

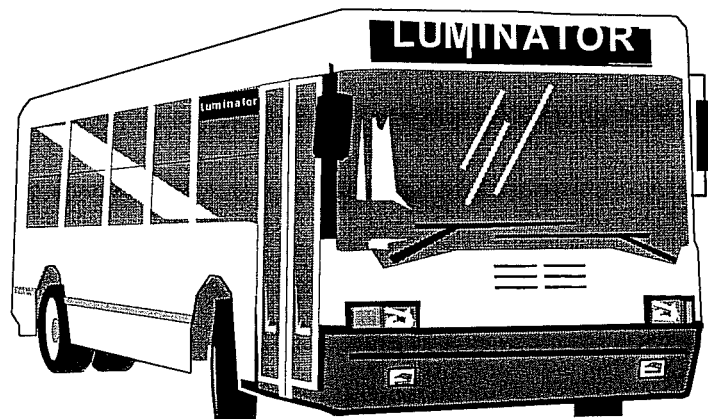
LUMINATOR

A Mark IV Industries Company

IDS

INFORMATION DISPLAY SYSTEM

OPERATION MANUAL



WARRANTY:

SELLER HEREBY EXPRESSLY EXCLUDES ALL EXPRESS AND IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS OR OTHERWISE, except such express warranties as are set forth in this paragraph below ANY COMPONENT SUPPLIED BY PARTIES OVER WHOM SELLER HAS NO CONTROL AS TO THE QUALITY OF THE MANUFACTURE IS HEREBY EXPRESSLY EXCLUDED FROM ALL EXPRESS AND IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS OR OTHERWISE, except as set forth in the express written warranty of the supplier of such component.

Seller warrants to the purchaser the products manufactured by Seller to be free from defects of material and workmanship for a period of one year from the date of shipment from Seller's plant provided the products are operated under normal conditions and within the limits of the specifications of the product.

During the period of one year from the date of shipment, Seller will correct within a reasonable time after receipt of the defective part, parts or product, any defect in any product sold hereunder which it finds to be defective, at Seller's option either by repairing or replacing the defective part, parts or product and such action shall be accepted by Buyer as full performance of the Warranty.

Buyer shall notify Seller in writing of any defect Seller will determine at its option whether the products should be returned to Seller or be repaired or replaced elsewhere.

The return of any product shall be at the expense of Buyer.

LIMITATION OF PROCEEDINGS: No action of any kind may be commenced against Seller more than one (1) year from the date Buyer's claim or cause of action against Seller first arose.

WAIVER: Waiver by Seller of a breach by Buyer of any provision of this contract shall not be deemed a waiver of future compliance therewith and such provision as well as all other provisions hereunder shall remain in full force and effect.

DAMAGES: Seller's liability shall in no event except in the case of non-delivery exceed the cost of repairing or replacing such part, parts or products or the amount of the purchase price paid with respect to the product on which the claim for damage is based, whichever is the lesser (Buyer is to return to Seller any product with regard to which Buyer receives the amount of the purchase price paid) in the case of non-delivery Seller's liability shall not exceed the difference if any between the contract price and the market price on the contract day of delivery of the product to be delivered.

SELLER IN NO EVENT SHALL HAVE ANY LIABILITY WHATSOEVER FOR PAYMENT OF INCIDENTAL, CONSEQUENTIAL, INDIRECT OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOSS OF PROFIT OR DAMAGES RESULTING FROM PERSONAL INJURY OR DEATH OR DAMAGE TO, OR LOSS OF USE OF ANY PROPERTY, INCLUDING BUT NOT LIMITED TO ANY PRODUCT SOLD HEREUNDER.

For Repair or information, contact your Luminator representative before shipping and for product support:

**Luminator
1200 E. Plano Parkway
Plano, TX 75074-8594
Phone: (972) 424-6511**

Contact name _____

SAFETY SUMMARY WARNING

LETHAL VOLTAGE POTENTIAL. ENSURE ALL POWER IS OFF BEFORE PERFORMING MAINTENANCE OR REPAIR ON ANY SIGN SYSTEM UNIT. FAILURE TO COMPLY COULD RESULT IN INJURY OR DEATH.

WARNING

FLUORESCENT LAMPS ARE FRAGILE, IMPLOSIVE, AND CONTAIN TOXIC ELEMENTS. WEAR APPROVED SAFETY EYE AND HAND APPAREL WHEN WORKING WITH OR NEAR FLUORESCENT LAMPS.

HANDLE FLUORESCENT LAMPS WITH EXTREME CARE TO AVOID BREAKAGE. IF BREAKAGE OCCURS, AVOID INHALATION OF VAPOR FROM THE BREAKING LAMP. AVOID SKIN CONTACT WITH THE TOXIC INTERNAL GLASS COATING.

CAREFULLY REMOVE AND PROPERLY DISPOSE OF ALL GLASS SHARDS.

CAUTION



ELECTROSTATIC SENSITIVE DEVICES.

ELECTROSTATIC CHARGE PREVENTION IS RECOMMENDED. USE WRIST GROUNDING STRAP AND/OR ANTISTATIC GROUNDED FLOOR MAT WHILE HANDLING ANY PWA. PLACE PWA IN ANTISTATIC BAG FOR TRANSPORTING AND STORING. SHOULD ANY PWA BE DETERMINED DEFECTIVE, REFER IT TO ELECTRONICS BENCH SERVICE, OR RETURN IT TO LUMINATOR FOR REPAIR AND OR REPLACEMENT.

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SECTION 1

INTRODUCTION, GENERAL SIGN SYSTEM DESCRIPTION, AND SIGN SYSTEM OPERATION

1.1 GENERAL

The GTI® sign system displays destination, public relations, and route information to transit authority customers and personnel. It automatically displays emergency messages when a controlling device on the vehicle is activated and automatically blanks the signs when the system is powered down.

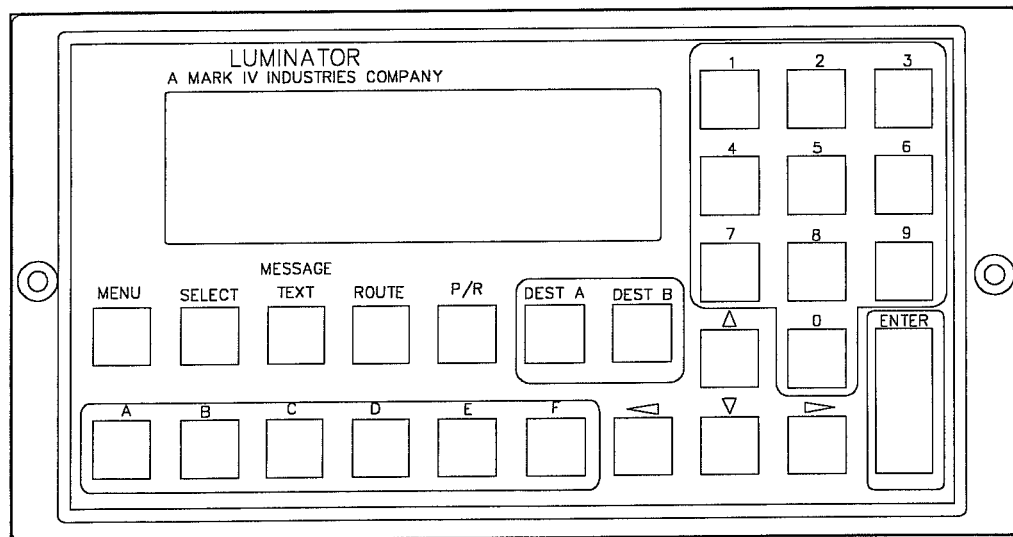
See separate manual for Luminator voice systems.

For all part numbers, refer to the separate illustrated parts catalog for your sign system component. An Illustrated parts catalog provides parts information by indexed figure and parts list table. Part numbers for your signs and sign system components are found in the illustrated parts catalog. Individual illustrated parts catalogs may be ordered from Luminator.

1.2 GTI® SIGNS

MAX signs, voice equipment, and other vehicle equipment can interface with GTI® sign systems. GTI® sign systems can contain the following signs:

- **Operator's Display and Keyboard (ODK)** - The Operator's Display and Keyboard (ODK) is used by the vehicle operator to control and verify the GTI® Sign System's message displays during normal operation.

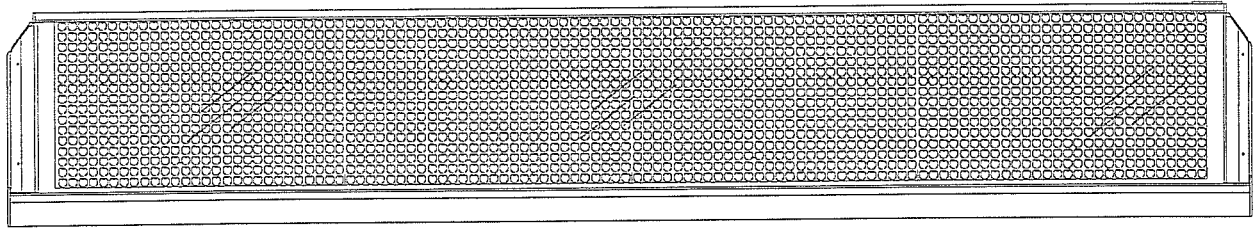


DD128-01

Operator's Display and Keyboard (ODK)

(See Illustrated Parts Catalog for your sign's parts list)

- **Front Destination Signs** - This sign is usually installed in the front window of a mass transit vehicle. It displays graphics and writes multiple line messages in various character fonts. The message statement, placement, timing and graphics are determined by the transit authority GTI® Message Writer programmer. Sign operation is automatic.

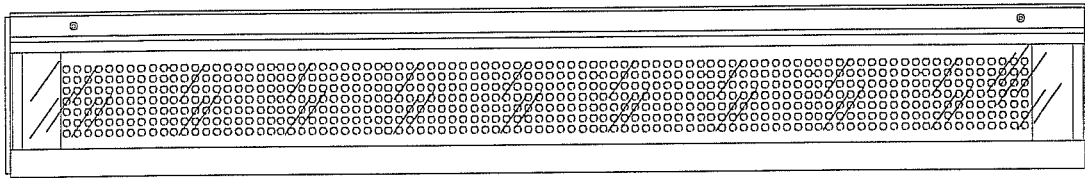


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Front Destination Sign

(See Illustrated Parts Catalog for your sign's parts list)

- **Side Destination Sign** - This sign is usually installed in a side window near the passenger boarding door, facing outward. It exhibits route, destination, and public relations messages.

