Section 3 FAULT FINDING PROCEDURES

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1. INTRODUCTION

1.1. BV FAMILY SYSTEM FAULT FINDING

Fault finding is a summary name for various activities to allocate faults which could occur during the life cycle of a BV Family System. Fault finding can be categorised into 2 groups:

I – Activities on performances – with a preventive nature – in order to demonstrate system correctness;

II – Activities on fault finding – with a corrective nature - in order to localise system malfunction;

NOTE

Before undertaking any form of troubleshooting or faultfinding, always start X-scope via the service PC to enable retrieval of historical or updated logfile information for DFI and/or SUCO;

NOTE

Always check the "Read.me" files of the X-scope floppy disk for the latest information;

NOTE

After any succesfull adjustment make a back-up from the SUCO callibaration data on the DFI;

This Section describes activities on fault finding with a *corrective nature* only; performance checks are dealt with in the System Manual Installation and/or in the PM manual. Image quality performance checks are dealt with in this System Manual Corrective Maintenance.

1.2. FAULT FINDING PROCESS

The fault finding process is of major importance for corrective maintenance and could be approached as follows.
Any user should like to have a system availability up to 100%, without any discontinuity or even an interruption.
With technical systems this is not possible and even a try to achieve this goal would be a major operation and would cost too much. For this reason planned- and corrective maintenance and [after sales] service are necessities.

Troubleshooting and faultfinding and as a consequence system corrections and/or parts replacements and/or adjustment & verification, are essential elements in this process. For optimal continuity and cost effectiveness in the operation of the system a statistical approach will be used.

Approximately 80% of the system faults – mechanical, electrical, video/image and functional oriented – should be addressed by field service. This should be done by the field service engineer himself with the help of the available BV Family service documentation.

Approximately 20% of the system faults are not addressable and/or could not be allocated within a limited period of time. These faults can only be allocated together with the dedicated support and/or assistance of specialists, of which the X-ray HelpDesk should be the entrance.

NOTE

It should be noted that faults can only be identified and resolved by competent and trained field service personnel; in the case an individual problem cannot be identified, field service is strongly advised to contact the centralised X-ray HelpDesk for the BV Family Systems. For communication with the HelpDesk refer to Section "General introduction";

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As stated above already, fault finding takes place in 4 different problem areas;

1- mechanical problems,
2- electrical problems,
3- video/image problems,
4- functional problems (application and/or software);

The fault finding process is subdivided based on these (4) potential problem areas.

Fault finding, if not followed by corrections and/or adjustments only, is related to so-called *FRU*'s. To reduce unnecessary time for fault allocation the fault finding procedures are tuned to the level of these FRU's. Important to know is that for the BV Family Systems fault finding process a distinction is made between hardware tests and functional tests.

NOTE

The fault finding process is called hardware test if the problem is identifiable and related to just one FRU. In the case the problem is identifiable and related to a function, incorporating one or more FRU's the fault finding procedure is called functional test;

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1.3. FAULT FINDING RECOMMENDATIONS

Due to growing complexity of the (sub-)systems, fault finding has a limited horizon, as stated before. Therefore fault finding should be limited in time as well. Incorporated in this section are some relevant fault finding recommendations.

These recommendations are:

- Mechanical fault finding by means of visual checks; MVS and CAS movement control;
- Electrical fault finding by means of research of sub systems: MVS and CAS sub systems. Fuses of MCU power supply and stand power supply. LED indicators of [MCU, DFI and SUCO] related PCB's together with the relevant drawings;
- Video/image fault finding by means of traceable visual checking;
- Fault finding by means of system messages & errors; via the Info button, [X-scope window] logging and [Power-on Monitoring] Service Menu logfiles for historical and actual information about DFI and SUCO;
- Fault finding by means of self tests; exchanging Combo's and/or PCB's of both DFI and SUCO;
- Fault finding by means of hardware and/or functional tests;

A distinction is made between the fault finding process of the general BV Family sub systems and the important [priority] PCB sub systems in DFI and SUCO

NOTE

The user is informed about the system status via the system messages & errors on the MVS console, on the CAS console and on the MVS monitors. These system messages & errors can be obtained via the info button and/or the logfiles. It gives the user all user required service information about indicators and system messages & errors;

1.4. DFI LISTING OF SYSTEM MESSAGES & ERRORS

Retrieve system messages and error list DFI.

[Select X-scope path]: **Faultfind – Power on Monitoring** – [reset DFI] – [press] **shift S** [for DFI Service menu];
Give choice [0 to 6]: **0**

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
1 CC_E_TIMEOUT	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
4 CC_E_LIMIT	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6 CC_E_EXIST	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1000 CC_E_CANCEL	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1001 CC_E_EMPTY	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1002 CC_E_ERROR	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1003 CC_E_SMALLER	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1004 CC_E_LARGER	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1005 CC_E_NOTRECV	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1006 CC_E_CANCELLED	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
1007 CC_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
1008 CC_E_TIMER	This error is possibly caused by other errors. Check the DFI logfile for further errors. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
2000 INIT_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
3001 IPDR_E_PCB_DUPLICATE	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3002 IPDR_E_PCB_NOT_PRESENT	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3003 IPDR_E_PCB_NOT_TESTED	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3004 IPDR_E_PCB_DEFECT	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3006 IPDR_E_UNKNOWN_MODE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
3007 IPDR_E_INIT_FAILED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
3008 IPDR_E_BUS_CONFLICT	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3009 IPDR_E_TIMEOUT	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3010 IPDR_E_INTERRUPT	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3011 IPDR_E_TEST_FAILED	Start the DFI power-up service menu and run the extended selftest. Notice the boards that are indicated by the extended selftest. See service manual chapter DFI for more solutions.
3012 IPDR_E_UNKNOWN_FREQUENCY	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
3013 IPDR_E_LIMIT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
4001 RSDR_E_COMMUNICATION	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
4002 RSDR_E_ILLEGAL_ACTION_REQUEST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
4003 RSDR_E_DOUBLE_ACTION_REQUEST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
4004 RSDR_E_STATUS	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
4005 RSDR_E_HW_BOARD	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
4006 RSDR_E_ILLEGAL_SIGNAL	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
4007 RSDR_E_NO_VERSION	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
4010 RSDR_E_NO_STATUS	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
4009 RSDR_E_LIMIT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
4008 RSDR_E_TIMEOUT	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.
5001 SCSI_E_READ	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.
5002 SCSI_E_WRITE	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.
5003 SCSI_E_ILLEGAL_START_SECTOR	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5004 SCSI_E_ILLEGAL_SIZE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5005 SCSI_E_ILLEGAL_PARAMS	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5006 SCSI_E_NOT_INITIALIZED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5007 SCSI_E_INIT_FAILED	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
5010 SCSI_E_NOT_ATTACHED	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.
5012 SCSI_E_WATCHDOG_TIMEOUT	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.
5013 SCSI_E_BUS_FAULT	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.
5014 SCSI_E_PARITY	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are Ì
5021 SCSI_E_SCSISEMATIMEOUT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5022 SCSI_E_SCSI_FIFO	Error not used anymore. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5030 SCSI_E_EMPTY	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5031 SCSI_E_NOTRECV	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
5032 SCSI_E_PREFETCH	DFI disk failed. Check the cabling of the DFI disk. CAUTION: After the following actions the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Start the DFI power-up service menu and low-level format the DFI disk. Re-install the DFI. See service manual chapter DFI for more solutions.
6001 IMPR_E_ILLEGAL_PARAM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6002 IMPR_E_ILLEGAL_ID	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6003 IMPR_E_SET_ACTIVE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6004 IMPR_E_SET_IN_USE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6005 IMPR_E_DEVICE_DOES_NOT_EXIST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6006 IMPR_E_ROUTING_NOT_POSSIBLE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
6007 IMPR_E_SCRIPT_CONFLICT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6008 IMPR_E_WRONG_DEVICE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6009 IMPR_E_SCRIPT_ACTIVE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6010 IMPR_E_SAME_OUTPUT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6011 IMPR_E_OUTPUT_IN_USE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6012 IMPR_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6013 IMPR_E_ILLEGAL_NR_OF_OUTPUT_DEVICES	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6014 IMPR_E_ROUTING_NOT_CONCURRENT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6015 IMPR_E_CHANGE_NOT_ALLOWED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6016 IMPR_E_SET_NOT_IN_SCRIPT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6017 IMPR_E_MAXIMUM_REGISTERED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6018 IMPR_E_SAME_DEVICES	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
6019 IMPR_E_MASK_NOT_LOADED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
7001 USR_E_ILLEGAL_NR	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
7002 USR_E_DOUBLE_REQUESTED_ACTION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
7003 USR_E_NO_CMS_AVAILABLE	CAN communication error between DFI and SuCo. Restart the system. If this problem remains, check the CAN cabling between SuCo and DFI and see service manual for more solutions.
7004 USR_E_NO_TRUIF_AVAILABLE	Communication error between DFI and MVS console (TRUIF). Restart the MVS. If this problem remains, check the cabling between the DFI and the MVS console. See service manual chapter DFI for more solutions.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
7005 USR_E_PROTOCOL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
7006 USR_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
7007 USR_E_ILLEGAL_APF_PARAMETERS	The DFI found errors in the APF parameters received from the SuCo. Use X-Scope, program automatic, SUCO, examination to install the default APF parameters. See service manual for more information.
7008 USR_E_ILLEGAL_CALIBRATION_DATA	The DFI found errors in the system type, video frequency or free space time limit received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7009 USR_E_ILLEGAL_CLEAN_CIRCLE_RADIUS	The DFI found errors in the clean circle parameters received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7010 USR_E_ILLEGAL_CAMERA_ROTATION	The DFI found errors in the camera rotation parameters received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7011 USR_E_ILLEGAL_FLIP_MODE	The DFI found errors in the flip mode received from the SuCo. Use X-Scope, program automatic, SUCO, examination to install the default APF parameters. See service manual for more information.
7012 USR_E_ILLEGAL_FRAME_RATE	The DFI found errors in the frame rate received from the SuCo. Use X-Scope, program automatic, SUCO, examination to install the default APF parameters. See service manual for more information.
7013 USR_E_ILLEGAL_II_FORMAT	The DFI found errors in the II format received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7014 USR_E_ILLEGAL_INT_FLUORO_TIME	The DFI found errors in the fluoro time received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7015 USR_E_ILLEGAL_IRIS_SETTINGS	The DFI found errors in the iris settings received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7016 USR_E_ILLEGAL_LAT	The DFI found errors in the LAT cross request from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7017 USR_E_ILLEGAL_FLUORO_MODE	The DFI found errors in the fluoro mode received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7018 USR_E_ILLEGAL_XRAY	The DFI found errors in the X-ray lamp request from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
7019 USR_E_ILLEGAL_PATIENT_DOSE	The DFI found errors in the dose data received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7020 USR_E_ILLEGAL_EFF_RAD_AREA	The DFI found errors in the dose effective area received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7021 USR_E_ILLEGAL_SHUTTER_SETTINGS	The DFI found errors in the shutter settings received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7022 USR_E_ILLEGAL_STATUS	The DFI found errors in the status received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7023 USR_E_ILLEGAL_ERROR	The DFI found errors in the error code received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7024 USR_E_ILLEGAL_NETWORK_STATUS	The DFI found errors in the CAN status received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7025 USR_E_ILLEGAL_EXAM_TYPE_DATA	The DFI found errors in the examination names received from the SuCo. Use X-Scope, program automatic, SUCO, examination to install the default examination names. Use X-Scope, program manual, SUCO, examination names to enter unique examination names. See service manual for more information.
7026 USR_E_ILLEGAL_PULSED_MODE	The DFI found errors in the pulsed mode received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
7027 USR_E_ILLEGAL_EXAM_TYPE	The DFI found errors in the exam type index received from the SuCo. The SuCo hardware and or software failed. Restart the stand. If this problem remains, please sent a problem report with the SuCo logfile to PMS. See service manual for more solutions.
8002 FILE_E_NOT_INITIALIZED	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8003 FILE_E_IMAGENR	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8004 FILE_E_IMAGEID	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8005 FILE_E_GROUPID	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
8006 FILE_E_DISK_FULL	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8007 FILE_E_BUFFER_FULL	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8008 FILE_E_NO_CAPACITY	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8009 FILE_E_CORRUPT	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8010 FILE_E_RECOVERED	The DFI detected an inconsistent image administration. This was recovered, but action needed if problem is persistent Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8011 FILE_E_ILLEGAL_IMG_SIZE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
8012 FILE_E_NOT_ENOUGH_ENTRIES	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8013 FILE_E_ILLEGAL_SPEED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
8014 FILE_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
8015 FILE_E_WRITE_NOT_ACTIVE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
8016 FILE_E_UNSTABLE	The DFI detected an inconsistent image administration. This can be recovered, but action needed if problem is persistent Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8017 FILE_E_UNABLE_TO_RESTORE	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
8018 FILE_E_ILLEGAL_PARAMETER	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9000 DB_E_RESET	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
9001 DB_E_LIMIT	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9002 DB_E_MEDIUM	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9003 DB_E_CONNECTION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9004 DB_E_CONNECTED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9005 DB_E_SIZE	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9006 DB_E_EXIST	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9007 DB_E_LEVEL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9008 DB_E_TREENAME	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9009 DB_E_TREE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9010 DB_E_RECORDS	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9011 DB_E_INSERT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9012 DB_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
9013 DB_E_DIFF	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
9014 DB_E_CHECKSUM	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9015 DB_E_GENERAL	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9016 DB_E_FULL	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
9017 DB_E_TIMESTAMP	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
11000 ADMI_E_ILLEGAL_MODE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11001 ADMI_E_DATA	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11002 ADMI_E_ACTIVATOR_ID	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11003 ADMI_E_ACTION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11004 ADMI_E_NO_SIGNAL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11005 ADMI_E_TABLE_FULL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11006 ADMI_E_TABLE_POSITION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
11007 ADMI_E_PAT_NO_EXAM	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
11008 ADMI_E_ILLEGAL_PAT	Restart the MVS. If this problem remains then perform the following. CAUTION: After reset database the PATIENT DATA, DFI CONFIGURATION DATA and DFI IP SETS are LOST. Reset the database via the DFI power-up service menu. Re-configure the DFI and reload the DFI IP sets. See service manual chapter DFI for more information.
11009 ADMI_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12001 GUI_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12002 GUI_E_RESET	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12003 GUI_E_DOUBLE_ACTION_REQUEST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12004 GUI_E_ACTION_REQUEST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12005 GUI_E_SIGNAL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12006 GUI_E_SIGNAL_INFO	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12007 GUI_E_UPDATE_INFO	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12008 GUI_E_UPDATE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12009 GUI_E_OPERATION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
12010 GUI_E_DIR	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
12011 GUI_E_DIR_INFO	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
12012 GUI_E_RESOURCE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
12013 GUI_E_REQUEST_BITMAP	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
12014 GUI_E_LAST_EXP	Error not used anymore. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
13000 VIEW_E_ILLEGAL_START_MODE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13001 VIEW_E_ILLEGAL_STATE_TRANSITION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13002 VIEW_E_NO_FUNCTION_DEFINED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13003 VIEW_E_NO_DATA_DEFINED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13004 VIEW_E_ID_LOST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13005 VIEW_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13006 VIEW_E_NO_MOSAIC_MASK	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
13007 VIEW_E_CALIBRATION	Error not used anymore. Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
13008 VIEW_E_VHCU_LUT	The DFI configuration data contains invalid vhcuLut data.
14000 LIVE_E_ILLEGAL_MODE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14001 LIVE_E_ACTION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14002 LIVE_E_ACTIVATOR	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14003 LIVE_E_STATE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14004 LIVE_E_RESET	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14005 LIVE_E_DATA	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14006 LIVE_E_RUNBUFFER	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14007 LIVE_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
14008 LIVE_E_EXIST	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
14009 LIVE_E_FREQ	DFI video frequency and SuCo detected video frequency do not match. Use X-Scope, program manual, DFI, site specific config to select the correct video frequency.
14010 LIVE_E_SYSTYPE	DFI SW licence key and SuCo detected system type do not match. Use X-Scope, program manual, DFI, site specific config to enter the correct SW licence key.
15000 SERV_E_ERROR	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
15001 SERV_E_COLD_RESTART_REQUEST	A cold restart was requested via service PC. No further actions needed.
15002 SERV_E_DFI_INCONSISTENT	System config data is modified by service actions. Continuing functions can lead to unpredictable results, Restart needed.
15003 SERV_E_DFI_HARDWARE_INCOMPLETE	The software license key does not match with installed hardware. More hardware needed to satisfy software license key requirements. Check software license key and hardware configuration..
16001 SYS_E_STARTUP_FAILURE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
16002 SYS_E_ILLEGAL_FC_RESP	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
16003 SYS_E_WARMRESTART	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
16004 SYS_E_COLDRESTART	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
16005 SYS_E_WRONG_PARAMETER	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17000 LOG_E_INIT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17001 LOG_E_INIT_BUF	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17002 LOG_E_INIT_FILE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17003 LOG_E_FLUSH	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17004 LOG_E_FLUSH_PERM	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17005 LOG_E_FREEZE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
17006 LOG_E_FREEZE_READ	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17007 LOG_E_FREEZE_WRITE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17008 LOG_E_FREEZE_CLOSED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17009 LOG_E_FREEZE_OPEN	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17010 LOG_E_READ_FILE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17011 LOG_E_READ_SELECTION	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17012 LOG_E_READ_TYPE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions
17013 LOG_E_READ_NO_FILE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17014 LOG_E_READ_END_OF_FILE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17015 LOG_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17016 LOG_E_WRITE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17017 LOG_E_WRITE_TYPE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17018 LOG_E_WRITE_ID	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17019 LOG_E_WRITE_BUF_FULL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17020 LOG_E_CLOSE	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17021 LOG_E_CLOSE_READ	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17022 LOG_E_CLOSE_OPEN	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
17023 LOG_E_CLOSE_FIND	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
17111 LOG_E_EXCEPTION	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
17112 LOG_E_CORRUPT_LOG _FILE	Start the DFI power-up service menu and high-level format the DFI disk. Reload the DFI software. See service manual chapter DFI for more solutions.
19000 RB_E_NOT_INITIALIZED	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19001 RB_E_MEM	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
19002 RB_E_RECOVERED	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19003 RB_E_IMAGEID	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19004 RB_E_KEEP	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19005 RB_E_UNKEEP	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19006 RB_E_EXAM	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19007 RB_E_EXAM_EMPTY	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19008 RB_E_FILE	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19009 RB_E_LIMIT	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19010 RB_E_FREE_SPACE	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.
19011 RB_E_ILL_PARAM	Restart the MVS. If this problem remains then perform the following. CAUTION: After the following actions ALL IMAGES on the DFI disk are LOST. Initialise the image disk via: X-Scope, program manual, DFI configuration. See service manual chapter DFI for more information.

