame Grabber (see Example A).

These part numbers determine the EM hardware configuration ONLY. The software level must be referenced in the comment section of the order. Also note in the comment section whether the system is a UM-4PLUS or a UM-4APLUS.

NOTE: *The part numbers below have an 8500- prefix.*

GRP #	Description (Feature)	System Type/Part Number	
	Core EM, 120V, 60 Hz	1001-02 CW Duplex	
1	Core EM, 120V, 60 Hz	1060-01 Dual Linear	
	Core EM, 120V, 60 Hz	1001-06 Linear Only	
		UM-4	UM-4A
	Sector w/CW Dup	1005-02	1005-02
2	Sector/Linear	1014-03	1014-03
	S/L w/CW Duplex	1014-04	1014-04
	Sector w/Dual Lin	1059-01	1059-01
	Single Acc w/EFT	1029-03	1029-03
3	Sin. Acc W/EFT/Dop	1029-11	1029-11
	Dual Acc w/EFT	1029-07	1029-07
	Dual Acc w/EFT & Dop	1029-13	1029-13
	ECG/M-mode	1013-02	1013-02
4	M-mode only	1013-01	1026-01
	w/o M-mode/ECG	1013-03	1013-03
5	w/Frame Grabber	1039-01	1039-01

NOTE: If the system is Linear only, no selections need to be made from GRP 2 or GRP 3.

EXAMPLE A

The customer has a UM-4PLUS HFC system at 28.XX software. It has Dual Access, EFT, Dual Linear, Doppler and Frame Grabber. Looking at the chart, the CSR needs to order the following:

1. 8500-1060-01 (Core EM, Dual Linear)
2. 8500-1059-01 (Sector w/Dual Linear)
3. 8500-1029-13 (Dual Acc. with EFT and Doppler)
4. 8500-1013-03 (w/o ECG and M-mode)
5. 8500-1039-01 (w/Frame Grabber)
6. Reference the system type and software level in the comments section of the order.

SECTION 2:
S2 SYSTEMS

To order an EM, the core part number as well as the feature part numbers must be listed on the order. For UM-4 and NR-UM-4, there should be a total of four part numbers for systems without Frame Grabber or five part numbers for systems with Frame Grabber. For UM-4A and UM-4CV, there should be a total of four part numbers. For UM-4PV, there should be a total of two part numbers (see Example B).

These part numbers determine the EM hardware configuration ONLY. The software level must be referenced in the comment section of the order. Also note in the comment section that the system is S2 and whether it is a UM-4A, CV, PV or NR-UM-4 (Northgate Research UM-4 [see page 1 for a description of a Northgate Research UM-4]).

NOTE: The part numbers below have an 8500- prefix.

GRP #	Description (Feature)	System Type/Part Number				
1	Core EM, 120V, 60 Hz	1001-01 (all S2 systems)				
		UM-4	UM-4A	UM-4CV	UM-4PV	NR-UM4
	Sector only	1005-01	1005-01	1005-01	1038-01	1005-01
	Linear only	1006-01	1006-01	N/A	N/A	1006-01
2	Sector/Linear	1014-01	1014-01	1014-01	1038-02	1014-01
	Sector/Annular	1015-01	N/A	N/A	N/A	1015-01
	Sector/Linear/AA	1016-01	N/A	N/A	N/A	1016-01
	w/o Acc/EFT/Dop	1029-01	1029-01	N/A	N/A	1029-01
	Single Acc w/Dop	1029-04	N/A	1029-04	N/A	N/A
	Single Acc w/EFT	1029-03	1029-03	N/A	N/A	1029-03
	Single Acc w/EFT/Dop	1029-05	N/A	N/A	N/A	N/A
3	Single Acc only	1029-02	1029-02	1029-02	N/A	1029-02
	Dual Acc only	1029-06	N/A	N/A	N/A	1029-06
	Dual Acc w/EFT	1029-07	N/A	N/A	N/A	1029-07
	Dual Acc w/Dop	1029-08	N/A	N/A	N/A	N/A
	Dual Acc/EFT/Dop	1029-09	N/A	N/A	N/A	N/A
	ECG/M-mode	1013-02	N/A	1013-02	N/A	1013-02
4	M-mode only	1013-01	1026-01	N/A	N/A	1013-01
	w/o M-mode/ECG	1013-03	1026-02	N/A	N/A	1013-03
5	w/Frame Grabber	1039-01	N/A	N/A	N/A	1039-01

EXAMPLE B

The customer has an S2 UM-4 system at 17.XX software. It has Single Access, EFT, Linear, M-mode, ECG, and Doppler. Looking at the chart, the CSR needs to order the following:

1. 8500-1001-01 (Core EM)
2. 8500-1014-01 (Sector/Linear)
3. 8500-1029-05 (Sin. Acc. with EFT and Doppler)
4. 8500-1013-02 (ECG and M-mode)
5. Reference the exact level of 17.XX in the comment section of the order.
6. Reference system type in comment section of the order.

Since the customer does not have the Frame Grabber option, the above four part numbers are all that need to be ordered.

SECTION 3:
S1 SYSTEMS

To order an EM, the core part number as well as the feature part numbers must be listed on the order. There should be a total of three part numbers for systems with M-mode or four part numbers for systems without M-mode (see Example C).

The three or four part numbers determine the EM hardware configuration ONLY. The software level must be referenced in the comment section of the order. Also note in the comment section that it is an S1 system.

The following chart lists the part numbers for S1 systems.

GRP #	Description (Feature)	Part Number
1	Core EM, 120V, 60 Hz	8500-1001
2	Linear only	8500-1006
	Sector/Linear	8500-1014
3	w/EFT	8500-1004-00
	w/o EFT	8500-1004-01
4	w/o M-mode/ECG	8500-1013-03

EXAMPLE C

The customer has an S1 UM-4 system at 6.XX software. They have an Access scanhead, but no Linear scanhead. They also have IVT, but no ECG and M-mode. The part numbers that need to be ordered are as follows:

1. 8500-1001 (Core EM)
2. 8500-1014 (Sector/Linear)*
3. 8500-1004-00 (EFT/IVT)
4. 8500-1013-03 (w/o M-mode/ECG)
5. Reference the exact level of 6.XX in the comments section of the order.

Even though they don't have a Linear scanhead, the Sector/Linear part number is ordered because there is no part number for Sector only.

Service Bulletin

Date: July 5, 1990	S.B. No.: UM4–116 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Tony Bills	

International Pixel Drop-out When in F2, F3, or F4 Smoothing on UM-4 and UM-6 Systems

PROBLEM: On International (240V, CCIR) UM-4 and UM-5 systems when SMOOTHING is set to F2, F3, or F4, pixel drop-out is observed. The potential for this problem exists on Domestic versions as well but has not been seen.

CAUSE: A timing error in the Frame Averager on the 2-D SC Interface PCB (A9).

SOLUTION: Rework to the 2-D SC Interface PCB.

PART NUMBERS: The following are the current dash versions of this PCB:

7500-0273-

	Current Rev Fab				Previous Rev Fab	
	Domestic/International				Domestic/International	
UM-4	14	15		UM-4	10	11
UM-5	20	21		UM-5	16	17

These have changed to the following dashes respectively:

	Domestic/International				Domestic/International	
UM-4	22	23		UM-4	60	61
UM-5	24	25		UM-5	62	63

STRATEGY: *International:* This defect has been a major problem in International systems only. International systems should be updated. The method of this upgrade will be on a next call basis. There will be no format upgrade program. International PCBs may be upgraded in the field using the following kits:

For 7500-0273-14, 15 – Use 6220-0095-01 Field Mod Scan Converter, UM-4

For 7500-0273-16, 17 – Use 6220-0095-03 Field Mod Scan Converter, UM-5

For 7500-0273-20, 21 – Use 6220-0095-02 Field Mod Scan Converter, UM-5

For 7500-0273-10, 11 – Use 6220-0095-04 Field Mod Scan Converter, UM-4

STRATEGY:
(Cont'd)

International Dealers should order required kit quantities from Solingen, West Germany Service. International Affiliates should order required kit quantities from Bothell, WA, USA, Service Operations.

Domestic: This defect has not been a problem domestically. However, PCBs will be updated in the factory. Systems will be updated as 2-D SC Interface PCBs are replaced for failure and not on a next call basis.

Service Bulletin

Date: February 25, 1994	S.B. No.: UM4–118 Rev: C
To: All Field Service Personnel	C.O. No.:
Author: Laurence J. Simanek	

UM-4A Power Distribution Assembly Part Numbers 3500-1094/1095/1096

Domestic	3500-1094-01, 02, 03		120V/100V
International	3500-1095-01, 02	220V/240V	
	3500-1096-01, 02, 03		240V in/120V out

This bulletin supersedes Service Bulletin UM4–118, UM4–118 Rev A and UM4–118 Rev B.

PROBLEM: In the AC input receptacle of the Power Distribution Assembly (UM-4A only), the fuses may repeatedly blow and/or the fuse holder may show signs of melting. Refer to Figure 1.

SCOPE: UM-4A only

EFFECTIVITY: Immediate

CAUSE: Surge current causes breakdown of the metal inside the fuse holder. This may be aggravated by incomplete installation of the fuse carrier into the fuse holder. In time, the breakdown of the metal causes oxidation to form, which increases resistance and makes the assembly more sensitive to surge currents. Eventually, the fuse holder will fail.

SOLUTION: Installation of a new Power Distribution Assembly on the next call or next PM.

MATERIAL:

ITEM	DESCRIPTION	ATL PART NUMBER	QTY
1	Power Distribution Assembly		
	(240V in/240V or 120V out)	3500-1463-01	1
	(100V/120V)	3500-1468-01	1
	(220V/240V)	3500-1469-01	1
2	Rear Panel	1065-1689-02	1
3	Label	4100-0719-02 (Domestic)	1
		4100-0894-01 (Int'l)	
4	Foam Tape (Qty in inches)	2210-0135	18
in			

PROCEDURE: 6. Turn off power.

7. Remove Rear Panel (Item 2 in Figure 2).

8. Inspect the Power Distribution Assembly

- If fuses continue to blow or there is evidence of melting or overheating, replace the Power Distribution Panel with appropriate replacement in the table above. Continue with step 4.

- If the Power Distribution Assembly is either a 3500-1094-04, 3500-1095-03, or 3500-1096-04 or if the Power Distribution Assembly is a 3500-1463, 3500-1468, or 3500-1469, no further action is required and the system can be reassembled.

9. Remove Power Distribution Assembly.

10. Install replacement Power Distribution Assembly (Item 1 in Figure 1).

11. Attach Item 3 and Item 4 to replacement rear panel (Item 2 in Figure 2).

12. Install Rear Panel.

13. Power up system.

14. Complete service documentation indicating parts replaced.

15. Return material to ATL for disposition.
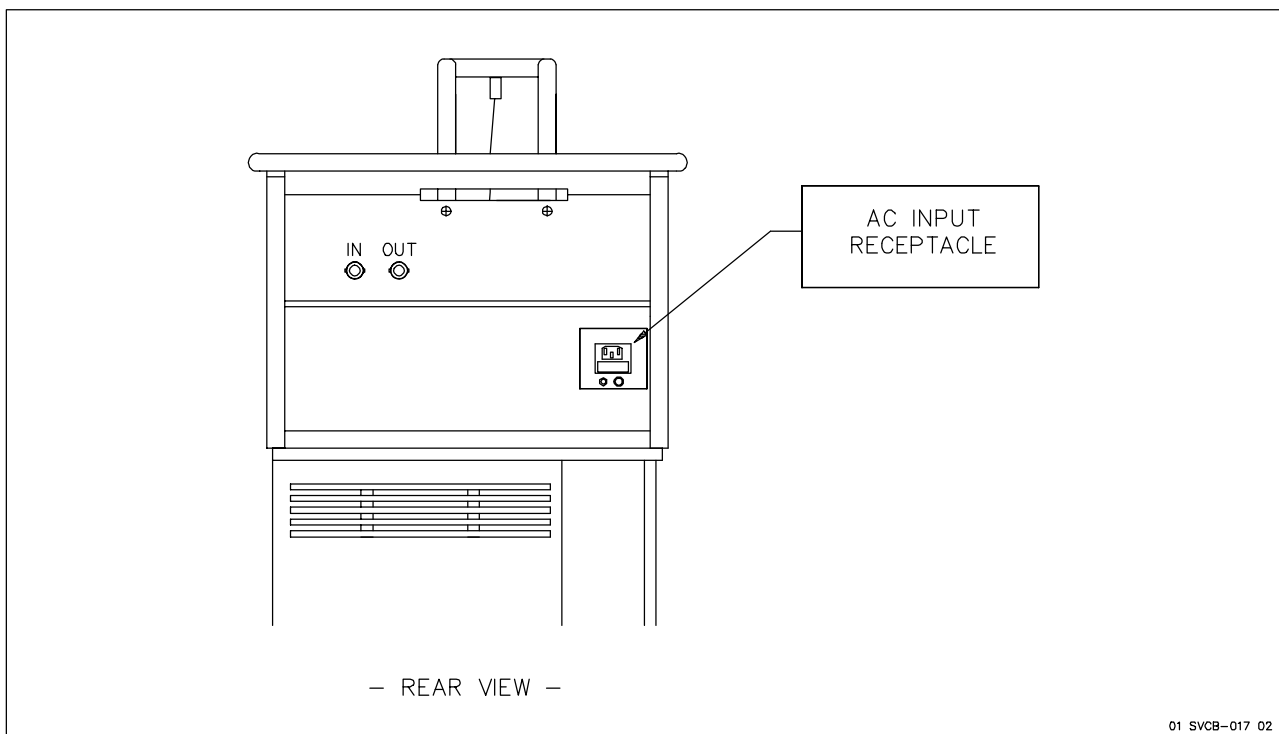
Figure 1.
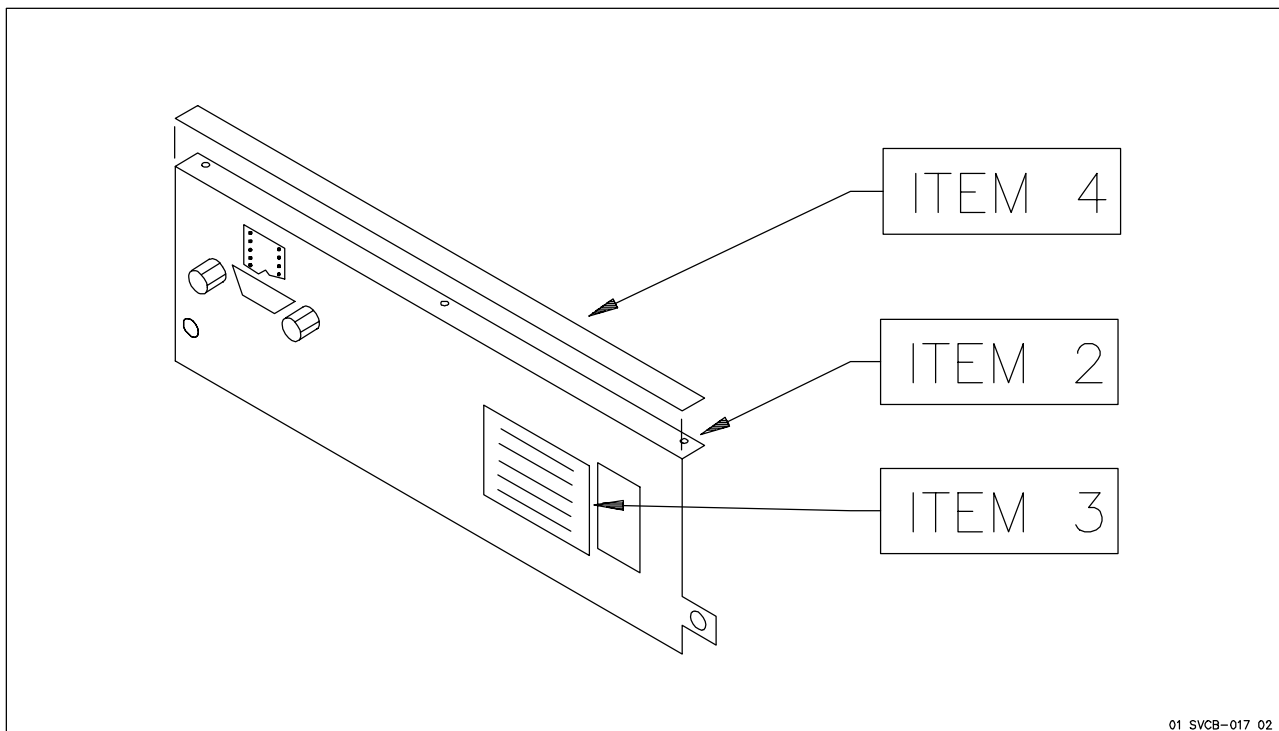
Figure 2.

Service Bulletin

PAGE <u>1</u> OF <u>1</u>

Date: September 5, 1991	S.B. No.: UM4–119 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Dennis Kracht	

Intermittent VCR Counter Reset (UM-4/5 Systems)

PROBLEM: Intermittently during system operation, the VCR counter will reset to "0000." The counter located at the bottom of the monitor will also read "0000." This may happen in any modality.

CAUSE: There are two different key stroke sequences which will cause the counter to reset. these key stroke sequences are:

"sfunc" "ctrl–x" – normally used to reset the VCR counter.

"sfunc" "clear Line" (on the keyboard there is a key labeled "clear Line") – This can be easily done if the customer is annotating on the screen and then clearing that annotation.

SOLUTION: Engineering is presently investigating why "sfunc" "clear line" is mimicking "sfunc" "ctrl–x". No solution is available at this time.

Advise your customer of the potential hazard and inform me of any site experiencing the problem. I Will Need The Key Sequence The Customer Used And Any Other Information That Can Be Acquired.

Service Bulletin

Date: April 3, 1992	S.B. No.: UM4–120 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Bach–Tuyet Thi Nguyen	

UM-4 VCR Tape Counter

PROBLEM: Some customers may complain that the UM-4 VCR tape counter and/or on-screen counter resets to zero after the system is turned off.

CAUSE: When power is applied, the VCR generates a reset signal to reset its own tape counter to zero. This reset signal is also sent to the A/V module and the system control bus, which causes the on-screen counter to reset to zero.

EFFECTIVITY: All UM-4 HFC systems with portable VCRs except the NV-8420.

SOLUTION: Recommend the customer work-around the problem as follows:

1. Recommend that your customer use the E/M ON/OFF switch (this switch is located on the front of the E/M). Do not use the system ON/OFF switch located on the right side of the HFC system. When you turn off the E/M switch, the power is still provided to the system OEM module (which includes the VCR) as long as the system is plugged into the wall outlet.

2. Do not unplug the system power cord from the wall outlet.

NOTE: *Some systems may have the new E/M front cover (PN 1064–0243). This new front cover has the E/M switch blocked off. The older style E/M front cover has an access slot for the switch. You may order P/N 1064-0233-01 to replace the new style as needed.*

WITH ATTACHMENTS: YES ☐   NO ■
WITH PARTS: YES ☐   NO ■

Service Bulletin

Date: April 3, 1992	S.B. No.: UM4–121 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Noel Joseph	

UM-4/UM-5 Dual Access Compatibility Issue

PROBLEM: After replacing a dual access panel, the UM-4 or UM-5 system will not ID access scanheads.

CAUSE: A wiring change was made to the access cables to accommodate design changes to all access scanheads.

SOLUTION: Check the part number of the dual access panel. For part number 3500-0683-09 TO 12 panels, use cable number 3500-0674-02. This cable connects the access select relay PCB to the system motherboard.

> **NOTE:** *If you have a 3500-0674-01 cable, the conversion to a -02 can be done in the field.*

EFFECTIVITY: Holding the connector with the wires to the left, count up to pin 11 (solid white wire). Extract the wire from the connector and continue to pin 18 (white and yellow striped wire). Extract the wire from the connector, move the white and yellow wire to pin 11 and the white wire to pin 18. Swap the wires on one side of the cable only. Mark the cable 3500-0674-02.


```
24

                                          18 WHITE/YELLOW

                                          11 WHITE

NOTE:  REVERSE WIRES FOR -02 ASSEMBLY.
                                  1
                                          01 SVCB-035 01
```
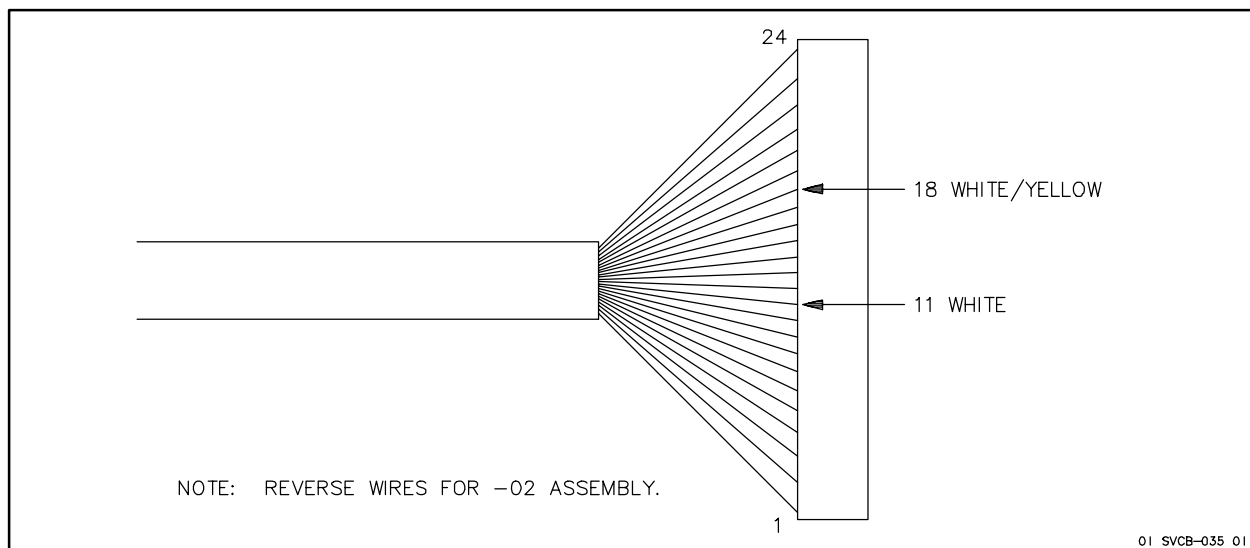
Figure 1.   Cable Assembly, Dual Access to Motherboard, P/N 3500-0674-01

Service Bulletin

Date: July 27, 1992	S.B. No.: UM4–122 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: David D. Vega	

UM-4 Fan Module Wiring

PROBLEM: Fan #5 inside Fan Module is miswired, causing it to not operate.

CAUSE: Assembly error during manufacturing.

EFFECTIVITY: UM-4 systems (both HFC and Small Cart) shipped on or between June 1 and June 15, 1992.

SOLUTION: On a next-call or next-PM basis (whichever comes first), verify fan #5 is operating. If it is not, correct fan #5 as follows:
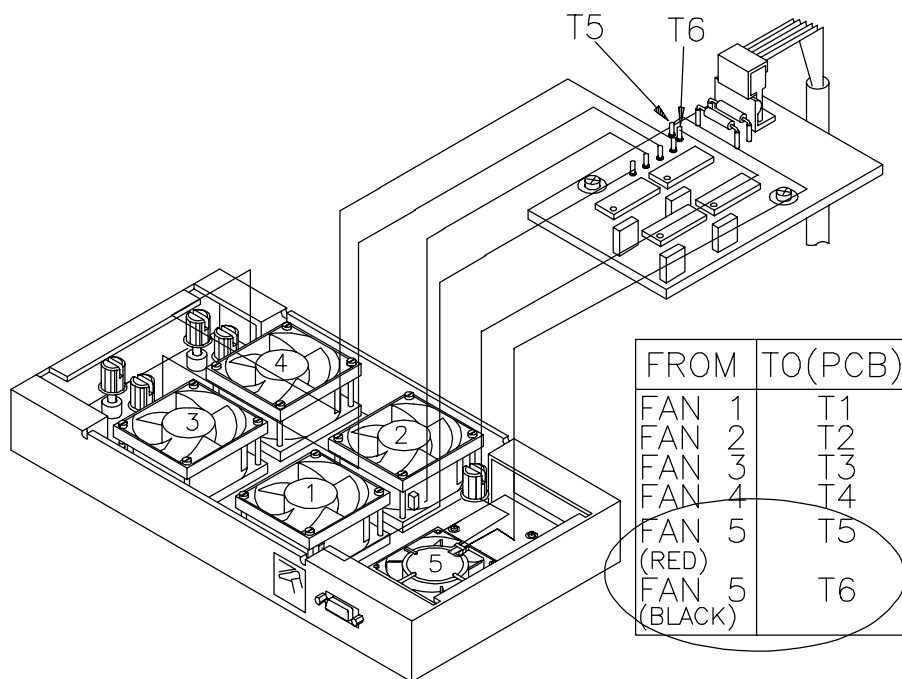
FROM	TO(PCB)
FAN 1	T1
FAN 2	T2
FAN 3	T3
FAN 4	T4
FAN 5 (RED)	T5
FAN 5 (BLACK)	T6

01 SVCB009 01

Figure 1

Service Bulletin

PAGE <u>1</u> OF <u>1</u>

Date: August 26, 1992	S.B. No.: UM4–123 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: David D. Vega	

UM-4 HFC OEM Rear Cover

PROBLEM: Wire mesh missing from cooling slots on lower right of cover (reference Figure 1, below). The presence of the mesh is required to meet UL specifications.

CAUSE: Vendor error during manufacturing of cover.

EFFECTIVITY: HFC UM-4 systems shipped on or after March 1, 1992 but before June 29, 1992. Systems shipped during this time may or may not have the wire mesh.

SOLUTION: On a next-call or next-PM basis (whichever comes first), verify wire mesh is present. If it is, no action is required. If it is not, order the following part numbers and replace upon receipt of parts:

ITEM	PART NUMBER	DESCRIPTION	QTY
1	1065-1169-01	Bezel, OEM Module, Rear, UM-4	1
2	4100-0327	Label, Image Printer, UM-4	1
3	4100-0352	Label, Video Out	1
4	4100-0353	Label, OEM warning	1
5	4100-0274	Label, Sys. Acc. Equip. Warning	1
6	1064-0304	Data Comm Blanking Panel	1
7	9901-0015	Double-sided Foam Tape	4

Figure 1

MONITOR ARM

KEP NUT, (2 PLACES)
P/N 1543-0002
(REPLACES BELLEVILLE CONE WASHER)

10-32 NUT, (2 PLACES)
P/N 1543-0001

01 SVCB-016 01
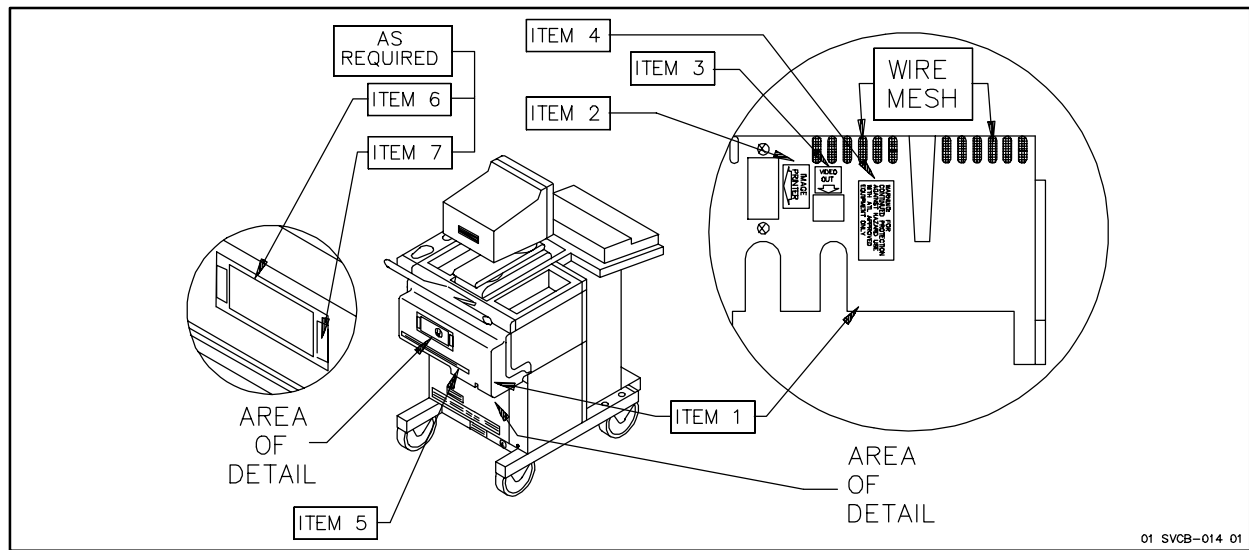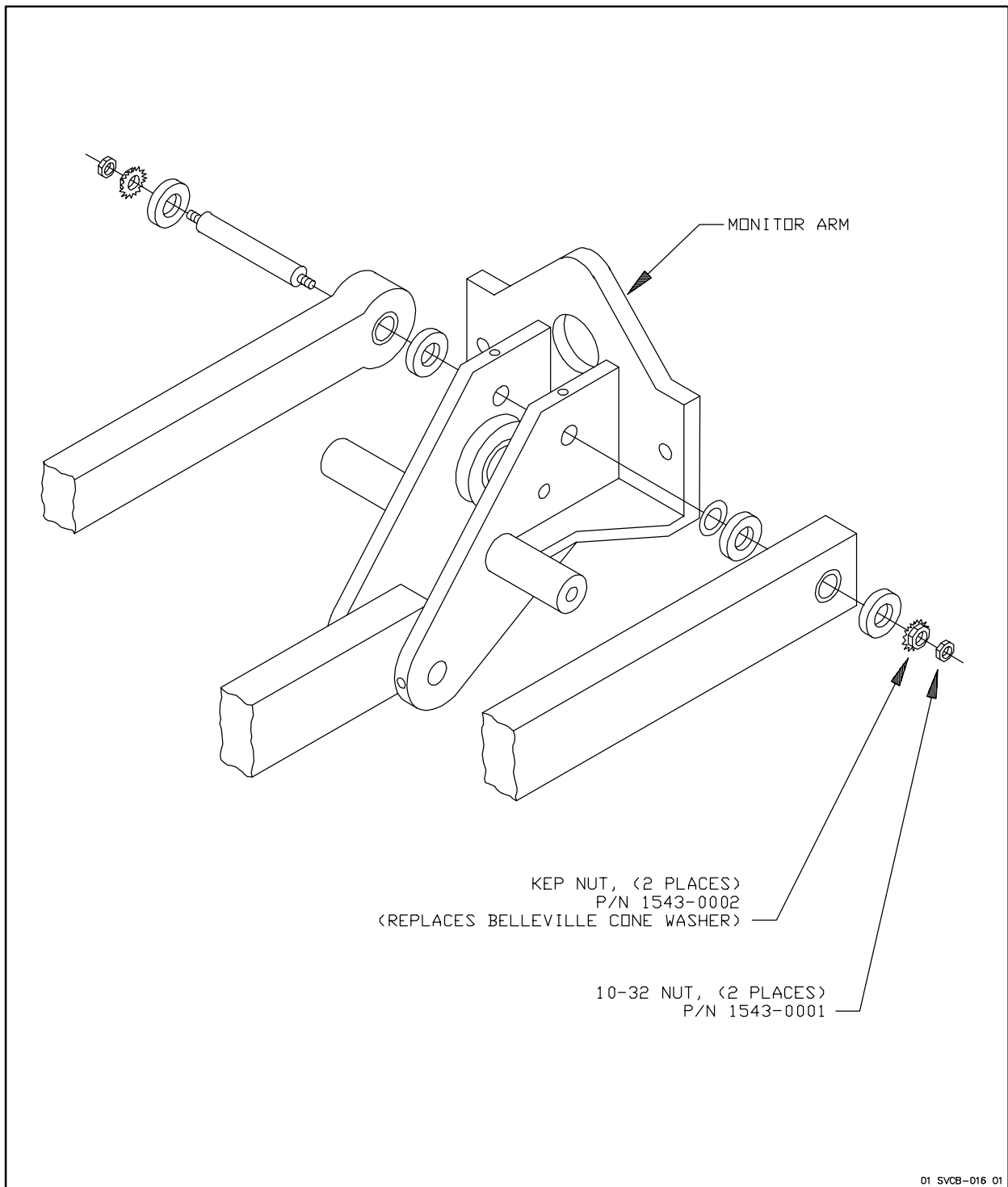
Figure 1

WITH ATTACHMENTS: YES ■   NO ☐
WITH PARTS: YES ☐   NO ■

Service Bulletin

PAGE 1 OF 1

Date:	November 5, 1992	S.B. No.: UM4–127	Rev:
To:	All Field Service Personnel	E.C.N. No.:	
Author:	Laurence J. Simanek		

Mis-Configured 2D Scan Converter Interface PCB in the UM-4 Systems

PROBLEM: The possibility exists that the UM-4 2D Scan Converter Interface PCB **(7500-0273-xx)** is mis-configured, resulting in a measurement error or inaccurate display. All revision levels must be checked to insure proper configuration.