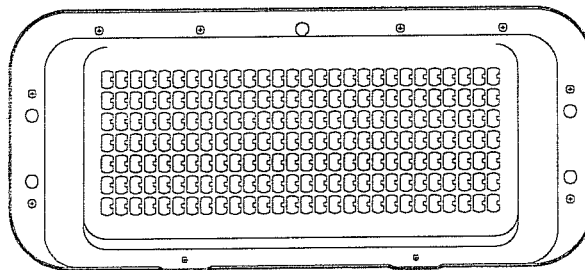


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Side Sign

(See Illustrated Parts Catalog for your sign's parts list)

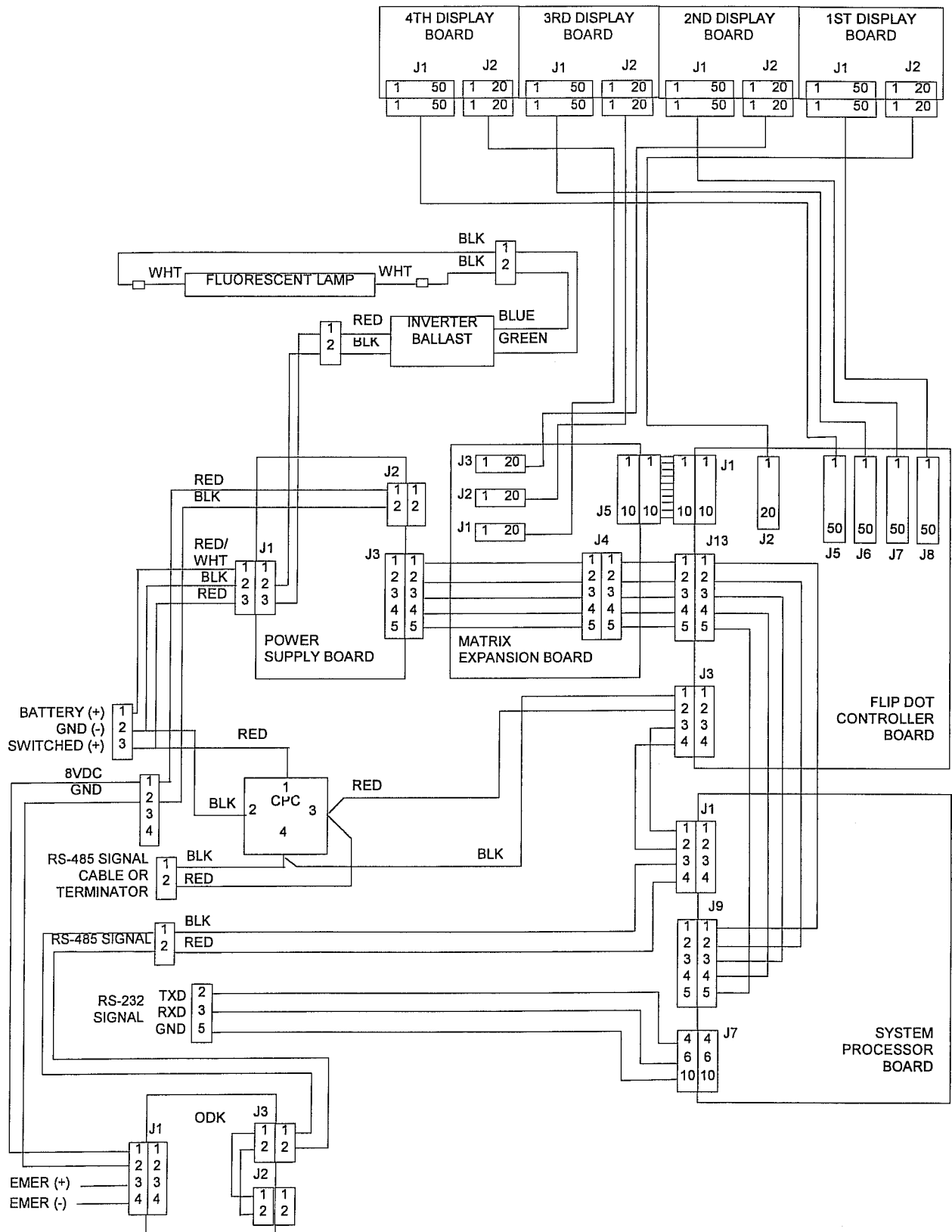
- **Rear Sign** - The rear sign is usually mounted on the rear of a mass transit vehicle. Access to the inside of the sign is through the lens assembly. It can display simple graphics, write numbers, letters, or symbols.



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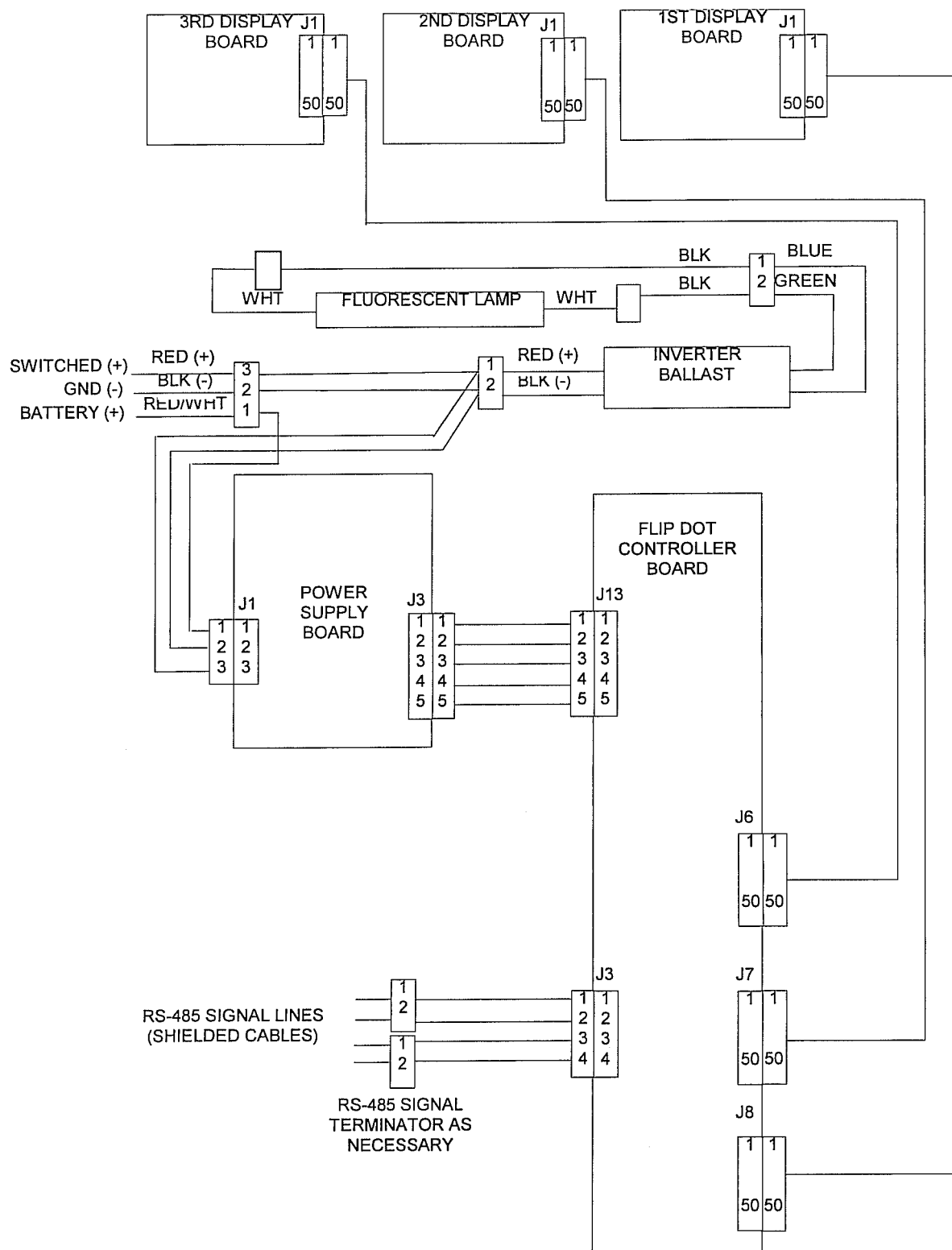
Rear/Route Sign

(See Illustrated Parts Catalog for your sign's parts list)



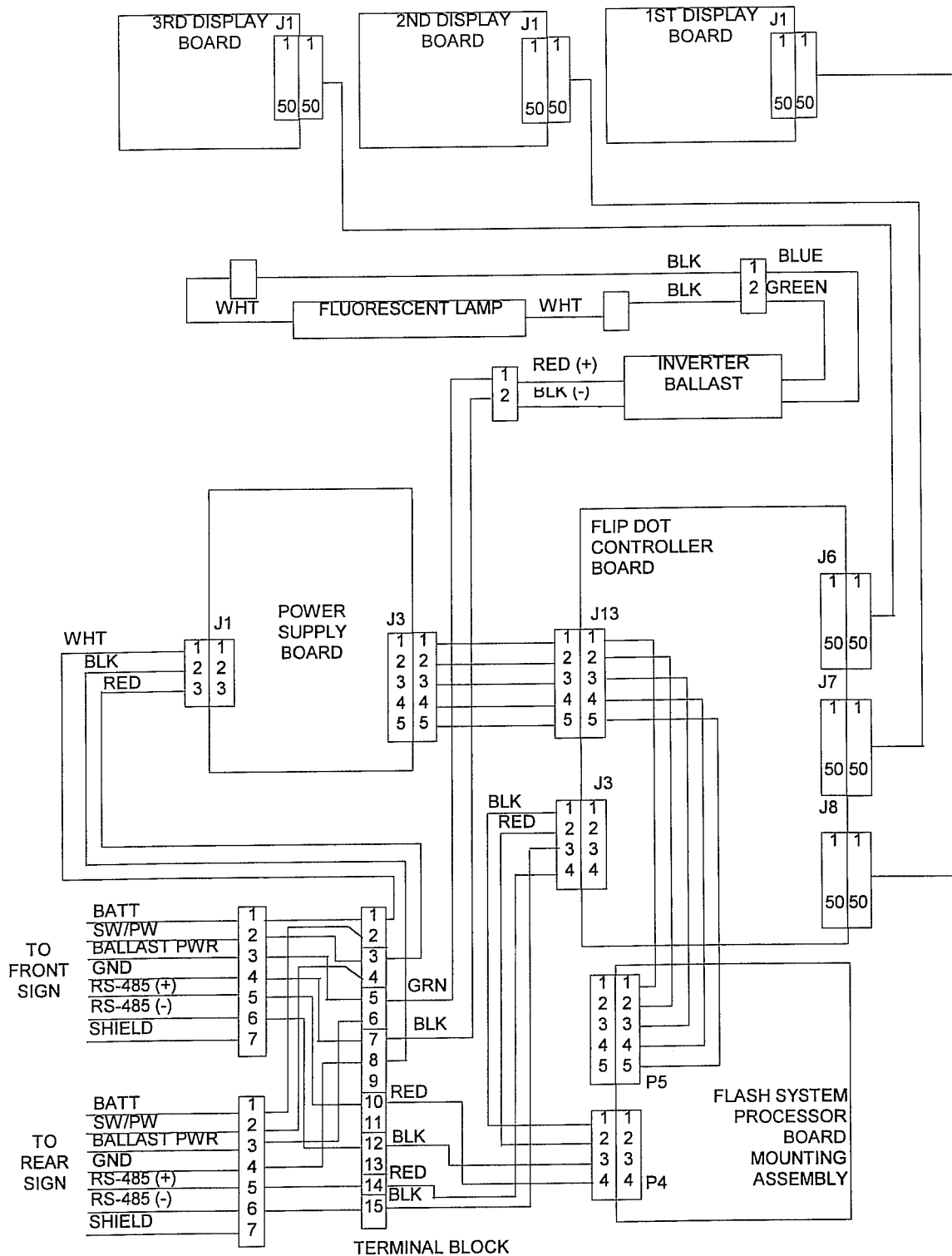
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ODK and Front Sign Interconnection Diagram