displayed Monitor text and error mnemonic	LOG filetext and remarks (co_error.c):
20001 HPI_E_FAIL	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20003 HPI_E_RESPONSE_TIMEOUT	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20004 HPI_E_ACKNOWLEDGE_TIMEOUT	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20005 HPI_E_ALREADY_INITIALIZED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
20006 HPI_E_NOT_INITIALIZED	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
20007 HPI_E_UNEXPECTED_EOM	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20008 HPI_E_UNEXPECTED_RESPONSE	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20009 HPI_E_MESSAGE_TOO_LONG	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20011 HPI_E_ILLEGAL_MESSAGE	The DICOM export device failed. Restart the MVS. If this problem remains, see service manual for more solutions.
20012 HPI_E_OUT_OF_MEMORY	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
20013 HPI_E_INVALID_CALL	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
20014 HPI_E_ILLEGAL_ARGUMENT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
20015 HPI_E_NOT_CONCURRENT	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.
20016 HPI_E_ERROR	Restart the MVS. If this problem remains, please sent a problem report with the DFI logfile to PMS. Reload the DFI disk software. See service manual chapter DFI for more information.

1.5. SUCO LISTING OF SYSTEM MESSAGES & ERRORS

Retrieve system messages and error list SUCO.

[Select X-scope path]: **Faultfind – Power on Monitoring** – [reset SUCO] – [press] **shift S** [for SUCO Service menu];
Give choice [0 to 9]: **5**

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
M 010 BIST_POST	Built-in selftest failed Call service	SuCo-COMBO (SHA1) built in self test has failed. Replace the SuCo-COMBO board.
M 011 BIST_ROM	Built-in selftest failed Call service	SuCo-COMBO (SHA1) built in self test has failed. Checksum BIOS , EBIOS or flash not correct. Check the SuCo logfile for FLASH ERROR message. If it appears, re-install the SuCo application software. Replace SuCo-COMBO board if the message does not appear.
M 012 BIST_VPP	Built-in selftest failed Call service	SuCo-COMBO (SHA1) built in self test has failed due to a power failure on the board. Replace the SuCo-COMBO board.
M 013 BIST_CAN	Built-in selftest failed Call service	SuCo-COMBO (SHA1) built in self test has failed due to a CAN failure on the board. Check jumper configuration on the SuCo-COMBO board (CAN configuration).
M 014 BIST_PWM	Built-in selftest failed Call service	SuCo-COMBO (SHA1) built in self test has failed due to failure of the timer chip. Replace the SuCo-COMBO board
M 020 BATRAM	Warning: system parameters are reset Call service	All BATRAM data has been reset or new BATRAM has been installed. Calibrated X-scope data has been removed and replaced with the default settings. Perform the following actions: Using the Program Automatic SuCo function, install configuration and examination .Check all program manual functions of the SuCo. Perform the following SuCo adjustments for the X-ray tube: Radiography and Dose output. Perform all the SuCo adjustments for the Image processor. Perform all the SuCo adjustments for the Collimator (excluding laser alignment). Perform the following SuCo adjustments for II/TV: Electrical-Dose rate.
M 021 CONFIG	Warning: system parameters are reset Call service	Configuration data has been reset. The default settings are now used. Perform the following action: Using the Program Automatic SuCo function, install Configuration 1) BATRAM of the SUCO contains default data and the SUCO has identified the DFI. There is a valid backup available on the DFI 1) BATRAM of the SUCO contains default data and the SUCO was not able to identified the DFI. There is a valid backup available on the DFI 1) BATRAM of the SUCO contains default data and the SUCO could not communicate with the DFI. There is no backup available on the DFI 1) BATRAM of the SUCO contains default data and the

1 The applicable message is logged.

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
		SUCO has identified the DFI. There is no backup available on the DFI 1) BATRAM of the SUCO contains default data and the SUCO was not able to identified the DFI. There is no backup available on the DFI
M 022 CALIBR	Warning: system parameters are reset Call service	No X-scope calibration has been performed, or calibration data has been reset. The default settings are now used. Perform the following actions: Perform the following SuCo adjustments for the X-ray tube: Radiography and Dose output. Perform all the SuCo adjustments for the Image processor. Perform all the SuCo adjustments for the Collimator (excluding laser alignment). Perform the following SuCo adjustments for II/TV: Electrical-Dose rate. 1) (Same logging as M021 for BATRAM backup)
M 023 APFDATA	Warning: system parameters are reset Call service	The APF data has been reset. The default settings are now used. Perform the following action: Using the Program Automatic SuCo function, install Examination (see Release Bulletin). Check program manual functions for Examination names and APF settings. 1) (Same logging as M021 for BATRAM backup)
M 024 HEATINT	Warning: system parameters are reset Call service	The heat integrator data has been reset. This will correct itself automatically within 5 minutes - no further action required.
M 025 CUMDOSE	Warning: system parameters are reset Call service	The current patient dose data has been reset. No action required.
M 026 ANABELLE	Warning: system parameters are reset Call service	Anabelle BATRAM data has been reset. The default settings are now used. No action required.
M 027 DOSERATE_DATA	Warning: system parameters are reset Call service	The dose output calibration data has been reset. Perform the following action: Perform the following SuCo adjustment for the X-ray tube: Dose output. 1) (Same logging as M021 for BATRAM backup)
M 028 TANK_DATA	Warning: system parameters are reset Call service	The tank history data has been reset. NOTE: The old tank history data has been deleted. No action required.
M 029 BATT_DATA	Warning: system parameters are reset Call service	The energy storage history data has been reset. NOTE: The old energy storage history data has been deleted. No action required.
M 030 CUMM_RADTIME	Warning: system parameters are reset Call service	NOTE: The dose report of the current acquisition patient is suspect. No action required.
M 031 XGEN_DATA	Warning: system parameters are reset Call service	NOTE: The filament adjustment data has been reset. Perform the filament adjustment procedure.
M 040 CAN_CONFIG	System not available Switch system off/on Call service if problem is persistent	The CAN network configuration has failed. Check that the installed software versions of the DFI and the SuCo are compatible. Are the stand and mobile viewing station from the same release?
M 041	System not available	CAN protocol error. Switch the system on and off If the