SCOPE: This bulletin affects all material in CSR car stock, upgrade kits, or any stocking locations. A purge notice has been issued to the field organization.

Domestic and international customers will need to be audited per the customer lists attached.

EFFECTIVITY: **Immediate purge** of all stock locations.

Customer verification and purge:

Program start: **NOVEMBER 13, 1992**
Program completion: **MARCH 31, 1993**

CAUSE: Installation of an incorrect Crystal at position **Y1** on the PCB and mis-configuration of the jumper at **JR1**.

MATERIAL: If a mis-configured 2D Scan Converter Interface PCB is discovered, order and replace through normal ordering process.

SOLUTION:
1. All materials in car stock, airborne, and any other stocking locations should be verified by the attached procedure.

2. If a PCB is found to be incorrect, purge it and return it to Bothell immediately after placing a P-3 replacement order.

3. A list of affected customers for both Domestic and International accounts is attached. Verification of these boards should follow the procedure below.

If an incorrect PCB is identified, it should be purged and returned to Bothell immediately after a proper PCB is installed. Order as a Doctor down.

PROCEDURE: The CSR or representative will need to check the system for the following:

CIRCUIT BOARD VERIFICATION

DOMESTIC (NTSC) (60 Hz applications)
P/N 7500-0273-XX (even-numbered dash levels, e.g. 06, 10)
Check component location **(Y1)** – Correct Crystal Frequency is 30.723 MHZ.
Check jumper location **(JR1)** – There should **NOT** be a jumper configured in this location.

INTERNATIONAL (PAL) (50 Hz applications)
P/N 7500-0273-XX (odd numbered dash levels, e.g. 07, 09)
Check component location **(Y1)** – Correct Crystal Frequency is 36.883 MHZ.
Check jumper location **(JR1)** – There **SHOULD** be a jumper configured in this location.

NOTE: *The Crystal frequency will either be silk-screened onto the body of the Crystal or stamped directly into the metal can. It may be necessary to remove the metal bail securing the Crystal to the PCB, as the marking could be on the bottom (obscured) side.*

SYSTEM ACCURACY

4. Use the calipers to measure the distance between two horizontal nylon pins in the phantom which are spaced 60mm apart.

5. Verify that the distance displayed on the display screen is 60mm $\pm$ 3mm.

    ($\pm$ 5mm for EFT, IVT, and TRT sector)

6. Use the calipers to measure the distance between two vertical nylon pins in the phantom which are spaced 80mm apart.

7. Verify that the distance displayed on the display screen is 80mm $\pm$ 2mm.

NOTE: *If caliper measurements are out of specification, contact the CSC and/or PSC as well as regulatory affairs to issue a customer complaint and follow-up procedure.*

NOTIFICATION

DOMESTIC
Please complete a FSR per the attached documentation and FSR coding. Contact the CSC center upon completion of customer verification. Indicate the serial number.

INTERNATIONAL
Please contact the upgrade coordinator, Jason Powell, with the system verified and completed. Indicate the system serial number and the country. **FAX (206) 487-7000**

FIELD SERVICE REPORT CODING

1. All customer information.

2. SO number.

3. CC – 05

4. SC – Per current status.

5. PC – Per current UM-4 code.

6. CI – 50

7. CSR number.

8. FSR number.

9. Invoice, mark <u>NO</u>.

10. Service completion date.

11. System location.

12. Customer phone number.

13. NA

14. Customer contact.

15. Part number (7500-0273-XX) appropriate dash level.

16. 2D Scan converter interface PCB.

17. Same as system.

18. Serial number of board.

19. FC – 26

20. . SC –   (04)   R&R if problem found.
            (18)   If no problem found.

21. . Write: Verification of 2D scan converter complete.
                    Corrective action.
                    (A) None required.
                    (B) Removed and replaced.
                    Caliper measurements within specification. (OK)

            NOTE: *No charge for labor or travel.*

The attachmentments for Service Bulletin No. 127 are not available electronically

Service Bulletin

Date:	March 12, 1993	S.B. No.: UM4–128	Rev: A
To:	All Field Service Personnel	E.C.N. No.:	
Author:	David D. Vega		

Motherboard Assembly Error

This service bulletin supercedes UM4–128.

EFFECTIVITY: UM-4 HFC and Small Cart Systems shipped between September 10, 1991 and April 6, 1992.

Problem/Symptom	Possible Cause	Solution
Dropouts in linear image that cannot be traced to a PCB, scanhead, cables or the DFT connector.	DFT signals are being shorted to ground at the junction of the Motherboard and the E.M. chassis. Refer to figure below: The Motherboard Vendor built the PCB incorrectly as follows: Kapton (insulating) tape was placed on top of, rather than under, the copper tape. The copper tape enhances the ground (GND) connection between the Motherboard and the E.M. chassis. The Kapton tape is intended to insulate DFT signal runs (lands) on the Motherboard from the copper tape (GND).	Repair the Motherboard on the next PM, next call, or upon failure. Domestic (U.S.) Customer Support Representatives (CSRs) who have affected UM–4 HFC systems in their area will receive the necessary parts to complete the rework (ATL P/N 8000/8055- 0837-01). International personnel need to order ATL part number 8000-0837-01. Estimated time for repair will be less than replacing the chassis or Motherboard.

AS BUILT   AFTER REPAIR

KAPTON TAPE   COPPER TAPE   KAPTON TAPE   COPPER TAPE

MOTHERBOARD   DFT SIGNAL RUNS   MOTHERBOARD   DFT SIGNAL RUNS

01 SVCB-026 02

WITH ATTACHMENTS: YES ☐   NO ■
WITH PARTS: YES ☐   NO ■

ATL
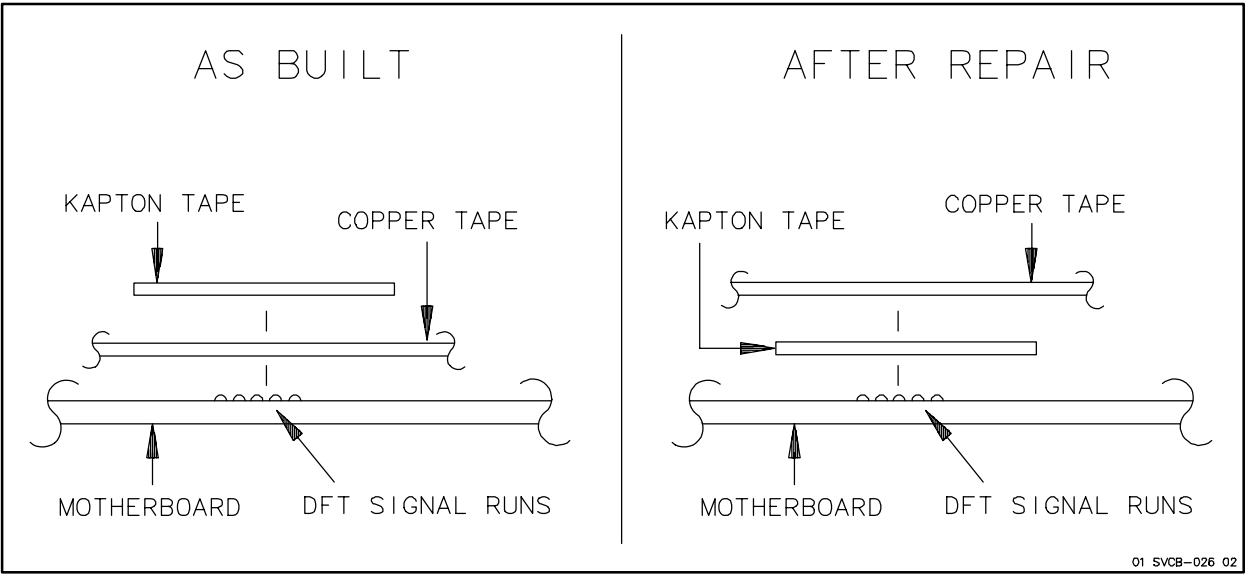
Service Bulletin

Date:	March 12, 1993	S.B. No.: UM4–130	Rev: A
To:	All Field Service Personnel	E.C.N. No.:	
Author:	Robert Elder/David D. Vega		

Limited Monitor Platform Swivel on UM-4 HFC

This service bulletin supercedes UM4–130.

EFFECTIVITY: UM-4 HFC Systems shipped between February 25, 1992 and June 5, 1992.

Problem/Symptom	Possible Cause	Solution
The monitor platform is not able to swivel as far to the right as it does to the left.	Manufacturing error during assembly of the monitor arm caused the monitor cable to be too short. When the monitor platform is swiveled to the right, the cable connector prevents it from going any further; this puts undue strain on the cable and connector.	Replace the monitor cable on a next call basis or upon failure. Domestic (U.S.) Customer Support Representatives (CSRs) who have affected UM-4 HFC systems in their area will receive the necessary parts kit to complete the rework (ATL P/N 8000- 0849-01). International personnel will need to order ATL part number 8000-0849-01 for replacement of the defective cable. Estimated time for install for a system with Lenzar is 2.5 hours and for a system without Lenzar, 1.75 hours. **NOTE:** *These parts are now available.*

See Page UM4–09A–1

Service Bulletin

Date: February 10, 1993	S.B. No.: UM4–131 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Noel Joseph	

Footswitch Compatibility on all Ultramark 4 Systems

PROBLEM: Intermittent operation of the footswitch.

EFFECTIVITY: Immediately.

CAUSE: The new footswitch is a mechanical switch and will bounce when activated.

SOLUTION: The System CPU has been modified to suppress the bounce. If you install a replacement footswitch part number 3500-0486-00, the System CPU needs to be at one of the following rev levels: -12, -64, -65, or -66.

ATL

Service Bulletin

Date: March 26, 1993	S.B. No.: UM4–132 Rev:
To: All Field Service Personnel	C O. No.: Hot Tip 93-22 A
Author: Paul Peterson/Dave Vega	M.C.R. 93-03-07

UM-4 30.X Software and MFI Scanhead Compatibility Issues

This Service Bulletin supercedes New Product Bulletins NPB 70 and NPB-70Rev A.

EFFECTIVITY: UM-4 Systems Configured with MFI Scanheads.

PROBLEM: Possible misconfiguration of UM-4 systems with MFI scanheads.

CAUSE: Several revisions to software for MFI scanhead support.

SOLUTION: Verify software levels of UM-4 systems with MFI scanheads. Use the <CTRL>-L function to verify software that levels are at least:

PCB			Software Minimum
Name	**Part Number**	**Dash Number(s)[1]**	**<CTRL>-L Code**
Pulse Processor	7500-0370	-08, -09	P22405 or higher
		-24, -25, -26, 27	P22707 or higher
	3500-1261 3500-1262	–01 –01	P22707 or higher P22707 or higher
System Controller	7500-0312	-XX	30.08 or higher
Motor Controller	7500-0348	-XX	482406 or higher

22. *If replacing a 7500-0370-08/-09 PCB, DO NOT order a -24, -25, 26, -27 or a 7500-1261/62 PCB. You will discover that the software PROMs are not interchangeable. Always order parts designated with an "R" (recommended) for the system's software level or order "like-for-like" only if so authorized by "L" designator.*

NOTE: *These levels should be verified on a next-call basis for existing MFI systems. 30.05 software can remain only in non-MFI systems.*

WARNING: *Do not order the 7500-0561-XX Pulse Processor PCB. This is a "generic" PCB that requires switches to be configured and the PCB to be calibrated.*

WARNING: *Do not install a generic PCB if it does not have a 3500-xxxx-xx part number label affixed (for example, the latest Display Controller, Scan Converter Interface, and Pulse Processor PCBs that are listed in the replacement matrix under a 3500 number). A generic 7500 PCB requires configuration and, in some cases, a specific crystal and calibration that should not be attempted in the field. The jumper information for these PCBs is included in the service manual only so correct configuration can be verified.*

Background: The MFI scanhead was introduced in January, 1992. It was supported by 30.05 system level software. In August, 1992, 30.08 software was released to improve the management of the system's acoustic output performance when used with the MFI scanhead. Installation of upgrade kits on systems with MFI scanheads is scheduled to be completed by March 31, 1993. It was decided that 30.05 software could remain in non-MFI systems.

30.10 software was released on September 7, 1992, to provide German FERT/GYN Calcs. 30.10 software supports MFI and includes the changes made at 30.08. 30.10 is now the 30.X replacement software. Refer to UM-4 Field Service Manual, 4720-0001-05:

- 30X Change Summary, pages UM4–05–20 and 21
- Table 5–1, <CTRL>-L Codes for System Controller and Pulse Processor PCB data and footnotes
- Revised (in work) Pulse Processor PCB replacement software data for 7500-, and 3500-1261-01 and 3500-1262-01 on page UM4–05–41 (see next page)
- System Controller PCB replacement software data for 7500-0312-XX on page UM4–05–71

NOTE: *Replacement Matrices are what the name implies: they show what should be ordered, based on a number of criteria. The listings are determined by what is required for correct configuration of the system at a specific system software level and number of spares that are on hand in stores. If a PCB is revised with a modified layout (a "re-layout") but there is no change in function, then that PCB will not be stocked for general replacement because there is a sufficient quantity of the lower rev PCBs on hand. The new PCB will be listed as like-for-like, "L". An example: for cost effectiveness, a Scan Converter Cine should not be ordered to replace a Scan Converter Interface. The S.C. Cine board supports Cineloop; the additional memory would be wasted on an older system which doesn't have Cineloop. Therefore, the S.C. Cine is listed as like-for-like.*

Pulse Processor PCB   A5

HFC PCBs   7500-0370-XX; 3500-1261/62 (= 7500-0561-XX plus configuration additions)

PCB/ Dash No. 7500-	REPLACEMENT LEVEL									FEATURE COMPATIBILITY						Notes
	8X	11X 12X	16X 17X	23X	25X	26 & up				DOP	NON- DOP SYNC	DOP SYNC	40mm CVA AIVT			
0370-08	R	L	L	L	L					N	Y	N	N			1, 2 ,5
09	A	R	R	R	R					Y	N	Y	N			1, 2 ,5
24						R				N	Y	N	Y			1, 2, 3
25						R				Y	N	Y	Y			1, 2, 3
26						L				N	N	Y	Y			1, 2, 3
27						L				Y	N	Y	Y			1, 2, 3
1261-01						L				Y	N	Y	Y			1, 2, 4
1262-01						L				N	Y	N	Y			1, 2, 4

UM-4A PCBs   (OB; CV; PV only) 7500-0370-XX

	OB	PV	CV	Notes
0370-09	R	R	R	1, 2, -05 rolled to -09

1. PROMs required.
2. Convertible, refer to Up/Down Rev Instructions.
3. 7500-0548-XX, -0549-XX, and -0370-24/25 are UM-4+ PCBs. The -0548 and -0549 PCbs must be used together. -0370-24/25s are backward compatible to 12X when configured with 8000-0570-XX software.
4. 3500-1261/62s are relayout of 7500-0370-24/25; they are backward compatible to 12X when configured with 8000-0570-XX or higher software.
5. 7500-0370-08/09 PCBs support MFI with 30.08 (8000-0177-12/13) or higher software.

PROMs

NOTE: *Substitute PCBs must have the appropriate software for that PCB at the same system software level.. Software (PROMs) for the different versions of Pulse Processor PCBs at the same system software level are not interchangeable; each PCB requires different board operating codes to achieve the same result.*

PCB/ Dash No. 7500-	PROM KIT		REPLACEMENT LEVEL											INDIVIDUAL PROM			FEATURE COMPATIBILITY			
	Part No.	Dash No.	8X	11 X	12 X	16/ 17 X	23 X	25 X	26- 28X	29 X	30X & up			Ref. Des.	P/N 4201-	Dash No.	AA	HR LA	MFI	
0370-08,	6220-0013	01	Y											U70	0285	01	N	N	N	
09	8000-0177	01		Y	Y	Y										02	N	N	N	
		02			Y	Y	Y									03	N	N	N	
		03			Y	Y										04	Y	N	N	
		05[1]				Y										06	Y	Y	N	
		07					Y									08	Y	Y	N	
		08						Y	Y							09	Y	Y	N	
	8000-0177	10							Y	Y					0285	11	Y	Y	N	
	8000-0177	11[2]							Y	Y					0913	01[2]	Y	Y	N	
08, 09	8000-0177	12									Y				0285	12	Y	Y	Y	
	8000-0177	13[2]									Y				0913	02[2]	Y	Y	Y	
24, 26	8000-0570	04[3]									Y				0887	04	Y	Y	Y	
25, 27	8000-0570	04[3]									Y				0887	04	Y	Y	Y	
1261-01	8000-0570	04[3]									Y			U67	0887	04	Y	Y	Y	
1262-01	8000-0570	04[3]									Y				0887	04	Y	Y	Y	

1. Linear noise fix.
2. Euro alternate only, w/o Gain governor.
3. Order 8000-00570-04 instead of -02; the -04 is an updated version of the -02 containing revised MFI power tables.

Service Bulletin

Date: March 31, 1993	S.B. No.: UM4–133 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Noel Joseph	

2D Scan Converter Interface Oscillator Rework Verification

Problem/Symptom	Possible Cause	Solution

Incomplete rework causes inaccurate measurements
Scope: All 2D Scan Converter
    Interface PCBs
    Domestic part numbers:
    7500-0273-02, 04, 06,
    08, 10, 60
    International part numbers: 7500-0273-03, 05,
    07, 09, 11, 61
Effectivity: Next PM or next call basis.
	Incomplete rework on the 2D Scan Converter PCB.	Inspect the 2D Scan Converter Interface PCB for the completion of the rework.
		1. Check the fabrication number of the PCB.
		    a. If the fabrication number is 2500-0273 Rev B, continue with the procedure. If the fabrication number is not 2500-0273 Rev B, mark the FSR as inspection complete.
		NOTE: *Fab number can be found on the solder side of the PCB on the top left corner.*
		2. Verify C162 (0.1 UF P/N 3725-0003) is attached to C56 (see figure below).
		3. Verify C163 (270 PF P/N 3725-0039) is attached to U83 pin 2 and U83 pin 4 (see figure below).
		4. Replace PCB if either of the capacitors is missing.
		5. Complete FSR, indicate verification of rework for the 2D Scan Converter Interface.

01 SVCB−033 01
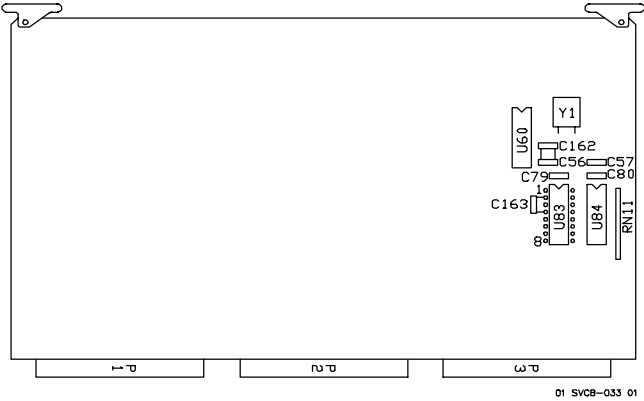
Service Bulletin

Date: May 5, 1993	S.B. No.: UM4–134 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: David D. Vega	

UM-4 Display Controller Problem on Boot-up

Effectivity: UM-4 HFC and Small Cart Systems

UM-4 HFC and Small Cart Systems

Problem/Symptom	Possible Cause	Solution
UM-4 System monitor screen is white and the status of the System Controller PCB indicates that the system has been booted up. Problem occurs after power is first turned on; or after the system is cycled off, then on, following a warm up period.	U125 (Sync generator) on the Display Controller PCB does not output any of the required timing signals to the PCB, resulting in no video output. Manufacturing Engineering has isolated the problem to a particular batch of I.C.s that are used in the U125 location. The I.C.s have a date code of 9240. These parts have been pulled from the production line.	Replace the Display Controller PCB upon failure.

Service Bulletin

Date:	June 29, 1993	S.B. No.: UM4–135	Rev:
To:	All Domestic Field Service Personnel	E.C.N. No.:	
Author:	David D. Vega		

UM-4 Master Spares Kits

PROBLEM: Difficulty in meeting shipping requirements of UM-4 Master Spares Kit (ATL P/N 6220-0023-08, DOM). Also, no spares kit exists for International (220/240V PAL) systems.

EFFECTIVITY: All UM-4 Master Spares shipments

CAUSE: Unavailability of CAD-related spare parts (DOM); lack of spares kit (INT'L).

SOLUTION: Remove CAD-related parts from the Domestic Master Spares Kit; create and release International Master Spares Kit (ATL P/N 6220-0023-11, available 6/4/93).

NOTE: *The following CAD-related parts were removed from the Domestic Master Spares Kit. These parts will need to be ordered, as required and in addition to the UM-4 Master Spares Kit, for repair of a Domestic UM-4 CAD system. A forthcoming kit will be created that includes these parts:*

Part Number	Description	Qty Req'd
4000-0225-05	CAD Module	1
4252-0486-02	CAD Disk	1
4252-0486-03	CAD Disk	1
4252-0486-04	CAD Disk	1
4252-0486-05	CAD Disk	1

Service Bulletin

Date: July 6, 1993	S.B. No.: UM4–136 Rev: A
To: All Domestic Field Service Personnel	E.C.N. No.:
Author: David D. Vega	

AG-5700 on UM-4 Small Cart

PROBLEM: "Jittery" or wavy playback image.

EFFECTIVITY: UM-4 Small Cart systems with an AG-5700 VCR.

CAUSE: The AG-5700 VCR is sensitive to any vibration while it is in the RECORD mode. The vibration is interpreted by the VCR as a jittery or wavy image and is recorded by the video as such. Possible causes include an out-of-balance or defective fan on the system and/or system location (i.e. on an upper floor and/or next to an elevator).

SOLUTION: Advise the user that in order to obtain jitter-free and wave-free images, they should not subject the UM-4 system to any kind of vibration or movement while the VCR is in the RECORD mode. If user or location causes are ruled out, determine if the system has an out-of-balance or otherwise defective fan on either the power supply or the Fan Module.

HINTS: If the jittery or wavy image is <u>continuous</u> throughout a given length of recording, the cause is probably a defective fan. If the jittery or wavy image is <u>intermittent</u> on a given length of recording, the cause is probably due to system location.

ATL   Service Bulletin

Date: December 10, 1993	S.B. No.: UM4–137 Rev: B
To: All Field Service Personnel	C.O. No.: 3635, 3739B, 3697
Author: Paul Peterson	

32X Software for UM-4

This bulletin replaces UM4-137, Rev A. French and German PROM kit part numbers were switched. A discussion of PCB/software compatibility has been added.

1.0   OVERVIEW

32X software is being released to incorporate a number of minor software changes. Most changes are transparent to the user but several result in minor user interface changes. Refer to 4705-0001-36, Rev A and 4705-0004-12, Rev A which are summarized below.

NRR was in late-August, 1993; FCD was in mid-November, 1993.

Softkey changes (4705-0001-36):

• Vascular ratios can now be calculated from measurements made in velocity mode.
• Several softkeys have been moved for ease of use.
• The + caliper is automatically displayed upon pressing the MEAS softkey.
• For M-mode operation in the OB calcs module, the Fetal Heart Rate menu is now the default menu.
• Turning on OB calcs by pressing CALC now displays the default menu, not the last menu displayed.

Hardkey changes (4705-0004-12):

• For M-mode operation in the OB calcs module, the Fetal Heart Rate menu is now the default menu.
• The EFT default setting under Transducer Type in the User Default Menu was changed to IVT to better reflect the scanheads currently in use.
• Turning on OB calcs by pressing CALC now displays the default menu, not the last menu displayed.
• Minor errors in the manual have been corrected.

NOTE: *A label will be affixed to the electronics module cover of all 32X systems to iden-tify them to operators and CSRs.*

2.0   SERVICE PHILOSOPHY

MANDATORY: *For systems configured with 32X (or higher), only PCBs tested with 32X (or higher) software are allowed to be installed with that software. Therefore, only those PCBs listed in the 32X column of the UM-4 Replacement Matrix are allowed to be ordered for installation in 32X systems.*

PCB replacements in systems with 31X or lower software shall still conform to the usage instruction in Section 5, Configuration, of the UM-4 Field Service Manual, 4720-0001-05 with Manual Change 4725-0001-07, July 1, 1993 or higher (-08 to be released in mid-December, 1993).

3.0   PRODUCT CODES (USA only)

3.1   FSR Product Coding (USA)

There is no FSR code for 32X software.

3.2   Product Configuration Codes (USA)

X — 32X software

4.0   FEATURES SUPPORTED

All features supported by 31X

5.0   FEATURES NOT SUPPORTED

No features have been deleted from 31X

6.0   HARDWARE DESCRIPTION

While there are no specific hardware changes associated with 32X, upgrading a system to 32X will most likely require that hardware replacements conform to a list of approved PCB assemblies. This is due to the formal definition of compatible hardware that will be released with 32.04. A total system hardware field baseline will not be required; however, all replacement PCBs (upgrade or repair) in a 32X system must be on the compatible list. Do not install a PCB in a 32X system unless it is included in the 32X column of the Replacement Matrix.

NOTE: *A number of PCBs are also being "depopulated" as a cost-reduction measure (circuitry for features no longer offered for sale is being removed). Therefore, when selecting PCBs pay particular attention to the "FEATURES" columns in replacement matrices to ensure correct operation after PCB replacement. For example, to reduce failures due to a relay failure the new replacement for the Motor Control PCB will not support AA scanheads. Only AA systems will receive an AA Motor Controller PCB, all others will receive a "defeatured" PCB to reduce failures. Also, the -13 Rear Panel PCB will not support CAD or LS-8; the -05 receiver will not support Duplex CW or Mercury scanheads.*

6.1   Unique Part Numbers

Part Number	Description
System Software Labels (place on front cover of Electronics Module)	
4100-0929-01	Label, Software Level 32, English
4100-0930-01	Label, Software Level 32, French
4100-0931-01	Label, Software Level 32, German
System Controller PCB 7500-0312-12, -64, -66	
8000-0598-19	Kit, Software, 32.04, English (81.32.04)
4201-0937-18	• PROM, U16
4201-0938-18	• PROM, U17
4201-0939-18	• PROM, U18
4201-0940-18	• PROM, U19
4201-0941-18	• PROM, U33
4201-0942-18	• PROM, U34
4201-0943-18	• PROM, U35
4201-0944-18	• PROM, U36
8000-0599-19	Kit, Software, 32.04, French (82.32.04)
4201-0945-18	• PROM, U16
4201-0946-18	• PROM, U17
4201-0947-18	• PROM, U18
4201-0948-18	• PROM, U19
4201-0949-18	• PROM, U33
4201-0950-18	• PROM, U34
4201-0951-18	• PROM, U35
4201-0952-18	• PROM, U36
8000-0600-19	Kit, Software, 32.04, German (83.32.04)
4201-0953-18	• PROM, U16
4201-0954-18	• PROM, U17
4201-0955-18	• PROM, U18
4201-0956-18	• PROM, U19
4201-0957-18	• PROM, U33
4201-0958-18	• PROM, U34
4201-0959-18	• PROM, U35
4201-0960-18	• PROM, U36
Motor Controller PCB 7500-0348-09 (U27) -11, -12 (U33), -60, -61, -62	
8000-0133-15	Kit, Software, Motor Controller PCB, 32X
4201-0265-15	• PROM, Motor Controller, U27 or U33

7.0   REFERENCE DOCUMENTATION

Manual Change, UM4PLUS, Softkey, English	4705-0001-36, Rev A
Manual Change, UM4PLUS, Hardkey, English	4705-0004-12, Rev A
Ops Notes, 32X, English	4707-0001-12, Rev B
Manual Change, UM4PLUS, Softkey, German	4775-0001-36, Rev A
Manual Change, UM4PLUS, Hardkey, German	4775-0004-12, Rev A
Ops Notes, 32X, German	4777-0001-12, Rev B

Service Bulletin

Date: August 16, 1993	S.B. No.: UM4–138 Rev:
To: All Field Service Personnel	E.C.N. No.:
Author: Paul Peterson	

UM-4 Lemo/BNC Connector Sequence

Problem/Symptom	Possible Cause	Solution
Confusion regarding proper procedure for scanhead removal and connection.	Contradicting procedures exist between old and recent operation manuals.	Follow instructions as described in the operation manual issued with the system.

The original procedure was based on the assumption that disconnecting the Lemo first might cause damage to the scanhead.

The Motor Controller PCB Engineer recommends the following procedure:

Connecting Access scanheads

1.. Freeze system.

2.. Connect BNC connector.

3.. Connect Lemo connector.

Disconnecting Access scanheads

1.. Freeze system.

2.. Disconnect Lemo connector.

3.. Disconnect BNC connector.
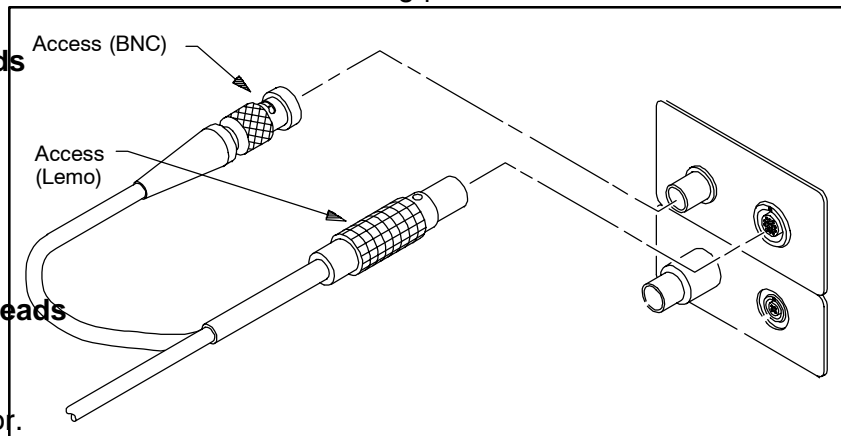
NOTE: *For older systems or your peace of mind*, *follow the procedure in the operation manual written for and shipped with the system.*

ATL

Service Bulletin

Date:	January 3, 1994	S.B. No.: UM4–140	Rev:
To:	All Field Service Personnel	C.O. No.:	
Author:	Noel Joseph		

Non-Annular Array Motor Controller

PROBLEM: Unreliable Relay on the Motor Controller causing premature failure.

CAUSE: Relay K1 on the Motor Controller tends to stick. This relay is necessary for the Annular Array and CW Duplex Scanheads to function. As a cost reduction and reliability improvement, the K1 relay has been removed on the Motor Controller for Non-Annular Array and Non-CW Duplex systems.