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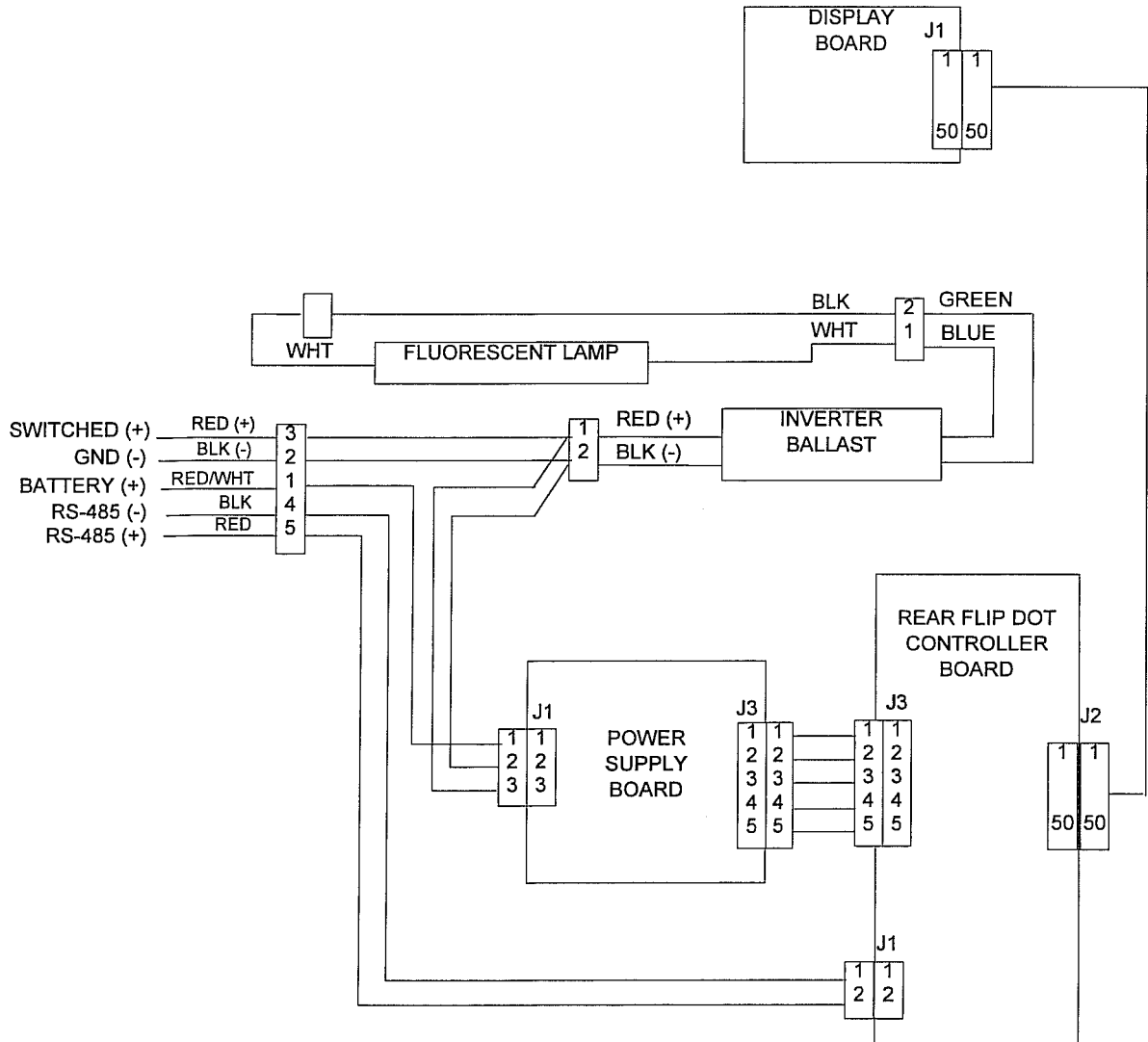
Side Sign Interconnection Diagram



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NOTE: EXTERIOR CONNECTIONS IS ICS CABLING.

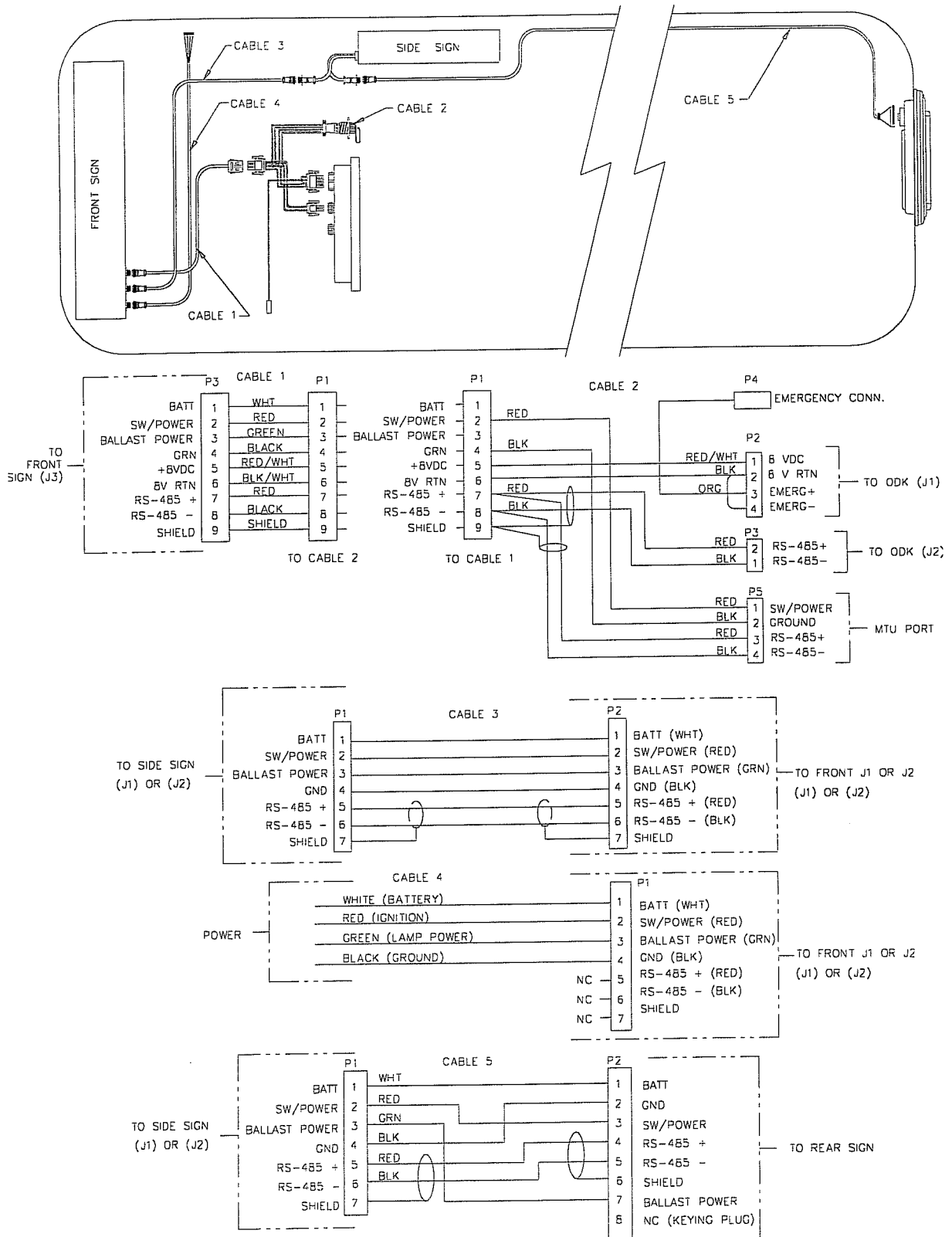
High Speed Reprogrammable Side Sign Connections