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
CAN_PROTOCOL	Switch system off/on Call service if problem is persistent	problem persists, check the DFI unit, the SuCo-COMBO board and the stand – mobile viewing station cable.
M 042 CAN_CONNECTION	System not available Switch system off/on Call service if problem is persistent	CAN node is down/not available. This means that the DFI is no longer active. Check the DFI power on self test Check the stand- mobile viewing station cable.
<M none> DFI_ERROR_STATE	Mobile Viewing Station not available Switch system off/on Call service if problem is persistent	Logfile text: <none>
<M none> DFI_SERVICE_STATE	Mobile Viewing Station in service mode Switch off/on to enter normal mode	Logfile text: <none>
M 050 INIT_TIMEOUT	System initialisation problem Switch system off/on Call service if problem is persistent	A start up timeout occurred. Switch the system off and on. If the problem persists, check that the DFI unit and the SuCo-COMBO board are correctly connected. Check the stand-mobile viewing station cable.
M 051 SW_VERSION_MM	Software version mismatch Call service	The software version installed on the stand is not compatible with the version installed on the mobile viewing station. Install the latest version of the software on either the stand or the DFI.
M 052 FREQUENCY_MM	System not available Switch system off/on Call service if problem is persistent	The video frequency of the stand is not compatible with the video frequency of the mobile viewing station. Check the SuCo and DFI Program Manual settings: Video Frequency.
M 053 DFI_TIMEOUT	Subsystem error, system still available It's possible to continue	The DFI is not responding within the allowed time, causing a timeout. Switch the system off and on. Check the DFI unit for errors.
M 054 INVALID_APF	APF parameters not accepted. The settings for the current selection are invalid. Call service	The APF data is invalid due to a incompatibility between the APF data and the IP set. Using the Program Automatic SuCo function, install Examination.
M 055 INVALID_IPSET	APF parameters not accepted. The settings for the current selection are invalid. Call service	Unknown IP set. Check the application data for errors. Load DFI IP sets.
<M none> INVALID_FFR	Storage speed not accepted Storage speed not selectable during X-ray	The selected frame speed is not acceptable during X-ray
M 056 CLI_TIMEOUT	Subsystem error, system still available It's possible to continue	The collimator control board is not responding within the allowed time, causing a timeout. Check the collimator device, board and cabling. If the problems persists, replace the SHA5 collimator board.
M 057	Subsystem error, system still available	The generator control board is not responding within the allowed time, causing a timeout. Check the generator

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
XGI_TIMEOUT	It's possible to continue	device, board and cabling. Check if the SuCo software is operational. If the problems persists, replace the SHA4 generator board.
M 058 TVI_TIMEOUT	Subsystem error, system still available It's possible to continue	The TVI sub-system is not responding within the allowed time, causing a timeout. Check the II, the camera, pulse master board and cabling. Check if the SuCo software is operational. If the problems persists, replace the pulse master board (SHA3).
M 059 PMI_TIMEOUT	Subsystem error, system still available It's possible to continue	The pulse master control is not responding within the allowed time, causing a timeout. Check the board and cabling and SuCo software. If the problems persists, replace the board (SHA3).
M 060 HIP_TIME_EXCEEDED	HIP time exceeded, LDF mode activated.	Maximum hip time reached so hip switched off.
M 061 DFI_MISMATCH	Warning: wrong Viewing Station connected. Connect the matching Viewing Station.	Incorrect DFI connected with the SUCO Find the correct DFI and connect this with the SUCO.
<M none> DOSELIMIT_EXCEEDED	Dose limitation active, only low dose fluoro Boost mode is blocked for this exam type	Dose limitation active, only low dose fluoro Reduced performance Beep type: attention beep
<M none> DOSELIMIT_ACTIVE	Dose limitation active, kV limited	Dose limitation active, kV limited Reduced performance. Beep type: attention beep
<M none> PRESS_HFSWITCH	Press H/F switch!	<Log text: none> Beep type: attention beep
<M none> KEEP_HFSW_PRESSED	Keep H/F switch pressed ...	Press and hold the H/F switch for at least ?
<M none> ADJ_IN_PROGRESS	Adjustment in progress	An adjustment is in progress
<M none> WAITING_XGEN_READY	Waiting X-gen cooled down ...	The generator temperature has exceeded the permitted levels and operation is suspended until the temperature falls back to normal range. Check tank OIL temperature indicator to ensure correct functioning.
<M none> ADJ_RAD_VERIFY_ERROR	Adjustment failed: verification error	During a radiography adjustment the voltage/current deviation has increased beyond the permitted range. Perform adjustment.
<M none> DEMO_MODE	This system is in non-X-ray mode No X-ray generated	The system is in demo mode. generation of X-ray is disabled.
<M none> BATT_CHECK_BY_SERVICE	Battery weak, charge battery if possible Call service if problem is persistent	The battery charge has fallen below 20%, due to the system being switched off for more than a day. Plug in the system and allow the battery to charge if possible. If problems persist, check battery voltage and charger current. Refer to the Energy Storage unit service manual. Message type: user resetable

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
<M none> BATT_MUST_24H_CHARGE	Charge battery 24 hours recommended Call service if problem is persistent	The battery has a charge level of between 90% to 20% due to the system being switched off for more than 3 months. Plug in the system and allow the battery to charge for 24 hours before use if possible. If problems persist, check battery voltage and charger current. Refer to the Energy Storage unit service manual. Message type: user resetable
<M none> BATT_RECOMMENDED_CHARGE	Charge battery recommended Charge battery 24 hours if possible	The battery has a charge level of between 60% to 20% due to the system being switched off for a period between half a day to 3 months. Plug in the system and allow the battery to charge for 24 hours before use if possible. If problems persist, check battery voltage and charger current. Refer to the Energy Storage unit service manual. Message type: user resetable
<M none> BATT_MUST_CHARGE	Charge battery strongly recommended Charge battery 24 hours if possible This will prolong battery life-time	The battery has a charge level of less than 20% due to the system being disabled for a period between half a day to a day. Plug in the system and allow the battery to charge for 24 hours before use. If problems persist, check battery voltage and charger current. Refer to the Energy Storage unit service manual. Message type: user resetable
<M none> BATT_LEVEL_00	<M none> Battery charge 0 % X-ray disabled	The battery charge level is 0% and the x-ray function is disabled until the battery charge level is restored to 15%. Plug in the system and allow the battery to charge for 24 hours before use. If problems persist, check battery voltage and charger current. If the problem continues for more than an hour, check the fuses. Refer to the Energy Storage unit service manual. Replace the ESU. Beep type: attention beep
<M none> BATT_LEVEL_10	Battery charge 10 %	Battery charge less than 10 percent. Beep type: attention beep
<M none> BATT_LEVEL_20	Battery charge 20 %	Battery charge less than 20 percent. Beep type: attention beep
<M none> BATT_LEVEL_30	Battery charge 30 %	Battery charge less than 30 percent. Beep type: attention beep
<M none> BATT_LEVEL_40	Battery charge 40 %	Battery charge less than 40 percent.
<M none> BATT_LEVEL_50	Battery charge 50 %	Battery charge less than 50 percent.
<M none> BATT_LEVEL_60	Battery charge 60 %	Battery charge less than 60 percent.
M 101 HW_NOT_PRESENT	System not available Switch system off/on Call service if problem is persistent	The STUCO board is missing (readout version register has failed). Check for STUCO board SHA2. Check connections and if the problems persists, replace the STUCO board.
<M none> 5_MIN_FLUORO_WARNING	Warning: 5 minutes fluoro reached Reset fluoro alarm timer	Warning: 5 minutes fluoro reached Reset the fluoroscopy timer
<M none> 10_MIN_FLUORO_WARNING	X-ray disabled: 10 minutes fluoro reached Reset fluoro alarm timer	X-ray disabled: 10 minutes fluoro reached Reset the fluoroscopy timer

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
<M none> SYSTEM_LOCK	X-ray disabled by key switch Turn key switch to enable x-ray	X-ray disabled by key switch The key switch is turned to the '0' position (off). X-ray function is disabled.
M 201 HW_NOT_PRESENT	System not available Switch system off/on Call service if problem is persistent	The Pulse master board is not present (HW version register read has failed). X-ray function is disabled. Check for Pulse master board SHA3. Check connections and if the problems persists, replace the board.
M 202 READBACK	System not available Switch system off/on Call service if problem is persistent	The BIST of the Pulse master board has failed because the set output value could not be accessed. Replace the Pulse master board SHA3.
M 203 CLOCK	System not available Switch system off/on Call service if problem is persistent	The BIST of the Pulse master board has failed because no clock pulses were detected. Replace the Pulse master board SHA3.
M 204 WATCHDOG_FAILURE	System not available Switch system off/on Call service if problem is persistent	The BIST of the Pulse master board has failed because the watchdog timer could not be programmed. Replace pulse master board SHA3.
M 205 TIMER	System not available Switch system off/on Call service if problem is persistent	The BIST of the Pulse master board has failed because one of the timers could not be programmed. Replace pulse master board SHA3.
M 206 NO_VSYNC	Image synchronisation problem Call service if problem is persistent	No vsync pulse detected between XTV and pulse master. Check XTV camera and cabling.
M 207 XACT_LATE	System not available Switch system off/on Call service if problem is persistent	No x-ray after switch on. Check board SHA4 and the generator unit SE. Check that the X-ray Active LED on board SHA4-H8b is lit during fluoroscopy. Check cabling.
M 208 XACT_GONE	Subsystem error, system still available It's possible to continue	Unexpected X-ray switch off. Check board SHA4 and the generator unit SE. Check cabling.
M 209 WATCHDOG	Subsystem error, system still available It's possible to continue	X-ray has been disabled by watchdog. Switch system off and on and retry. If the problems persists, replace the SuCo-COMBO board (SHA1) or the SuCo software.
M 210 II_HIGH_TENSION	Subsystem error, system still available It's possible to continue	The II High Tension is not ready. Check the cable between pulse master and the HT convertor.
M 211 TV_DIAPHRAGM	Camera iris positioning error Call service if problem is persistent	The XTV diaphragm is not ready. Perform dose calibration. Check cable. Check power supply to the XTV.
M 212 II_FORMAT	Subsystem error, system still available It's possible to continue	The II format is not ready. Check the pulse master board SHA3. Check the C-arm cable
M 213 READBACK	II/TV not available Switch system off/on Call service if problem is	II/TV readback error Perform dose calibration. Check cable. Check power supply to the XTV.