SOLUTION: For Non-Annular Array and Non-CW Duplex systems, order Motor Controller PCB numbers 7500-0348-12, 60, 61, 62.

For Annular Array and CW Duplex systems, order Motor Controller PCB numbers 7500-0348-09, 10, 11.

NOTE: *Refer to the UM-4 Configuration section of the Service Manual.*

Motor Controller PCB 7500-0348-12 is a new layout and will not support Annular Array, CW Duplex, non-sync systems and systems with CAD.

PROCEDURE: Check system performance with all scanheads after replacing the Motor Controller PCB.

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Service Bulletin

Date: February 11, 1994   S.B. No.: UM4–141   Rev:

   To: All Field Service Personnel   C.O. No.:

Author: Noel Joseph

32XX Label for UM-4 Ultrasound Systems

EFFECTIVITY: Upon installation of 32XX software.

SOLUTION: To help the user identify this software level of the UM-4, a label has been installed on the front cover of all new build UM-4 systems. This label, part number 4100-0929-01 for English, 4100-0930-01 for French, and 4100-0931-01 for German, needs to be positioned on the top left corner of the front cover, P/N 1064-0223-01, when you perform a software upgrade in the field. In the event this cover is replaced due to damage, this label must to be installed on the replacement cover.

   NOTE: *When ordering a replacement cover, order the label—it is not included with the cover.*

```
                           ┌─ 32XX LABEL

              ╭──────────────────────────────────────╮
              │ (SOFTWARE LEVEL 32)                   │
              │───────────────────────────────────────│
              │                                        │
              │                                        │
              │  ┌─────────────────────────┐           │
              │  │ ULTRAMARK  4   Plus      │           │
              │  └─────────────────────────┘           │
              ╰──────────────────────────────────────╯
```
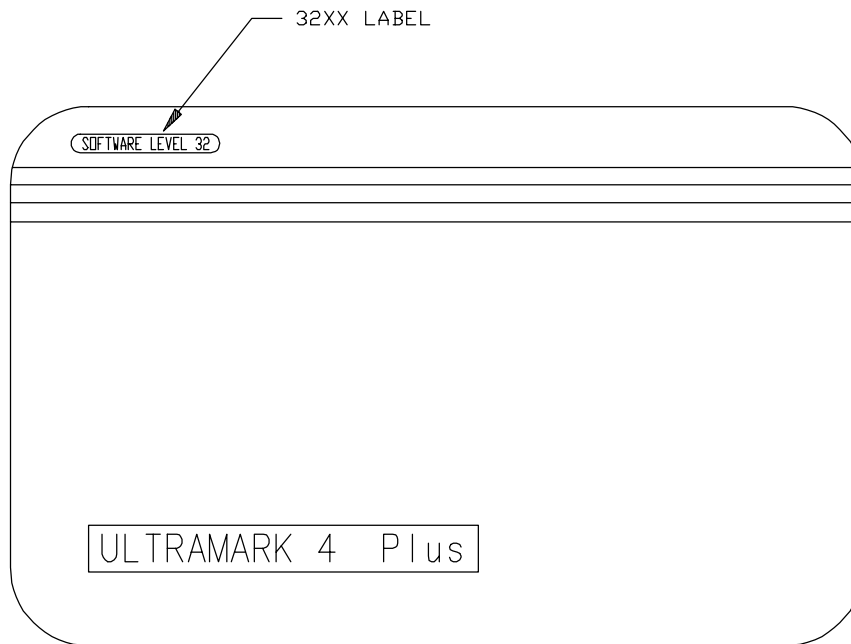
                                              01 SVCB–066 01

   NOTE: *It is important to install this label upon installation of the 32.XX upgrade.*

Service Bulletin

Date: March 15, 1994	S.B. No.: UM4–142 Rev:
To: All Field Service Personnel	C.O. No.:
Author: Laurence J. Simanek	

Incorrect Relay on Dual Linear Array PCB (7500-0630-01) on UM-4 Systems

PROBLEM: On the Dual Linear Array PCB (ATL P/N 7500-0630-01), one or more incorrect 5-volt relays (manufacturer's part number TN2E-L-5V) may be installed in the K-1 to K-34 locations.

CAUSE: Vendor inadvertently mixed 5-volt parts with 12-volt parts.

MATERIAL: Since there are 34 of these relays, the incorrect operation of the PCB is dependent upon quantity and location of the wrong devices. Incorrect relays on PCB 7500-0630-01 could produce the following results:

- Poor image quality
- Wrong scanhead annotation
- Wrong scanhead identification
- AP & I limit issues

EFFECTIVITY: All Dual Linear Array PCBs should be inspected on a Quality Assurance visit (formerly PM) or next call basis if the customer complains about above issue.

PROCEDURE: Visually inspect both 7500-0630-01 Dual Linear Array PCBs and verify that all relays have the correct manufacturer's part number:

TN2E-L2-H-12V

1. If you identify any incorrect relays (TN2E-L-5V) on the PCB, replace the Dual Linear Array PCB with a correct version.

2. Return the defective Dual Linear Array PCB with a note on the RCA to "MRB."

3. Document your activity on a hard copy service report or through the electronic CCDE.

ATL

Service Bulletin

Date:	March 31, 1994		S.B. No.:	UM4–143 Rev:
To:	All Field Service Personnel		C.O. No.:	100100
Author:	Laurence J. Simanek			

Failure of CLA 15 mm 5 MHz Intravaginal Scanhead to Initialize on UM-4 Systems

PROBLEM: The UM-4 system will not initialize the CLA 15 mm 5 MHz IVT Array Scanhead. This problem could occur intermittently or consistently.

SCOPE: Systems with Beamformer Controller PCB 7500-0548-09 and below and/or CLA 15 mm 5 MHz IVT Array Scanhead 4000-0238-06 and -07.

EFFECTIVITY: March 24, 1994

CAUSE: Changes in components due to obsolescence caused erratic operation of the CLA 15 mm 5 MHz IVT Array Scanhead. The failure of the UM-4 to recognize the IVT personality is due to ringing effects on the clock input. It was recommended that both the IVT and Beamformer Controller be repaired. These two corrections will work independent of each other or together.

SOLUTION: If the UM-4 exhibits intermittent or no initialization of the CLA 15 mm 5 MHz IVT Array Scanhead; replace the Beamformer Controller with a 7500-0548-10 PCB.

1. If the problem described is not specific to the UM-4 initialization of the CLA 15 mm 5 MHz IVT Array Scanhead, replace the IVT Array Scanhead with 4000-0238-08.

2. If problem persists, replace both.

Service Bulletin

Date: September 12, 1994	S.B. No.: UM4–144 Rev: A
To: All Field Service Personnel	C.O. No.:
Author: Noel Joseph	C.A.R.: 216

+10 Vdc Adjustment on UM-4 Motor Controller

This service bulletin supercedes S.B. UM4–144.

PROBLEM: Potential for measurement error with the +10Vdc adjustment on the Motor Controller in UM-4 systems.

SCOPE: All UM-4 systems.

CAUSE: Reference +10Vdc out of tolerance.

EFFECTIVITY: Next call and at every Quality Assurance call.

SOLUTION: Perform the following procedure:

1. Remove all non-mechanical scanheads from system.

2. Attach a 5 MHz IVT scanhead (use any Access scanhead if IVT is not available).

3. Attach a DVM to test points on the Motor Controller with mini clips (see Table 1 for locations).

4. Initialize the 5 MHz IVT scanhead (or Access scanhead).

5. Verify the voltage is between 9.95 Vdc and 10.04 Vdc.

6. See Table 1 for adjustment pot location (the 7500-0517-XX Motor Controller has no adjustment).

7. If the adjustment cannot be made, replace the Motor Controller.

Table 1.   Test Point Locations

PCB Part Number	DVM (+)	DVM (−)	Adjustment
7500–0304	TP1	Analog GND	R44
7500-0348-00 to 09, -60, -64, -65	TP7	TP1 (AGND)	R44

7500-0348-08, -10, -11, -12, -61	TP2	TP1 (AGND)	R1
7500-0517-XX	TP20	TP27 (AGND)	None

Service Bulletin

Date:	August 23, 1994	S.B. No.: UM4–145	Rev:
To:	All Field Service Personnel	C.O. No.: 100344A	
Author:	Stan Trussell	C.A.R.:	

Silk Screen Indicating Mislabeled Polarity for C128 on the UM-4 Display Controller PCB

PROBLEM: Noise interference in video display.

SCOPE: PCB part number 7500-0827-03, assembly part numbers 3500-1480-02 (Domestic) and 3500-1481-02 (PAL).

EFFECTIVITY: Upon failure.

CAUSE: The silk screen on the PCB fab is backwards from what the actual orientation is for C128. The automated surface mount machine places the part in the correct orientation but it is believed that operators later in the build process might change the capacitor to match the polarity marking on the PCB.

SOLUTION: Replace PCB only if noise appears in video display and capacitor has been verified to be reversed (same polarity as silk screen—see Figure 1). A new fabrication will be released to correct the artwork.

Figure 1

ATL
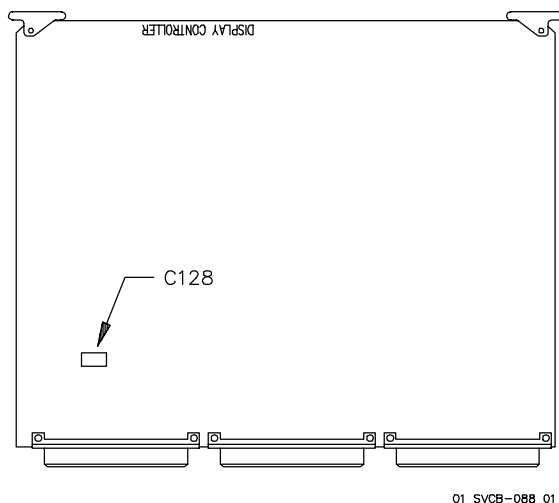
Service Bulletin

Date:	December 5, 1994	S.B. No.:	UM4–146 Rev:
To:	All Field Service Personnel	C.O. No.:	
Author:	David D. Vega	C.A.R.:	

Domestic (120V/NTSC) UM-4 Small Cart with AG-7400 VCR

PROBLEM: Service Documentation doesn't show the Small Cart (SC) configuration with the Panasonic AG-7400 VCR.

EFFECTIVITY: Domestic (120V/NTSC) UM-4 SC Systems shipped after October 21, 1994.

CAUSE: The UM-4 SC has not previously shipped with the 7400 VCR. This change was made due to inventory availability.

SOLUTION: A future service manual change will include the following information:

Part Number	Description	Remarks
2100-0502-01	AG-7400 VCR	Existing, used on HFC
2275-0193-01	EM to VCR Cable	Existing
2275-0194-01	EM to VCR Cable	Existing
2275-0267-01	VCR to Speaker Amp Box	New, 2-way compatible
2100-0420-01	VCR Power Adapter	Existing, compatible with 6400 & 7400
1065-2619-01	VCR Mounting Bracket	New, compatible only with 7400

NOTE:

- The 7400 VCR is now the preferred VCR to ship with Domestic SC systems. After depletion of the 7400 VCR inventory, systems will again ship with the AG-5700 VCR.
- The cabling for the 7400 VCR is identical to that for the 6400 VCR.
- Production personnel will configure the VCR to operate in the conventional VHS mode. Recording and playback in the Super VHS (S-VHS) mode are still possible by using a S-VHS cassette and setting the VCR front panel switch "S-VHS ON/OFF" to "ON".
- The Video Cassette included with the system will be a conventional VHS type, not S-VHS.
- The "extended" monitor mounting hardware is required for adequate clearance for the VCR.
- There is no upgrade kit for this VCR and it is not an orderable upgrade.

Service Bulletin

Date: February 23, 1995	S.B. No.: UM4–147 Rev:
To: All Field Service Personnel	C.O. No.:
Author: Bach-Tuyet Nguyen	C.A.R.:

System Controller PCB Modification for UM-4/5 Systems

PROBLEM: The modified System Controller Module, P/N 7500-0312-13, will not support the UM-4/5 systems that have disk drive function.

CAUSE: The floppy drive interface IC, DC9229BT(P), ATL P/N 2042-0012 (U62) of the System Controller PCB is no longer available. A design change was made to the UM-4 System Controller PCB module to remove the floppy disk drive function. The change consists of removing the IC (U62) and adding five jumpers.

SOLUTION: For systems with a data communication/floppy disk drive, use System Controller PCB P/N 7500-0312-12 or lower.

![ATL logo] **ATL**

Service Bulletin

Date: March 13, 1995	S.B. No.: UM4–148 Rev:
To: All Field Service Personnel	C.O. No.:
Author: David D. Vega	C.A.R.:

UM-4 Default Settings for OB/GYN Users

PROBLEM: OB/GYN users cannot quickly use the UM-4 system without manual optimization.

EFFECTIVITY: All UM-4 OB/GYN installations.

CAUSE: Factory default settings for the CLA 76mm and CLA 11/40mm (Array IVT) have to be changed prior to scanning.

SOLUTION: Change the default settings for these scanheads to the settings shown in the table below using the following procedure.

   CAUTION: *If the System Controller PCB or U6 have been replaced, remember to check the settings and to change the settings as necessary.*

   NOTE: *The settings are stored on the System Controller EEPROM (U6). After release of the revised test procedure, Manufacturing personnel will make the changes prior to the shipment of new systems.*

CLA 76mm		CLA 11/40mm (Array IVT)	
Setting	**Change To**	**Setting**	**Change To**
Dynamic Range	47db	Dynamic Range	47db
Power	30%	Power	30%
Reject	1	Reject	1
Edge	2	Edge	2
Grey	3	Grey	3
Smooth	2 (not F2)	Smooth	2 (not F2)
Focal Zones	3 & 4 (center of sector)	Focal Zones	3, 4, & 5 (bottom of sector)
Depth	180mm	Depth	110mm

PROCEDURE: 1. With the system turned on, select either the CLA 76mm or the Array IVT scanhead.

2. Change the Dynamic Range, Power, Reject, Edge, Grey, and Smooth settings.

   NOTE: *The CLA 76 and the Array IVT each have a total of 5 focal zones. Starting at the apex, the zones are numbered 1, 2, 3, 4, and 5.*

3. Press the focal zone button to select zone 1 and zone 2.

4. Use the trackball to move the focal zone selection to zones 3 and 4. The process is similar for selecting zones 3, 4, and 5.

5. Change the depth setting to the value shown in the table for the selected scanhead.

6. Press **CTRL U** and then press **Y** to save the settings.

7. Verify the settings are stored by resetting the system (**CTRL P**), and by rebooting the system.

Section 8   Replaceable Parts

8–1   Introduction

This section is intended for use by ATL Technical Service Representatives. Listed are the major field replaceable parts for the Ultramark® 4 systems. Some internal parts of major subassemblies are included for international use only (for example, the Data Comm and Audio/Video Modules which are currently end-item-swaps domestically). The parts are listed at the current recommended replacement level at the time of printing. Changes to ATL equipment are sometimes made reflecting component or design improvements. Subsequent revisions to part numbers, especially those assigned to PCBs are reflected in the Configuration section which includes compatibility and PCB/PROM replacement matrices.

8–2   Description

An explanation of the columns in the tables follows:

Figure Number (Fig No.)

This column lists the figure number of the illustration on which a particular index number or reference designation will be found. The Figure and its corresponding Table will have the same number, unless otherwise noted. For example, **Figure 8–1** goes with **Table 8–1**. Also, a Figure may be made up of more than one sheet, e.g., **Figure 8–x** (Sheet 2 of 3).

Index Number (Index No.)

The index number (or locater number) cross-references a particular item, part, or subassembly found in an illustration with its part number and description in the table.

ATL Part Number (ATL Part No.)

This column lists the ATL part number for an item. The number should be used whenever an order is being made. If, instead of a dash number (e.g., -03), the part number ends with "-xx", the correct dash number must be located using the Configuration section. Instructions are included there to aid in the proper selection of circuit boards and software.

If an item does not include a part number, this indicates that the item is included for reference but is not a field replaceable part.

Description

The name of the item or part is listed here. The description column also provides a breakdown of the equipment into its assemblies, subassemblies, individual component parts, and attached parts, through the use of bulleted indentures. The indentures show the relationship of parts to their next higher assemblies:

• Top assemblies, or items with no replaceable parts, stand alone (no bullets);

• Parts, components, or subassemblies of top assemblies are indented by one bullet (•); these parts are included in the next higher assembly but can be ordered separately.

• Parts or components of subassemblies are indented with two bullets (••); these parts are included in the next higher assembly but can be ordered separately.

Where appropriate, the description column also includes size, tolerance, type or model, and material data for the part.

Notes

Manufacturer's part numbers, special applications, and other information pertaining to a specific part are listed in the Notes column. For top assemblies containing replaceable parts, the applicable figure or table for further breakdown of parts is also listed here.

8–3   Parts Ordering Information

Technical Service Representatives

For parts ordering procedures, ATL Customer Support Representatives should refer to their Standard Operating Procedures manual.

Customers

Customers may order parts through a Customer Support Representative or directly from the ATL Customer Service Order Processing Department. Contact your local ATL Customer Support Representative for the phone number.

Customers need to provide:

1. Shipping address

2. Purchase Order number of equipment

3. ATL part number(s)

4. Part description(s)

5. Quantity

8–4   Abbreviations

Abbrev.	Definition
A	Ampere
AA	Annular Array
ACQ	Acquisition
ADPTR	Adapter
ASSY	Assembly
AMP	Ampere
A/V	Audio/Video Module
AWG	American Wire Gauge
B/W	Black and White
BRKT	Bracket
CAD	Coronary Artery Disease
CAP	Capacitor
CARD	Cardiology
CCIR	625–line, B/W video standard
CFM	Cubic feet per minute
CKT	Circuit
CM	Centimeter
CONN	Connector
CONV	Converter
CV	Cardiac Vascular (Ultramark 4CV)
DBF	Digital Beamformer
DIG	Digital
DOM	Domestic—North America service area; 120VAC and EIA/ NTSC video
DOP	Doppler
EM	Electronics Module
EFT	End Fire Transducer
EIA	Electronic Industries Association (525–Line Video format; B/W)
EUR	European (Solingen Service Area)

EXT	External		PH	Philips Head
FIG	Figure		PLC	Places
FLH	Flathead		P/O	Part Of
FLTR	Filter		POS	Positive; Position
FPC	Full Peripheral Cart		PNH	Pan Head
FR	Front		PS	Power Supply
FT	Foot		PWR	Power
FXD	Fixed		PV	Peripheral Vascular
HD	Head			(Ultramark 4PV)
HEX	Hexagon		REF	Reference Tabbed Section
HFC	Human Factors Cart		RH	Right Hand
HK	Hardkey		RND	Round
HV	High Voltage		PPLC	Replace(s)
ID	Inside Diameter		RPT	Receptacle
IN	Inch		RT	Right
INT	Internal		SA	Stand–Alone
INTL	International (Non–North Amer. area ; 220/240/CCIR)		S/B	Should Be
			S/H	Scanhead
			SHLDR	Shouldered
ISO	Isolation		SK	Softkey
JS	Joystick		SKT	Socket
KEYBD	Keyboard		SS	Stainless Steel
LCK	Lock		SW	Switch
LKG	Locking		TB	Trackball
LT	Left		TBA	To Be Added
MECH	Mechanical		TBD	To Be Determined
MM, mm	Millimeter		TBL	Table
MTG	Mounting		TERM	Terminal
NTSC	National Television System (525–Line Video format; Color)		UM	Ultramark
			U/M	Unit of Measure
OAG	Output Address Generator		U/W	Use With
OB	Obstetrical (Ultramark 4OB)		V	Voltage
OD	Outside Diameter		VAC	Volts Alternating Current
OEM	Optional Equipment Module		VCR	Video Cassette Recorder
OEM	Original Equipment Manufacturer		VDC	Volts Direct Current
			VID	Video
PAL	Phase Alternating Line (625–Line Video format; Color)		W/	With
			W/O	Without
PCA	Printed Circuit Assembly		WHT	White
PCB	Printed Circuit Board		XFMR	Transformer
PNH	Panhead		ZIF	Zero Insertion Force
REQ	Required; Requires			

Table 8–1.   UM-4 Human Factors Cart (HFC)

Fig No./ Index	ATL Part No.	Description	Notes
8–1			
1	3500-1325-01	Rail Assy w/o Lenzar (5" Casters)	Set of 2 rail assys
2	3500-1326-02	Rail Assy w/Lenzar (6" Casters)	Set of 2 rail assys
2a	1065-2482-01	• Tubular Rail, Smooth Stem	2 plc (was 1065-1095-02)
2b	2950-0186-01	• Cap, Plastic Screw Cover	4 plc
2c	2950-0186-00	• Base, Plastic Screw Cover	4 plc
2d	1064-0545-01	• End Cap, Rail	4 plc
2e	1517-0063-01	• Set Screw, 8–32 x 3/8", HD, Cup PT, ST ZN	8 plc
2f	1530-0036-01	• Screw, 5/16–24 x 5/8", SKH, CS, HD, SS	6 plc (tubular rails only)
2g	1561-0017	• Washer, Int Lk, 5/16", ST, ZN	6 plc
3	2950-0411-02	• Caster, 5", Tente w/Swivel Lock, Smooth Stem	2 plc, p/o 3000-1325-01
	2950-0583-01	• Caster, 6", Heavy Duty II, Swivel Lock, Lenzar	2 plc, p/o 3000-1326-02
4	2950-0411-01	• Caster, 5", Tente w/Brake, Smooth Stem	2 plc, p/o 3000-1325-01
	2950-0520-01	• Caster, 6", Heavy Duty II, Total Lock, Lenzar	2 plc, p/o 3000-1326-02
4a	1615-0005	• Cap Screw, 6 x 20mm, DIN912	Caster mtg, 4 plc
4b	1065-0468	Spacer, EM to Rail	6 plc
5	1065-0646-01	Cross Brace, Lenzar installation	
	1516-0074	Screw, 6–32 x 3/8", PNH, INT SEM, PD, ST, ZN	8 plc, u/w 1065-0646-01
5a	1065-2481-01	Cable/Footswitch Tray	was 1066-0153
	1516-0074	Screw, 6–32 x 3/8", PNH, INT SEM, PD, ST, ZN	6 plc, u/w 1066-0153
6	3500-0484-04	Footswitch, 2 Pos, FF/2DTM	
	3500-0486-04	Footswitch, 4 Pos, FF/PRINT/VCR/2DTM	
7	Note 1	Electronics Module	Tbl 8–4
8	Note 1	Optional Equipment Module (OEM)	Tbl 8–5
9	Note 2	Photomodule	
		CAD Module	Tbl 8–11
		Video Copy Processor	Peripheral manual
10	Note 3	Audio/Video Module	Tbl 8–7; Repl matrix
11	Note 2	VCR, Internally Mounted	
12	Note 1	Human Factors Assy (HF Module)	Tbl 8–6; Ref
13	1065-0443	Cable Cleat, 3 Pos	
14	1065-0442	Cable Cleat, 2 Pos	
15	1064-0338-01	Storage Tray	w/o CAD

Table 8–1.   UM-4 Human Factors Cart (HFC) (Cont'd)

Fig No./ Index	ATL Part No.	Description	Notes
	1065-0952-02	Storage Tray	w/CAD
16	1064-0591-02	Transducer Tray	
17	1064-0363-01	S/H Holder	
18	1065-1106-02	S/H Holder, Generic	
19	1064-0270-00	Handle	
20	Note 3	Monitor Assy	Tbl 8–10; Repl matrix
20a	4100-0615-01	Label, Monitor, "UM-4"	
	4100-0615	Label, Monitor, "UM-4CAD"	
	4100-0707-02	Label, Monitor, "UM-4PLUS" (New Logo)	7500-0548-xx Bmfrmr Cntrlr
20b	4100-0313	Label, Monitor, "SAFE TRANSPORT"	
20c	4100-0278	Label, "BRIGHTNESS/CONTRAST"	
21	Note 3	Control Module	Tbl 8–9; Repl matrix
22	1065-2478-01	Bezel, Rear EM	(was 1064-0234-02)
22a	4100-0508-01	Label, "RISK CURRENT"	Dom
	4100-0345	Label, "RISK CURRENT"	Intl
22b	4100-4027	Label, "POWER FUSE"	Dom
	4100-4049-01	Label, "POWER FUSE"	Intl
22c	4100-0271	Label, System "WARNING"	
23	1064-0268	Cover, Rear EM Panel	
23a	1514-0049	Screw	u/w 1064-0268
24	1065-1172-01	Bezel, Front OEM	
24a	1064-0228-01	Bezel, Blank	w/o Photo Mod
24b	1065-1265-01	Bezel, Dress	w/Video Printer
24c	9901-0015	Tape, Double-Sided Foam	u/w 24a and 24b, u/m in
24d	1065-0949-01	Front Cover, CAD bullnose	
24e	4100-0528-01	Label, "UM-4CAD"	u/w 24e
24f	1517-0079	Screw. 8–32 x 1/2", WHT	u/w 24e
24g	4100-0582-01	Label, "UM-4CAD"	
25	1065-1169-01	Bezel, Rear OEM	Dom w/o CAD
	1065-4123-03	Bezel, Rear OEM	Intl w/o CAD
	1065-0954-02	Bezel, Rear OEM	w/CAD
25a	4100-0353	Label, OEM "WARNING"	
25b	4100-0352	Label, "VIDEO OUT"	
25C	4100-0327	Label, "IMAGE PRINTER"	

Table 8–1.   UM-4 Human Factors Cart (HFC) (Cont'd)

Fig No./ Index	ATL Part No.	Description	Notes
26	Note 3	Data Comm Module	Tbl 8–8; Repl matrix
27	3500-0609-01	Speaker Assy, w/Cable	2 plc; Doppler
28	3500-0608-02	Volume Control	w/cable
29	4400-0022	Knob, Rubber	
29a	4100-0351	Label, "VOLUME"	
30	2265-0056-01	Power Cord, UM4, 10' (Detachable)	120 V; alt. 3500-1009-01
	3100-0714	• Plug, Hosp, 15A, 125V	
	3500-0360-01	Power Cord Assy (Int'l) HFC	240 V; w/o plug
	3100-0553	Plug, Hosp, 15A, 240 V	u/w 3500-0360-01
31	1065-0292	Spacer, Upper Monitor	
32	1065-0411-01	Washer, Lower Thrust	
32A	1520-0004	Set Screw, Thrust Washer	3 plc
33		Plate, Lower Monitor	
34	1516-0074	Screw, 6–32 x 3/8", PHMA, PD, w/Lck Wshr	
35	1064-0369-01	Mtg Plate, Front Storage Bin	2 plc
35a	1516-0005	Screw	4 plc
35b	1516-0017	Washer	4 plc
36	1066-0176-02	Storage Bin	
37	1065-2477-01	Bezel, Front EM (was 1064-0233-02)	Requires Labels
37a	4100-0266	Label, "UM-4"	
37b	4100-0619-01	Label, "UM-4CAD"	
37c	4100-0706-02	Label, "UM-4PLUS" (New Logo)	7500-0548-xx Bmfrmr Cntrlr
	4100-0929-01	Label, Software Level 32, UM4, English	
	4100-0930-01	Label, Software Level 32, UM4, French	
	4100-0931-01	Label, Software Level 32, UM4, German	
38	1516-0114	Screw, 6–32	2 plc
39	1514-0060	Screw, 4–40	2 plc
40	1064-0304	Panel, Blank	
40a	9901-0015	Tape, Foam, Double-Sided	u/m inch
41	119-27314-01	Label, Surgery, "WARNING"	
42	4100-0363-01	Label, Serial Number	Intl
	4100-0363-02	Label, Serial Number	Dom
43	4100-0341	Label, TUV	Intl
	4100-0371-01	Label, UL	Dom
44	1065-0520-05	Bracket, Lower Lenzar Mounting	
45	1065-1150-02	Bracket, Lower Front Lenzar Mounting	

Table 8–1.   UM-4 Human Factors Cart (HFC) (Cont'd)

Fig No./ Index	ATL Part No.	Description	Notes
46	1065-0525-02	Bracket, Lenzar Mounting	
47	1517-0040	Screw, 8–32 x 3/8", PNH	
48	1517-0005	Screw, 8–32 x 3/8", FLH	
49	1516-0141	Screw, 6–32 x 5/16"	
50	2210-0137	Tape, Foam	u/m foot
51	1065-0521-01	Bracket, Keyboard Support	
52	3500-1055-01	Jack Assy, Headphone/Microphone	For system w/Lenzar only
53	2208-0125-01	Clip, Saddle (Cable Holder)	For system w/Lenzar only

1. To order, refer to the Reference section to determine the correct replacement part number.
2. To order a peripheral, refer to the appropriate Peripheral Field Service Manual (Cameras, B/W Recorders or Misc) to determine the correct replacement part number.
3. To order, refer to the Replacement Matrix in the Configuration section to determine the correct replacement part number.