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Rear/Route Sign Connections

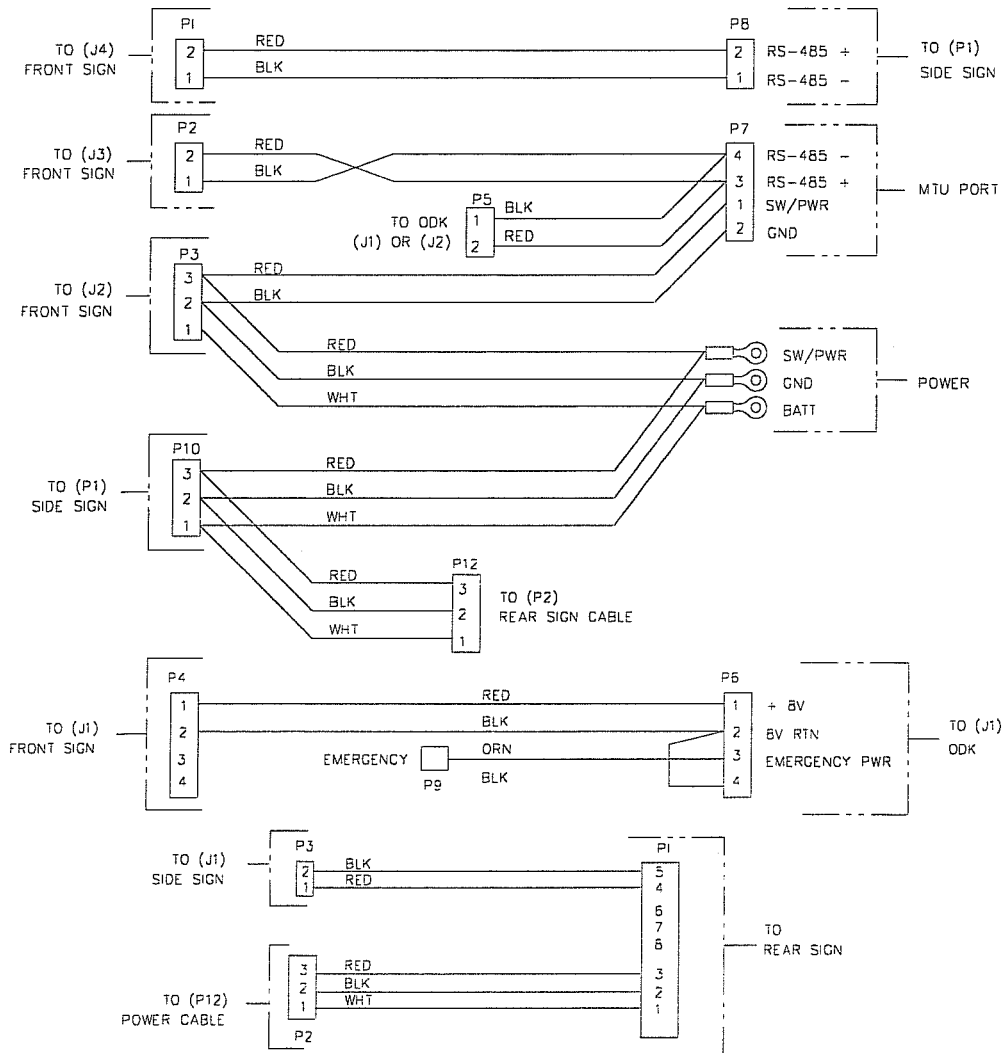
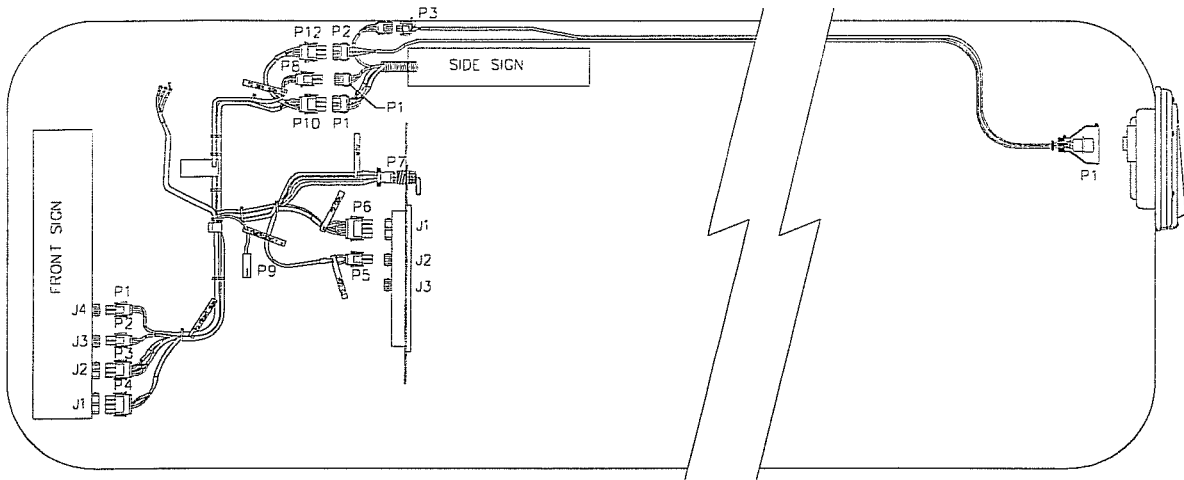
IDS OPERATION MANUAL



DD128-08

Integrated Cabling System Interconnection Diagram

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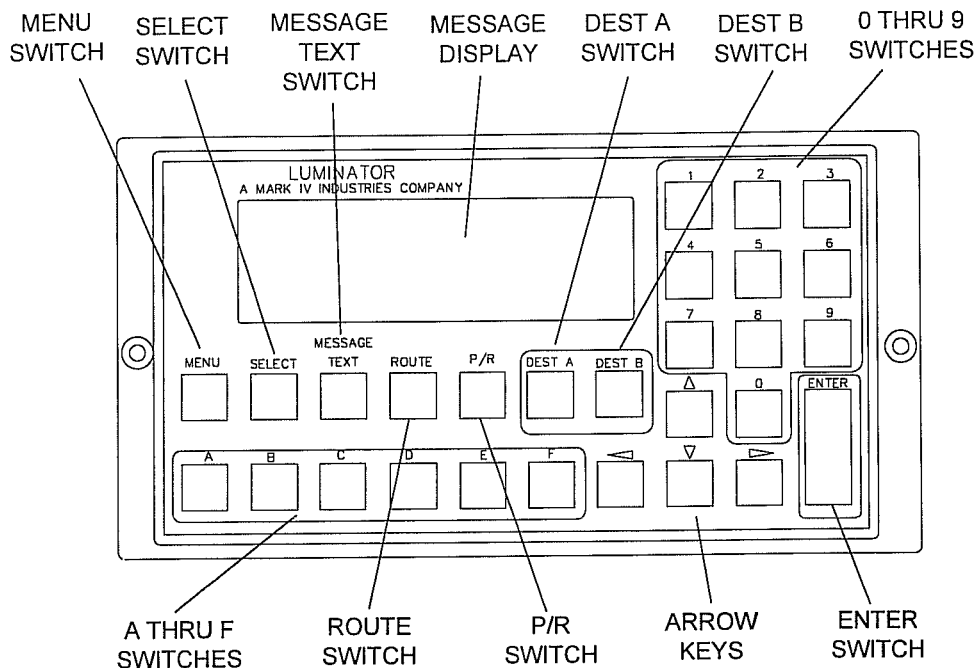


DD128-09

Mate-N-Lok II Cabling System Interconnection Diagram

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1.3 ODK DESCRIPTION



DD128-10

ODK Controls

(See Illustrated Parts Catalog for your sign's parts list)

The three methods to remove an emergency message from the ODK are:

1. Power down the vehicle. The last destination and public relations (P/R) messages will resume.
2. Enter a new destination into the ODK.
3. If a toggle switch is used, set the toggle switch in the OFF position. (Automatic Emergency Mode must be set)

ODK OPERATING PROCEDURE

EITHER DESTINATION "A OR B" MAY BE USED

EXAMPLE: ENTER AND DISPLAY MESSAGE # 15

PUSH **DEST A** , **1** **5** , **ENTER** WAIT 5 SECONDS

EXAMPLE: DISPLAY PUBLIC RELATIONS (ADD ON) MESSAGE 12

PUSH **P/R** , **1** **2** , **ENTER** WAIT 5 SECONDS

EXAMPLE: REMOVE PUBLIC RELATIONS MESSAGE

PUSH **P/R** , **0** , **ENTER** WAIT 5 SECONDS

EXAMPLE: RECALL DESTINATION "A" AND DISPLAY

PUSH **DEST A** **ENTER** WAIT 5 SECONDS

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P/N 501870-003

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ODK Operating Procedure Label

When the sign system is first powered up, the ODK indicates "SYSTEM INITIALIZE . . PLEASE WAIT". This message is then followed by a scrolling dot which indicates the ODK and SPB communication has **NOT** been established. Once communication has been established the last message entered before power down will be displayed on the ODK.

ALL messages are changed at the ODK; destination, public relations (P/R), and emergency.

There are two rows of vacuum fluorescent displays (VFD) on the ODK. Each row displays up to twenty (20) characters. Both rows can display a total of forty (40) characters per one (1) display.

The ODK receives its information via RS-485 data line. The data connector can plug into either J2 or J3.

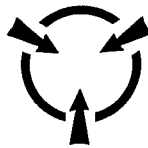
There is a four position power input connector on the back of the ODK.

The emergency message on the vehicle is activated when the operator toggles or depresses a vehicle's emergency switch. When the vehicle's switch is activated, power is applied to the ODK emergency circuit and the emergency message is displayed.

Any message can be changed at any time during normal operation by entering a new message code.

1.4 SIGN SYSTEM PRINTED WIRING ASSEMBLIES

CAUTION



ELECTROSTATIC SENSITIVE DEVICES.

ELECTROSTATIC CHARGE PREVENTION IS RECOMMENDED. USE WRIST GROUNDING STRAP AND/OR ANTISTATIC GROUNDED FLOOR MAT WHILE HANDLING ANY PWA. PLACE PWA IN ANTISTATIC BAG FOR TRANSPORTING AND STORING. SHOULD ANY PWA BE DETERMINED DEFECTIVE, REFER IT TO ELECTRONICS BENCH SERVICE, OR RETURN IT TO LUMINATOR FOR REPAIR AND OR REPLACEMENT.

DISCONNECT RS-485 SIGNAL LINES BEFORE DISCONNECTING POWER CABLE. WHEN INSTALLING, CONNECT POWER CABLE FIRST, THEN RS-485 SIGNAL LINES.

A Luminator GTI® Sign System contains the following printed wiring boards:

- **Power Supply Board**

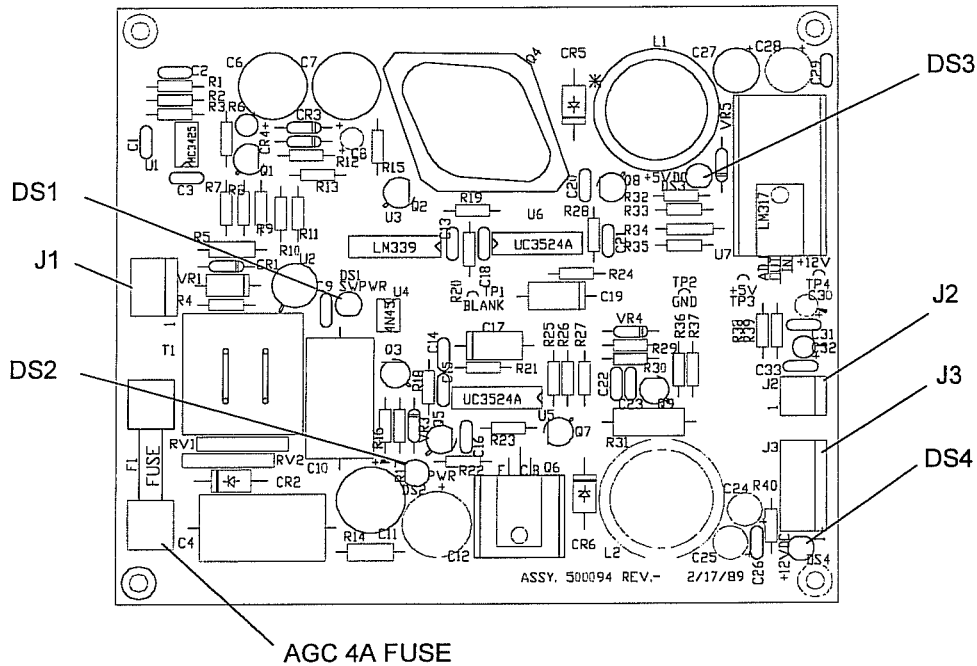
Each sign has a power supply board. The ODK receives power from the front sign power supply board through the power supply board J2 connector. All power supply boards are interchangeable.

Power supply boards receive switched and vehicle voltage into J1 three pin connector on the power supply board. Unswitched voltage is used to power the sign during normal

operation and for the automatic sign blanking feature when the vehicle is powered down. The switched voltage is used to control lamps and the autoblanking feature.