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
	persistent	
M 220 SWITCH_ACTIVE_AT_STARTUP	Hand- or footswitch pressed at start-up Check switches and release if pressed Call service if problem is persistent	Check the handswitch and footswitch for a defective switch.
M 221 SWITCH_TEST	System not available Switch system off/on Call service if problem is persistent	The test on the hand and foot switches failed. Check the handswitch and footswitch for proper functioning. Check SHA3 pulse master board and replace if necessary.
M 302 FOCUS_SWITCH_BLOCK	X-ray disabled during focus switch. After a few seconds X-ray is enabled.	Logfile text: <none>
M 303 MA_GUARDING_FAULT	mA guarding failure. Call service if problem is persistent	Check system calibration using X-ray tube verification procedure.
M 304 KV_GUARDING_FAULT	kV guarding failure. Call service if problem is persistent	Check system calibration using X-ray tube verification procedure.
<M none> BLOCK_AFTER_SINGLE_PULSE	Allow tube to cool down a few seconds...	Logfile text: <none>
M 320 HW_NOT_PRESENT	X-ray generator not available Switch system off/on Call service if problem is persistent	The generator board is not present (HW version register read has failed). The X-ray function is disabled by the software. Check that the generator board SHA4 is present. Replace the generator board SHA4.
M 321 MUXADC_FAILED	X-ray generator not available Switch system off/on Call service if problem is persistent	There was a MUX ADC conversion timeout on the generator board. Replace the generator board SHA4.
M 322 DSRTADC_FAILED	X-ray generator not available Switch system off/on Call service if problem is persistent	There was a Doserate ADC timeout on the generator board. Replace the generator board SHA4.
M 323 NOT_SUPPORTED	X-ray disabled by safety-circuit Call service if problem is persistent	The FA generator board SHA4 board does not support doserate sampling (HiP disabled).The version of the generator board is incorrect. Replace the generator board.
M 324 KV_READ_EXCEEDS_KVMAX	X-ray generator not available Switch system off/on Call service if problem is persistent	The kV value of the generator board SHA4(read via PPI1) exceeds the permitted value. Replace the generator board.
M 325 SELFTEST_FA	X-ray generator not available Switch system off/on Call service if problem is	The self test of the FA generator board SHA4 board has failed. The X-ray function is disabled. Check the cabling between the generator board and the SE unit. Replace

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
	persistent	the generator board.
M 326 SELFTEST_RA	X-ray generator not available Switch system off/on Call service if problem is persistent	The self test of the RA generator board SHA4 has failed. The X-ray function is disabled. See error message 325
M 334 MA_OUT_OF_RANGE	X-ray generator not available Switch system off/on Call service if problem is persistent	The tube current of the generator board SHA4 (read via the board's MUXADC) exceeds the permitted limit of 100 mA (RA). Check the generator board and replace if required.
M 335 GENERATOR_NO_FRENCH_HOMOLOGATION	X-ray generator not available Switch system off/on Call service if problem is persistent	The generator board SHA4 does not support French homologation. mA setting remains 20 mA Message type: user resetable
M 340 GENERATOR_NO_READY_PREPARE_X	X-ray generator not available Switch system off/on Call service if problem is persistent	The Ready prepare X-ray response from the generator board SHA4 and/or the generator is not given after Enable X-ray is activated. In FA systems replace the generator board. In RA systems check that the generator unit rotor is OK, and replace the generator board if required.
M 341 GENERATOR_NOT_READY	X-ray generator not available Switch system off/on Call service if problem is persistent	RA generator board SHA4 Generator ready signal is inactive. Check generator board. Check generator unit.
M 342 FILAMENT_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	RA generator board SHA4 Filament alarm status is active. Check generator unit.
M 343 GENERATOR_ALARM_KVMA_MAXLOAD	X-ray generator not available Switch system off/on Call service if problem is persistent	Generator alarm active status is active. The generator will be reset within a few seconds. If problem persists, check that the HF generator's fan is rotating. Check error LEDs on generator unit. Follow the fault finding procedure given in the HF Generator service manual.
M 344 TIMER_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	Timer alarm status is active. The generator is reset within a few seconds. If problem persists, check the SHA3 pulse master board and/or SHA4 generator board. Message type: user resetable
M 345 GEN_CABLE	X-ray generator not available Switch system off/on Call service if problem is persistent	The cable connecting the XGEN to the RA/FA generator board is probably not connected (all generator alarms are active). Switch off the system and check the cable between the X-ray generator and the SHA4 generator board.
M 350 FA_FILAMENT_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	The filament alarm is active. Generator is reset within a few seconds. Check filament current on the filament board. Check cabling between SE and the tube.

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
M 351 FA_INVERTER_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	FA generator board SHA4 Inverter status signal is active. Generator is reset within a few seconds. Check the kV/mA values of the tank.
M 352 FA_TIMER_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	The timer alarm is active. The generator is reset within a few seconds. If problem persists, check the SHA3 pulse master board and or SHA4 generator. Message type: user resetable
M 353 FA_600HZ_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	FA generator board X600AL status signal is active. Generator is reset within a few seconds. Check FET power control on the generator board.
M 354 FA_ELDISA_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	Keying and ELCO discharge alarms are active. Generator is reset within a few seconds. Replace SEA3 board.
M 355 FA_RECTIFIER_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	The Keying alarm (only) is active. Generator is reset within a few seconds. Check Keying circuit. If the actual kV has risen to the maximum value, replace SEA2 or SEA3 board.
<M none> BOOST_TIMEOUT	Boost time limit exceeded. Release and press hand/foot switch to continue	Logfile text: <none>
<M none> PULSED_TIMEOUT	Pulsed time limit exceeded. Allow tube to cool down a few seconds, then press hand/foot switch to continue	Logfile text: <none>
M 360	X-ray generator not available Switch system off/on Call service if problem is persistent	The rotor is not ready after the Enable rotation command has been given. Check SEA2 Rotor Control board and jumper positions. Program for 50 or 60 Hz.
M 365 TANK_TOO_WARM_ERROR	X-ray disabled: tank too warm X-ray is automatically enabled when tank reaches normal temperature	The RA generator board thermal switch is activated. If the tank is hot, check oil temperature circuit. If the tank is not hot, replace the tank.
M 366 LOW_OILTEMP	Warning: Limited fluoro time available X-ray tank warm Increase cooling time between runs	Wait for the tank to cool down
M 367	Warning: very limited	Wait for the tank to cool down

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
MIDDLE_OILTEMP	fluoro time available X-ray tank very warm Increase cooling time between runs	
M 368 HIGH_OILTEMP	X-ray disabled: tank too warm X-ray is automatically enabled when tank reaches normal temperature	Wait for the tank to cool down
M 369 TOO_LOW_OILTEMP	X-ray generator not available Switch system off/on Call service if problem is persistent	The measured oil temperature is below 3o. Check if the system is being used in an unsuitable environment (not within system temperature specifications). Check oil temperature circuit.
M 370 OILPUMP_NOT_ROTATING	X-ray generator not available Switch system off/on Call service if problem is persistent	The oil pump is not rotating. Check the SE generator unit and or C-arm cabling.
M 371 OILPUMP_ROTATING	X-ray generator not available Switch system off/on Call service if problem is persistent	The oil pump is rotating without rotating command. Check the SE generator unit and or C-arm cabling.
M 375 BATT_OC_NOT_STARTED	Battery overcharge not started last time. Keep the system connected to mains power next time.	Battery overcharge not started when the system was switched off. Message type: user resetable
M 376 BATT_OC_TIMER_EXPIRED	Battery overcharge timer expired Call service if problem is persistent	Overcharge not completed within maximum time limit. Check ESU. Message type: user resetable
M 377 BATT_OC_NO_ENABLE	Battery overcharge enable not received. Call service if problem is persistent	ESU does not respond to overcharge request. Check ESU. Message type: user resetable
M 378 BATT_OC_REQ_LOST	Battery overcharge request lost. Call service if problem is persistent	Overcharge request no longer stored in ESU. Check ESU. Message type: user resetable
M 379 BATT_OC_ESU_EN_ITSELF	Battery overcharge has enabled it self Call service if problem is persistent	Battery overcharge has enabled it self although overcharge was not requested Check the ESU. Message type: user resetable
M 380 BATTV_0UT_OF_RANGE	X-ray generator not available Switch system off/on Call service if problem is persistent	MUXADC battery voltage is not within the range 250 - 365 V. Check the battery voltage. See the Energy Storage Unit service manual.
M 381 BATT_CHARGER	X-ray generator not available	The X-ray function has been disabled because the RA generator board is reporting that the battery charger's

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
_FUSE_BLOWN	Switch system off/on Call service if problem is persistent	fuse has blown. Replace the fuse If problem persists, replace the ESU.
M 382 BATT_CHARGER_SWITCHED_OFF	X-ray generator not available Switch system off/on Call service if problem is persistent	The X-ray function has been disabled because the RA generator board is reporting that the battery charger has been switched off by the software. Check the ESU functioning.
M 385 BATT_VALARM_3MA_ONLY	Battery weak, HDF is disabled. Charge battery. Call service if problem is persistent	The battery voltage is low. Battery at end of life? Replace the ESU if needed.
M 383 EOL_WARNING	Battery is near end of life Call service	The battery is near the end of life. See the battery history file. Perform the discharge test (see ESU service manual). Order a new ESU for the eventual replacement
M 384 EOL_DETECTED	Battery at end of life Call service	The battery has reached the end of life. Replace the ESU.
M 387 OVERLOAD_YELLOW	Allow tube to cool down... X-ray blocked until heat indicator level is save	The YELLOW level of the heat indicator has been on for more than the 20 minute time limit. The system is disabled until the tube has cooled down and the heat indicator level is GREEN.
M 388 OVERLOAD_RED	Allow tube to cool down... X-ray blocked until heat indicator level is save	The RED level of the heat indicator has been on for more than the 10 (FA) or 15 (RA) minutes time limit. The system is disabled until the tube has cooled down and the heat indicator level is GREEN.
M 389 10MIN_CONT_TIMEOUT	X-Ray switched off: max 10 min fluoro Release and press hand/foot switch to continue	Continuous radiation has been performed for more than the 10 minute time limit. The system is immediately available for use.
M 390 RED_BLOCKED	Hot anode! Low dose fluoro still available. Boost is blocked until heat indicator level is save	The heat indicator has reached the RED level. HDF, Digital Exposure, Radiography X-ray are disabled until the tube has cooled down and the heat indicator level is YELLOW.
M 391 OVERLOAD	Allow tube to cool down... X-ray blocked until heat indicator level is save	The heat indicator has reached the BLOCKED state. The system is disabled until the tube has cooled down and the heat indicator level is YELLOW.
M 392 BATTERY_CHARGER_ALARM	X-ray generator not available Switch system off/on Call service if problem is persistent	The battery charger function is malfunctioning. The battery voltage is below 310 volts while the system is in stand-by (charging state). Replace ESU.
M 394 KV_UNDER_NORM_WORKING_RANGE	Warning: kV under normal working range !	kV under normal working range.
M 395 BATT_ALARM_H	Battery ok, hardware error in generator.	Battery voltage in generator differs from voltage in ESU. Check both generator and ESU.

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
W_ERROR	Call service if problem is persistent	Message type: user resetable
M 396 BATT_NOT_PRESENT	Battery voltage not present. Call service if problem is persistent	Battery voltage not present . Check connections to battery. Message type: user resetable
M 397 BATT__LOW_BATTERY	Battery charger voltage too low Call service if problem is persistent	Battery charger voltage too low. Check ESU charger. Message type: user resetable
M 400 IRIS	X-ray disabled, Iris positioning error Switch system off/on Call service if problem is persistent	Iris positioning error on the collimator. X-ray is disabled. Check collimator functionality and cables. Perform Iris adjustment calibrations.
M 401 SHUTA1	Shutter A positioning error Call service if problem is persistent	Shutter failure with motor A1. Perform shutter adjustment calibrations.
M 402 SHUTA2	Shutter A positioning error Call service if problem is persistent	Shutter failure with motor A2. Perform shutter adjustment calibrations.
M 403 SHUTB1	Shutter B positioning error Call service if problem is persistent	Shutter failure with motor B1. Perform shutter adjustment calibrations.
M 404 SHUTB2	Shutter B positioning error Call service if problem is persistent	Shutter failure with motor B2. Perform shutter adjustment calibrations.
M 405 LAT	Laser alignment function not available Call service if problem is persistent	A status error has occurred when switching the collimator LAT on and off. Check the LAT function on the flatpanel of the stand.
M 406 STOK	System initialisation problem Switch system off/on Call service if problem is persistent	Read ADC failed. Calibrate CLI.
M 407 SPFI	System initialisation problem Switch system off/on Call service if problem is persistent	Not used spectral filter error indicator
M 408 SPFI_FUNC	System initialisation problem Switch system off/on Call service if problem is persistent	Spectral filter not used status indicator
M 409	System not available Switch system off/on	On power on, the Collimator self test failed.

error mnemonic:	displayed STUIF texts (dismsg.c):	LOG file text and remarks (co_error.c):
INITIAL	Call service if problem is persistent	X-ray is disabled. Check collimator.
M 410 HW_NOT_PRESENT	System not available Switch system off/on Call service if problem is persistent	There is no collimator interface board SHA5 present in SuCo rack. X-ray is disabled.
M 411 MCI	System not available Switch system off/on Call service if problem is persistent	<Not used>
M 412 RECOVERY_IRIS	X-ray disabled, Iris positioning error Switch system off/on Call service if problem is persistent	Recovery failed on collimator's iris. X-ray is disabled. Check collimator.
M 413 RECOVERY_SHUTA1	Shutter A positioning error Call service if problem is persistent	Recovery failed on collimator's shutter A1 motor. X-ray is disabled. Check collimator.
M 414 RECOVERY_SHUTA2	Shutter A positioning error Call service if problem is persistent	Recovery failed on collimator's shutter A2 motor. X-ray is disabled. Check collimator.
M 415 RECOVERY_SHUTB1	Shutter B positioning error Call service if problem is persistent	Recovery failed on collimator's shutter B1 motor. X-ray is disabled. Check collimator.
M 416 RECOVERY_SHUTB2	Shutter B positioning error Call service if problem is persistent	Recovery failed on collimator's shutter B2 motor. X-ray is disabled. Check collimator.
<There are no active system messages. No first text line message is displayed> <none>	There are no active system messages.	Logfile text: <none>

2. GUIDANCE TO THE FAULT FINDING PROCESS

2.1. MECHANICAL FAULT FINDING

Mechanical fault finding will hardly be needed if a well-defined Planned Maintenance schedule has been agreed upon. The mechanical aspects are related to the MVS and its mechanical environment and the CAS and its mechanical environment. A check should be done on brakes, all wheel steering or rear wheel steering and a visual check on end positions for geometry and [electrical] height movement.