Table 8–2.   UM-4 Full Peripheral Cart

NOTE: *Only the following parts are available for the Full Peripheral Cart. PCBs, software and peripherals should be ordered using the replacement matrices in* Section 5*. For other parts or information, call the Customer Support Center or Country Manager.*

Fig. No./ Index	ATL Part No.	Description	Notes
	3500-0501	Monitor Assy, Large Cart	
	2251-0002	Cable, EM (B) to Control Module	
	2251-0004	Cable, EM (B) to Control Module	Lower cable
	2275-0107	Cable, EM (D) to A/V Module (D)	
	2275-0094	Cable, EM (E) to A/V Module (E01)	
	2275-0104	Cable, EM (F) to Data Comm Module (F)	
	2275-0123-01	Cable, EM Data Comm Module to Printer	Ribbon cable
	3500-0600-00	Fan Assy	(Behind VCR)

Table 8–3.   Ultramark 4AFF, 4A (OB), 4PV and 4CV

Fig. No./ Index	ATL Part No.	Description	Notes
8–3			
1	3500-1325-01	Rail Assy (5" Casters)	Set of 2 rail assys
1a	1065-2482-01	• Tubular Rail, Smooth Stem	2 plc (was 1065-1095-02)
1b	2950-0186-01	• Cap, Plastic Screw Cover	4 plc
1c	1517-0040	• Set Screw, 8–32 x 3/8", PNH	4 Plc
1d	2950-0186-00	• Base, Plastic Screw Cover	4 plc
1e	1064-0545-01	• End Cap, Rail	4 plc
1f	1517-0063	• Set Screw, 8–32 x 3/8", HD, Cup PT, ST ZN	8 plc
1g	1530-0036-01	• Screw, 5/16–24 x 5/8", SKH, CS, HD, SS	6 plc; only u/w tubular rail
	(1520-0006)	(Screw, 5/16–24 x 1–1/2", SKH, CS, HD, SS)	(6 plc; for non-tubular rail)
1h	1561-0017	• Washer, Int Lk, 5/16", ST, ZN	6 plc
1i	2950-0411-02	• Caster, Tente w/Swivel Lck, 5", Smooth Stem	2 plc (Alt 2950-0411-04)
1j	2950-0411-01	• Caster, Tente w/Brake, 5", Smooth Stem	2 plc (Alt 2950-0411-03)
1k	1615-0005	• Cap Screw, 6 x 20mm, DIN912	Caster Mtg, 4plc
2	1064-0468	Spacer, EM to Rail	
3	1065-2481-01	Tray, Cable/Footswitch	(was 1066-0153)
4	1516-0074	Screw, 6–32 x 3/8", PNH, INT SEM, PD, ST, ZN	6 plc, u/w 1066-0153
5	3500-0484-03	Footswitch, 2 Pos, FF/2DTM	
	3500-0639-01	Footswitch, UM4A, 1 Pos	
6		Electronics Module	Tbl 8–4
7 (Ref)	3000-0207-XX	Optional Equipment Module (OEM) (*For OEM "–XX", see Section 9, Reference*)	
8	1065-0511-XX	• Base, OEM	
9	1064-0512-XX	• Plate, Slide, OEM	
10	1065-1289-01	• Cable Clip, Scanhead, Wireform	4 plc (2 plc Doppler)
11	1064-0514-XX	• Plate, Keyboard Mounting	
12	1064-0515-XX	• Panel, Left Side	
	1065-4091-XX	• Panel, Left Side	UP-870
13	4100-0381-01	Label, (Non/Doppler)	Not p/o OEM
	4100-0380-01	Label, (Doppler)	Not p/o OEM
14	1064-0516-XX	• Panel, Right Side	
	1065-4090-XX	• Panel, Right Side	UP-870
15		• Panel, Sheer, Rear OEM (was1064-0517-01)	w/o Video In/Out
	1064-0517-02	• Panel, Sheer, Rear OEM	w/ Video In/Out

Table 8–3.   Ultramark 4AFF, 4A (OB), 4PV and 4CV (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
16	1064-0521-03	• Tray, S/H, UM4A	
16a	1065-1290-01	• Scanhead Holder, Urethane	
17	1064-0532-XX	• Frame, 1" Tubing	24" front-to-back
	1064-0532-XX	• Frame, 1" Tubing, Extended	26.5" front-to-back, AG5700
17a	1065-0580-01	• Plug	End cap for item 17
18	1065-0534-XX	• Mounting Bracket, Monitor	
	1065-2106-XX	• Mounting Bracket, Monitor, Extended	u/w AG-5700 VCR
19		• Mounting Strip, Rear	
20		• Mounting Strip, Front	
21	1065-1287-XX	• Tray, S/H, Universal, Long Flange	
	1064-0538-01	• Panel, Blank, Linear Holder	PV
22 Note 1	3500-1468-01	Power Distribution Assy, 100V/120V	Repl 3500-1094-XX
	2700-0231-01	• Fuse, 3.0A, 250V, Time Del	
	2700-0225-01	• Fuse, 10A, 250V, Slo Blo	2plc
	2265-0056-01	Power Cord, 9'10", Detachable, w/Conn	Alt:2245-0018 cord w/3100-0714 plug
	2245-0006	Power Cord, 6'7", w/Conn	
	3500-1469-01	Power Distribution Assy, 220/V240V	TUV; Repl 3500-1095-XX
	2700-0224-01	• Fuse, 1.25A, 250V, Slo Blo	
	2700-0061	• Fuse, 5A, 250V, T Rated	2 plc
	3500-1463-01	Power Distrib'n Assy, 240V In/120V & 240V Out	240V, TUV; Repl -1096-XX
	2700-0224-01	• Fuse, 1.25A, 250V, Slo Blo	
	2700-0061	• Fuse, 5A, 250V, T Rated	2 plc
	2265-0036–01	Cord, Power, 2.5m, w/o connector, 240V	Alt:2245-0018 cord w/3100-1555-01 plug
	3100-1555-02	Connector, Power Cord, 240V	u/w 2265-0036-01
22	3500-0629-xx	Power Distribution Assy, 120V	Obsolete, Ref only
	2700-0225-01	• Fuse, 10A	120V; 2plc
	2700-0231-01	• Fuse, 3A	240V; 2 plc
23	Note 3	Video Printer	
24	Note 3	VCR, Panasonic	
25	1064-0588-02	Bracket, VCR Mounting	AG-6400
	1064-0539-02	Bracket, VCR Mounting	AG-2400/NV-180
26	Not Used		
27	Note 2	Monitor Module Assy	Tbl 8–10
28	1064-0520-01	Plate, Dress, Tilt Swivel	

Table 8–3.   Ultramark 4AFF, 4A (OB), 4PV and 4CV (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
29	1065-0292	Spacer, Monitor, Upper	
30	1065-0540	Spacer, Monitor, Lower	
31	1065-0411	Washer, Lower Thrust	
32	1520-0004	Set Screw, 5/16–18 x 5/16", cone point	
33	1516-0076	Screw, 6–32 x 5/16"	
35	1064-0369-01	Mtg Plate, Front Storage Bin	2 plc
35a	1516-0005	Screw	4 plc
35b	1516-0017	Washer	4 plc
36	1066-0176-02	Storage Bin	
37	1065-2477-01	Bezel, Front EM (was 1064-0233-02)	Requires labels
37a	4100-0372-01	Label, "UM-4A", EM 2 plc	7500-0362-xx Bmfrmr Cntrlr
37b	4100-0706-02	Label, "UM-4PLUS", EM (New Logo) 2 plc	7500-0548-xx Bmfrmr Cntrlr
38	4100-0618-01	Label, "UM-4A", Monitor	
39	4100-0707-02	Label, "UM-4PLUS", Monitor (New Logo)	
	4100-0929-01	Label, Software Level 32, UM4, English	
	4100-0930-01	Label, Software Level 32, UM4, French	
	4100-0931-01	Label, Software Level 32, UM4, German	
40	3500-0671-04	Speaker Amp Box Assy	
41	7500-0355	• PCB, Audio Amp	
42	4400-0022	Knob, Rubber, .875" Dia	
	4400-0022-01	Knob, Rubber, .875" Dia, Brn	PV
43	3500-0662-03	Speaker Assy, w/Cable	2 plc; Doppler
44	Note 2	Control Module	See Section 5 for P/Ns
45	1065-1276-02	Bezel, Dress, Video Printer	UP-870
46	Not Used		
47	Not Used		
48	1064-0518-01	Cover, Back	System w/o Printer
	1065-1689-01	Cover, Rear OEM, Serial Data Port Connector	System w/ Printer or new
	3500-1259-02	• Cable, OEM Serial Data Port/Rear Panel "G"	style power distr. assy (#22)
	4100-0894-01	Label, OEM Rear Panel, Int'l	Req for 1065-1689-XX cover
	4100-0719-02	Label, OEM Rear Panel, Domestic	Req for 1065-1689-XX cover

Table 8–3.   Ultramark 4AFF, 4A (OB), 4PV and 4CV (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
49 (no 50)	3500-1528-01	Cable, Monitor/Video Copy, Molded, UM-4A	Req for AG-5700 VCR; Alt. 2275-0184-02
51	6013-0116-01	Remote Control, P–60U	Note 3
	2100-0504-01	Remote Control, Sony 811/UP1810	
52		Mounting Bracket, P–60U	
	1065-0912-02	Cover, Video Printer	
Misc.	1516-0076	Screw, 6–32 x 5/16"	
	1517-0040	Screw, 8–32 x 3/8", PNH	

1. These power distribution assemblies require 1065-1689-02 rear panel and appropriate label, item 48.
2. To order, refer to the Replacement Matrix in the Configuration section to determine the correct replacement part number.
3. To order a peripheral, refer to the appropriate Peripheral Field Service Manual; (Cameras, B/W Recorders or Misc) to determine the correct replacement part number.

Table 8–4.   UM-4 Electronics Module

NOTE: *To order any part that includes a dash level of "-XX", refer to the Replacement Matrix in* *, Configuration for the correct dash level.*

Fig. No./ Index	ATL Part No.	Description	Notes
8–4			
1		Electronics Module (EM)	
2		EM Chassis	
3		Card Cage	
4	1700-0032-xx	Power Supply Assy, 120V	120 VAC only
	1700-0002-xx	Power Supply Assy	120V or 240V
5	2700-0072	• Fuse, 15.0A/250V, Slo Blo	120V, F201/ F202
	2700-0045	• Fuse, 8.0A/250V, Slo Blo	240V, F201/ F202
6	7500-0318-xx	Rear Panel Assy	
7		Shield Plate, Motherboard	
8		Shield Plate, Motherboard	
9		Motherboard PCB	
10	3500-0443-03	Cable Assy, EM/Rear Panel Video Out	Push-on
10A	3500-0957-01	Cable Assy, EM/Rear Panel Video In	Screw-On
11	3500-0456	Cable, MB P8/Power Supply	Sensor signals, EM
	3500-0506-01	Cable, Dop Audio MB/Rear Panel	
12	2100-0121	Battery	4 plc
	3700-0134-01	Super Cap	2 plc
13		U-Channel, EM Card Cage	
14		Cover, EMI, Motherboard	
	1066-0169	Mylar, Adhesive (for inside Cover)	
15	3500-0738-01	Fan Module Assy	5 Fans
	3500-0738-02	Fan Module Assy	Euro, 5 Fans
	2100-0386	• Fan, 24 Vdc, 94 CFM	4 plc
	2100-0387	• Fan, 18–30 Vdc, 32 CFM	1 plc
16	3500-0432	• Cable Assy, Fan	
15	3500-0431	Fan Module Assy	2 Fans
	2100-0125-00	• Fan, 24 Vdc, 110 CFM	2 plc
16	3500-0432	• Cable Assy, Fan	
17		• PCB Assy, Fan Module Controller	
18		• Cover, Fan Assy	
19	7500-0630-01	Dual Linear Relay PCB	2 plc (Not shown)
19A	7500-0384-02	PCB, Access Select	
19b	1064-0531-01	Plate, Mounting, Dual Access	u/w 3500-0518-xx only

Table 8–4.   UM-4 Electronics Module (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
20	3500-0581-xx	System Receiver Assy	
	3500-1016-xx	System Receiver Assy, Duplex CW-Ready	
	7500-0511-xx	• PCB Assy, System Receiver, Duplex CW-Ready	
	1065-1148-01	Bracket, Adapter, 3500-1016 System Receiver	For older EMs, only
21	3500-0583	Cable, Sys Rcvr/MB (P1/J16)	
22	2275-0171	Cable, DFT to Motherboard	
	2275-0278-01	Cable, Dual Linear PCB to Motherboard	4 plc (Chabin cable)
	3500-1185-02	Cable, Access Select PCB to Dual Linear cable	
23	3500-0518	ECG Module	
	7500-0323	• PCB, ECB Isolation	
	9901-0025-01	Tape, Copper Foil	Not shown
24		ECG Connector Plate	
25	3500-0489-04	S/H Conn Panel Assy, DFT	Single Linear
	3500-0489-09	S/H Conn Panel Assy, AA	Single AA
	3500-0489-08	S/H Conn Panel Assy, DFT/AA	
	3500-1373-01	S/H Conn Panel Assy, Dual Linear	Replaces factory part, 3500-1184-02
26	3500-0445-07	S/H Conn Panel, EFT	Single
	3500-0797-01	S/H Conn Panel, EFT & CW	
27	3500-0437-04	S/H Conn Panel, Access	Single S/H Conn Panel, Dual Access
26/27	3500-0683-10	S/H Conn Panel, Dual Access w/EFT	u/w 3500-0581-xx (item 20)
	3500-0802-02	S/H Conn Panel, Dual Access w/EFT & CW	u/w 3500-1016-xx (item 20)
28	7500-0317	A1, RF Select PCB	S1
	7500-0369-xx	A1, Doppler Pulser PCB	S2
	7500-0525-xx	A1, Doppler Pulser PCB	S2; Dplx CW
29	7500-0288-xx	A2, Beamformer Front End	
30	7500-0320-xx	A3, Beamformer Focus	S1
	7500-0361-xx	A3, Beamformer Focus	
	7500-0549-xx	A3, Beamformer Focus	
31	7500-0324	A4, Beamformer Controller PCB	S1
	7500-0362-xx	A4, Beamformer Controller PCB	
	7500-0548-xx	A4, Beamformer Controller PCB	

Table 8–4.   UM-4 Electronics Module (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
32	7500-0313-xx	A5, Pulse Processor PCB	S1
	7500-0370-xx	A5, Pulse Processor PCB	S2
	3500-1261-xx	A5, Pulse Processor PCA	Doppler
	3500-1262-xx	A5, Pulse Processor PCA	Non-Doppler
33	7500-0346-xx	A6, Doppler Acquisition PCB	
	7500-0394-xx	A6, Doppler Acquisition PCB	
34	7500-0347-xx	A7, Doppler Processor PCB	
	7500-0390-xx	A7, Doppler Processor PCB	
35	7500-0304-xx	A8, Motor Controller PCB	
	7500-0348-xx	A8, Motor Controller PCB	
	7500-0517-xx	A8, Motor Controller PCB	
36	7500-0273-xx	A9, 2D Scan Converter Interface PCB	
	3500-1413-xx	A9, 2D Scan Converter Combo PCB, 525-line	7500-0778 PCB plus config.
	3500-1414-xx	A9, 2D Scan Converter Combo PCB, 626-line	
	3500-1425-xx	A9, 2D Scan Converter Cine PCB, 525-line	7500-0798 PCB plus config.
	3500-1426-xx	A9, 2D Scan Converter Cine PCB, 625-line	
37	7500-0315-xx	A10, 2D Scan Converter Buffer	256-lines
38	7500-0314-xx	A11, 2D Output Address Generator PCB	
39	7500-0411-xx	A12, Combined TM Mode PCB	
	7500-0322-xx	A12, TM Mode PCB	Req TM Aux PCB
40	7500-0374-xx	A13, TM Aux PCB	Req TM Mode PCB
41	7500-0300-xx	A14, Display Controller PCB	
42	7500-0312-xx	A15, System Controller PCB	
43	2275-0124	Cable, Beamformer (A2/J4–A4–J4)	Bottom cable
44	2275-0118	Cable, Beamformer (A2–J5/A4–J5)	Top cable
45	3500-0584	Cable, Dop Plsr/Rcvr (A1–J1/PD PULS)	
45A	3500-1021-01	Cable, Dop Plsr/Rcvr (A1–J2/CWPl)	
46	3500-0587	Cable, PP/Rcvr (A5–J1/2D RF)	
47	3500-0586	Cable, PP/Rcvr (A5–J2/2D PULS)	
48	3500-0585	Cable, PP/Rcvr (A5–J3/TGC)	
49	3500-0615	Cable, PP/BF Focus (A5–J4/A3 FOCUS)	
50	3500-0589	Cable, Dop Acq/Rcvr (A6–J1/CW OUT)	
51	3500-0588	Cable, Dop Acq/Rcvr (A6–J2/PDOP)	
51A	3500-0694-01	Cable, Dop Acq/Dop Proc (A6–J4/A7–J2)	
51B	3500-0695-01	Cable, Dop Acq/Dop Proc (A6–J3/A7–J1)	

Table 8–4.   UM-4 Electronics Module (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
52	2275-0078	Cable, Ribbon, 2D Scan Conv (A9–P4/A10–P4)	
52a		Ground Straps (A2/Case)	2 plc
53	1514-0060	Screw, 4–40 X 3/8 PNH	6 plc
54		Shield, Front EM	
54a	1066-0169	Mylar, Adhesive	(inside Shield)
55	1064-0466	Panel, EM, Left Side	
56	1064-0467	Panel, EM, Right Side	
57	1064-0214	Cover, EM, 3-Sided	FPC and Stand-Alone
58	Not Used		
59	1064-0465-01	Top Cover, EM	
60	1065-0385-01	Bolt, Mounting, OEM Module	4 plc (mushroom)
61	Not Used		
62	Not Used		
63	3500-0695-01	Cable Assy, Local Oscillator, 90 degrees	u/w 7500-0394-01 & up
64	3500-0694-01	Cable Assy, Local Oscillator, 0 degrees	u/w 7500-0394-01 & up
	198-12443-00	PCB Puller	(not shown)
	7500-0269	PCB Extender	(Req Mgr approval)
	2100-0121	Battery, 1.2V Nicad	4 plc

Table 8–5.   HFC Optional Equipment Module Assembly

Fig. No./ Index	ATL Part No.	Description	Notes
8–5			
	Note 1	Optional Equipment Module (OEM)	
1		Chassis Assy, OEM	
2		Base, OEM	
3		Panel, Support, Rt Side	
4		Panel, Support, Lt Side	
5		Panel, Dress, Rt Side	
6		Panel, Dress, Lt Side	
7		Plate, Slide	
8		Plate, Locking	
9		Bracket, Mounting, Front Bezel	
10		Bracket, Mounting, OEM Rear Bezel	
11		Bracket, Mounting, OEM Connectors	
12	2251-0004	Cable, EM(B)/OEM Keyboard	Lower cable, non- extended OEM
13	2275-0064	Cable, EM(A)/Monitor	Lower cable, non- extended OEM
14		Panel, Power Switch Insert	
15	Not Used		
16	3500-0608-02	Volume Control Assy, HFC	
17	4400-0022	Knob, Rubber, .875" Dia x .5 H	
18	3500-0910-06	Power Distr Assy	120 Vac
	3500-0951-05	Power Distr Assy	240 Vac
19	Ref only	• Switch, Power, Rocker	
20		Bracket, Cables	
21	Note 2	Video Cassette Recorder	
22		Plate, Mounting, VCR	
23		Bracket, Mounting, VCR	
24		Audio/Video Module	Tbl 8–7
25		Plate, Clamp, A/V Module	
26		Data Communications Module	Tbl 8–8
27		Bracket, Mounting, Data Comm	
28	Note 2	Photo Module or Video Copy Processor	
29		Bracket, Mounting	For item 28
30	Not Used		
31	1065-0949-01	Bezel, CAD Bullnose	Tbl 8–11
	1517-0079	Screw and Washer, CAD Bullnose	2 plc

Table 8–5.   HFC Optional Equipment Module Assembly (Cont'd)

Fig. No./ Index	ATL Part No.	Description	Notes
32	1064-0229-04	Bezel, Front OEM w/Photo Mod	Uses 1064-0228-00
	1065-1172-01	Bezel, Front OEM, CAD or Video Printer	Uses 1064-0228-01
33	1064228-10	Bezel, Blank, w/o Photo Mod	Use w/1064-0289-xx
	1064-0228-01	Bezel, Blank, w/o Video Printer or CAD	Use w/1065-1172-01
	1064-0228-01	Bezel, Blank, w/o Video Printer or CAD	Use w/1065-1172-01
	1064-1276-02	Bezel, Video Printer Dress (UP870)	Use w/1065-1172-01
	1064-0304	Tape, Double-sided	Req 12" for 1064-0228-00/01; 2" for 1065-1276-01/02
34		Bezel, Blank A/V Module	
35	1064-0248-04	Bezel, Rear OEM w/Bump (Non-CAD)	
36	1064-0304	Bezel, Blank Data Comm, Rear	
	3500-1431-01	Assy, Printer Interface, HFC, Domestic	Replaces Data Comm
	3500-1259-03	• Cable Assy, RS232, Serial Comm	Rear Panel to Printer Interface Panel 3500-1431-XX
37	1064-0302	Bezel, Blank Data Comm, Side	
38	1064-0299	Bezel, NV-8420 VCR	
	1064-0444	Bezel, Upper, VR-40 VCR	
		Bezel, Lower, VR-40 VCR	
		Bezel Assy, Generic VCR	
	1064-0301	Bezel, Blank VCR	

1. To order, refer to the Reference section to determine the correct replacement part number.
2. To order a peripheral, refer to the appropriate Peripheral Field Service Manual; (Cameras, B/W Recorders or Misc) to determine the correct replacement the part number.

Table 8–6.   Human Factors Module Assembly

Fig.No./ Index	ATL Part No.	Description	Notes
8–6			
	4000-0144-10	Human Factors Module, Includes:	
1	1064-0338-01	Tray, Storage, Left Side	
2	1064-0591-02	Tray, Multiple Transducer	
3		Not Used	
4	1064-0363-01	Tray, Scanhead, Right Front	(DFT S/H holder)
5	1064-1106-02	Tray, Scanhead, Generic, Right Rear	Replc 1064-0364
6	1064-0368-00	End Cap, Active Scanhead Holder	
6a	1516-0115	Screw, 6–32 x 5/8, PNH, SEMS, PD, ST, ZN	u/w 1064-0368-00
7	1065-0443	Cleat, Cable, 3 Position	
8	1064-0442	Cleat, Cable, 2 Position	
	1514-0060	Bolt, Cleat Securing, 4–40x3/8, PNH, SEM, PD, ST, ZN	4 plc; OEM Bezels, Fr EM Shield
	1560-0031	Washer, FL, #6 (use with 1514-0060)	4 plc
	1065-1289-01	Clip, Cable	2 plc
9		Handle	
10	1064-0282	End Cap, Handle	2 plc
11		Cover, UM4 Handle	
12		Monitor Platform	
13	3500-0609-01	Speaker Assy	2 plc
14	7500-0355	Speaker Amplifier PCB	2 plc
15	3500-0608-02	Volume Control Assy	
	4400-0022	• Knob, Volume Control, Rubber	
16	2275-0125	Cable, AV Mod/Speaker Amps	
17	3500-0606	Cable, Amp Connecting	
18	2275-0102-02	Cable, EM/Monitor	For 4000-0144-03 thru -09
19	2251-0003-01	Cord, Coiled, EM/Keyboard	
20		Not Used	
21		Cover, Top Link Arm	
22		Cover, Lower Link Arm	
23	1563-0083	Screw, Cover Attachment	
24	2950-0123	Spring, Ext, 1/8Dx2L, K=1.67#/IN, SS	
25	1064-0281	Handle, Latch Release	
26	2950-0143	Spring, Comp 3 plc	(u/w 1517-0035 screw 2plc)
27	1065-0305	Latch, Keyboard Support	

Table 8–6.   Human Factors Module Assembly (Cont'd)

Fig.No./ Index	ATL Part No.	Description	Notes
28	2950-0016	Spring, Tension	
29	1065-0364	Latch, Monitor Arm	
30	2950-0130	Spring, Ext	
31	1514-0063	Screw, 4–40x5/32"	Req #6 flat washer
32	2950-0144	Spring, Ext	
33	1065-0658-01	Plate, Mounting, Right Side	
33a	1065-0687-01	Plate, Mounting, Left Side	
33b	1517-0009	Screw, 6–32 x 7/16", PNH, PD, ST, ZN	
34	1064-0506-01	Mounting Block	
34a	1517-0093-01	Screw, 8–32 x 7/16", SKH	
34b	1517-0094-01	Screw, 8–32 x 1", SKH	
35	8000-0862-01	Kit, Field Installation, HFC Dampers	
	2950-0549-01	• Damper, Oil Filled	2 Plc; Rplc gas springs
	1065-2336-01	• Label, Pin Retention	2 Plc
	1065-2193-01	• Clevis Pin	2 Plc
36	1065-0292	Spacer, Monitor, Upper	
37	1065-0411-01	Lower Thrust Washer	
	1520-0004	• Set Screw	3 plc
38		Plate, Lower Platform, Monitor	
39		Screw, 6–32x3/8" PHN, w/Lock Washer	
40	1543-0002	Keps Nut, 10–32	2 plc; Keps rplcs 1563-0061 Belleville cone washers
41	1543-0001	Nut, Standard 10–32	2 plc
	2301-0194	Epoxy	For Mounting Trays

Table 8–7.   Audio/Video Module Assembly

Fig. No./ Index	ATL Part No.	Description	Notes
8–7			
	4000-0143-xx	Audio/Video Module	
NOTE: *The 4000-0144-10 (with switch) and the -12 (without switch) are not interchangeable. Refer to the Replace ment Matrix for correct replacement part numbers.*			
1		Chassis, A/V Module	
2		Binding Post, Metal, 6–32	
3		Line Filter, 6A, 120/250 VAC	
4		Rocker Switch, DPST, 16A, 250 VAC	
5		Fuseholder, 5x20 mm, Panel Mount	
6	2700-0066	Fuse, 800 mA, Extra Slo Blo, 250V	120 V
	2700-0064	Fuse, 400 mA, Extra Slo Blo, 250V	240 V
7		Fuse Block, 10–5x2	
8	2700-0066	Fuse, 800 mA, Extra Slo Blo, 250V	
9	2700-0061	Fuse, 5A, Slo Blo, 250 V	
10		Transformer	
11		PCB, Motherboard	
12		PCB, Power Supply	
13		Bezel	
14		Cover, Enclosure	
15		Insulator, Cover	
16		Plate, Mounting	
17		PCB, Stereo Interface	
18		PCB, Digital Interface	
18		PCB, VCR Interface	Repl Dig. Interface PCB

Table 8–8.   Data Communications Module Assembly

Fig. No./ Index	ATL Part No.	Description	Notes
8–8			
	4000-0158-xx	Data Comm Module	EIA
	4000-0159-xx	Data Comm Module	CCIR
1		Chassis Assy, Data Comm	
2		• Switch, Rocker	
3		• Post, Binding	
4		• Receptacle, Male, w/EMI Filter	
5		• Power Supply Assy	
6		•• Transformer, Power	
7		•• PCB, Power Supply	
8	2700-0058	•• Fuse, 1.6 A, Slo Blo	
9	2700-0192-01	•• Fuse, 0.4 A, Slo Blo	
10	2700-0059	•• Fuse, 2.5 A, Slo Blo	
11	2700-0061	•• Fuse, 5 A, Slo Blo	
12		• PCB, Data Comm Signal Dist.	
13		• PCB, Data Comm Isolation	
14		RS-232/Iso Xfmr Assy	
15	2700-0062	• Circuit Breaker, 1.5 A, 1 Pole	120 V
	2700-0063	• Circuit Breaker, 8 A, 1 Pole	240 V
16		• Receptacle, AC, Hosp Grade	
17		• Transformer, Isolation	
18		• Cable Assy, Pwr Sup/Iso Xfmr	
19		Cable Assy, Iso PCB/RS-323	
20		Cable Assy, Iso PCB/Distr PCB	
21		Cable Assy, Data Comm Pwr, Epson	
22		Cable Assy, Data Comm, 34-Pin	
23		Disk Drive, 3.5" Micro floppy, 2-Sided	
24		Cover, Data Comm	
25		Bezel, Connector	
26		Bezel, Disk Drive	
27	2700-0065	Fuse, 3.15 A, Extra Slo Blo	120 V
	2700-0067	Fuse, 1.6 A, 250 V, Extra Slo Blo	240 V

Table 8–9. Control Module Assembly

Fig. No/ Index.	ATL Part No.	Description	Notes
8–9			
	4000-0154-xx	Control Module, Hardkey, TB	
	4000-0155-xx	Control Module, Hardkey, JS	
	4000-0156-xx	Control Module, Softkey, TB	
	4000-0214-xx	Control Module, TGC Slidepot	Dom CAD
	4000-0222-xx	Control Module, TGC Slidepot	Intl
	4100-0260	Overlay, Full Feature Hardkey	(Text descriptors)
	4100-0326	Overlay, Generic Hardkey	(Text descriptors)
1	Ref only	Base Assy, Hardkey	Base Assy, Softkey
2	Ref only	• Base, Molded	
3	Ref only	• Regulator Assy	
4	Ref only	• Bail, Base Assy	
5	Ref only	• Insulator, Keyboard Controller PCB	
6	Ref only	• Cable Assy, System Interconnect	
7	Ref only	• Cable Assy, Keyboard Controller PCB	
8	Ref only	• Cable, Softkey Control Control Mod	
9	Ref only	• Buzzer Assy, Sonalert	
10	Ref only	• PCB, Keyboard Controller	
11	Ref only	•• Kit, PROM	
12	Ref only	• Keyboard, 56 Key, w/o Legends	SK
13	Ref only	• Keyboard, 56 Key, w/Legends	HK
14	Ref only	Not used	
15	Ref only	• Bezel, Molded	
16	Ref only	• Insert, Bezel	
17	4400-0021	• Knob, Rubber, 0.625"	
	4400-0021-01	• Knob, Rubber, Brn, 0.675"	PV
18	4400-0022	• Knob, Rubber, 0.825"	
	4400-0022-01	• Knob, Rubber, Brn, 0.875"	PV
19	Ref only	• Pot, Precision, 5K	
20	3500-0421-01	• Joystick	
21	Ref only	• Plate, Joystick Mounting	
22	2100-0461-02	• Trackball Assy (Replaces –04)	Req No. 34, overlay
	3000-0177-03	• Trackball Assy	Medasonics
23	Ref only	• Plate, Trackball Adapter	
24	Ref only	• PCB, Hardkey Backlight	
25	Ref only	• PCB, Hardkey Interconnect	

Table 8–9.   Control Module Assembly (Cont'd)

Fig. No/ Index.	ATL Part No.	Description	Notes
26	Ref only	• Cable Assy, Hardkey Interconnect	
27	Ref only	• Cable Assy, Hardkey Backlight PCB	
28	Ref only	Top Assy, Softkey	
29	Ref only	Top Assy, Softkey	PV
30	Ref only	Bezel, Molded	
31	Ref only	• Switch Array, Membrane, 12 Pos	
32	Ref only	• Display, 80 Character, Vacuum	
33	Ref only	• Cable, Softkey Display	
34	4100-0235-01	Overlay, Trackball, Blue	Adhesive back
	1065-1915-01	Keycap w/Skirt	Slidepot keycap

Table 8–10.   Monitor Module Assembly

Fig. No./ Index	ATL Part No.	Description	Notes
8–10			
1	3500-0764-xx	Monitor Module, Hi Contrast	EIA, Detail B
	3500-0696-xx	Monitor Module Assy, Medasonics PV	PV
	3500-0908-xx	Monitor Module, Medasonics PV, Hi Contrast	PV
	3500-0426-xx	Monitor Module Assembly	UM4A, OB, PV, CV
	3500-1087-xx	Monitor Module, UM-4/5	
2		Chassis Assy w/CRT & PCB	
3	Not Used		
4		Plate, Lower Mounting	
5	1065-1388-01	Lens, Polarized Plastic, UM4/5, Monitor (use with 1065-1389-01 & 1065-1390-01)	Alt: 1065-1210-01 use with 1065-1209-01 Brkt (2 plc) & 1065-1211-01 Screws (2 plc)
5a	1065-1389-01	Brkt, Plastic Lens Mounting, UM4/5, Monitor	2 plc
5b	1065-1390-01	Screw, Plastic, Lens Mounting, UM4/5 Monitor	2 plc
6	Not Used		
7		Bezel	
8		Pot Assy	
9	1065-1168-01	Cover	
10	3000-0129-02	Tilt and Swivel Assy	Incl video cable (13)
11		• Plate, Upper Swivel Mount	
12		Insulator, Monitor Mount	
13		Cable, EM/Monitor	P/O Item 10
14	1516-0174-01	Screw, Cover Mounting	2 plcs
15		Label, Warning	Table 8-1, Figure 8-1 Sht 3
16		Label, Contrast/Brightness Symbols	Table 8-1, Figure 8-1 Sht 3
17		Label, System	Table 8-1, Figure 8-1 Sht 3, Table 8-3, Figure 8-3 Sht 2

Table 8–11.   UM-4CAD Integral CAD Module

Fig. No./ Index	ATL Part No.	Description	Notes
8–11			
	4000-0225-xx	Final Assy, CAD Module, 4Mb	Dom
	4000-0227-xx	Final Assy, CAD Module, 4Mb	Intl
	4000-0228-xx	Final Assy, CAD Module, 8Mb	Intl
1		PCB, CAD Motherboard	
2	2100-0527-01	PCB, CPU	Slot 1
3		Power Supply, Switching, 110W	
4	2100-0536-01	Fan, 115V, 53 CFM	
5	2100-0547-02	Disk Drive, Hard, 3.5", 40 Mb	Alt: 2100-0547-01
6	2100-0529-02	Disk Drive, Floppy, 3.5", 2 Mb	Alt: 2100-0529-01
	2100-0548-01	Floppy Disk, DSHD	CSR P/N; UM-4/6
7	2100-0530-02	PCB, Cine System Controller	Dom; Slot 2
	2100-0626-02	PCB, Cine System Controller	Intl; Slot 2
8	2100-0533-01	PCB, Video Memory, 4Mb	Slot 3
	2100-0627-02	PCB, Video Memory, 8Mb	Slot 3; CCIR
9		Not used	Slot 4
10	2100-0531-01	PCB, CGA Overlay	Dom (Graphics); Slot 5
	2100-0628-01	PCB, CGA Overlay	Intl (Graphics); Slot 5
11	2275-0225-01	Cable, Ribbon; 40:40:10	
12	2275-0226-01	Cable, Ribbon; 26:26	
13	2275-0227-01	Cable, Ribbon; 40:40:40	
14	1065-0949-01	Bezel, CAD Bullnose	
	3500-0919-01	Cable Assy, CPU/Floppy Drive	
	3500-0920-01	Cable Assy, CPU/Hard Drive	
	3500-0915-01	Cable Assy, EM "G"/CAD module	
	2100-0565-02	Keyboard, Hand Controller, CAD, w/cable	Alt: 2100-0565-01 w/ 2100-0625-01
	3500-0954-01	Panel Assy, Printer Power Connector, UM-4CAD	