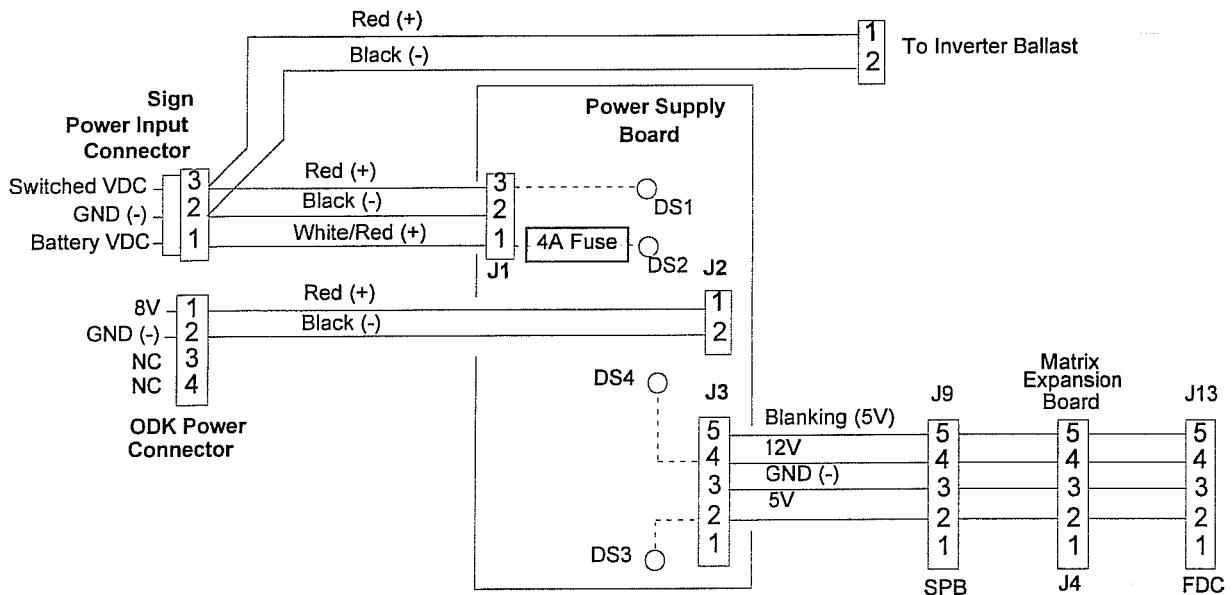
The power supply board will shut off if less than 9 Vdc or more than 35 Vdc is present.

There are four LED power indicators on each power supply board; DS1 indicates ignition power is present, DS2 indicates battery power is present, DS3 indicates +5Vdc output, and DS4 indicates +12Vdc output.



DD128-12

Power Supply Board

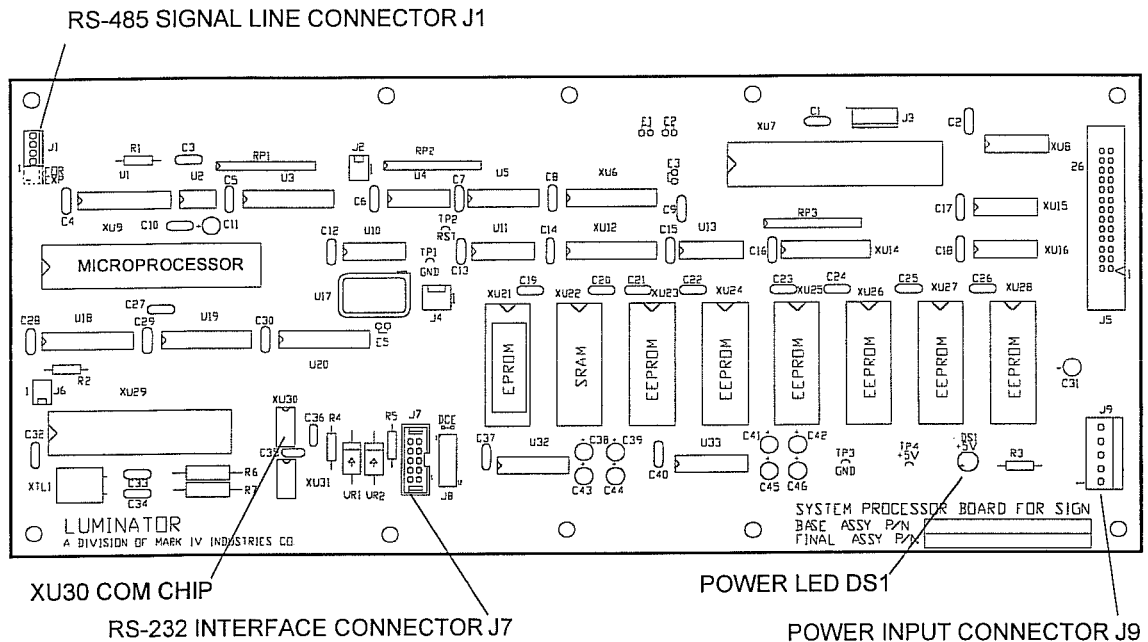


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Power Supply Board Connections

• System Processor Board (SPB)

There is one system processor board (SPB) per vehicle located in the front or side sign. The SPB contains the entire message listing and system operation programming. It controls the sign system by communicating operation and message writing data.



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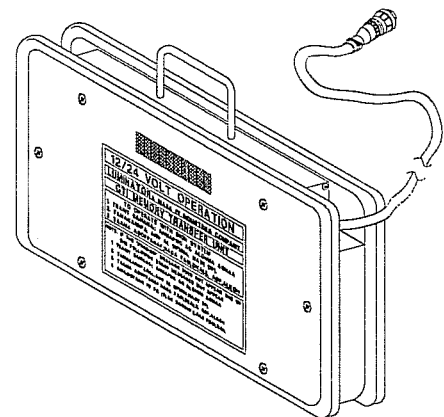
System Processor Board (SPB)

The SPB is the brain of the sign system. All messages are stored on EEPROMs. The quantity of EEPROMs used is determined by the size of the message listing. EEPROMs are located from XU23 through XU28 for a total of six EEPROMs. An EPROM is also located on the SPB at location XU21 that contains operating instructions. There is a SRAM on the board at XU22. The SRAM holds temporary data only when power is applied to the board. When powered down, data on the SRAM is erased.

An EPROM is erased by UV light and an EEPROM is erased by a pulse of electricity. The EPROM has a window covered by a part number label on its back, while the EEPROM does not have a window. **Do not remove the label from the EPROM.**

Upon power up, the system processor board (SPB) polls for the memory transfer unit (MTU). If the MTU is found, all other units are ignored until the system processor board EEPROMs are reprogrammed.

When the EEPROMs are reprogrammed, the following addresses are polled:



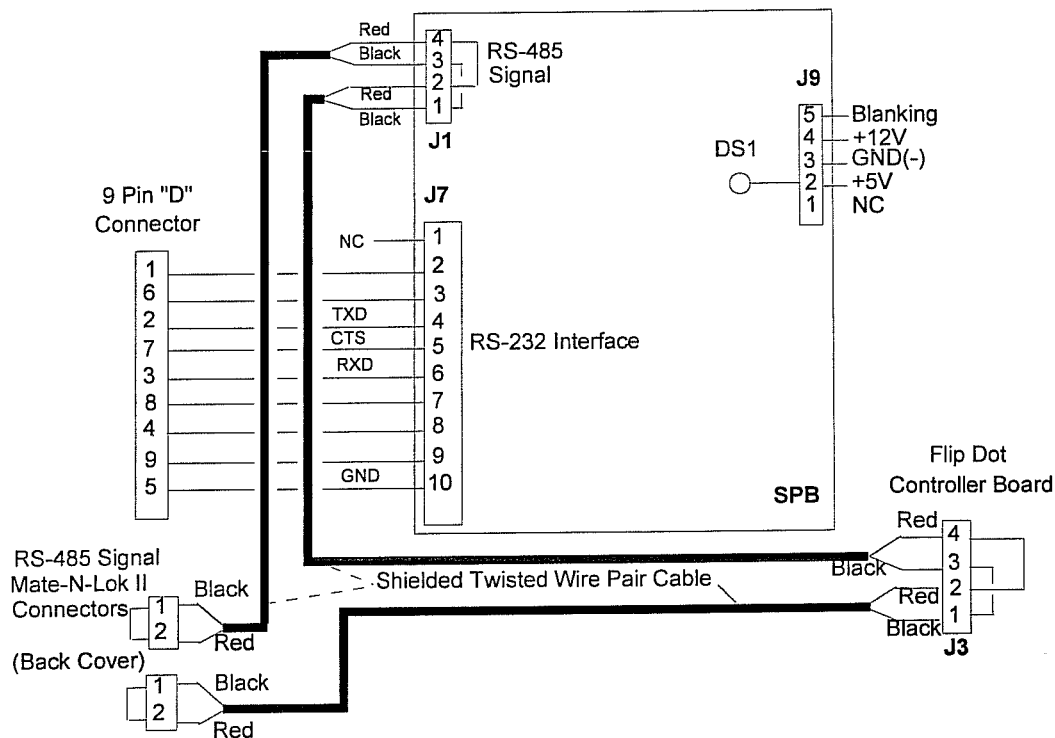
DD128-14

Memory Transfer Unit (MTU)

Sign Addresses - Examples of vehicle sign configurations are:

- SIGN ADDRESS NUMBER 1 is the ODK
- SIGN ADDRESS NUMBER 2 is the FRONT SIGN
- SIGN ADDRESS NUMBER 3 is the SIDE SIGN
- SIGN ADDRESS NUMBER 4 is the REAR SIGN

Refer to the transit authority's Message Writer listing for appropriate addresses.