There are no other mechanical aspects to be covered.

2.1.1. MOVEMENT CONTROL MVS

1. Check the MVS brakes
2. Check the MVS steering mechanism

2.1.2. MOVEMENT CONTROL CAS

1. Check the [CAS] brakes
2. Check the [CAS] all wheel steering mechanism
3. Check the [alternative] rear wheel steering mechanism [if present]
4. Check the end positions for geometry
5. Check the [electrical] height movement

2.2. ELECTRICAL FAULT FINDING

2.2.1. POWER SUPPLY AND FUSES

CAUTION

Always allow for 10 seconds between switching the system OFF and ON again. This delay will prevent possible damage to the power supply components of the system;

Fuses are related to the power supply and are mainly applied to protect the BV Family sub systems against over voltages and high currents. Refer to the relevant drawings to apply the troubleshooting and/or faultfinding process via fuses.

Powering on / off

CAUTION

All system units will be powered "ON" once a Power on key at the MVS or the CAS is pressed. Pressing power "OFF" at the MVS console means switching off all system units, pressing Power "OFF" at the CAS console means switching off the stand only;

Sub system	***Key pressed***	***Switching [sub system]***
MVS	Power on	MVS & CAS: ON
	Power off	MVS & CAS: OFF
CAS (interface cable connected)	Power on	MVS & CAS: ON
	Power off	CAS: OFF

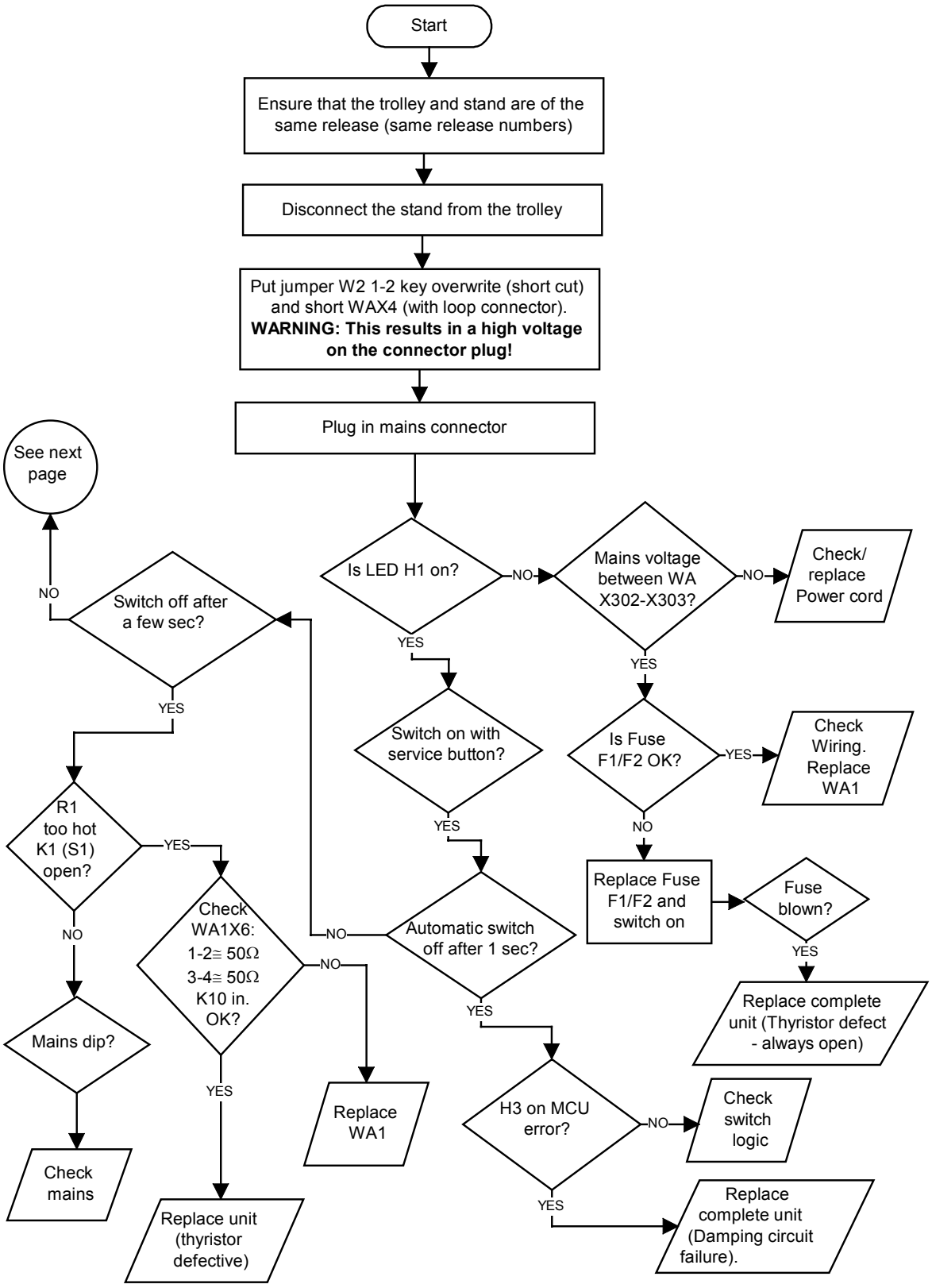
NOTE

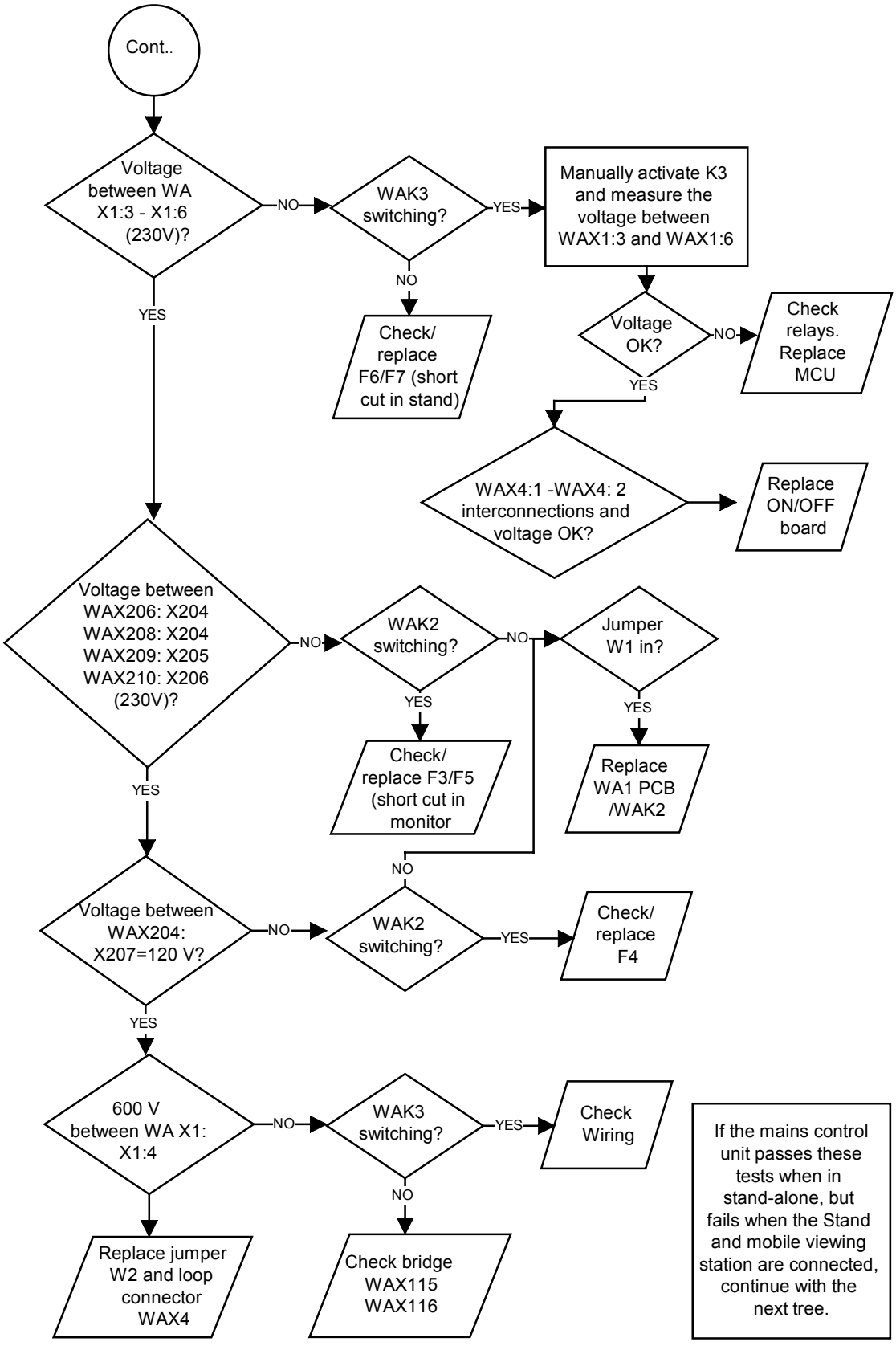
The [ESU] battery charger – for the BV Pulsera only – will be powered upon connection of the MVS mains plug to the hospital mains, the interface cable between CAS and MVS properly connected. The LED indicates the actual charging of the [ESU] battery;