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Table 8-1

Table 8-1

01 ES08—A01 01

Figure 8–1.   UM-4 Human Factors Cart (1 of 4)

Table 8-1

Table 8-1

Table 8-1

See Detail A

See Detail B

— DETAIL A —

— DETAIL B —
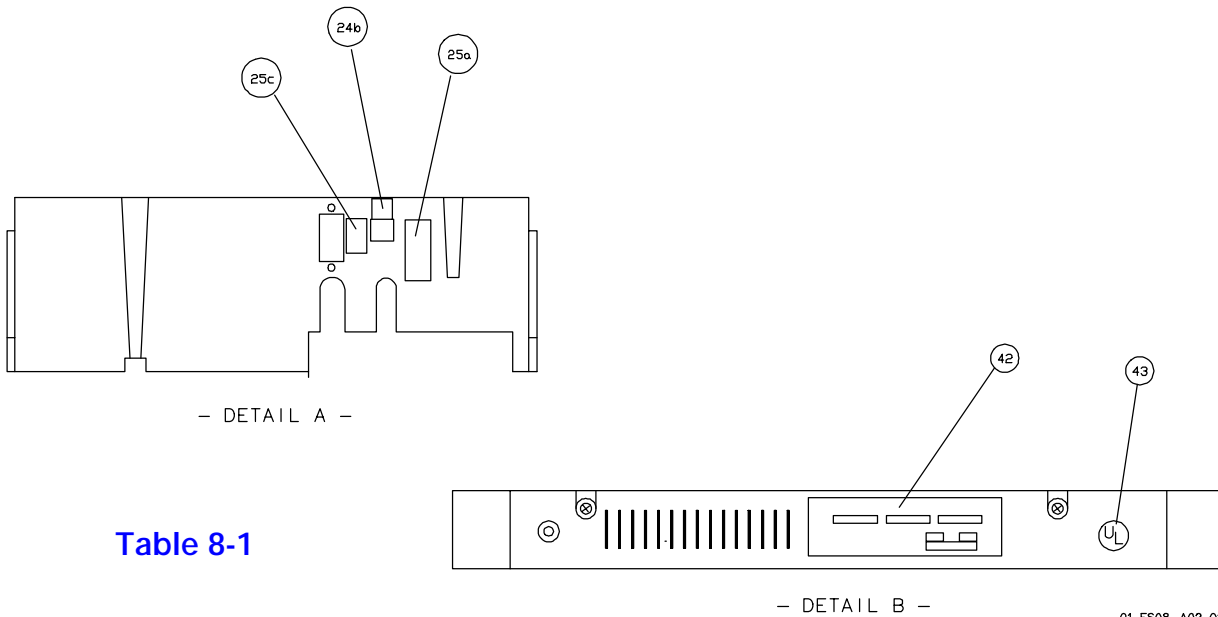
01 ES08—A02 01

Figure 8–1.   UM-4 Human Factors Cart (2 of 4)

Table 8-1

31

20

20c

20a

20b

– DETAIL A –

32

See Detail A

32a

33

34

(3 plcs)
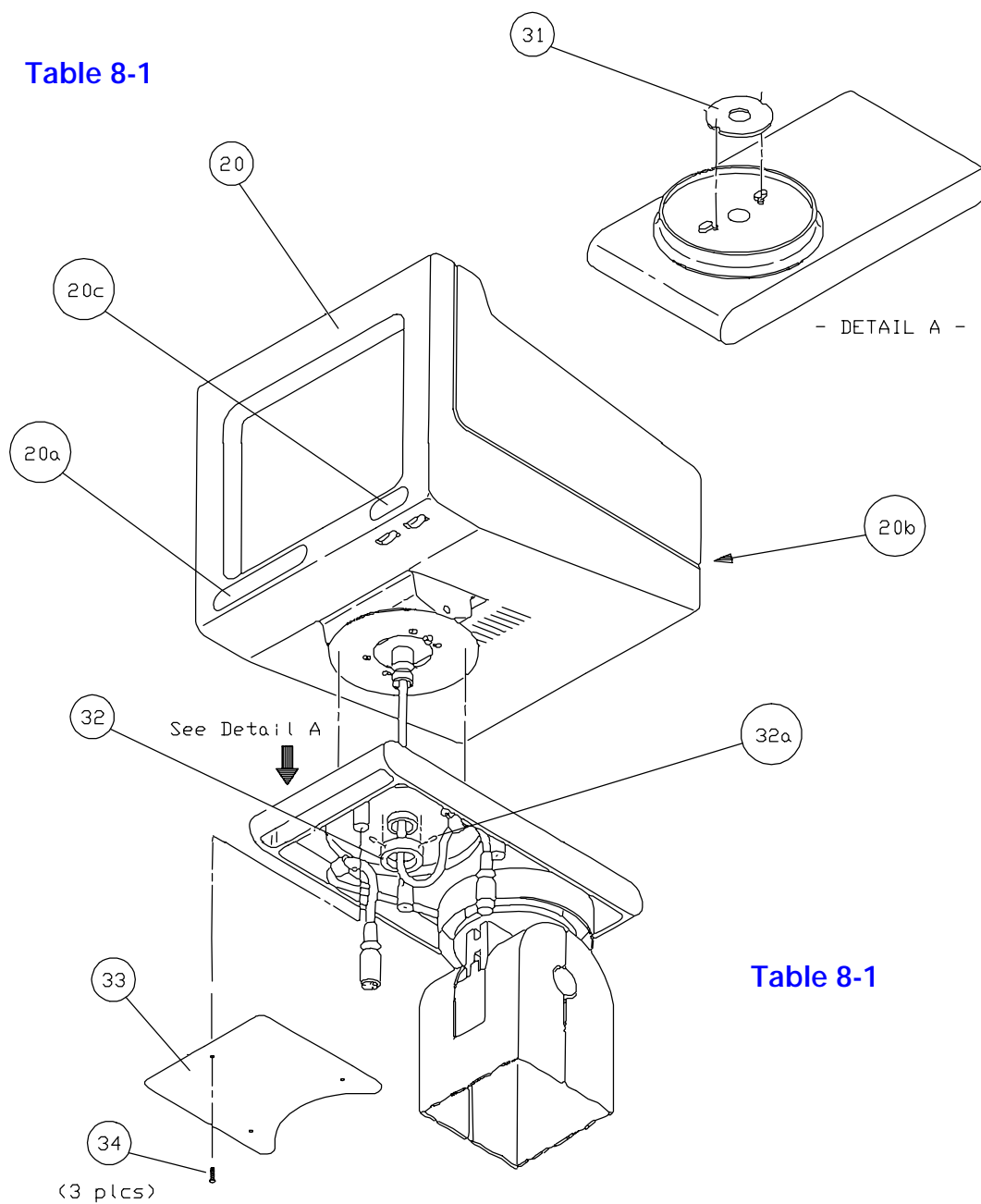
Table 8-1

01 GO02–A01 01

Figure 8–1.   FUM-4 Human Factors Cart (3 of 4)

Table 8-1

Table 8-1

Table 8-1

Figure 8–1.   UM-4 Human Factors Cart (4 of 4)

Figure 8–2.   (No Figure)
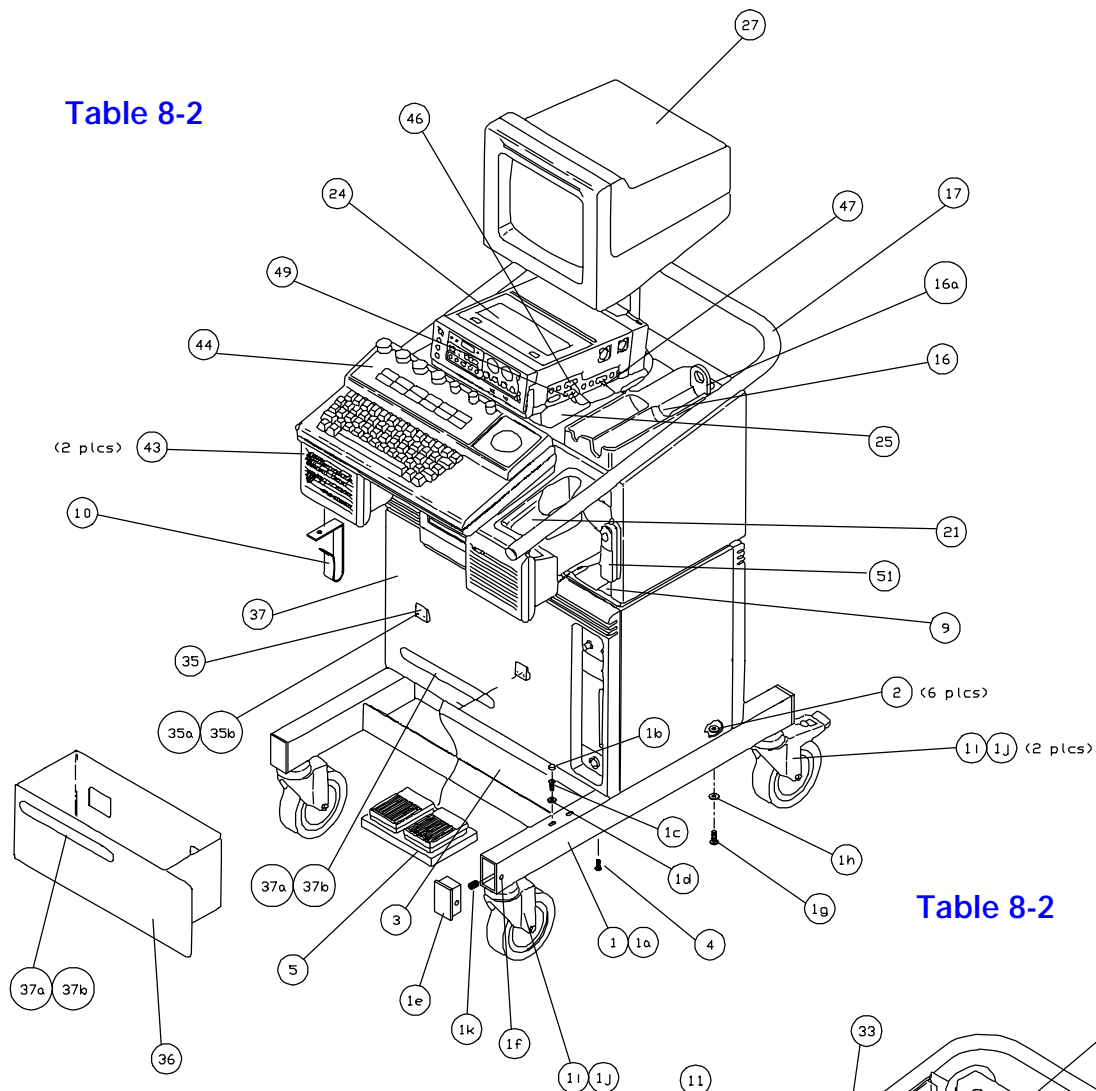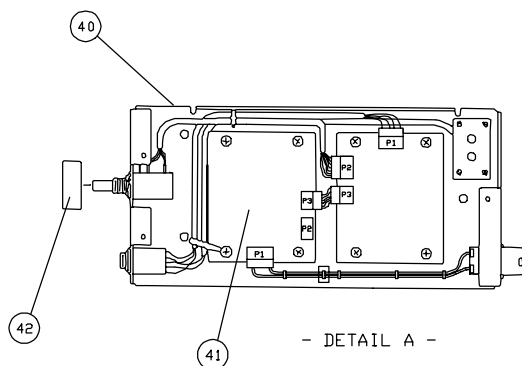
01 ES08–A01 01

Table 8-2

Table 8-2

Table 8-2

- DETAIL A -

01 ES08-A05 02

Figure 8–3.   Ultramark 4AFF, 4A(OB), 4PV and 4CV (1 of 2)

Table 8-3

18

21

43
2 plc

7

45

6

22

23

27

38 39

28

Cable Part of
Tilt and Swivel

18

29

30

31

32

Table 8-3

(3 plcs)

49

— MONITOR MOUNTING —

01 ESD8–A06 02

Table 8-3

Figure 8–3.   Ultramark 4AFF, 4A(OB), 4PV and 4CV (2 of 2)

Table 8-4

(4 plcs) 12

Table 8-4

Table 8-4

– REAR VIEW –
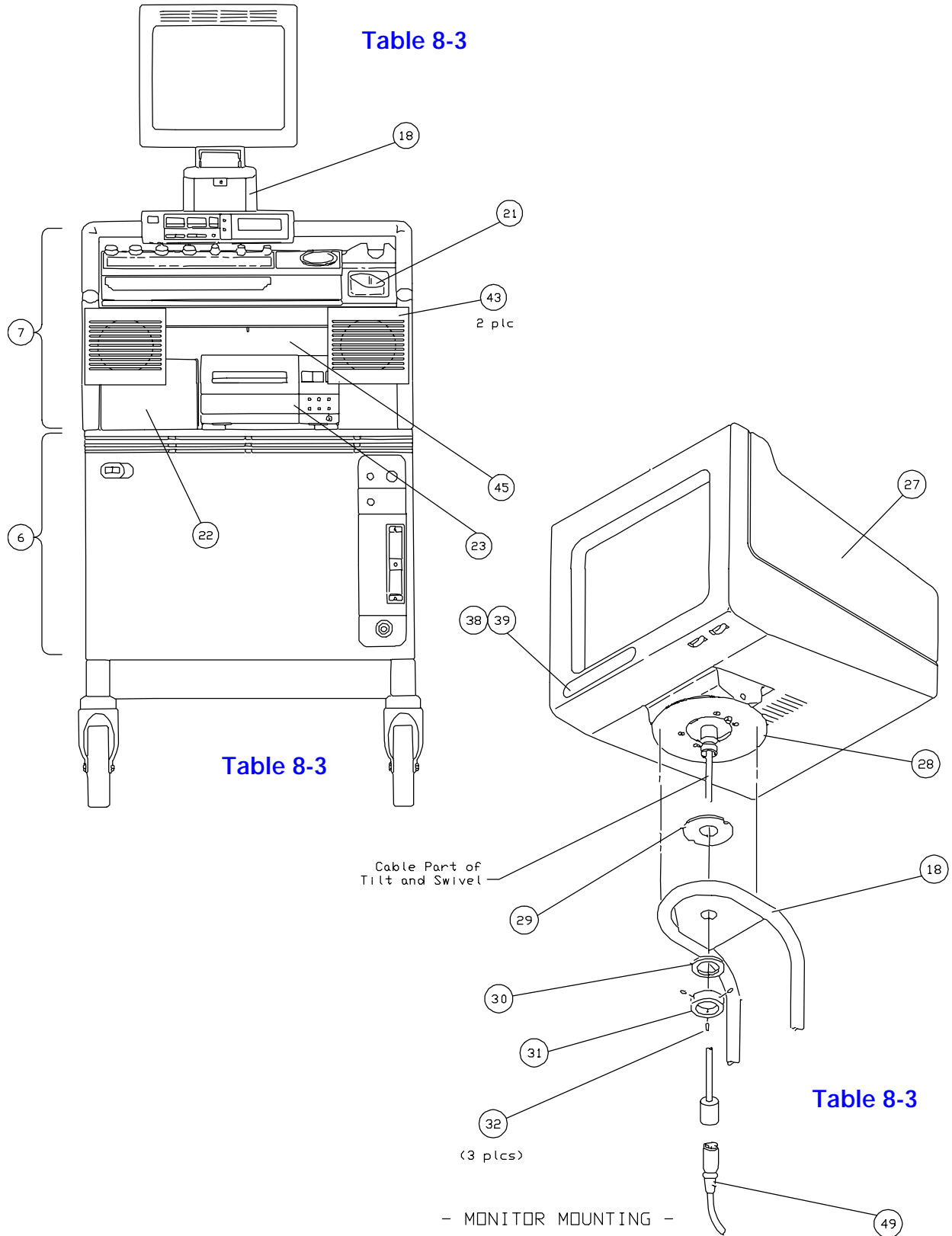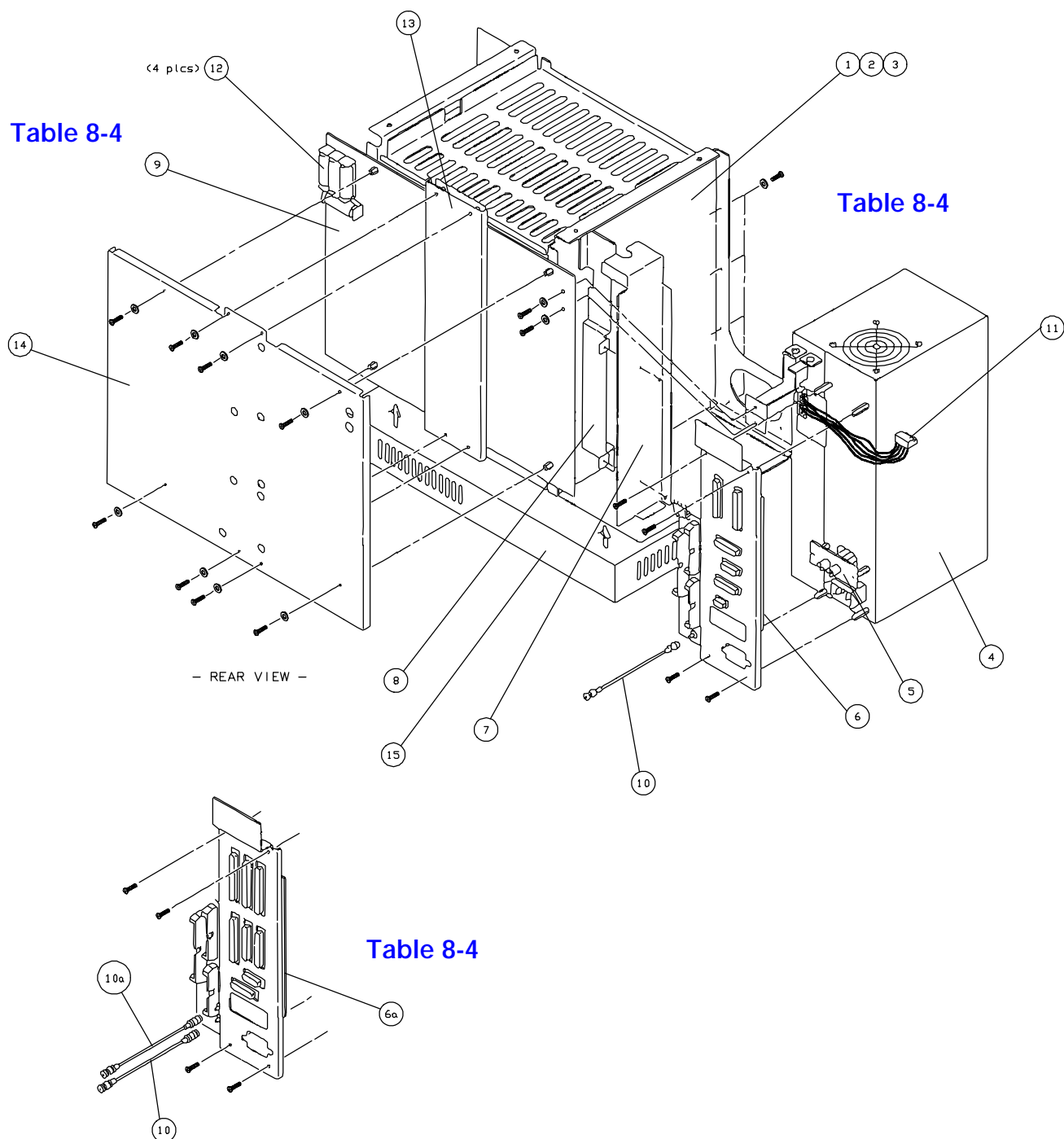
01–ES08–A07 01

Figure 8–4.   UM-4 Electronics Module (1 of 3)
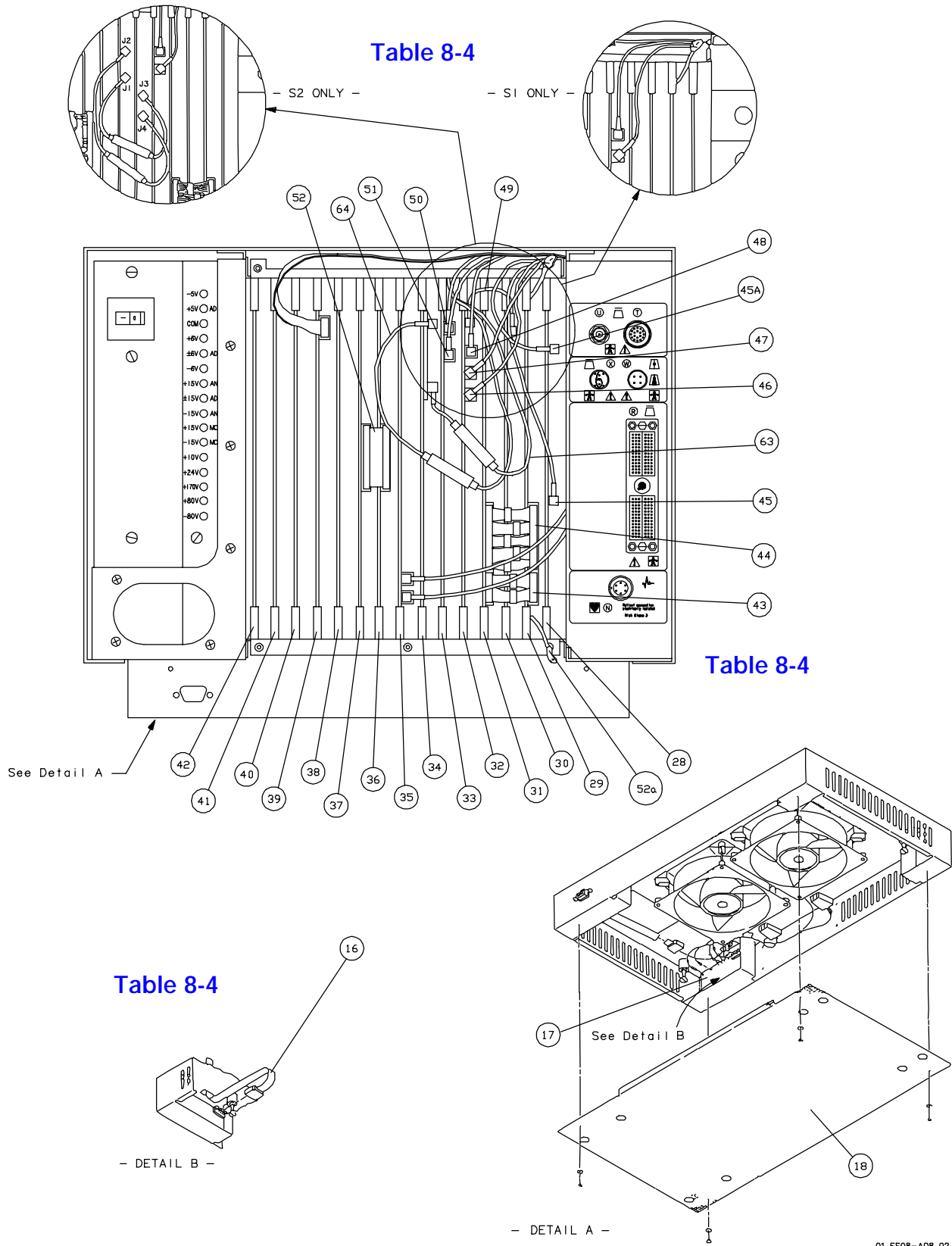
Figure 8–4.   UM-4 Electronics Module (2 of 3)

Figure 8–4.   UM-4 Electronics Module (3 of 3)

NOTE: The following index numbers are not used on this figure; 15,30 and 31.
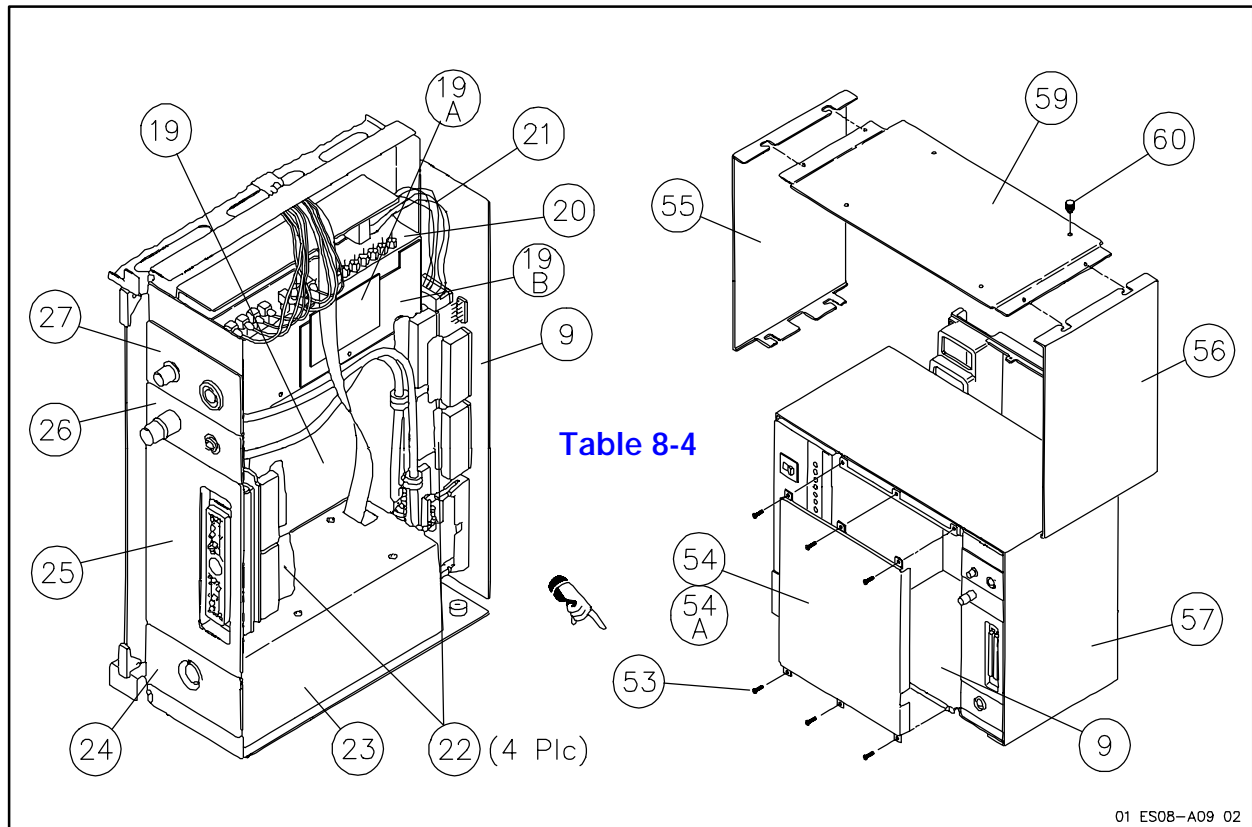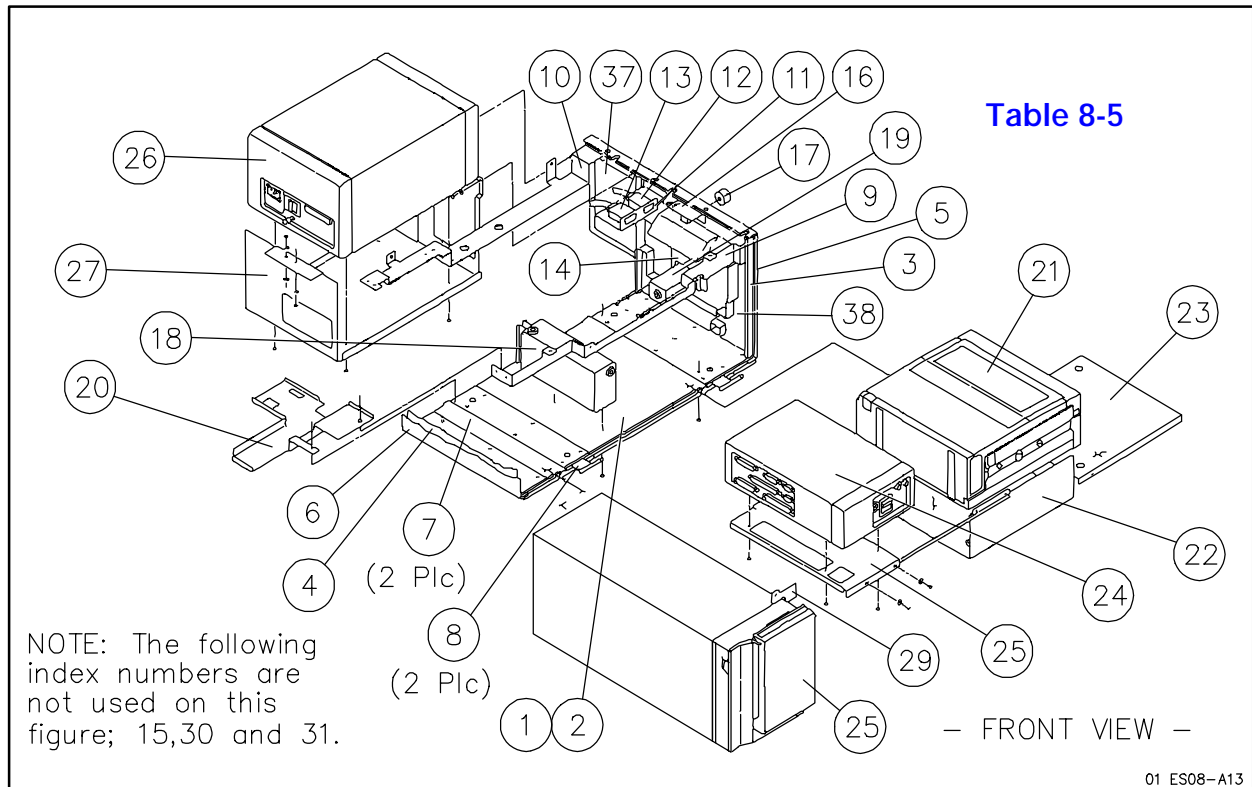
01 ES08–A13

Figure 8–5.   HFC Optional Equipment Module Assembly (1 of 2)