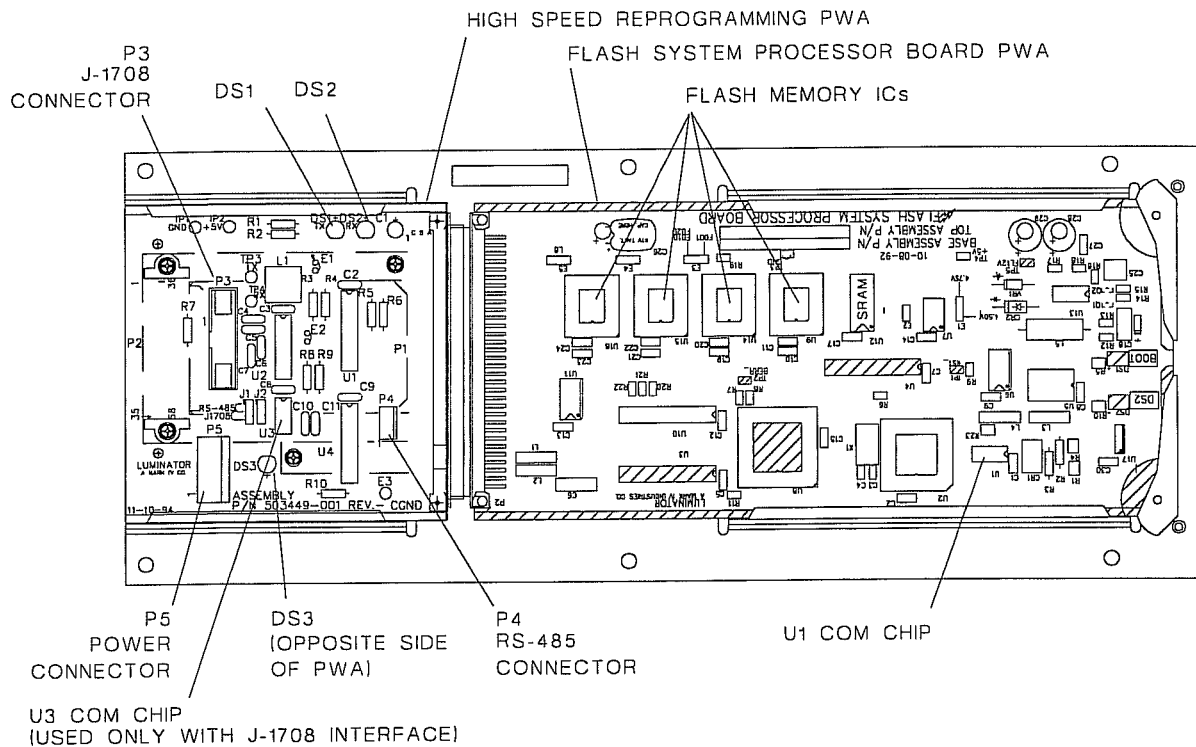
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Typical System Processor Board (SPB) Connections

How a Message is Changed

- The vehicle operator enters the new message into the ODK.
- The system processor board (SPB) recognizes the message change.
- The SPB pulls the message from the EEPROM.
- The new (changed) message is sent to all flip dot controller (FDC) boards on the RS-485 line.
- The FDC decodes the new change and displays the message.
- **Flash System Processor Board**

There is one flash system processor board (FSPB) per vehicle located in the front or side sign. The FSPB contains the entire message listing and system operation programming. It controls the sign system by communicating operation and message writing data.



(VIEW AS SEEN ON INSIDE BACK COVER ASSEMBLY)

DD128-23

Flash System Processor Board Assembly

The system processor board controls the GTI[®] sign system by communicating message writing data to each unit in the sign system.

The high speed reprogramming printed wiring assembly (PWA) interfaces the flash system processor board to the sign system. All voltages, data and signals to and from the flash system processor board go through the high speed reprogramming PWA.

Flash system processor board memory is programmed and updated with a Personal Computer Card International Association (PCMCIA) flash memory card or a GTI[®] memory transfer unit (MTU).

The FSPB is the brain of the sign system. All messages are stored in flash memory integrated circuit chips (ICs).

Upon power up, the FSPB polls for the MTU or message transfer card (MTC). If the MTU or MTC is found, all other units are ignored until the flash system processor board flash memory ICs are reprogrammed. When the flash memory ICs are reprogrammed, the following addresses are polled:

Sign Addresses - Examples of vehicle sign configurations are:

SIGN ADDRESS NUMBER 1 is the ODK

SIGN ADDRESS NUMBER 2 is the FRONT SIGN

SIGN ADDRESS NUMBER 3 is the SIDE SIGN

SIGN ADDRESS NUMBER 4 is the REAR SIGN

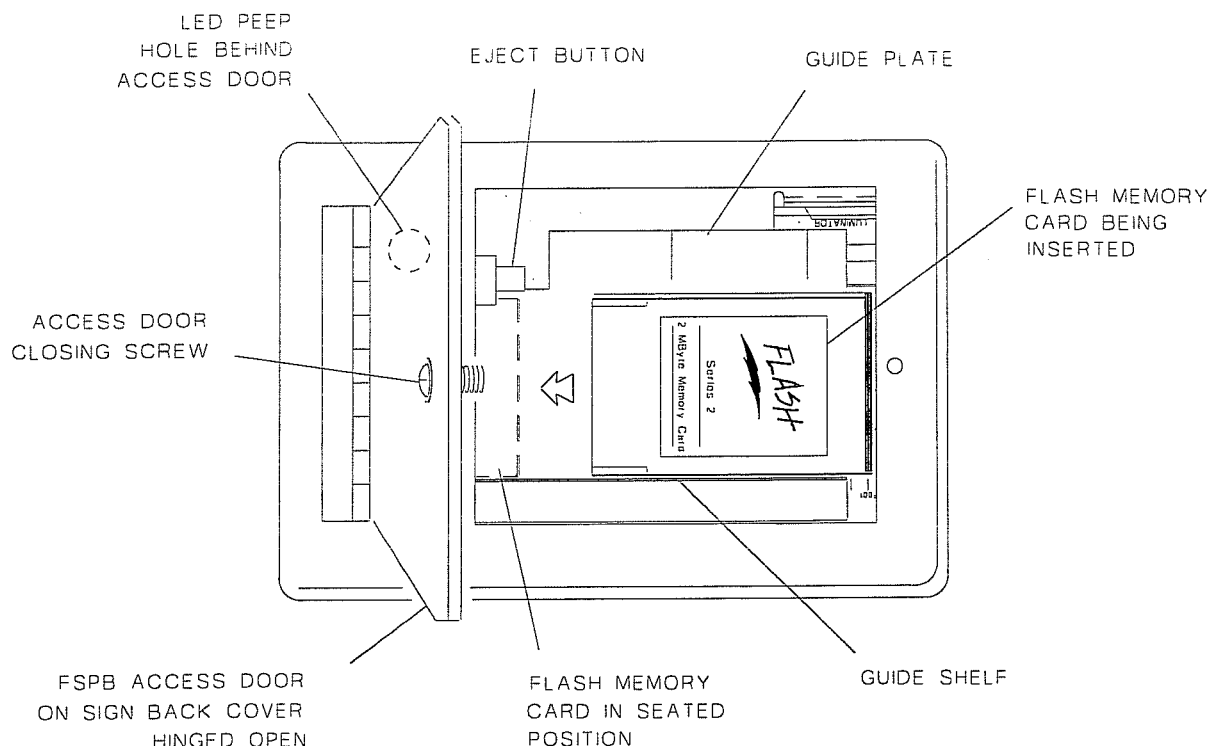
Refer to the transit authority's Message Writer listing for appropriate addresses.

How a Message is Changed

- The vehicle operator enters the new message into the ODK.
- The system processor board (SPB) recognizes the message change.
- The FSPB pulls the message from the flash memory ICs.
- The new (changed) message is sent to all flip dot controller (FDC) boards on the RS-485 line.
- The FDC decodes the new change and displays the message.

How a Program is Changed

- Open the FSPB access door in the sign's back cover.
- Orient the flash memory card with the **FLASH** label out and with the connector end toward the FSPB's connector mechanism.
- Place the flash memory card on the guide shelf. Hold the card flat against the guide plate, then slide the flash memory card into the FSPB's connector mechanism until seated.
- Ensure power is activated to the sign system. Memory update is automatic and very fast. LED DS3 on the FSPB indicates memory update status. LED DS3 is observed through the peep hole behind the access door in the sign's back cover.
 - Rapid flashing indicates data transfer and tests in progress.
 - Solid illumination indicates data transfer is complete and determined correct by the FSPB. The sign system initializes and starts displaying the first message in the new message listing.
- Press the eject button on the FSPB connector mechanism. The flash memory card partially ejects from the seated position and LED DS3 ceases illumination. Remove the flash memory card from the connector mechanism.
- Enter message codes from the new message listing into the ODK and verify proper sign system operation.
- Close and secure the access door on the sign's back cover.



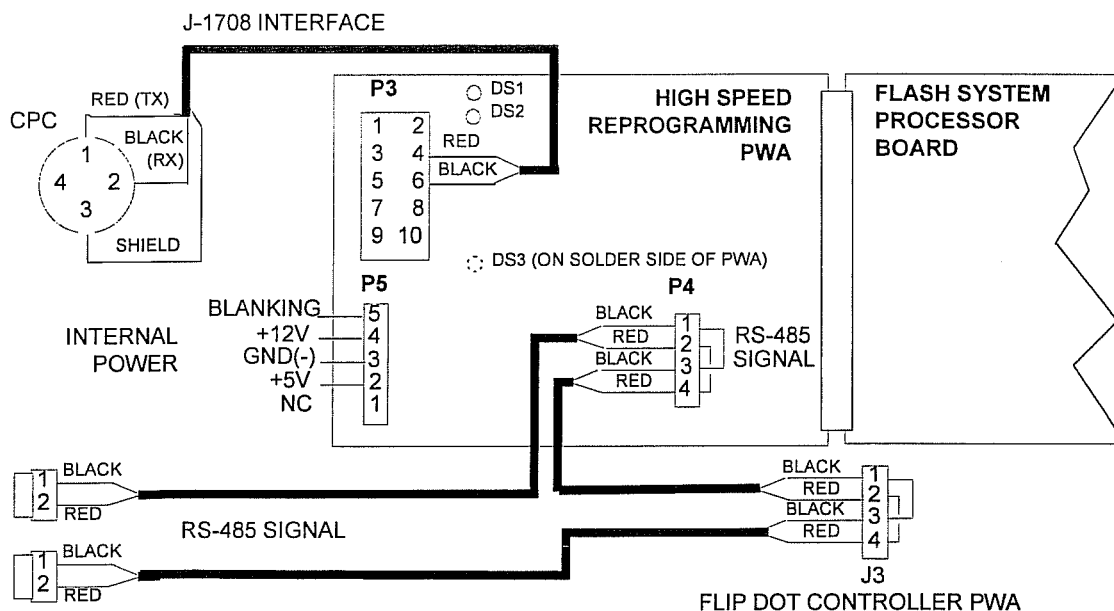
DD128-27

FSPB Flash Memory Card Connector Port

J-1708 Interface Connection and Indicators

P3 pins 4 and 6 connect the J-1708 interface to a four position CPC pins 1 (TX) and 2 (RX).

LEDs DS1 (TX) and DS2 (RX) indicate J-1708 signal activity. DS1 flickers when signal is being transmitted. DS2 flickers when signal is being received.