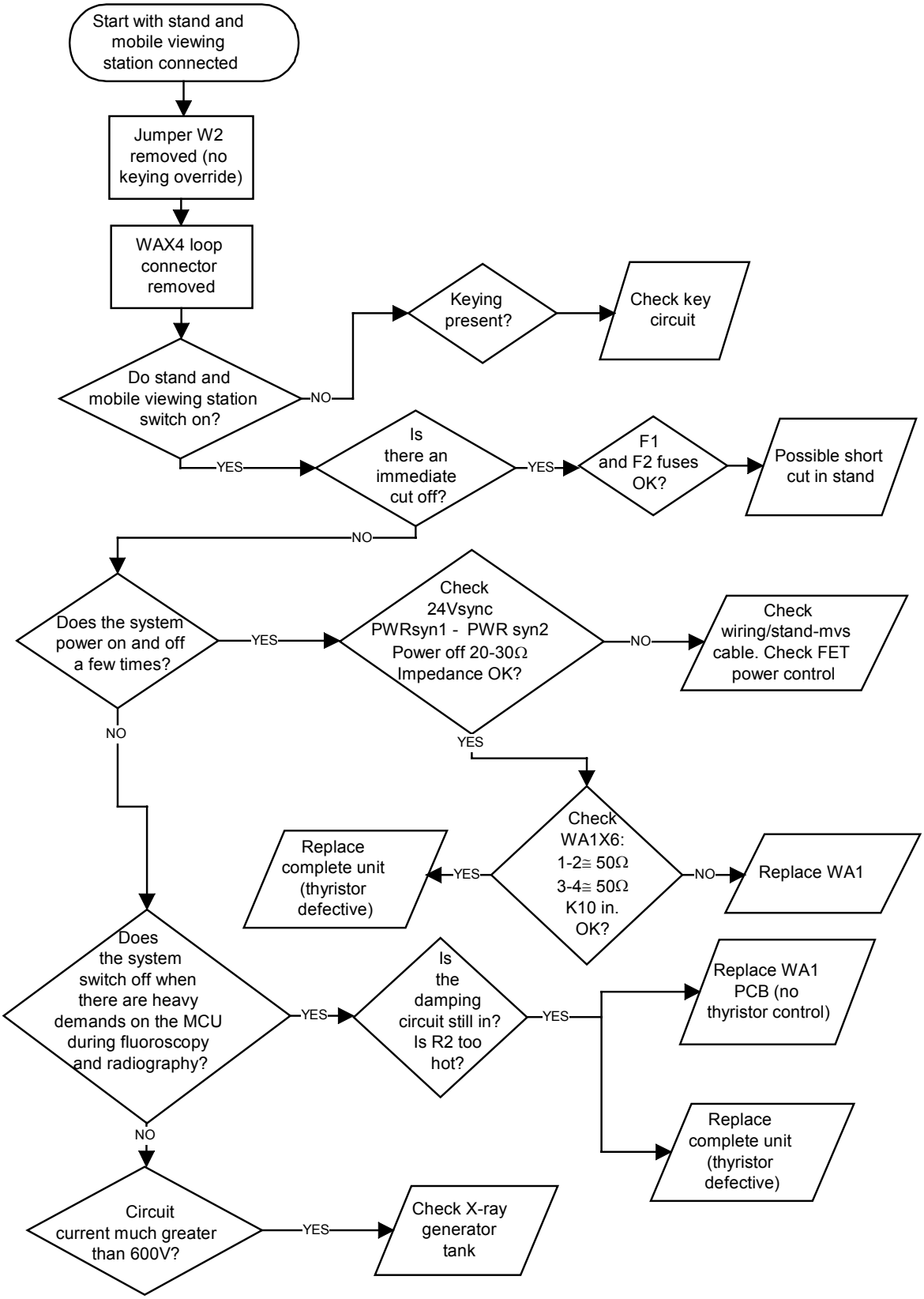
NOTE

Preferably the system must remain connected to the mains [secure the MVS - CAS interface cable properly connected and the key switch in the OFF position];

Power flow diagrams







2.2.2. STATUS LED INDICATORS

Most of the BV Family PCB's does have status led indicators, involving 2 [red. green] or 3 [red, green, yellow] status LED's.

Two status LED configurations; events which cause individual LED's or combinations to be illuminated.

H1 [red]	*H2 [green]*	*Event*
Off	Off	No power, BIST [or EBIST] not running or reset active
Off	On	BIST [or EBIST] results: OK and application running
On	Off	BIST [or EBIST] results: not OK [see note]
On	On	BIST [or EBIST] running

NOTE

This situation can occur when the result of the self-test is not OK, but the application can run while the service PC port can't be accessed. The red LED indicator is showing defective hardware;

Three status LED configurations; events which cause individual LED's or combinations to be illuminated.

H4 [red]	*H2 [green]*	*H3 [yellow]*	*Event*
Off	Off	Off	Power off / hardware malfunction
Off	Off	On	Unused code
On	Off	Off	BIST [or EBIST] failure
On	Off	On	Default after reset/failure processor halted
Off	On	Off	BIST [or EBIST] ok / application running
Off	On	On	BIST [or EBIST] ok / application not running or error
On	On	Off	BIST [or EBIST] in progress / additional information via H3
On	On	On	BIST [or EBIST] in progress / additional information via H3

These tables indicate the events, which will cause individual LED's to illuminate.

2.3. VIDEO/IMAGE SIGNAL MEASUREMENT

Faultfinding will be done by checking the video sub system signal.

The CAS with it's sub systems X-ray tube, II/TV and SUCO.

The MVS with its sub system DFI including hard disk and monitors. If the input signal is valid and there is no output signal or the output signal is not valid, the DFI is malfunctioning.

2.4. FUNCTIONAL FAULT FINDING

2.4.1. DATA LOGGING FAULT FINDING TOOLS

Under [X-scope]: **Faultfind**, **Power on Monitoring** and press **shift S,** the VT100 terminal emulator will start up the Service Menu for DFI or SUCO [to be pre-selected]. A logfile of the system messages & errors will become available.

Under [X-scope]: **Faultfind** and **Logging,** other logfiles with the system messages & errors will be recorded and made available for fault finding for DFI or SUCO [to be pre-selected].

2.4.2. SELF TESTING SERVICE TOOLS

To provide an adequate service tool to field service some selftesting applications have been implemented. For both DFI and SUCO:

- POST [Power-on Self Testing]; a self testing tool which will be started up automatically after the DFI and/or SUCO is Powered-on; a test programme to check the Combo board and the presence of the other PCB's; the results can be retrieved via Power on Monitoring and/or Logging

- BIST [Built-in Self Test]; this - restricted – self test procedure will start up automatically after either commencing the DFI and/or the SUCO application or a reset; a - restricted - programme will be performed for the DFI or SUCO PCB's; the results can be retrieved via the DFI and/or SUCO Service Menus and/or Faultfind Logging

For DFI only:

- EBIST [Extended Built-in Self Test] could be performed as a complete, unrestricted BIST; this has been developed for the DFI only and will allow to start manually by field service via X-scope; the results can be retrieved via the DFI Service Menu and/or Faultfind Logging

NOTE

*X-scope does **not** support diagnostic testing; hardware testing and functional testing as start up tests and extended self-tests can be done. Test results can be **inspected** via X-scope "Power-on monitoring" or "logging" functions;*

2.4.3. HARDWARE AND FUNCTIONAL TESTS

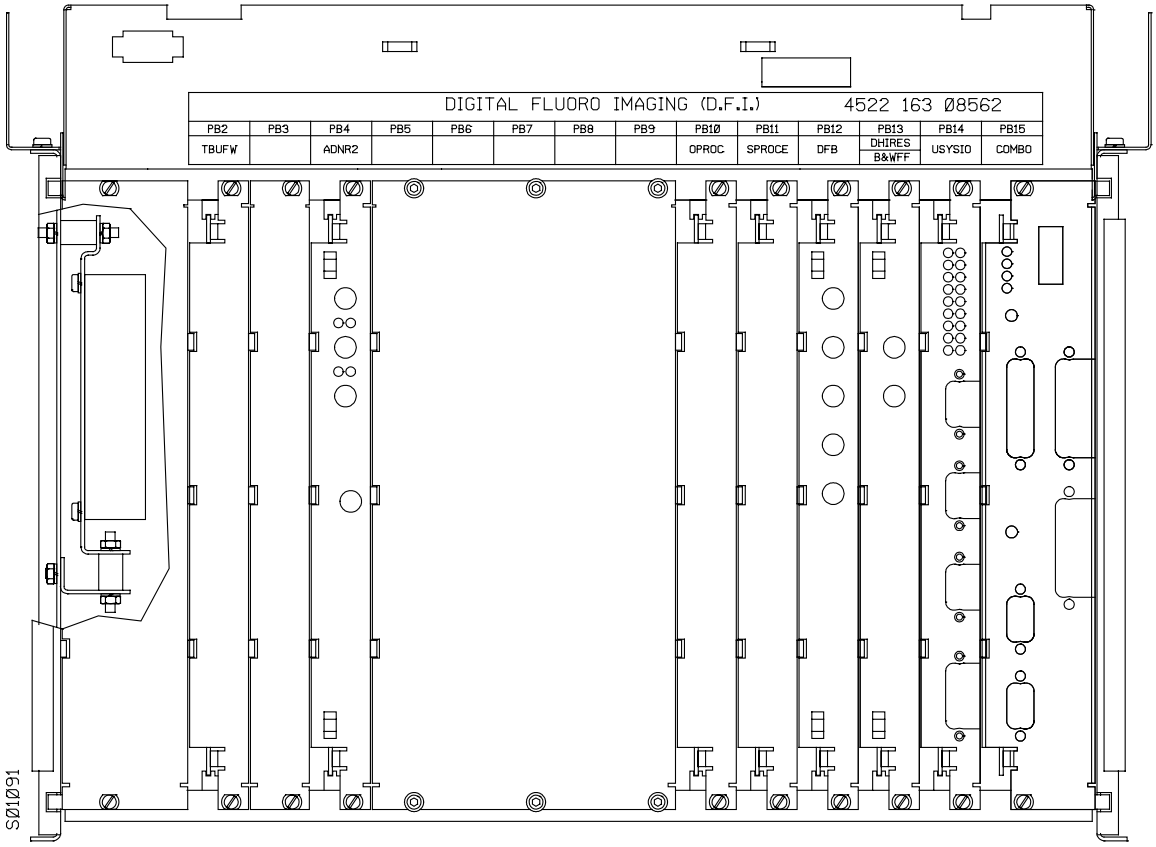
Hardware tests are used to show malfunction of a single and well-defined FRU.
Functional tests are used to show malfunction of a single and well-defined system function. Such a test can involve 1 or more FRU's and is intended to achieve background information for system malfunction. System errors will be localised. A functional test is not always providing sufficient information to allocate a system function fault. However, the test results might provide additional information to reach a solution for faulty FRU's, which are not revealed by a hardware test.

The special hardware and functional tests are:

1- the [PCB hardware] Bypass tests 1 and 2
2- the [PCB functional] System test.

3. DFI FAULT FINDING PROCESS AND REPLACEMENTS

DFI hardware configuration.



The fault finding strategy for the DFI is based on the assumption that the problem will be either hardware or software oriented. Hardware problems should be resolved by field service, software problems mean a re-installation of the existing - available - software or patching a software bug. In the latter case a solution could only be reached through the support of PMS software specialists.

A software patch is issued for the “Installed Base” to enable to resolve the software problem and a release bulletin published to communicate the solution to field service and the relevant group of BV Family System users and how to handle it.
The DFI consists of several PCB’s and a hard disk. Faultfinding of the DFI takes place at board level and not at component level.

NOTE

Backward compatibility of the DFI hard disk [FRU] is always guaranteed. A jumper setting modification will be attached to a new DFI hard disk;

3.1. STATUS LED INDICATORS

3.1.1. LED GUIDANCE TROUBLESHOOTING

Problem description	***Remedy***
LED's not illuminated on back panel and/or PCB's	Check mains and power supply. Check fuses at back panel behind hard disk. Check USYSIO connectors. Check back panel.

3.2. VIDEO INPUT/OUTPUT SIGNAL CHECK

DFI video input signal faultfinding will be done by checking the output of the DFI (the processed analogue video signal with digital archive) in comparison with the DFI input (the analogue video signal with digital patient data); the DFI is responsible for the electronic image processing and displaying features. If the video input signal is valid and there is no output signal or the output signal is not valid, the DFI is malfunctioning.

Prior to the visualisation of the shape of the video input signal, the presence of this signal could be checked. Field service has to check the presence of a valid video input signal by checking the [green] sync-LED on the ADNR board. If the sync-LED is not ON, there is no sync signal and hence no valid video signal.

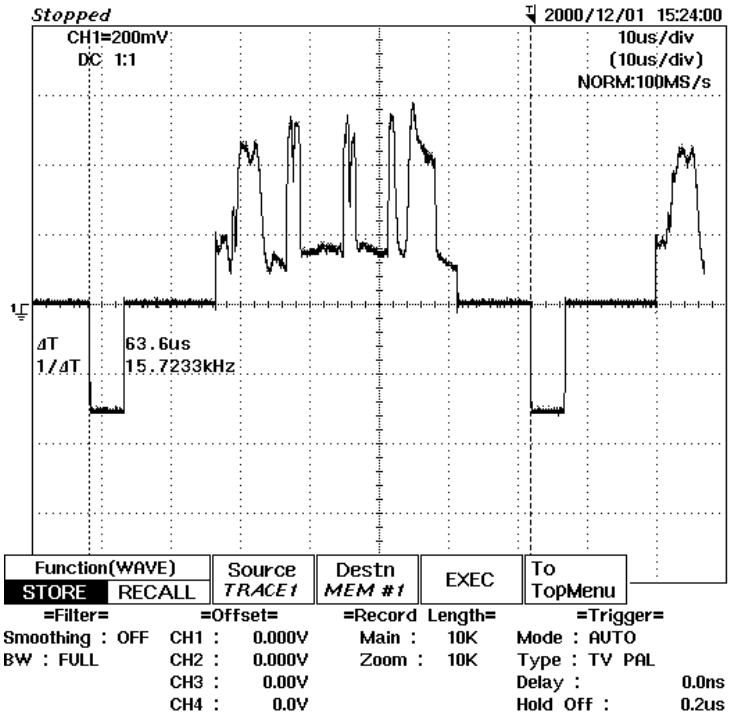
The electronic image processing and displaying features of the DFI are part of the BV Family image processing chain: X-ray tube, II/TV, SUCO, DFI and Monitors.
An example of a typical and valid video input signal is shown in the figure below.