Table 8-5

UM-4 BEZELS
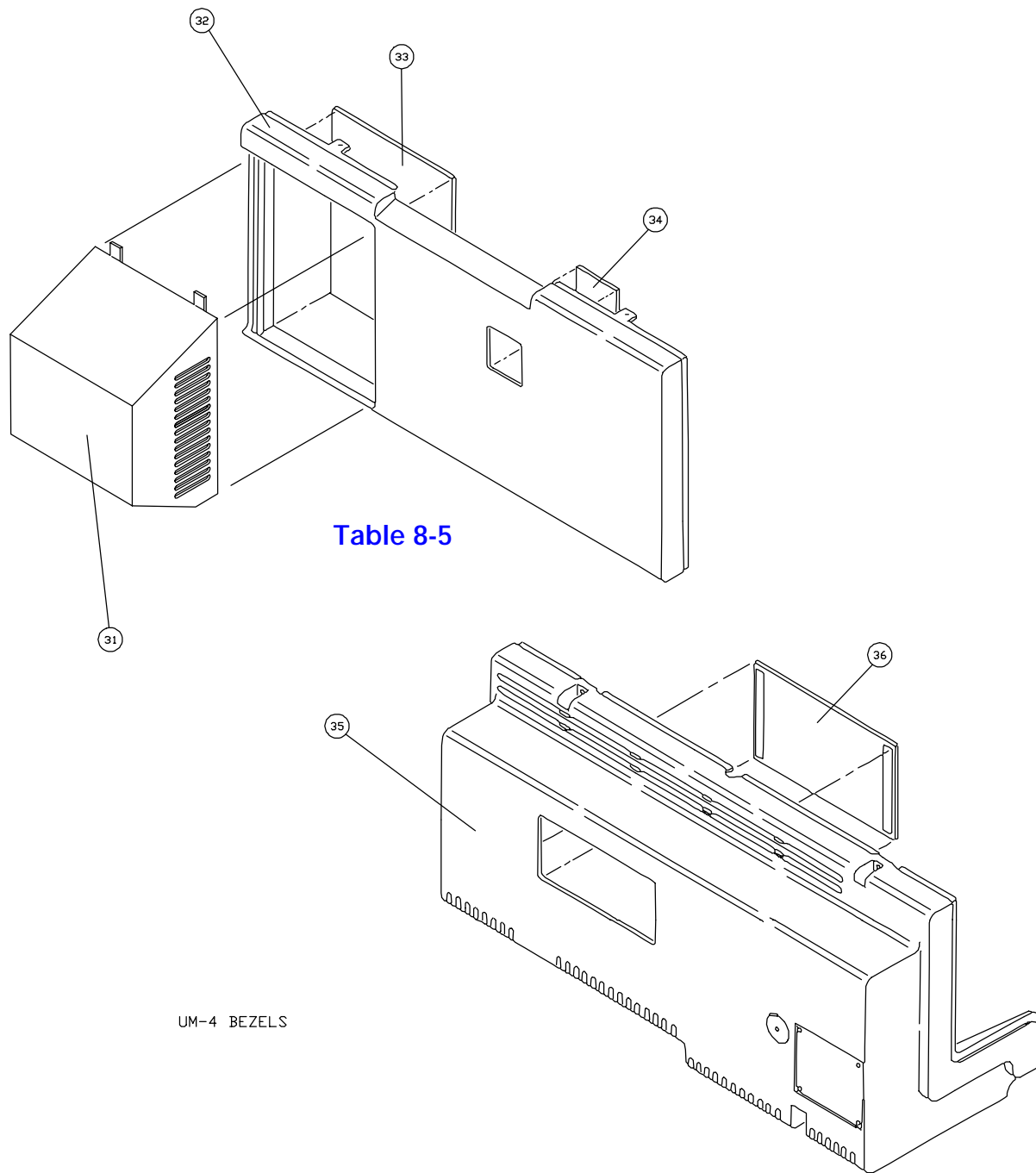
01 ES08–A10 01

Figure 8–5.   FHFC Optional Equipment Module Assembly (2 of 2)
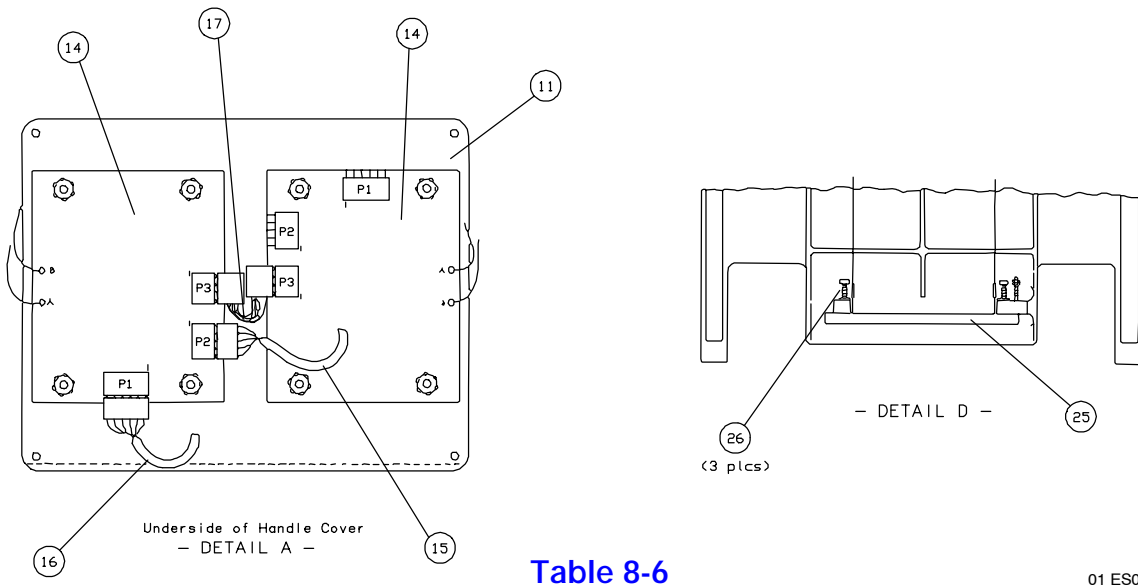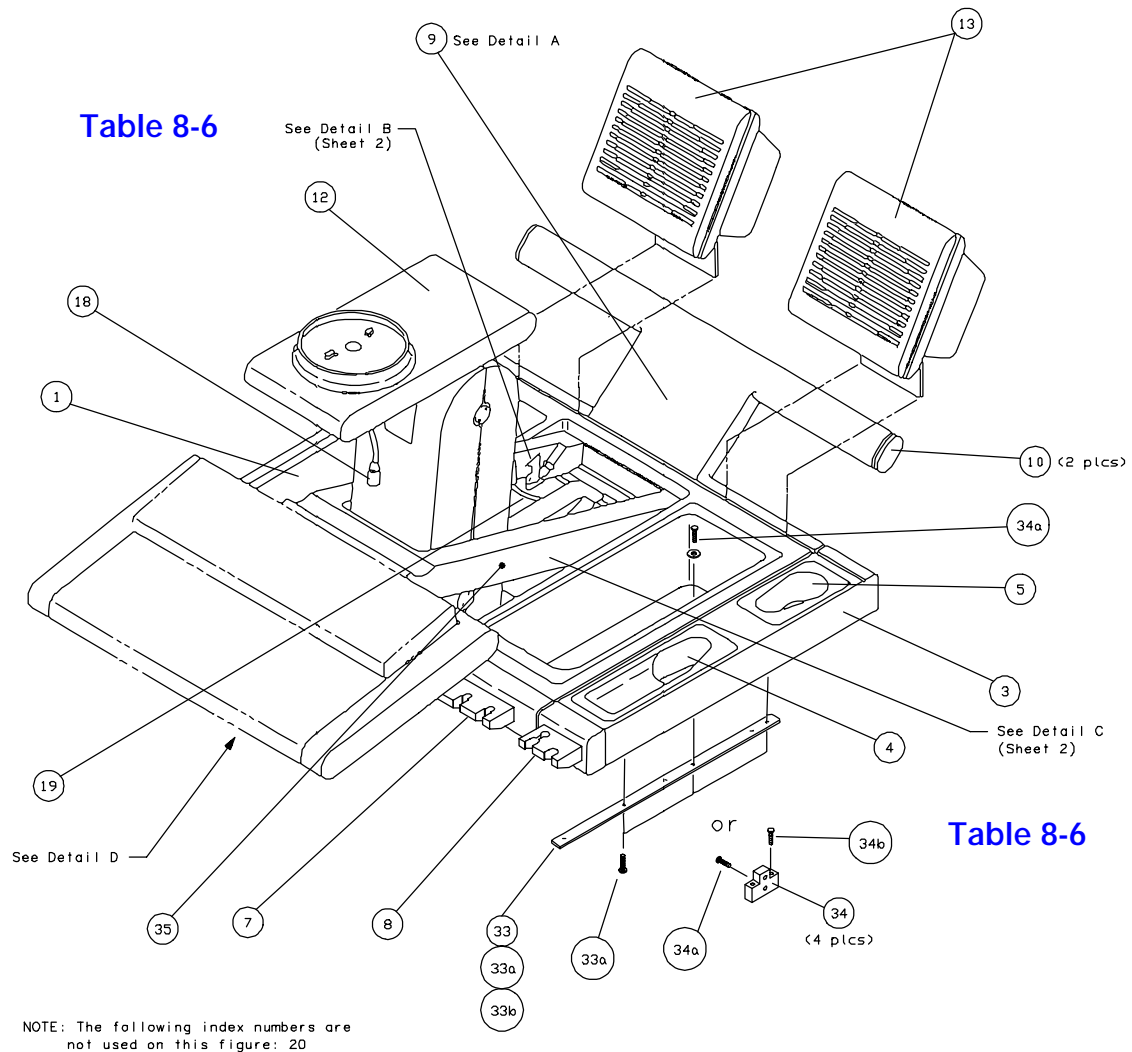
Figure 8–6.   Human Factors Module Assembly (1 of 2)

Table 8-6

Table 8-6

Table 8-6

Monitor Arm Latch
– DETAIL B –

Keyboard Support Latch
– DETAIL C –

01 ES08–A12 02

Figure 8–6.   Human Factors Module Assembly (2 of 2)
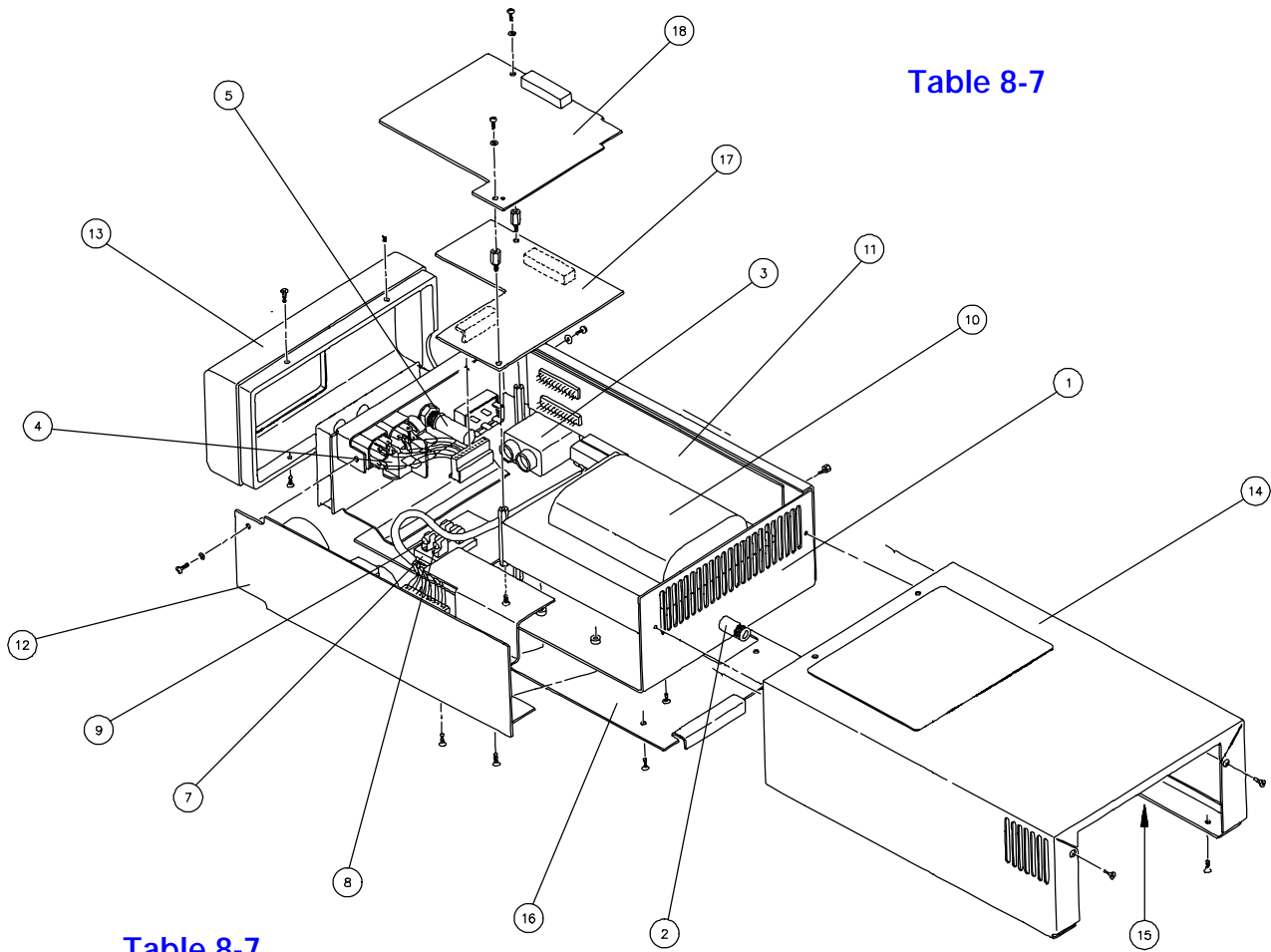
Table 8-7

Table 8-7
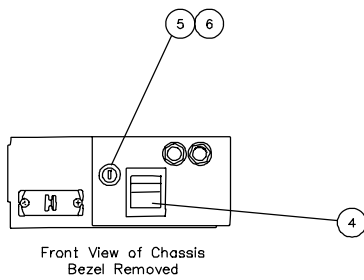
Front View of Chassis
Bezel Removed

01 ES08—A15 01

Figure 8–7.   A/V Module
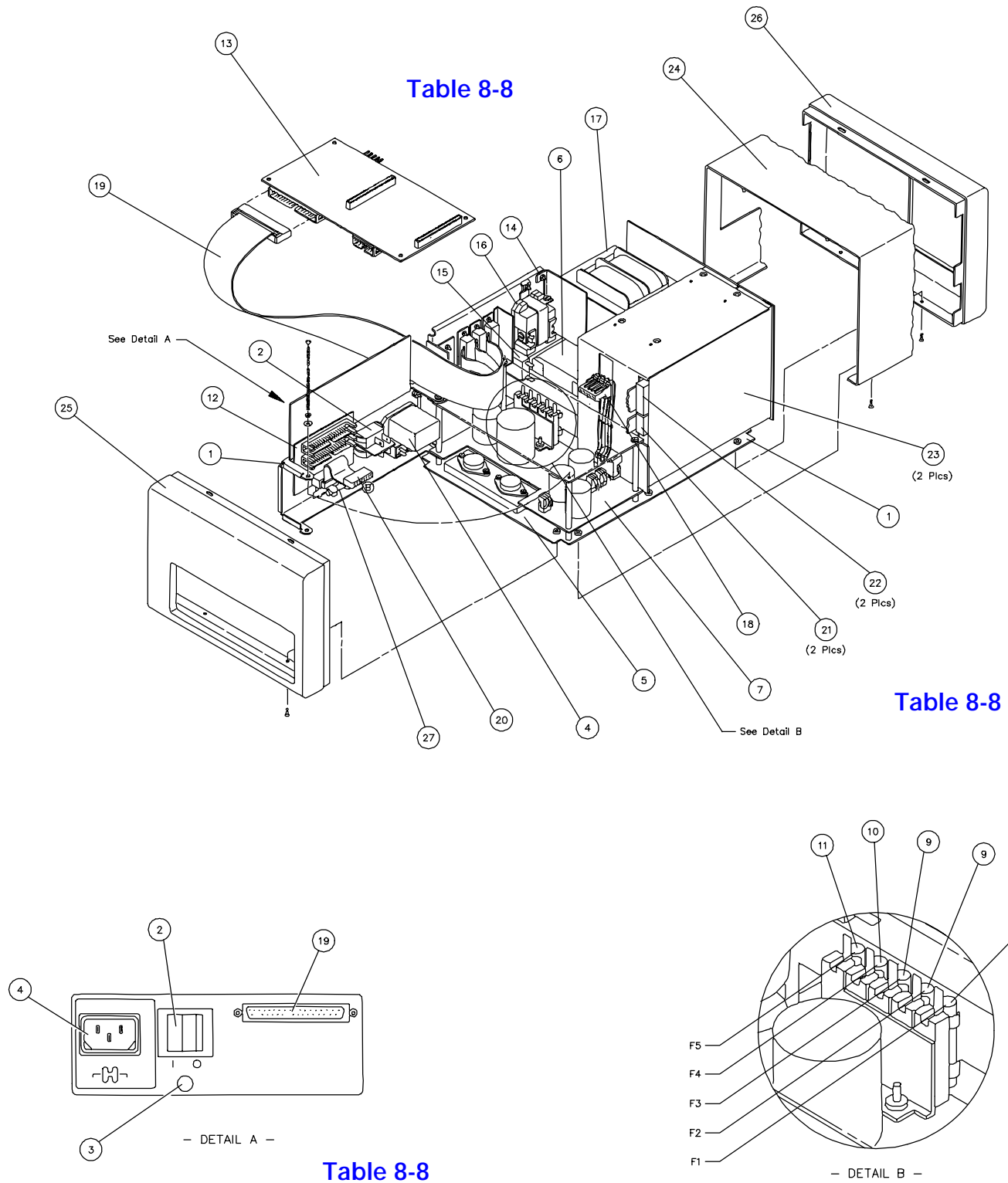
Figure 8–8.   Data Comm Module
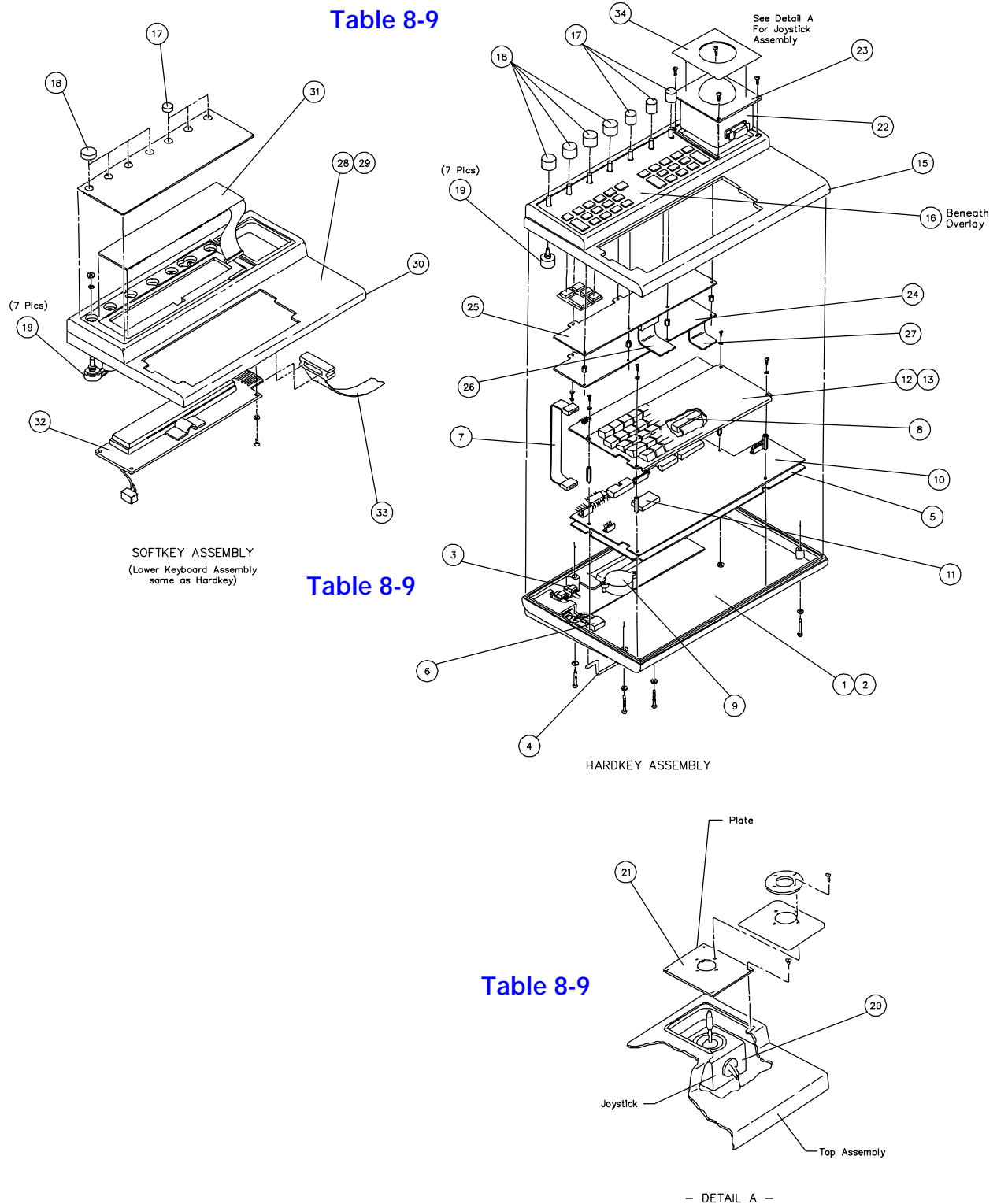
Figure 8–9.   Control Module

— DETAIL A —

— DETAIL B —
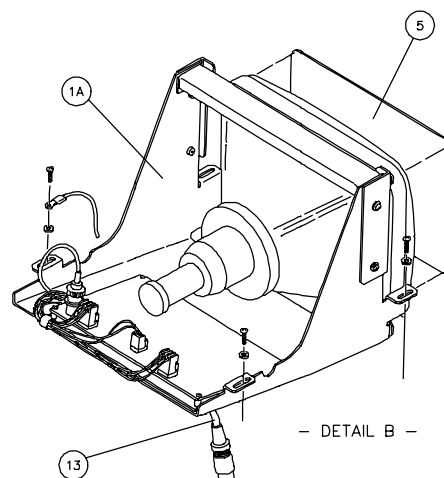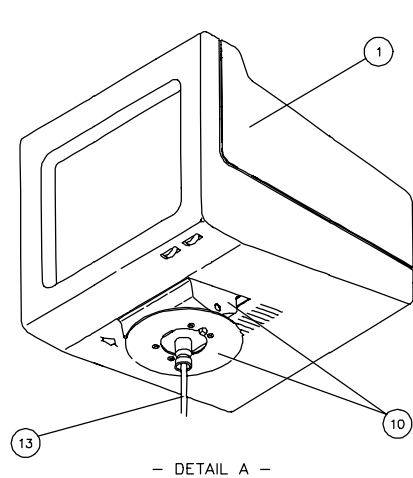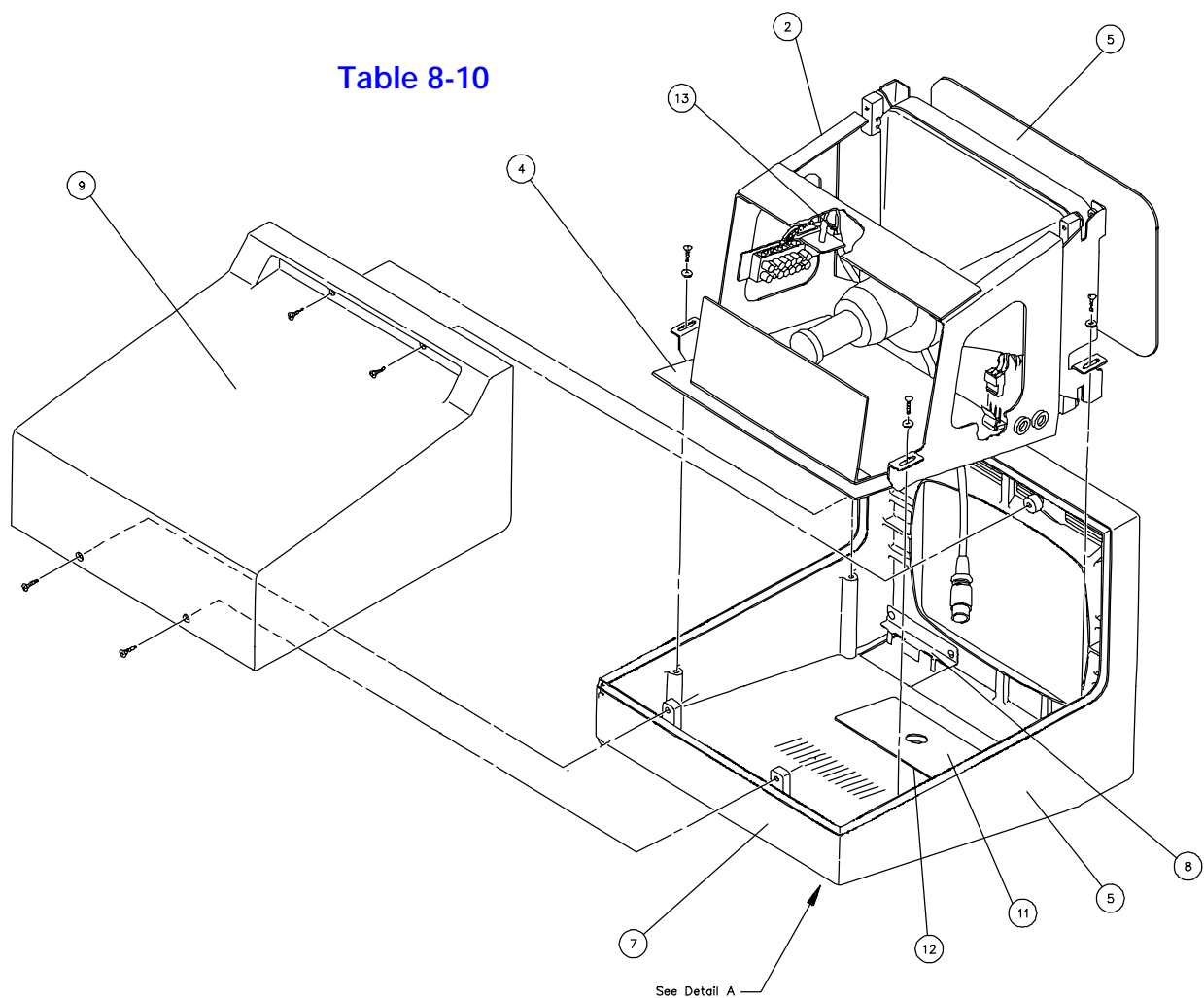
01 ES08–A18 01

Figure 8–10.   Monitor (1 of 2)
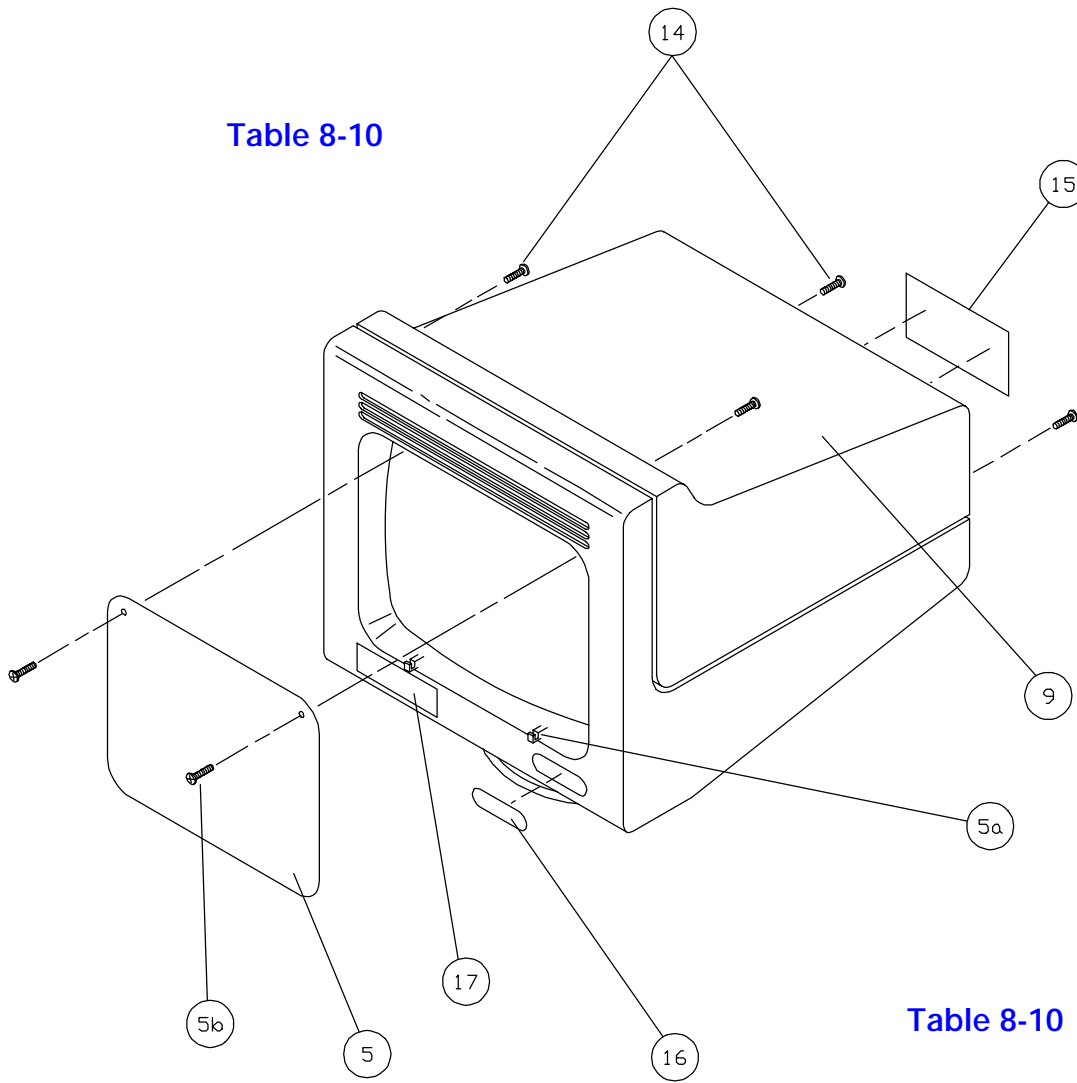
01 ES08—A14 01

Figure 8–10.   Monitor (2 of 2)

SE Module Cover

Tray (Ref)

Table 8-11

OEM Rear Panel

10 EECAS PC Cards (PCBs)

8

7

2 Single Board CPU

Card Guide (Ref)

Disk Drive Mounting Bracket (Ref)

5 Hard Drive

Guide Pin Alignment Hole

4 Fan

Plenum

OEM Front Panel

1 SE Motherboard

3 Power Supply

Guide Pin (Ref)

Bottom Cover

Table 8-11

6 Floppy Drive

CAD Module Bezel

Slot #5 10

Slot #3 8

Fan

FRONT

REAR

11

Slot #2 7

13

12

Slot #1 2

Table 8-11

— TOP VIEW —

01 ES08–A19 01

Figure 8–11.   UM-4CAD Integral CAD Module

Section 9   Reference

9–1   Introduction

Included in this section are mixed data such as the "Up/DownRev Instructions", connector pin-outs, part identifications aids and other material previously contained in the the original UM-4 Service Manual.

The Up/Down Rev Instructions begin on page UM4–09–1. All other material begins on page UM4–09A–1.

PCB UP/DOWN REV INSTRUCTIONS FOR THE CSR
SPARES KITS

ATL

Advanced Technology Laboratories, Inc.