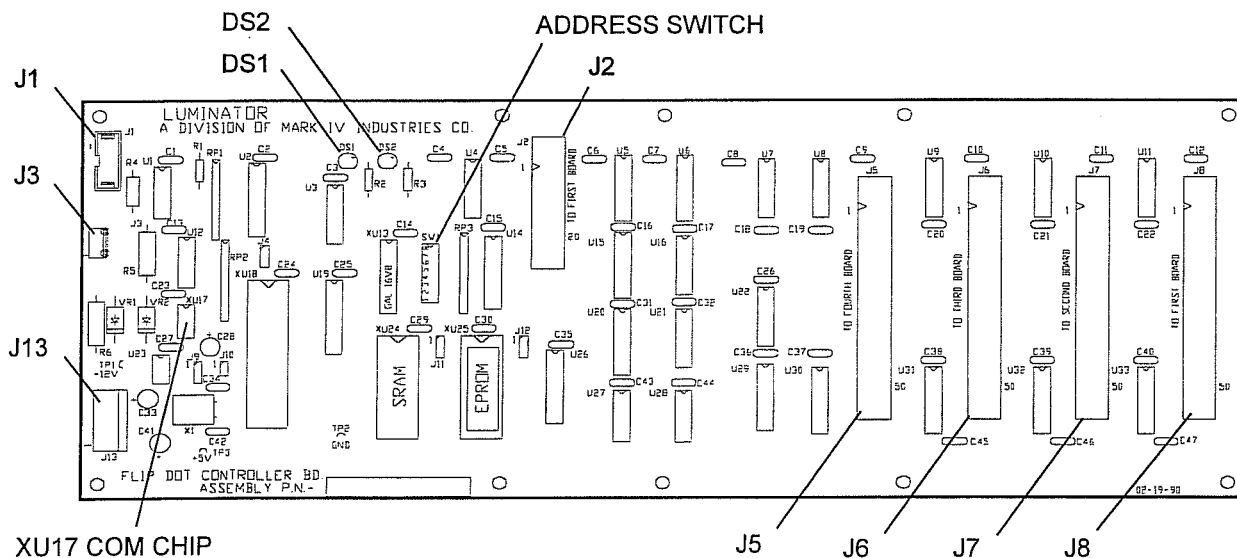


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Flash System Processor Board Connections

- Flip Dot Controller Board (FDC)**

There is one flip dot controller board per sign. It contains the sign's address and receives and holds in memory the last message sent from the system processor board.



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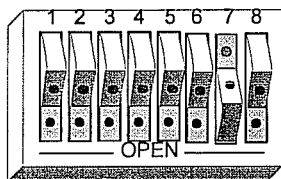
Flip Dot Controller Board (FDC)

Each sign's flip dot controller board contains an eight position DIP switch. The setting of the DIP switch determines the address of the sign. Each sign's DIP switch is set to a different address. Each sign is different in size and displays the same message in a different manner.

The board contains an internal test used to evaluate the sign's internal condition. This test is known as HEX 8F or Binary 143. Signal communication from the SPB is not tested when test address is activated.

When the vehicle is powered down, the FDC receives the blanking signal from the power supply. This signal blanks the display board.

Address switch settings are binary and start with the eighth rocker switch. The rocker switch is closed when depressed toward the number above the switch.



ADDRESS DIP SWITCH
(ADDRESS 2 SHOWN)

DD128-17

TYPICAL ADDRESS SETTINGS		DIP SWITCH SETTING 0= OPEN 1=CLOSED							
		BINARY VALUES							
		128	64	32	16	8	4	2	1
		ROCKER SWITCH NUMBER							
UNIT	ADDRESS	1	2	3	4	5	6	7	8
ODK	1	0	0	0	0	0	0	0	1
FRONT SIGN	2	0	0	0	0	0	0	1	0
SIDE SIGN	3	0	0	0	0	0	0	1	1
REAR SIGN	4	0	0	0	0	0	1	0	0
ROUTE SIGN	5	0	0	0	0	0	1	0	1
HEX 8F 16 x 112	143	1	0	0	0	1	1	1	1

RS-485 Communication Address Settings, Typical

There are two LEDs on the board; **DS1** and **DS2**. DS1 is on all the time. The only time DS1 turns off and then back on is after a new message is received by the flip dot controller board from the system processor board (SPB). DS2 is constantly strobing off and on looking for a new message from the SPB on the RS-485 information line. DS2 will flash rapidly when the sign is being updated with a new message.

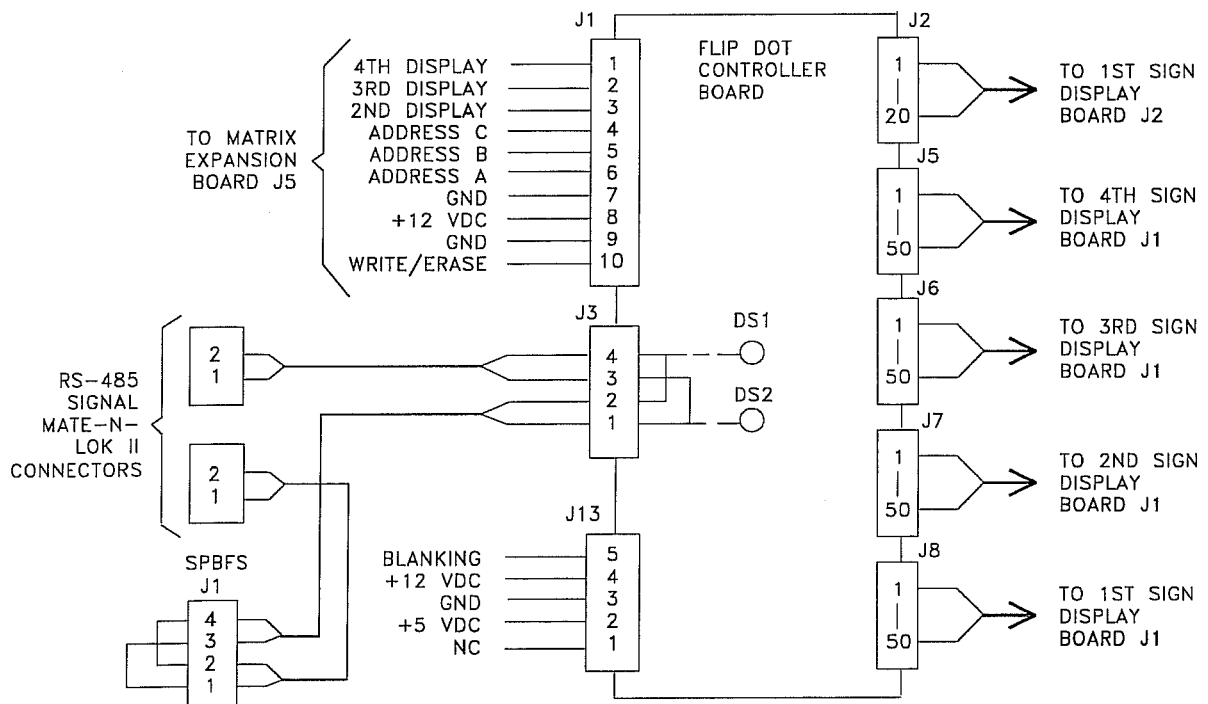
How to Test for FDC and SPB Communication:

1. Enter a new destination at the ODK.
2. Check to ensure that the LED at DS2 goes off and then back on rapidly to indicate the sign is being updated. DS1 will go off and on once indicating an acknowledgment that the message was updated.
3. If it does not go off and then back on, there is an RS-485 or Address communication error.

DS2 is constantly strobing off and on looking for a new message from the SPB on the RS-485 information line. If the LED is constantly ON or OFF, check:

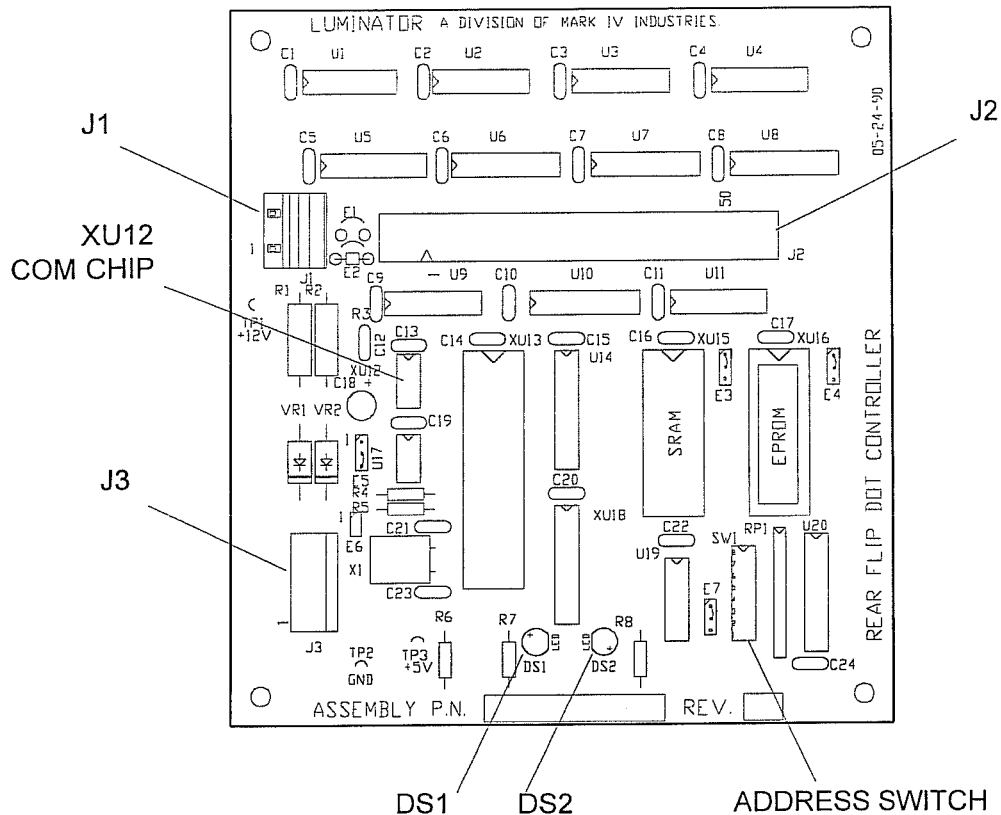
1. The DIP address switch setting.
2. Check the COM CHIP for burn-out or damage. This is the eight pin socket chip.
3. Check the RS-485 information line cable connections between the FDC and the RS-232 system processor final PWA.

NOTE: The rear sign FDC has a different address and controls one display board. Operation is similar to the front and side flip dot controller boards.