Signal measuring takes place through a video line triggering oscilloscope. For the specification of the oscilloscope refer to the Section “General Introduction”.

NOTE

To measure video input, a T-connector should be installed to warrant a 75 ohms signal termination. No other termination is appropriate to measure video input signals;

A typical video input signal



If this signal is correct, the problem is located inside the DFI. The faultfinding procedure will continue with the DFI selftests.

3.2.1. IMAGE GUIDANCE TROUBLESHOOTING

Problem description	*Remedy*
No picture on Monitor	Check the power cord properly connected. Check the power supply switched “ON”. Check the coax cable on DHIRES and ADNR. Check brightness, contrast, horizontal and vertical hold on the Monitor. Check the camera and VCR connection(s).
Picture scrambled	Check the coax cable on DHIRES and ADNR. Perform a BIST or EBIST. Check the DFI sub system options. Check the images ‘accepted’ if so, run images from previous examinations.

3.3. SERVICE MENU MONITORING & LOGGING

3.3.1. SERVICE MENU

[Select X-scope path]: **Faultfind** – **Power-on Monitoring** – [reset DFI or SUCO; DFI COMBO connected] - [press] **shift S** [for DFI Service menu];

DFI Service Menu
==========
0 retrieve error list
1 disk format operation (high level only)
2 X-scope (software loading, DFI reset)
3 [EBIST] extended selftest
4 start DFI application with logging on COM1
5 set reference checksums
6 start DFI application

Example / give choice: **3** (EBIST extended selftest)

starting DFI selftest
DFI selftest results:

ADNR	version 1	OK
TBUF	version 3	OK
OPROC	version 0	OK
SPROC	version 1	OK
USYSIO	version 0	OK
DFB	version 0	OK
DHIRES	version 0	OK

3.3.2. [X-SCOPE] LOGGING

[Select X-scope path]: **Faultfind – [**Select **DFI** or SUCO**] – Logging -** give choice [1/2/3/4]**;**
Perform X-scope window instructions.
Scroll if required.

with alternative choices.
1. most recent,
2. error + starts,
3. error + history,
4. complete.

The following DFI data has been logged and could be retrieved:
- Input events;
- Start up events;
- Self test results;
- Input events from X-scope;
- Errors;
- Service updates of IP set and configuration data;

Example / give choice: **1**
Most recent

3.4. COMBO POWER ON SELF TEST

CAUTION

When working with PCB's always use a wriststrap connected to earth;

3.4.1. POST

The [COMBO] Power on self test is started up automatically each time the power is switched ON. The POST is checking:

1. Type, version and correct location of COMBO and via COMBO the DFI PCB's;
2. Read and write checks of COMBO;

Sub 1-

DFI COMBO
|
USYSIO
|
ADNR
|
SPROC
|
OPROC
|
DHIRES / VIEWMASTER
|
DFB
|
TBUF
|
Starting up the DFI application

Sub 2- All memories and register(s) which offer read / write functions will be verified. The results are "Passed" in case of success, "Failed" in case of problems or "Not present" in case of absence of particular boards.

A check on the POST results has to be carried out in case of not passing the test results.

3.5. BUILT IN SELF TESTS

3.5.1. BIST

DFI BIST [selftests] are built in for 2 reasons:

a- to prove system correctness (towards users of the BV Family System);
b- to localise system malfunctioning;

Sub a- System correctness will be dealt with in the Section Performance testing of the System Manual Installation.

Sub b- System malfunctioning/faultfinding will be described in this Section of the System Manual Corrective Maintenance.

The BIST will start up automatically after the [DFI] application is started or with a start up or a reset of the DFI COMBO.

3.5.2. EBIST

The EBIST is available to field service to be selected. The procedure will be started up via X-scope, the DFI already running:

[Select X-scope path]: **Faulfind** – **Power on Monitoring** – [reset DFI**]** – [press] **Shift S** [for Service Menu];

DFI Service Menu
==========

Give choice: **3**;

The EBIST will provide additional testing.
c- Availability checks;
d- Bypass tests;
e- System tests;

Sub c- The [final] result of the EBIST availability check: a statement on boards available and in the right slot.

Sub d- The bypass tests are functional tests using a test image created on one of the PCB's. The test image is processed and a checksum of the processed image is calculated on one of the – pre-selected – PCB's. The checksum will be compared with a reference checksum. The following bypass tests are defined:
A bypass test is executed if the PCB's needed for the test are available, regardless the results of previous tests.

NOTE

No processing is available when bypass tests are in progress. All functions have to be switched off;

There are 2 bypass tests which will perform automatically, one after the other.

TEST_BYPASS_1
A test image is generated on ADNR and processed via SPROC and/or OPROC. If the test image as received does not match the checksum expectations, it is not processed fully. If an error message occurs, the ADNR has to be replaced. Refer to the Section “Replacement procedure”.

TEST_BYPASS_2
A test transmitted via COMBO to TBUF and processed via SPROC and/or OPROC (no processing on ADNR). If the test image as received does not match checksum expectations, it is not processed fully. If an error message occurs, one or more hardware items are defective. The relevant hardware has to be replaced prior to continuing the procedure. Refer to the Section “Replacement procedure”.

Results of bypass testing

Bypass test 1	***Bypass test 2***	***Replacement***
No report	No report	No replacement
Failure report	No report	ADNR
No report	Failure report	COMBO
Failure report	Failure report	OPROC and/or SPROC and/or DFB, to be checked

Sub e- System tests are executed whereas a test pattern is visible on the left hand and the right hand monitor of the MVS. Various hardware functions of the PCB’s are tested using this test pattern.
The following order of functional PCB testing is used during the system test:

The results of the testing might be successful, however the coverage can not be 100%. If problems remain to exist, field service should carry out some additional activities.

1. Analyse the fault carefully and use the PCB test results to allocate the particular fault. Swap the faulty PCB and/or hard disk and re-test after replacement;
2. Swap all PCB’s [not the COMBO], re-install the appropriate software – if required - and re-test after replacement and re-installation of the PCB’s;
3. If the problem still exists, contact the X-ray Helpdesk;

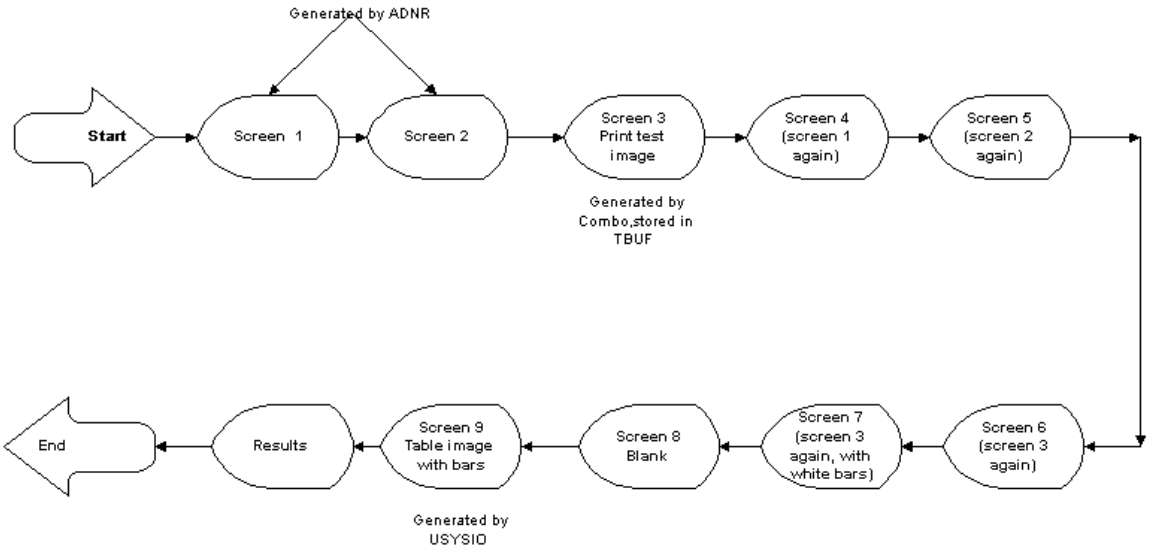
3.6. SELF TEST RESULTS

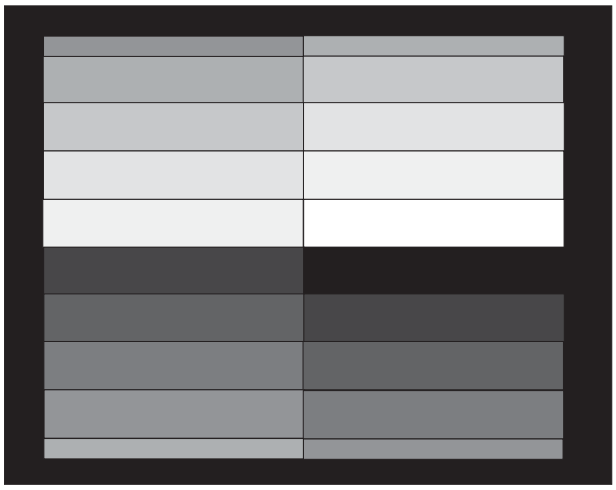
The following table gives more information about testing the individual DFI boards.

PCB Tested	Details of Test
USYSIO	• Generate a VGA test pattern to check the VGA chip. • If the USYSIO board is in order, the message **init IPDR (checking USYSIO): success** appears. The abbreviation IPDR means Image Processor Driver.
ADNR2	• Set the ADNR2 PCB to a constant K (K-factor ½) with Noise Reduction on. • Verify that the levels are set. • If the modifications are not correct an error is given. If no interrupt occurs, the board is not present.
SPROC	The SPROC test checks the edge enhancement (low, medium and high), the Contrast Brightness luts, the Blanking lut and the Blank whole screen. • Turn on edge enhancement. Select low, medium and high and verify that the levels are set. • Completely load the Contrast Brightness lut with zeros. Activate lut and verify the value. • Completely load the Contrast Brightness lut with 255s. Activate lut and verify the value. • Load the default Contrast Brightness lut and the V-shaped blanking lut. Activate them and verify the values. • Load the default blanking and turn on the SPROCE complete screen blanking. Check the blanking. • Turn the complete screen blanking on the SPROCE off.
OPROC	The OPROC test checks the bypass, zoom, load and display masks, the subtraction and pixel shift (4 combinations), the landmarking (low, medium and high) and the subgain. • Turn off all processing on the OPROC and insert OPROC in the video path (input from AEC). • Select a valid zoom source and destination, then switch zoom on. Verify zoom and area without shutters • Load the V-shaped blanking and position the zoom source so that it will zoom the blanking edge. • Load the default blanking. Load a mask and then display it. • Verify subtraction on. • Turn on pixel shift and shift the image in 4 different ways. These are: x-shift y-shift –30 +15 +30 +15 +30 -15 –30 -15 • Set the landmark levels to LOW, MEDIUM and HIGH. Verify that the correct levels are set. • Select sub-gain levels 3, 5 and 7. Verify sub-gain on all levels. • Turn off pixelshift and landmarking, select sub-gain 0 and select normal display mode.