Bothell, Washington 98041-3003

Dwn:	SEE HISTORY FOR ORIGINAL	Date:
Check:	SIGNATURES	
Eng:	*Steve Carter*	*1/22/91*
Mfg:	*John Hart*	*1/22/91*
QC:		
Apvd:	*Don Crotty*	*3/25/91*

Document Title:

PCB Up/Down Rev Instructions
for the CSR Spares Kit

Document Number	ECO/CN	REV	Sheet 1 of: 39
6420-0009-01	D-5010	G	

9010-0291   8/90

ACTIVE SHEET RECORD

INITIAL SHEETS		ADDED SHEETS		INITIAL SHEETS		ADDED SHEETS	
Sheet #	REV	Sheet #	REV	Sheet #	REV	Sheet #	REV
1	G	21	G				
2	G	22	G				
3	G	23	G				
4	G	24	G				
5	G	25	G				
6	G	26	G				
7	G	27	G				
8	G	28	G				
9	G	29	G				
10	G	30	G				
11	G	31	G				
12	G	32	G				
13	G	33	G				
14	G	34	G				
15	G	35	G				
16	G	36	G				
17	G	37	G				
18	G	38	G				
19	G	39	G				
20	G						

REVISIONS				D W N	C H K	E N G	M F G	Q C	A P V
LTR	ECO #	DESCRIPTION	DATE						
G	D-5010	REFORMATTED, SEE HISTORY COVER SHEET FOR SIGNATURES. SEE CN							

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

PCB UP/DOWN REV INSTRUCTIONS
FOR THE CSR MASTER SPARES KIT

DOCUMENT NUMBER 6420-0009-01

1.0   PURPOSE

To provide a document to accompany the UM-4 master kit to instruct the CSR on how to convert selected PCBs to different functionalities to conform to any UM-4 system. In this way, the quantity of PCBs required in the kit can be minimized.

2.0   FORM

A cover page is provided for each set of instructions that apply to a particular PCB. This cover page consists of a brief description of the meaning of the dash levels addressed. It also will have a chart of the variables that make up the different dash levels. Detailed instructions that apply to the master kit are included.

7500-0348-XX
MOTOR CONTROLLER PCB
CONVERSION INSTRUCTIONS

The following page describes how to convert this PCB from -10, -09, -08, -06, -05, or -04 to a Non-Sync type.

The -10; same as the -08 but has ACQ Sync changes for the CAD system.

The -08 is a new FAB and is equivalent to the -06.

The -09; same as the -06 but has ACQ Sync changes for the CAD system.

The -06 is the same as -05 but has a fix for Servo Loop Oscillation.

The -05 supports Annular Array and 12 MHz Sync.

The -04 supports 12 MHz Sync but not Annular Array.

The -07 is the same as -03 but has a fix for Servo Loop Oscillation.

The -03 is not 12 MHz Sync and does not support Annular Array.

The following chart is a synopsis of the differences between the different dash levels. Refer to Figure I and Figure IA for a PCB layout.

7500-0348-XX

	-06/05 12 MHz Sync Annulary Array	-04 12 MHz Sync	-07/03 Non-Sync
U26	4201-0264-02	4201-0264-01	4201-0264-01
U48	4201-0261-02	4201-0261-01	4201-0261-01
U61	4201-0266-01	4201-0266	4201-0266
R122	NOT INSTALLED	NOT INSTALLED	1 K OHM 2831-0013
U62	74F14 2035-0331	74F14 2035-0331	74F04 2035-0140
JP1	2–3	2–3	N/A

	-10/08 NEW FAB		-09/06 12 MHz Sync
U16	4201-0264-02	U26	4201-0264-02
U68	4201-0261-02	U48	4201-0261-02
U63	4201-0266-01	U61	4201-0266-01
R37	NOT INSTALLED	R122	NOT INSTALLED
U18	74F14 2035-0331	U62	74F14 2035-0331
JP1	2–3	JP1	2–3

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0348-XX   MOTOR CONTROLLER   (A8) PCB

From: -10/09/08/06/05/ 04	To: Non-Sync	System: UM-4	Date: 10/10/88

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
2831-0013	RESISTOR, 1 K OHM, 1/8 W	1
2035-0140	IC, 74F04	1
4100-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS:

For 7500-0348-09/06/05/04 PCBs

1. Install a 1K OHM resistor, 2831-0013, at the R122 location (see Figure I).

2. Change U62 to a 74F04 IC, 2035-0140. (Preserve any lifted pins and jumpers)

3. Move thejumper connector at Pins 2 and 3 of JP1 to Pins 1 and 2 of JP1.

4. Using 4100-0092 label or any available small blank stick-on label, mark the board as "Non Sync" near the dash level indicator.

For 7500-0348-10/08 PCBs

1. Install a 1K OHM resistor, 2831-0013, at the R37 location (see Figure IA).

2. Change U18 to a 74F04 IC, 2035-0140. (Preserve any lifted pins and jumpers)

3. Move the jumper connector at Pins 2 and 3 of JP1 to Pins 1 and 2 of JP1.

4. Using 4100-0092 label or any available small blank stick-on label, mark the board as "Non Sync" near the dash panel indicator.

COMMENTS: This change renders the PCB as a Non-Sync type with its own independent clock.
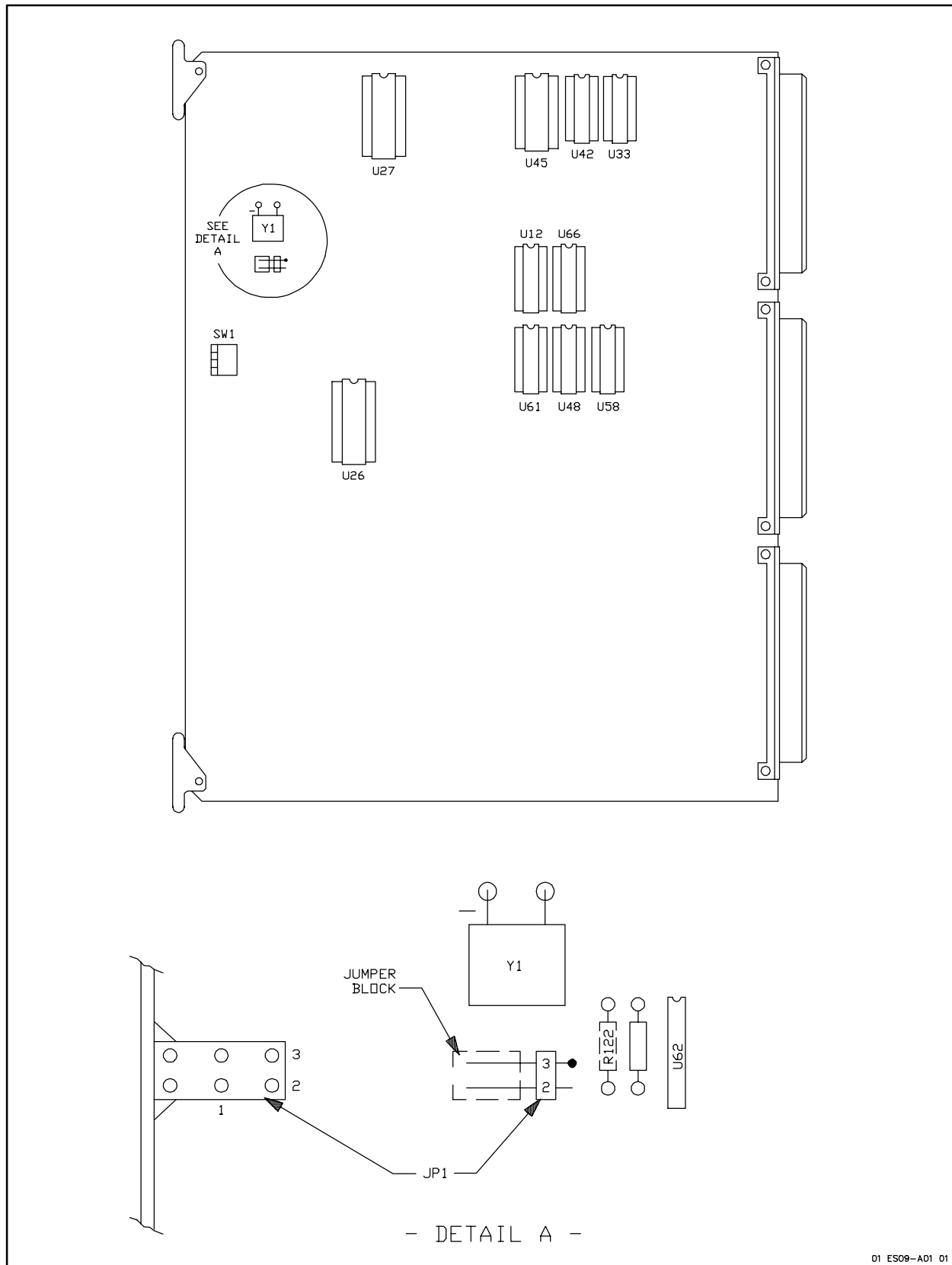
Figure I.   7500-0348-09/06/05/04 PCB

SEE
DETAIL
A

U8

Y1

JP1 1
     2   R37
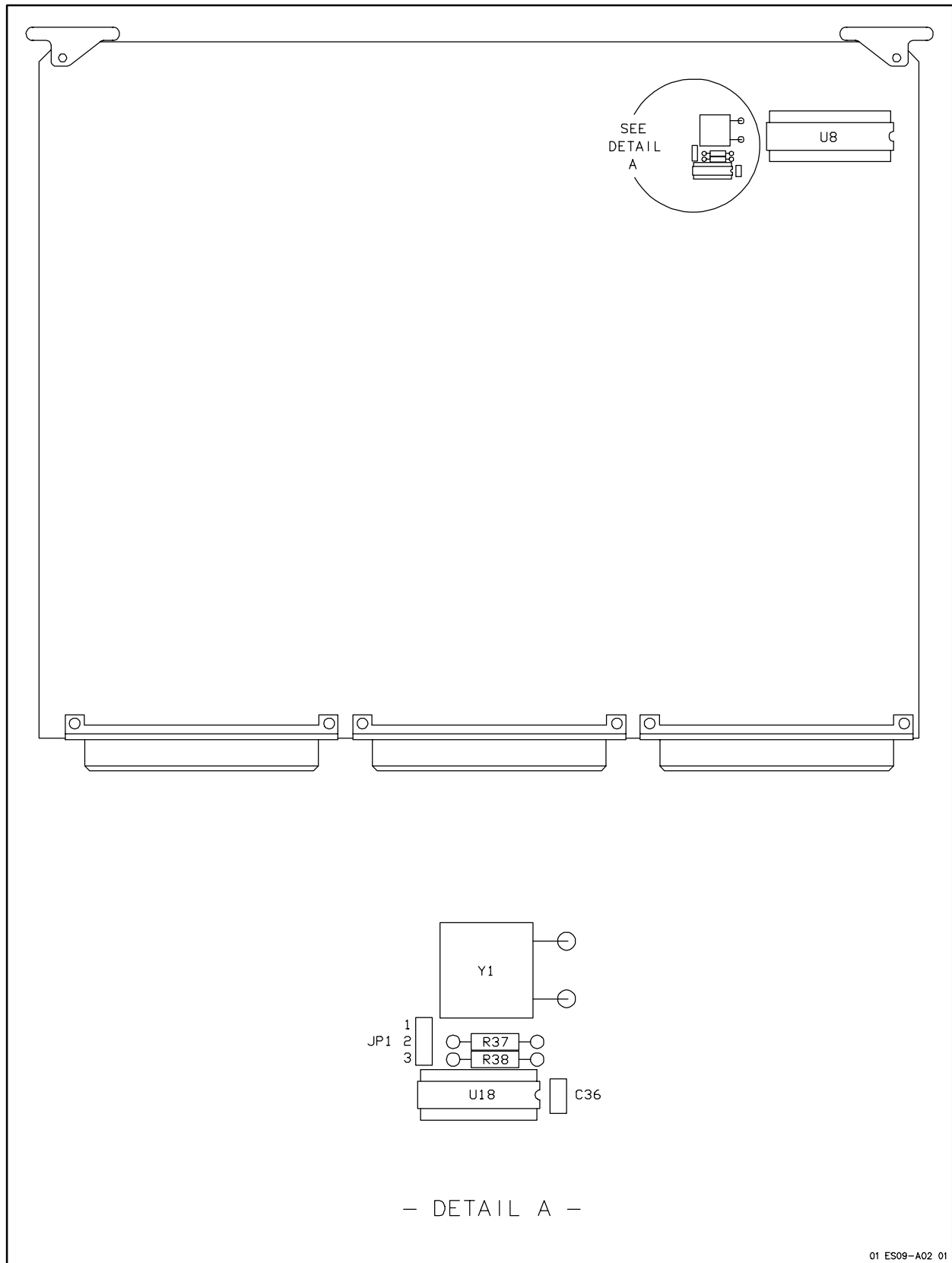   3   R38

U18   C36

— DETAIL A —

01 ES09–A02 01

Figure IA.   7500-0348-10/08 PCB

7500-0362-XX
BEAMFORMER CONTROLLER PCB
CONVERSION INSTRUCTIONS

The following page describes how to down convert this PCB from -04 , -03 , -02 , or -01 to a Non-Sync version.

The -08 is an oscilator fix to the -07.

The -07 is an oscillator fix to the -06.

The -06 is an oscillator fix to the -05.

The -05 is a relayout of the -04 with changes to support the 76mm CVLA.

The -04 is the same as the -03 below except that superior Annular Array FETS have been incorporated for a reliability improvement.

The -03 supports HFLA and is compatible only with 16X or subsequent SW because of hardware changes (16X S on this PCB is compatible with 12X systems).

The -02 supports Annular Array and 12 MHz Sync.

The -01 supports 12 MHz Sync but not Annular Array.

The Non-Dash is not 12 MHz Sync and does not support Annular Array.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure II for PCB layout.

7500-0362-XX

	-02/03/04/05/06/07/08 12 MHz Sync Annulary Array	-01 12 MHz Sync	Non-Dash Non-Sync
U33	4201-0162-01	4201-0162	4201-0162
U34	4201-0163-01	4201-0163	4201-0163
R20	NOT INSTALLED	NOT INSTALLED	1 K OHM 2831-0013
U52	74F14 2035-0331	74F14 2035-0331	74F04 2035-0140
JPH	2–3	2–3	N/A

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0362-XX   BEAMFORMER CONTROLLER (A8) PCB

From: -04/03/02/01	To: Non-Sync	System: UM-4	Date: 2/9/89

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
2831-0013	RESISTOR, 1K OHM, 1/8 W	1
2035-0140	IC, 74F04	1
4100-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS:

1. Move the wire that comes from the JPH-1 to the right solder post of R20 if it is on the left solder post. (See Figure II)

2. Cut the run to the pad directly underneath the R20 body (underneath and hidden by the body of the resistor as one looks directly down on the PCB; this run and pad are within the silkscreen for the R20 resistor body) on the component side.

3. Install a 1K OHM resistor, 2831-0013, at R2O location.

4. Change U52 to a 74F04 IC, 2035-0140. (Preserve any lifted pins and jumpers)

5. Move jumper connector at Pins 2 and 3 of JPH to Pins 1 and 2 of JPH.

6. Using 4100-0092 label or any available small blank stick-on label, mark the board as "Non Sync" near the dash level indicator.

COMMENTS: This change renders the board as a Non-Sync type with its own independent clock. Steps 1 and 2 of the instructions above correct a build error.
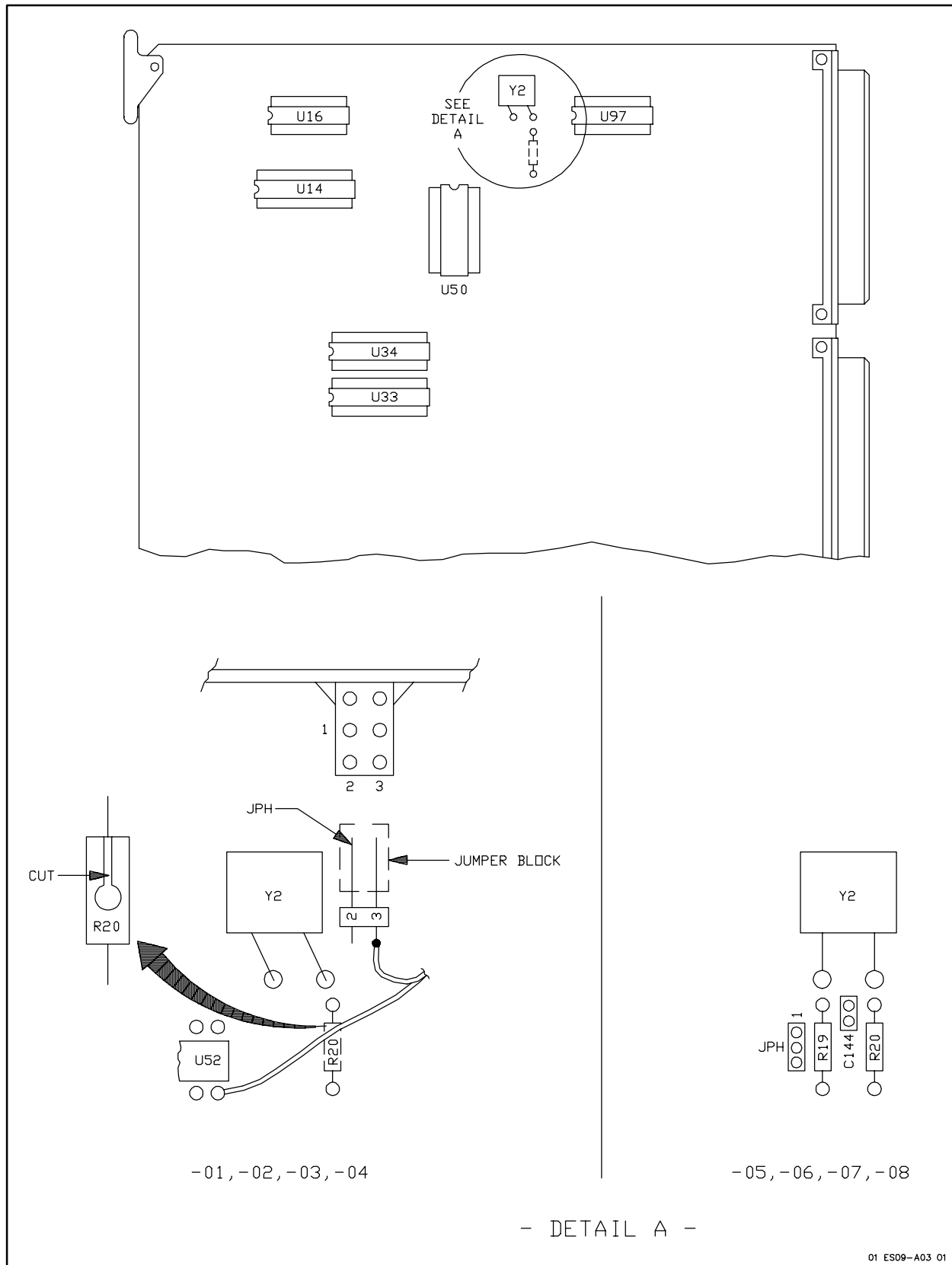

Figure II.   7500-0362-08/07/06/05/04/03/02/01 PCB

7500-0370-XX
PULSE PROCESSOR PCB
CONVERSION INSTRUCTIONS

The following five pages describe how to down-REV this PCB from -25 to -24, -09 to -11 , -09 to -08, - 11 to -10, -08 to -10, -05 to -03, -04 to -02, -03 to -01, -05 to -04, -03 to -02, and -02 to -01.

The -25 is the same as -09 but has memory expansion for PHX Phase II.

The -09 is the same as -05 but has a radial line noise fix.

The -05 supports Annular Array and 12 MHz Sync in Doppler systems.

The -08 is the same as -04 but has a radial line noise fix.

The -04 supports Annular Array and 12 MHz Sync in non-Doppler systems.

The -11 is the same as -03 but has a radial line noise fix.

The -03 supports 12 MHz but not Annular Array in Doppler systems.

The -10 is the same as the -02 but has a radial line noise fix.

The -02 supports 12 MHz Sync but not Annular Array in non-Doppler systems (the -02 is backwards compatible to the -01).

The -01 is not 12 MHz Sync and does not support Annular Array.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure III for PCB layout.

7500-0370-XX

	-09/05/25 Sync Coppler AA	-08/04/24 Sync Non-Doppler AA	-11/03 Sync Doppler	-10/02 Sync Non-Doppler	-01 Non-Sync Either
R222	90.9 OHM 2820-0187	90.9 OHM 2820-0187	237 OHM 2820-0074	237 OHM 2820-0074	237 OHM 2820-0074
U49	74F14 2035-0331	OSCILLATOR 3401-0027	74F14 2035-0331	OSCILLATOR 3401-0027	OSCILLATOR 3401-0027
JP8	N.C.	1–2	N.C.	1–2	N.C.
JP7	JUMPERED	DON'T CARE	DON'T CARE	DON'T CARE	DON'T CARE

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0370-XX   S2 PULSE PROCESSOR (A5) PCB

From: -05 -09	To: -03 -11	System: UM-4	Date: 1/21/88

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
2820-0074	RESISTOR, 237 OHM	1
4100-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Remove the top cover of the Pulse Processor shield (see Figure III).

2. Remove R222 (if R222 is not mounted on a solderable post, cut the leads as close to the body of the resistor as possible and use those leads to install a new resistor per Step 3).

3. Replace R222 with a 237 OHM resistor, 2820-0074.

4. Replace the Pulse Processor shield.

5. Using 4100-0092 label or any available small blank stick-on label, mark the board as -03 if it was originally a -05 or a -11 if a was originally a -09.

COMMENTS: This change renders the board as a Non-Annular Array compatible and allows it to function with non-Annular Array software. The -03 version that results is a Sync type which requires an external clock from the Doppler processor.

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0370-XX   S2 PULSE PROCESSOR (A5) PCB

From: -04
        -08
	To: -02
	          -10
		System: UM-4	Date: 1/21/88

PARTS REQUIRED:

PART NUMBER   DESCRIPTION   QTY

| 2820-0074 | RESISTOR, 237 OHM | 1 |
| 4100-0092 | LABEL, BLANK | 1 |

REWORK INSTRUCTIONS :

1. Remove the top cover of the Pulse Processor shield (see Figure III).

2. Remove R222 (if R222 is not mounted on a solderable post, cut the leads as close to the body of the resistor as possible and use those leads to install a new resistor per Step 3).

3. Replace R222 with a 237 OHM resistor, 2820-0074.

4. Replace the Pulse Processor shield.

5. Using 4100-0092 labe or any available small blank stick-on label , mark the board as -02 if it was originally a -04 or -10 if it was originally a -08.

COMMENTS: This change renders the PCB as a Non-Annular Array compatible and allows it to function with non-Annular Array software. The -02 is backwards compatible.

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0370-XX   S2 PULSE PROCESSOR (A5) PCB

From: -03	To: -01	System: UM-4	Date: 8/4/87

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
3401-0027	IC, OSCILLATOR	1
4100-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Change U49 from 74F14 to oscillator, 3401-0027.

2. Using 4100-0092 label or any available small blank stick-on label, mark the board as -01.

COMMENTS: This change renders the PCB as a Non-Sync with its own independent clock.

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0370-XX   S2 PULSE PROCESSOR (A5) PCB

From: -05 -03 -09 -11 -25	To: -04 -02 -08 -10 -24	System: UM-4	Date: 1/21/88

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
3401-0027	IC, OSCILLATOR	1
4100-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Change U49 from 74F14 to oscillator, 3401-0027.

2. Place jumper connector so as to connect Pins 1 and 2 on JP8.

3. Using 4100-0092 label or any available small blank stick-on label, remark the PCB as a -02, -04, -08, -10, or -24 as is appropriate.

COMMENTS: This change renders the PCB as Non-Doppler Sync when it was Doppler Sync before.

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0370-XX   S2 PULSE PROCESSOR (A5) PCB

From: -02	To: -01	System: UM-4	Date: 8/4/87

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
NONE		

REWORK INSTRUCTIONS :

NONE

COMMENTS: Conversion is not necessary as -02 is backwards compatible.

SHIELD BODY

R222

U36

U49

U34   U42   U48

SEE
DETAIL
A

U70

3
2
1
CAL

JP7

ALTERNATE LOCATION FOR JP8

JP3

JP6

JP2

JP1

JUMPER BLOCK   JP8

BOARD EDGE
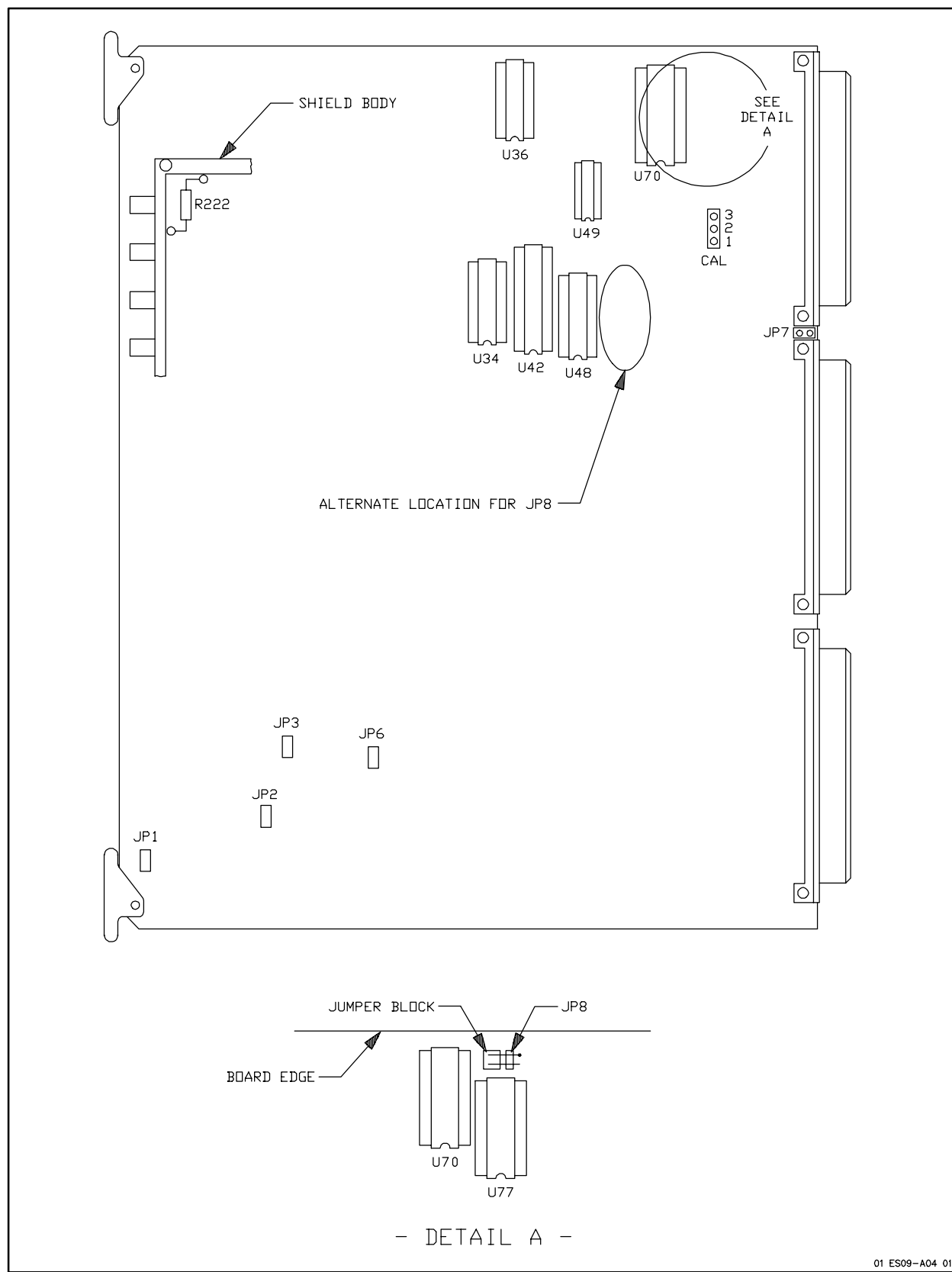
U70

U77

- DETAIL A -

01 ES09-A04 01

Figure III.   7500-0370-XX PCB

3500-1261-XX
3500-1262-XX
PULSE PROCESSOR PCB
CONVERSION INSTRUCTIONS

The following two (2) pages describe how to REV this PCB from a 3500-1261-01 to a 3500-1262-01.

The 3500-1261-01 is a Doppler Sync PCB.

The 3500-1262-01 is Non-Doppler Sync PCB.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure IIIA for the PCB layout.

	3500-1261-01 Sync Doppler AA	3500-1262-01 Sync Non-Doppler AA	
U84	74F14 2035-0331	Oscillator 3401-0027	
JP14	N.C.	Jumpered	
JP15	Jumpered	N.C.	

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE: [X]

PCB PART NUMBER: PCB NOMENCLATURE:
3500-1261-02   BEAMFORMER CONTROLLER

From: 3500-1261-XX	To: 3500-1262-XX	System: UM-4	

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
3401-0027	IC, Oscillator	1
4100-0092	Label, Blank	1

REWORK INSTRUCTIONS :

1. Change U84 from a 74F14 to the Oscillator, 3401-0027.

2. Remove the jumper from JP15 and install it at JPI4.

3. Using the label 4100-0092 or any small blank stick-on label, re-mark the PCB as a 3500-1262-XX.

COMMENTS: This change renders the PCB as a Non-Doppler Sync when it was a Doppler sync before.
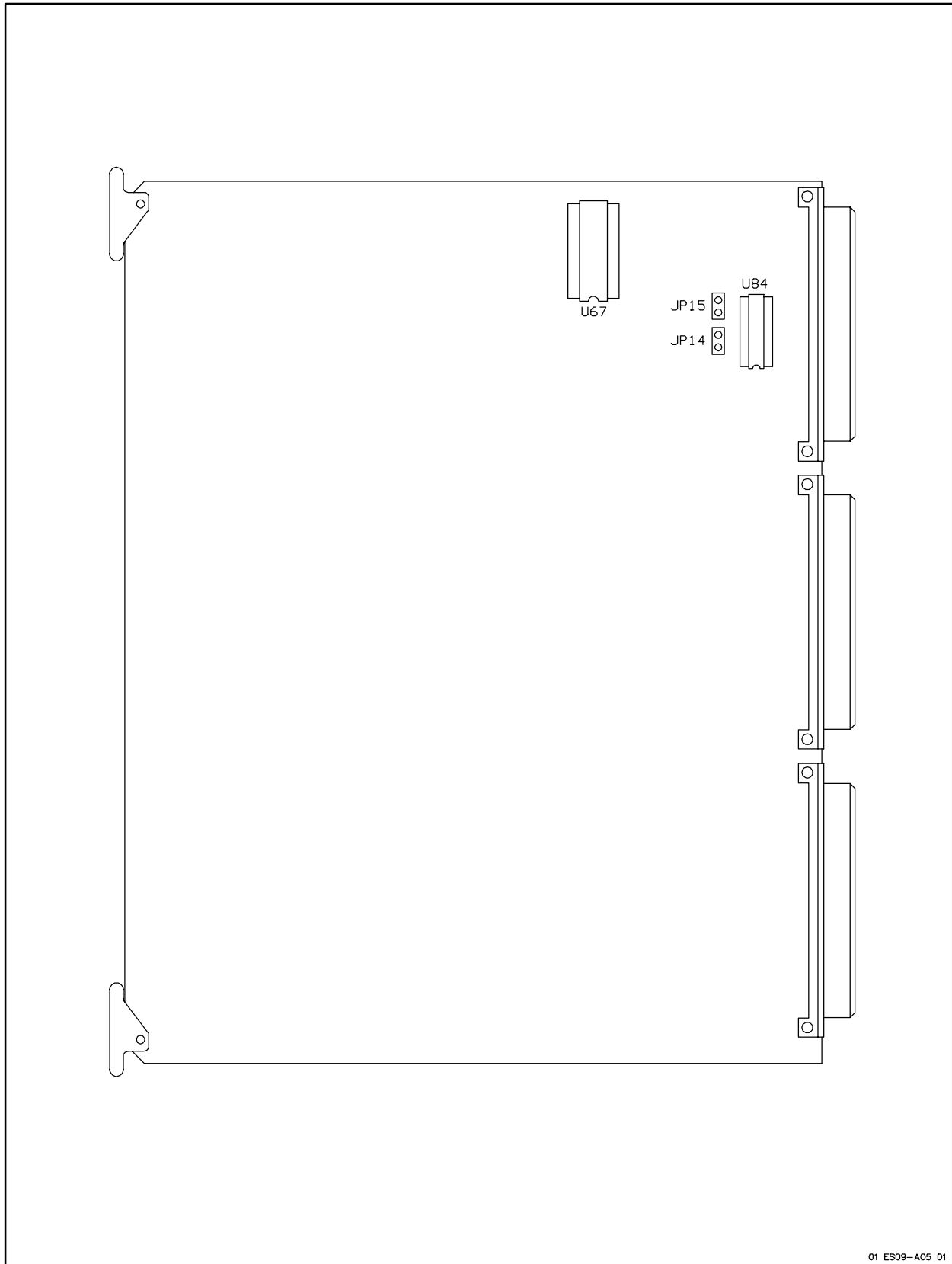
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01 ES09−A05 01

Figure IIIA.   3500-1261/1262-XX PCB

7500-0347-XX
DOPPLER PROCESSOR PCB
CONVERSION INSTRUCTIONS

Since the -05 version of this PCB is backwards compatible to the -04 and the -04 is backwards compatible (see note), no conversion instructions are required.