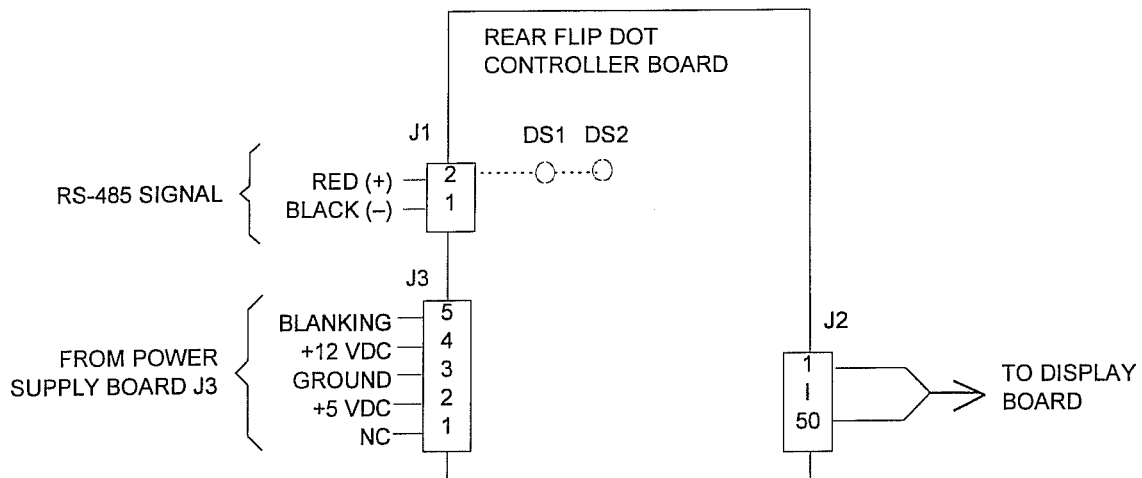
DD128-21

Flip Dot Controller Board Connections



DD128-20

Rear Flip Dot Controller Board

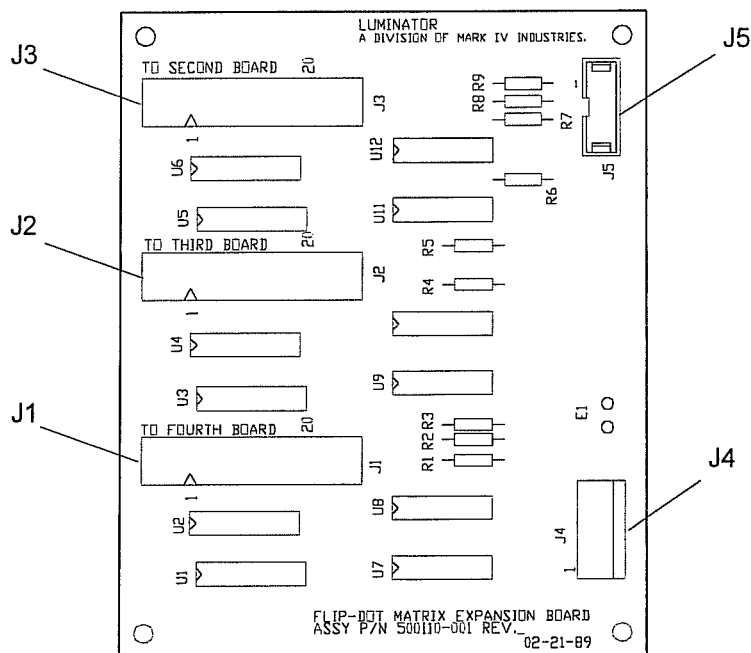


DD128-22

Rear Flip Dot Controller Board Connections

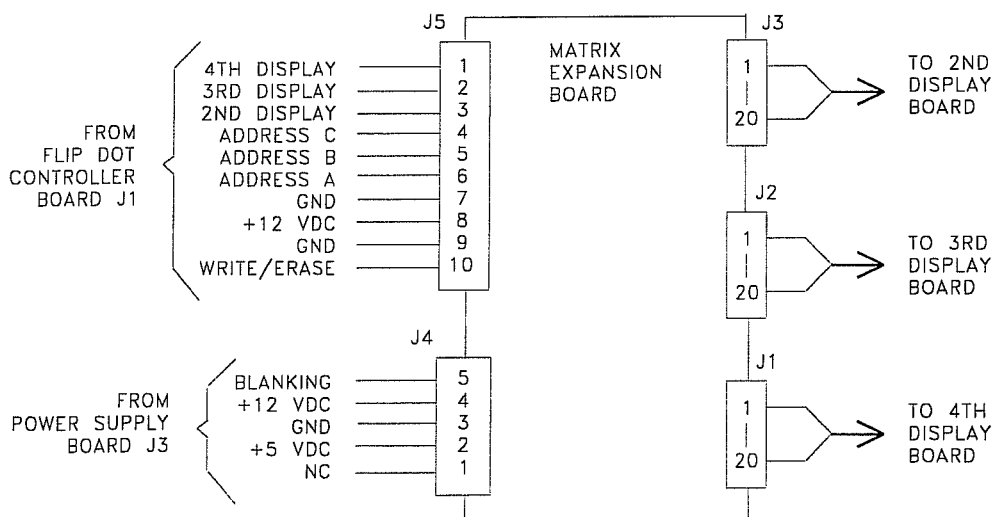
• Flip Dot Controller Matrix Expansion Board

The flip dot controller matrix expansion board is part of the flip dot controller board. It was added to drive rows 9 through 16 in signs that have more than eight rows. It receives information from the J5 connector. The expansion board drives the lower 8 rows of the 2nd, 3rd, and 4th displays of a Mega:Max sign.



DD128-19

Flip Dot Controller Matrix Expansion Board



DD128-26

Flip Dot Controller Matrix Expansion Board Connections

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SECTION 2

TROUBLESHOOTING

2.1 Troubleshooting

The following tables provide troubleshooting guides for a GTI® sign system. If the problem is not solved contact your Luminator representative.

CAUTION

BEFORE REMOVING OR REPLACING PARTS, BE SURE POWER IS OFF TO SIGN SYSTEM.

2.1.1 ODK TROUBLESHOOTING

Table 2-1. ODK Troubleshooting

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
No ODK display indications.	No voltage to ODK. Defective ODK.	Check for proper cable connections from sign power supply board to J2 pins 1 and 2 on ODK. Repair/replace connections/cable, as necessary. If DS4 LED on sign power supply board is illuminated, replace ODK. If DS4 LED is not illuminated, replace power supply board. Replace ODK.
Scrolling dot appears on ODK (pac-man).	Incorrect address setting. Loose/defective RS-485 signal cable(s)/terminator or power supply cable. Front sign SPB or FSPB defective. Front sign SPB or FSPB defective.	Call your Luminator representative. Ensure RS-485 cable, power supply cable, and terminator are secured properly. If SPB or FSPB DS1 LED is not illuminated, replace front sign power supply board. If SPB or FSPB DS1 LED is not illuminated, replace front sign power supply board. If DS1 LED is illuminated, replace front sign SPB or FSPB.
No ODK message or code entry indications of any kind.	Defective ODK.	Momentarily turn off power to sign system/ODK. If operation is not restored upon power activation, replace ODK.
"Exceeded Range" or "Invalid Message Code" indication appears on display.	Invalid message code entry with respect to programming or defective SPB or FSPB.	Update SPB or FSPB programming. Restore sign system to operating condition. Enter a valid DEST code. If message remains, replace SPB or FSPB.

2.2 GTI® MATRIX SIGN TROUBLESHOOTING

The following tables provide troubleshooting guides for a GTI® MATRIX sign. Troubleshooting procedures are the same for front, side, route, and rear signs.

WARNING

LETHAL VOLTAGE POTENTIAL. THE INVERTER BALLAST APPLIES HIGH AC VOLTAGE TO THE FLUORESCENT LAMP SOCKETS. DO NOT PROBE INTO INVERTER BALLAST AND FLUORESCENT LAMP CIRCUITRY WITH SWITCHED POWER APPLIED TO SIGN. TEST BALLAST AND LAMP BY REPLACEMENT ONLY. FAILURE TO COMPLY MAY RESULT IN INJURY OR DEATH.

CAUTION

TO AVOID DAMAGE TO RS-485 DEVICES, DO NOT UNPLUG OR CONNECT ANY SIGN INPUT HARNESS WITH POWER APPLIED TO SIGN.

Table 2-2. Troubleshooting Lamp Illumination

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Lamp(s) not illuminating.	Bad lamp.	Replace lamp.
	Connections or wiring.	Check connections and wiring to ballast assembly. Repair or replace ballast power cable assembly as necessary.
	Bad ballast assembly.	Substitute known good ballast assembly. Replace ballast assembly as necessary.
	Damaged lampholder.	Replace suspect lampholder.

Table 2-3. Troubleshooting No Automatic Blanking

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Message remains on sign display after power down.	Incorrect voltage input applications.	Check switched and battery power to sign.
	Internal power cable assembly.	Check connections of internal power cable assembly. Substitute known good internal power cable assembly. Replace internal power cable assembly as necessary.
	Sign power supply PWA.	Check blanking signal from sign power supply PWA. Replace sign power supply PWA as necessary.
	Flip dot controller PWA.	Substitute known good flip dot controller PWA. Replace flip dot controller PWA as necessary.

Table 2-4. Troubleshooting Blank (No Image) Display or Slow/Erratic Message Update

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Blank display or slow/erratic message update.	Blank message.	Check message code on ODK. Refer to transit authority message listing reference and check for blank or legible message. Enter code for legible message as necessary.
	No power to sign power supply PWA or open fuse.	Look at sign power supply PWA LEDs. Check or replace fuse on sign power supply PWA. Check condition and connections of wiring to sign power supply PWA. Repair or replace DC power cable assembly as necessary.
	Flip dot controller PWA.	Substitute known good flip dot controller PWA. Replace flip dot controller PWA as necessary
	Internal power cable assembly.	Check internal power cable assembly connections. Substitute known good internal power cable assembly. Replace internal power cable assembly as necessary.
	RS-485 address switch setting(s).	Check and reset suspect and/or all RS-485 address switches in the sign system.
	RS-485 signal terminator.	Replace or install RS-485 signal terminator in both ends of the RS-485 signal line.
	Programming or system processor PWA.	Update system processor PWA memory. Check message and sign type programming with GTI® Message Writer programmer. Replace system processor PWA as necessary.

Table 2-5. Troubleshooting FSPB

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
LED blinking: Two blinks, pause, repeat.	Incorrect memory storage.	Repeat flash memory card installation and recycle sign system power.
LED blinking: Three blinks, pause, repeat.	Error during data download.	Repeat flash memory card installation and recycle sign system power.
LED blinking: Four blinks, pause, repeat.	Problem reading data from the flash memory card.	Repeat flash memory card installation and recycle sign system power.
Persistent error code(s).	Faulty flash memory card or FSPB.	Replace flash memory card with known good. Replace FSPB with known good.

Table 2-6. Troubleshooting Display Flip Dots

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
One or random flip dots erratic or inoperative.	Stuck flip dots.	Gently bump display assembly and/or gently free flip dots with finger.
	Display driver cable, or expansion interconnect cable assembly.	Re-seat display board connectors. Check condition and connections of cable assemblies. Substitute known good cable assemblies. Replace cable assemblies as necessary.
	Display assembly.	Substitute known good display assembly. Replace display assembly as necessary.
	Flip dot controller PWA.	Replace flip dot controller PWA.
Lower rows erratic.	Expansion interconnect cable assembly.	Check condition and connections of expansion interconnect cable assembly. Substitute known good expansion interconnect cable assembly. Replace expansion interconnect cable assembly as necessary.
	Display assembly.	Substitute known good display assembly. Replace display assembly as necessary.
	Internal power cable assembly.	Check internal power cable assembly connections. Substitute known good internal power cable assembly. Replace internal power cable assembly as necessary.
	Matrix expansion PWA.	Substitute known good matrix expansion PWA. Replace matrix expansion PWA as necessary.
	Flip dot controller PWA.	Substitute known good flip dot controller PWA. Replace flip dot controller PWA as necessary.

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