The -05 provides a baseline noise fix to the -04.

The -04 supports 12 MHz Sync.

The -03 is not 12 MHz Sync.

Note: *The backward compatibility of the -04/05 is based on the fact that it is designed to output a l2 MHz clock on a motherboard bus. This bus is unused in systems without 12 MHz Sync and therefore presents no compatibility problem. However, since the 7500-0370-02/04/08/10/24 versions of the 52 Pulse Processor output a 12MHz clock on the same bus, these PCBs cannot be used concurrently.*

7500-0374-XX
TM-MODE AUX PCB
CONVERSION INSTRUCTIONS

The following page describes how to down-Rev this PCB from -02 to -01.

The -02 supports 12X or higher software.
The -01 supports 8X software.

The following chart is a snyopsis of the differences between the different dash levels.

Refer to Figure IV for PCB layout.

7500-0374-XX

	-02 12X	-01 8X	
U13 SW1	4201-0282-01 POS. 1 = OFF	4201-0282 ALL ON	

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0374-XX   TM-MODE AUX   (A13) PCB

From: -02	To: -01	System: UM-4	Date: 8/4/87

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
4201-0282	PAL, 75-374	1
4201-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Remove IC from U13 socket (See Figure IV).

2. Install 4201-0282 into U13 socket.

3. Make sure all switches on SW1 are "ON. "

4. Using 4100-0092 label or any available small blank stick-on label, mark the board as -01.

COMMENTS: This change renders the PCB compatible with software at a lower Rev than 12X.
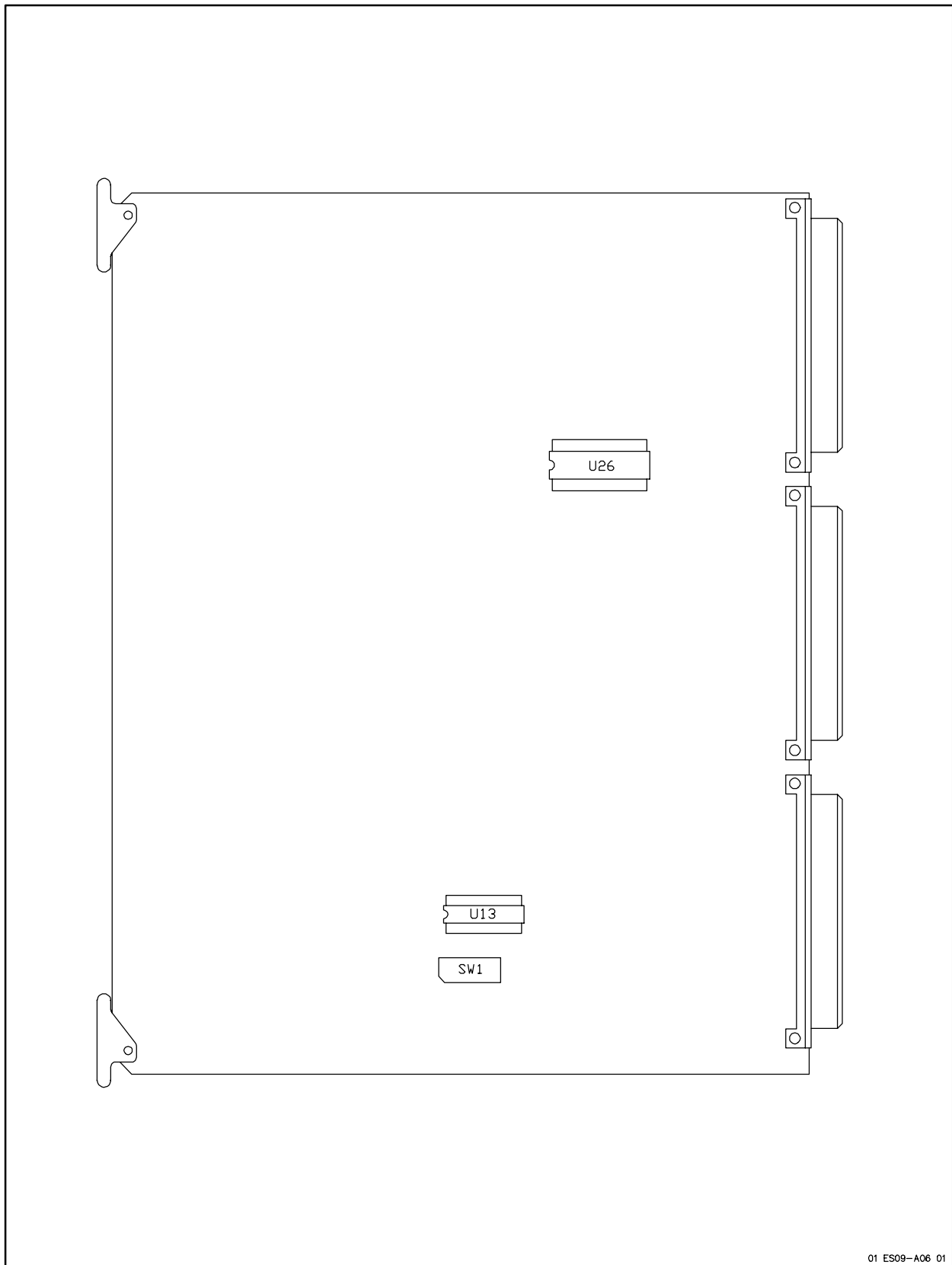
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01 ES09−A06 01

Figure IV.   7500-0374-XX PCB

7500-0313-XX
PULSE PROCESSOR, S1 PCB
CONVERSION INSTRUCTIONS

The following page describes how to Down-Rev this PCB from -03 to -02.

The -03 supports 17X software.
The -02 supports 4X, 5X, 6X software.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure V for PCB layout.

7500-0313-XX

-03   -02
12X   4X, 5X, 6X

| U78 | 4201-0214-02 | 4201-0214-01 | |

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0313-XX   S1 PULSE PROCESSOR (A5) PCB

From: -03	To: -02	System: UM-4	Date: 8/4/87

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
4201-0214-01	PROM, 75-313	1
4201-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Remove IC from U78 socket (See Figure V)

2. Install 4201-0214-01 into U78 socket.

3. Make sure all switches on SW1 are "ON."

4. Using 4100-0092 label or any available small blank stick-on label, mark the board as -02.

COMMENTS: This change renders the PCB compatible with 4X, 5X, 6X software.

---

01 ES09–A07 01
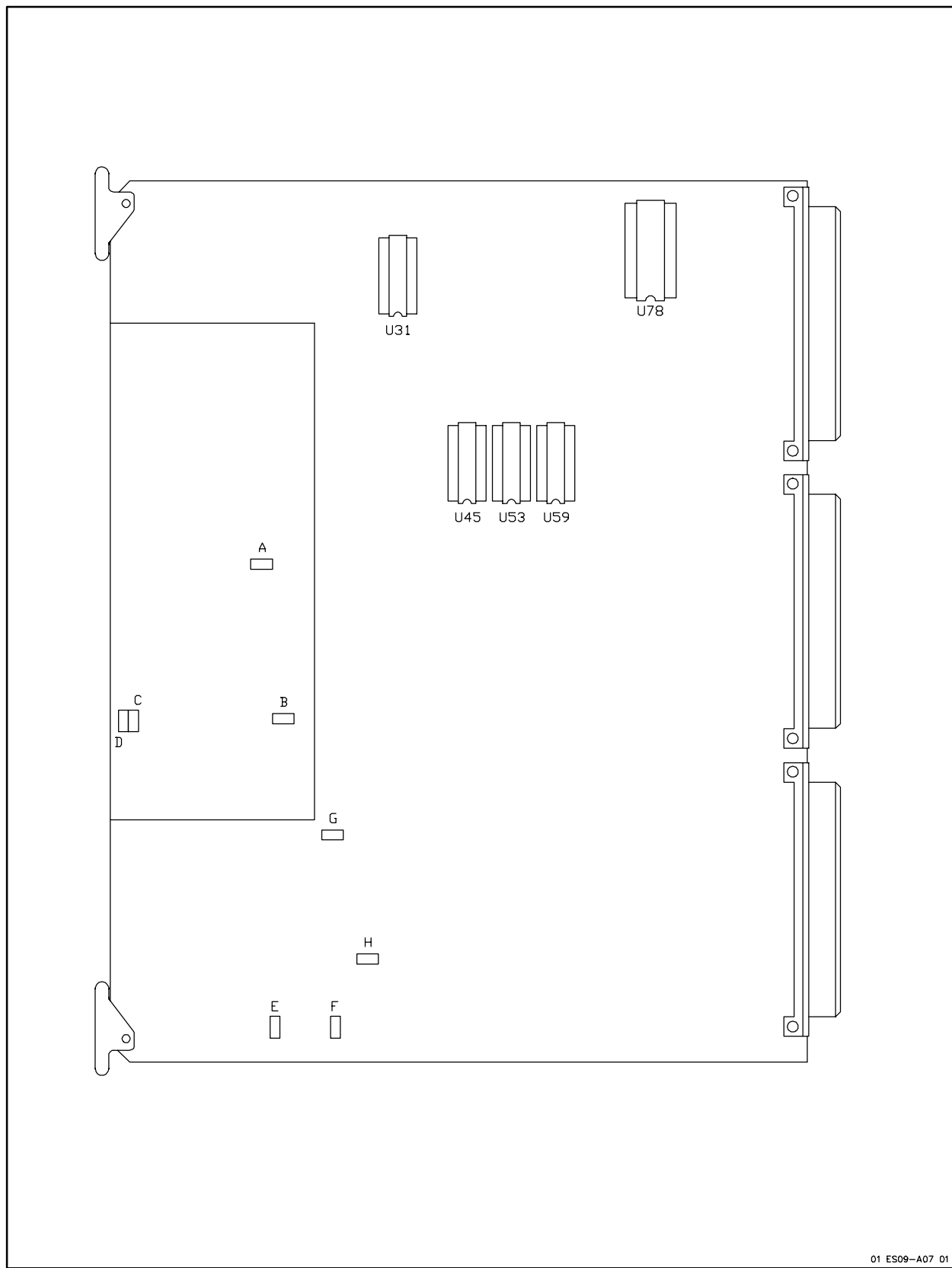
Figure V.   7500-0313-XX PCB

7500-0346-XX
DOPPLER ACQUISITION PCB
CONVERSION INSTRUCTIONS

The following page describes how to Up-Rev this PCB from -01 to -02.

The -02 supports DADA or deep abdominal Doppler applications.
The -01 does not support DADA.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure VI for PCB support

7500-0346-XX

	-02 DADA	-01 NON-DADA	
R225	237 OHM 2820-0074	392 OHM 2820-0061	

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0346-XX   DOPPLER ACQUISITION (A6) PCB

From: -03	To: -02	System: UM-4	Date: 8/4/87

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
2820-0074	RESISTOR, 237 OHM	1
4201-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Remove Doppler Acquisition shield (See Figure VI).

2. Remove R225 (if R225 is not mounted on solderable posts, cut the leads of R225 as close to the body of the resistor as possible and use the leads to mount the resistor in Step 3).

3. Replace R225 with a 237 OHM resistor, 2820-0074.

4. Replace Doppler Acquisition shield.

5. Using 4 100-0092 label or any available small blank stick-on label , mark the board as -01 .

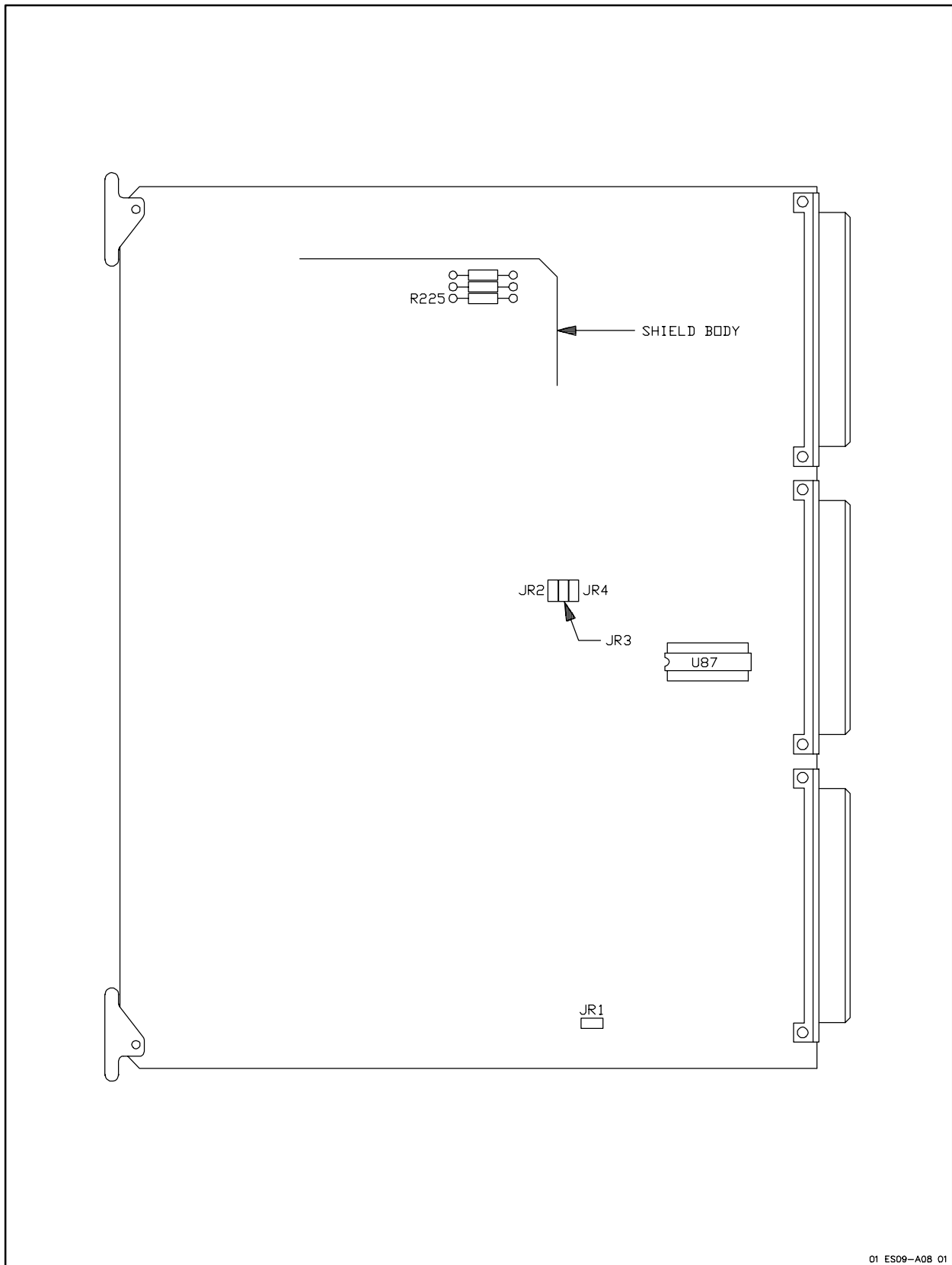**COMMENTS: This change renders the PCB DADA compatible.**

R225

SHIELD BODY

JR2 ☐ JR4

JR3

U87

JR1

01 ES09−A08 01

Figure VI.   7500-0346-XX PCB

7500-0273-XX
2-D SC INTERFACE PCB
CONVERSION INSTRUCTIONS

The following page describes how to down convert this PCB for -14, -22 (-15, -23 for Int'l) or -10, -60 (-11, -61 for Int'l) to a non-CAD or 23X software type.

The -22/23/60/61 are equivalent to the -14/15/10/11 except for a pixel dropout fix.

The -14/15 is a new Fab and is equivalent to the -10/11.

The -10/11 is the same as the -08/09 except that the sample clock is synchronized to the display. This is a CAD change and is compatible only with 23X software.

The -08/09 is equivalent to the -06/07.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure VII for PCB layout.

7500-0273-XX

-23/61
-22/60
-14/10
-15/11 for Int'l Smpl Clk Sync Non-Sync

S1–3	ON/CLOSED	OFF/OPEN	

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE: [ ]

PCB PART NUMBER:
7500-0273-XX

PCB NOMENCLATURE:
2-D SC INTERFACE   (A9) PCB

From: -23/61 (Int'l) -22/60 -14/10 -15/11 (Int'l)	To: Non-23X	System: UM-4	Date: 8/27/90

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
4201-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Open Switch SI – 3 (See Figure VII).

2. Using 4100-0092 label or any available small blank stick-on label, mark the PCB as "Non-23X or higher" near the dash level indicator.

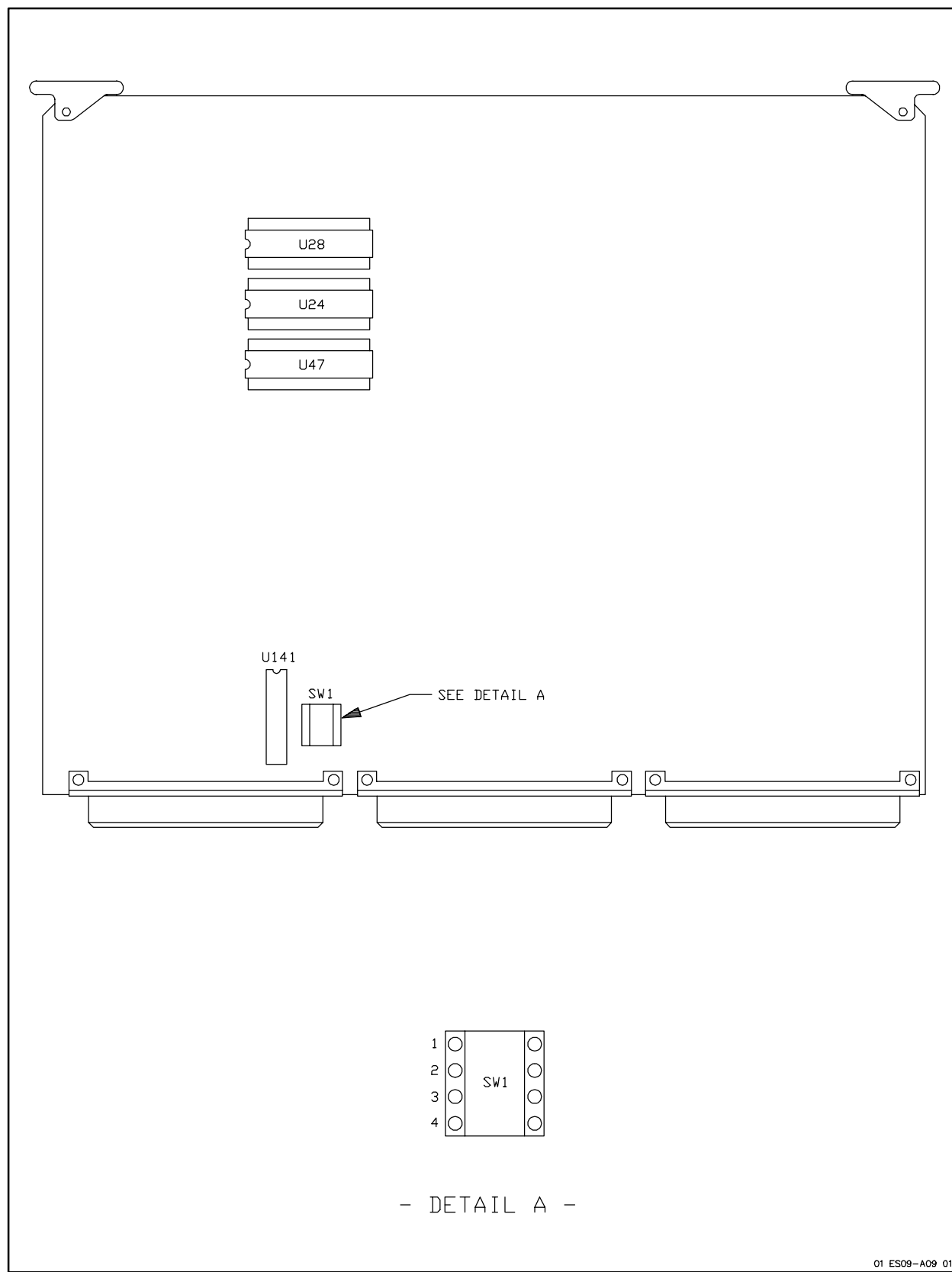**COMMENTS: This change renders the PCB as a Non 23X or higher software type.**

Figure VII.   7500-0273-XX PCB

7500-0411-XX
T-M MODE AUX COMBO PCB
CONVERSION INSTRUCTIONS

The following page describes how to down convert this PCB from -06 to a non-Sync type.

The -08 is the same as the -07 but is a new Fab.

The -07 is the same as the -06 but is convertible to non-Sync.

The -06 is the same as the -05 but has 12 MHz clock Sync changes for 240 volt systems. It is compatible only with the 7500-0373-05 motherboard.

The-05 is essentially the released version of this PCB.

The following chart is a synopsis of the differences between the different dash levels.

Refer to Figure VIII for PCB layout.

7500-0411-XX

	-07, -08 12 MHz Sync	-01 Non-Sync	-05 Non-Sync
JP10 JP11	2–3 NOT CONNECTED	1–2 CONNECTED	N/A N/A

PCB REWORK SHEET

HARDWARE: [X] SOFTWARE [ ]

PCB PART NUMBER: PCB NOMENCLATURE:
7500-0411-XX   TM-MODE/AUX COMBO (A12) PCB

From: -07/08	To: NON-SYNC	System: UM-4	Date: 2/9/89

PARTS REQUIRED:

PART NUMBER	DESCRIPTION	QTY
3100-0660	HEADER JUMPER	1
4100-0092	LABEL, BLANK	1

REWORK INSTRUCTIONS :

1. Install a header jumper at JP11 (see Figure VIII).

2. Move the jumper connector at Pins 2 and 3 of JP10 to Pins 1 and 2 of JP10.

3. Using 4100-0092 label or any available small blank stick-on label, mark the board as "Non-Sync" near the dash level indicator.

COMMENTS: This change renders the PCB as a Non-Sync type with its own independent clock.
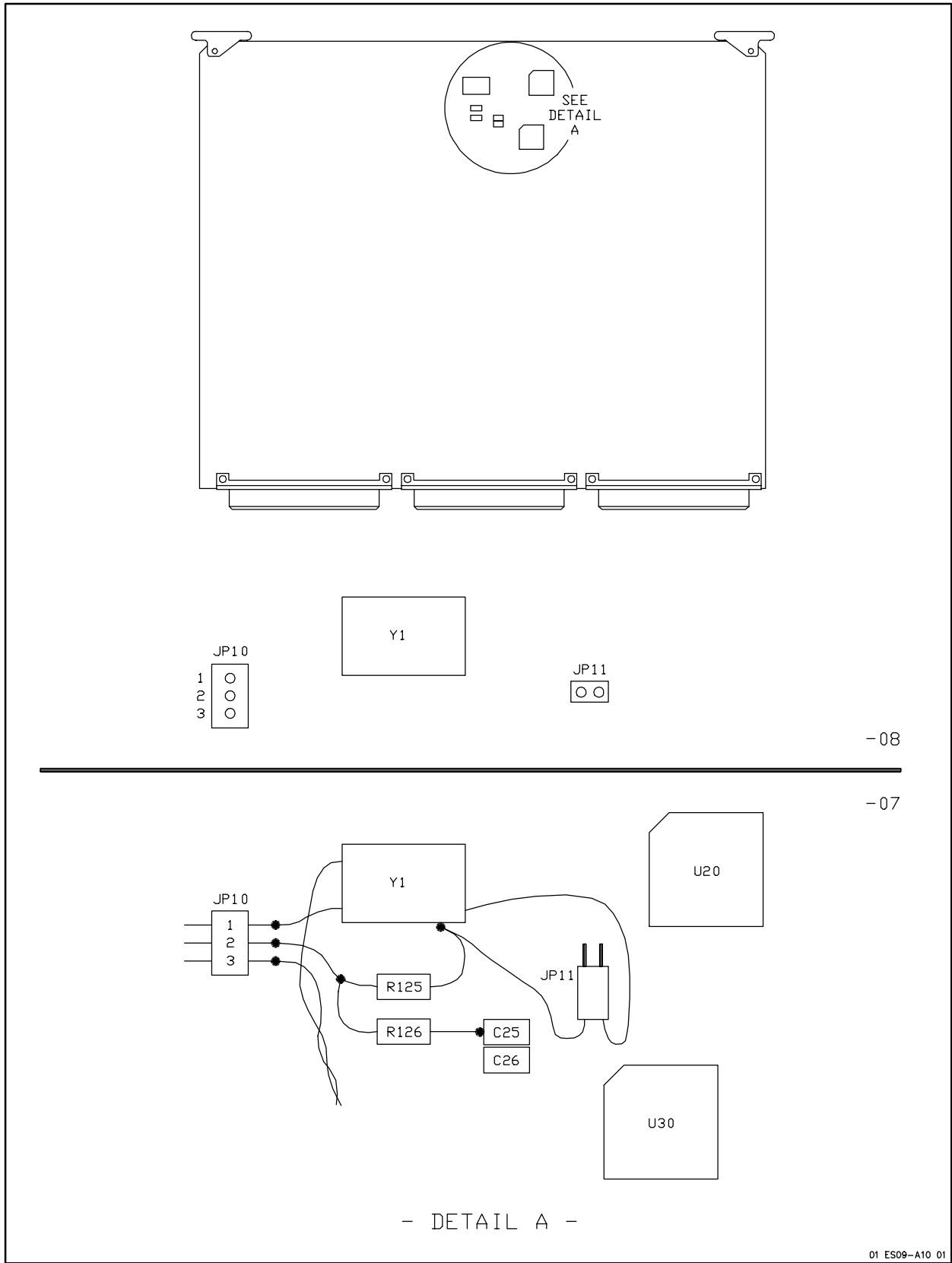

SEE
DETAIL
A

Y1

JP10
1
2
3

JP11

−08

−07

U20

JP10
1
2
3

Y1

R125

R126

C25

C26

JP11

U30

− DETAIL A −

01 ES09−A10 01

Figure VIII.   7500-0411-XX PCB

Table 9A–1.   Compatibility Chart for the Human Factors and OEM Modules

OEMs 4000-0144	HFC CART ("L" Bracket)[1] 3000-0112-02	HFC CART (Block)[1] 3000-0112-021	HFC Cart (Block)[1] 3000-0112-02	Extnd HFC (Block)[1] 3000-0231-01	Univers. HFC ("L" Bracket)[1] 3000-0249-01
–– (No dash)/60	L				
-06/66[2]	L				
-01/61 & -02/62		B	B	B	
-03/63 & 04/64[2]		B	B	B	
-05/65[2]	L				L
-07/67, -08/68, -09/69[2,3]	L				L
-10/70[2,3,4]	L				L
-11/71[5]	L				L
-12//72[6]	L				L
-13/73[7]	L				L
-14[8]	L				L

1. "L" Bracket and Block refer to the attachment method between HFC and OEM modules.

2. HFC modules configured with longer monitor and keyboard cables which reach the EM. The others require extension cables.

3. Compatible with CAD hand controller.

4. Phillips head screws replace the friction retainer pins for keyboard support assembly pins.

5. Adds Lenzar cable management.

6. 4-40x½ inch cap head (allen) screws replace phillips head screws (note 4).

7. Deletes two Belleville cone washers (1563-0061) and adds two Keps nuts (1543-0002) which are locked down with the standard 10-32 nuts (1543-0001) after monitor arm tension is set.

8. -14 and higher and the -60 series incorporates oil-filled dampers instead of gas shocks.

CAUTION: *Do not use pin removal tool, P/N 6005-0563-01, for removing the upper gas spring pivot pins on 4000-0144-10 and above versions of the Human Factors Module. The pins on -10 and -11 modules are secured with Phillips head screws, and -12 and higher module pins are secured with 4–40 x ½ inch cap head (allen) screws.*

NOTE: *Replace gas shocks with oil-filled dampers upon failure. Instructions are included in the 8000-0862-01 kit.*

Tables 9A–2 through 9A–4 contain Optional Equipment Module part numbers that differ between dash revisions of 3000-0207-XX.

Table 9A–2.   OEM 3000-0207-07 and Lower

8	1065-0511-01	• Base, OEM	
9	1064-0512-01	• Plate, Slide, OEM	
11	1064-0514-03	• Plate, Keyboard Mounting	
12	1064-0515-02	• Panel, Left Side	
14	1064-0516-01	• Panel, Right Side	UP-870
16	1064-0521-02	• Tray, S/H, UM4A	
17	1064-0532-01	• Frame, 1" Tubing	24" front-to-back (short)
18	1065-0534-02	• Mounting Bracket, Monitor	
21	1064-0363-02	• Tray, Right, S/H	
21a	1064-0538-01	• Panel, Blank, Linear Holder	PV

Table 9A–3.   OEM 3000-0207-08 and –09

8	1065-0511-03	• Base, OEM	
9		• Plate, Slide, OEM	
11	1064-0514-04	• Plate, Keyboard Mounting	
12	1065-4089-02	• Panel, Left Side	
14	1065-4093-02	• Panel, Right Side	
16	1064-0521-03	• Tray, S/H, UM4A	
16a	1065-1290-01	• Scanhead Holder, Urethane	
17	1064-0532-01	• Frame, 1" Tubing	24" front-to-back (short)
18	1065-0534-02	• Mounting Bracket, Monitor	
21	1064-1287-02	• Tray, Right, S/H	

Table 9A–4.   OEM 3000-0207-10 and Higher
(Extended for AG-5700)

8	1065-0511-03	• Base, OEM	
9		• Plate, Slide, OEM	
11	1064-2106-01	• Plate, Keyboard Mounting, UM4 PLUS	
12	1065-4089-03	• Panel, Left Side	UP-870
14	1065-4093-03	• Panel, Right Side	UP-870
16	1064-0521-03	• Tray, S/H, UM4A	
16a	1065-1290-01	• Scanhead Holder, Urethane	
17	1064-0532-02	• Frame, 1" Tubing, Extended	26.5" front-to-back, AG5700
18	1065-0534-02	• Mounting Bracket, Monitor	
21	1064-1287-02	• Tray, Right, S/H	