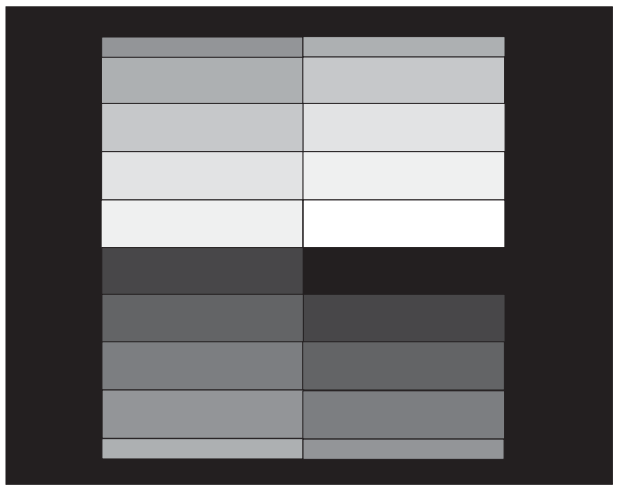
PCB Tested	Details of Test
DHIRES	The DHIRES test calculates a checksum and compares this against the expected checksum. • Put DHIRES into a defined state by selecting an INTERLACED monitor type. • Turn off the blanking on DHIRES. Verify that DHIRES is on default processing.
VIEWMASTER	The VIEWMASTER test calculates a checksum and compares this against the expected checksum. • Put VIEWMASTER into a defined state by selecting an NON-INTERLACED monitor type. • Turn off the blanking on VIEWMASTER. Verify that VIEWMASTER is on default processing.
DFB	The DHIRES or VIEWMASTER board must be functioning correctly before the DFB test can be performed. The DFB test checks the Field repition function. • Turn on Field Repetition on the DFB left channel. Check that the DFB is performing field repetition mode on the DHIRES or VIEWMASTER board.
TBUFW	The TBUFW test checks the loading and displaying of the ADNR CPU-generated test pattern test image in full and reduced mode. • Put Hardware into Default Mode. • On the TBUFW, select the storage of noise and movement values, reading of the (minified) buffer and image compression and decompression and turn them OFF. • Turn ON the software image available mode and set image available on. • Turn ON the image input modes from XBUS1 and XBUS2. • Load SPROC with TBUFW blanking pattern to load the TBUFW with a full size image. • Load image from ADNR into the image buffer. • Disconnect ADNR from XBUS1 and let TBUFW display its image buffer on XBUS1 in full mode. Verify the Checksum. • Load the TBUF with a reduced size image. • Repeat the steps given above but with image compression and decompression ON. This generates a monitor test pattern in Full size image. Verify the Checksum from the TBUFW.
Disk Access test	• A read and write test to check readiness of the DFI hard disc

EXAMPLE: *The appearances of the screens are shown on the following page*.

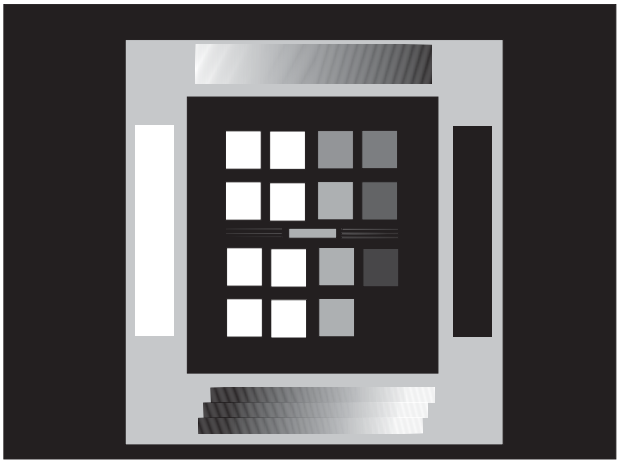




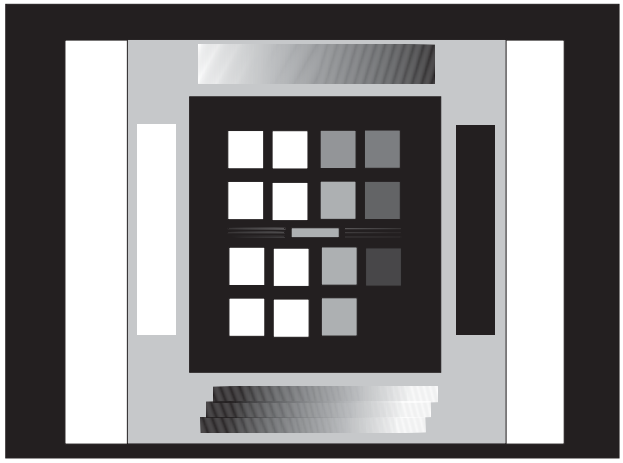
Screen 1 and 4



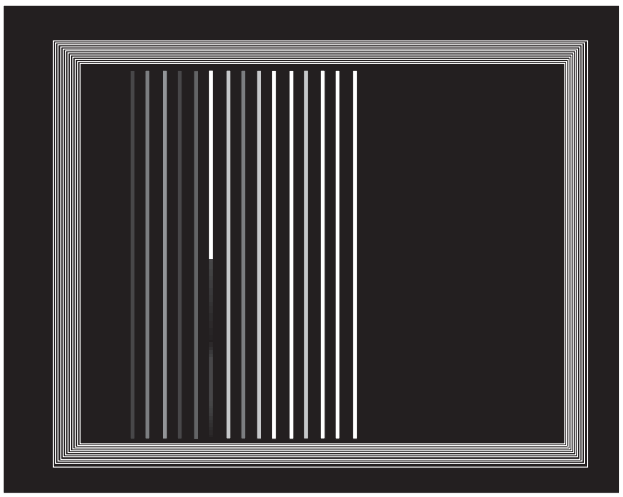
Screen 2 and 5



Screen 3 and 6



Screen 7



Screen 9

Screen 10

NOTE

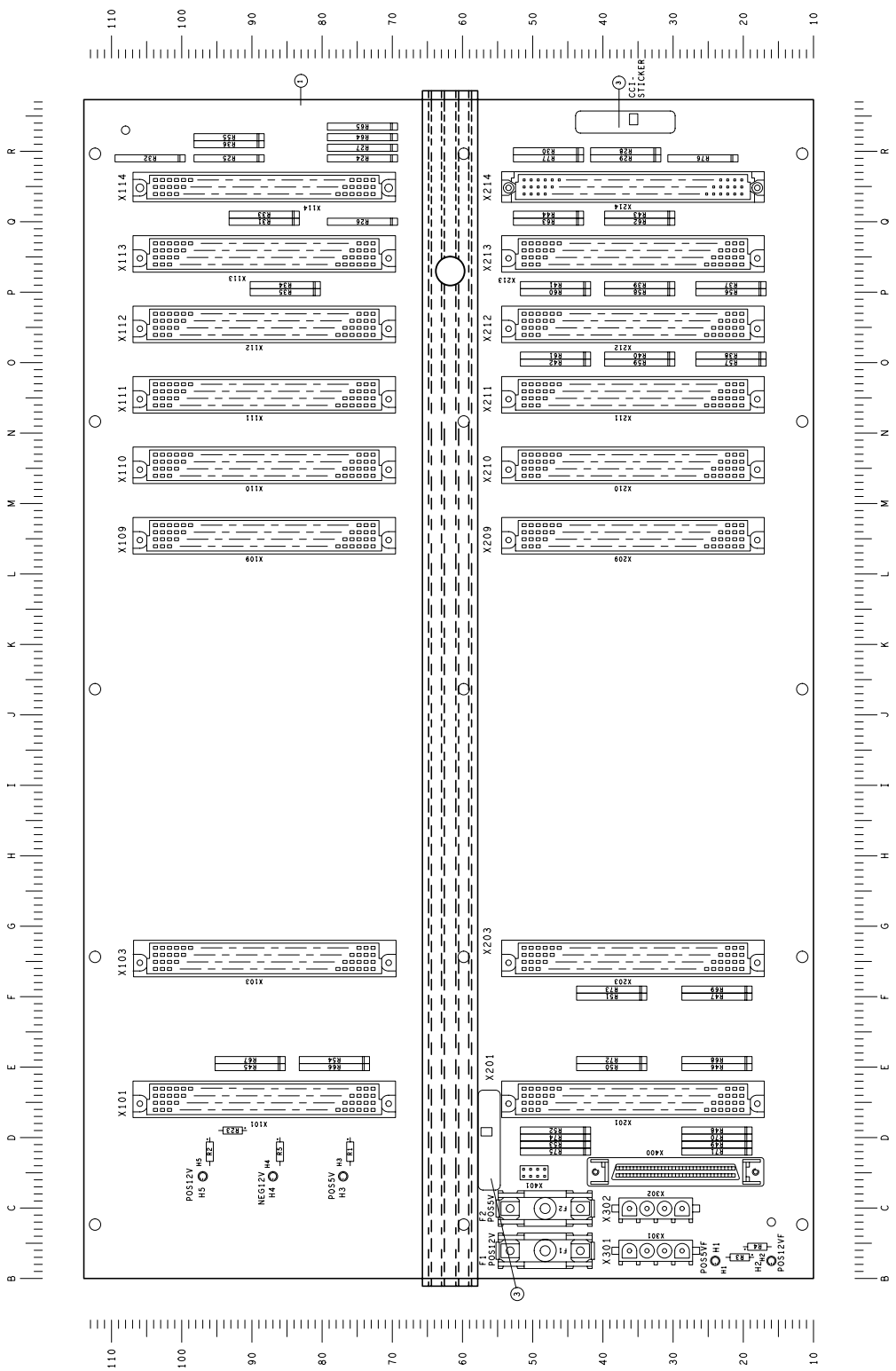
The 10th line from the right hand side blinks during the functional test. If the 10th line does not blink or another line blinks, the DFB board is defect (check the jumper switches on the DFB board as a first step);

3.7. DFI FAULT FINDING AND [PCB] REPLACEMENTS

NOTE

LED's are located on the back panel as well as on the COMBO, USYSIO and ADNR board. Components which require either + 12 V or + 5 V power supply are protected by fuses on the back panel;

3.7.1. BACK PANEL



1 Functional aspect

The backpanel is the backbone of all [DFI] PCB's. It serves as a router interconnecting all individual PCB's.

2 LED's

The position of the LED's for the power supply is:

H1	Green	Power indicator	+5 V power supply to PCB's is active
H2	Green	Power indicator	+12 V power supply to PCB is active
H3	Green	Power indicator	+5 V power supply is active
H4	Green	Power indicator	-12 V power supply is active
H5	Green	Power indicator	+12 V power supply is active

3 Fuses

The positions of the fuses of the power supply are shown in the figure below.

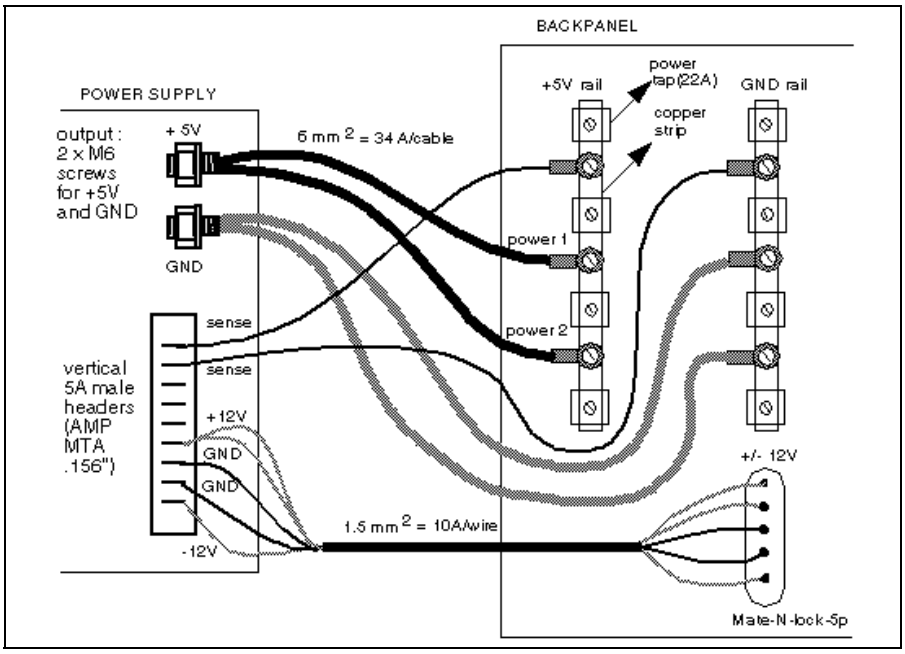
F1	2 A	Power fuse	Protects +12 V supply to hard disk only
F2	3 A	Power fuse	Protects +5 V supply to hard disk only

4 Jumper settings

X401	A	ON
	B	ON
	C	ON
	D	ON

5 Replacement

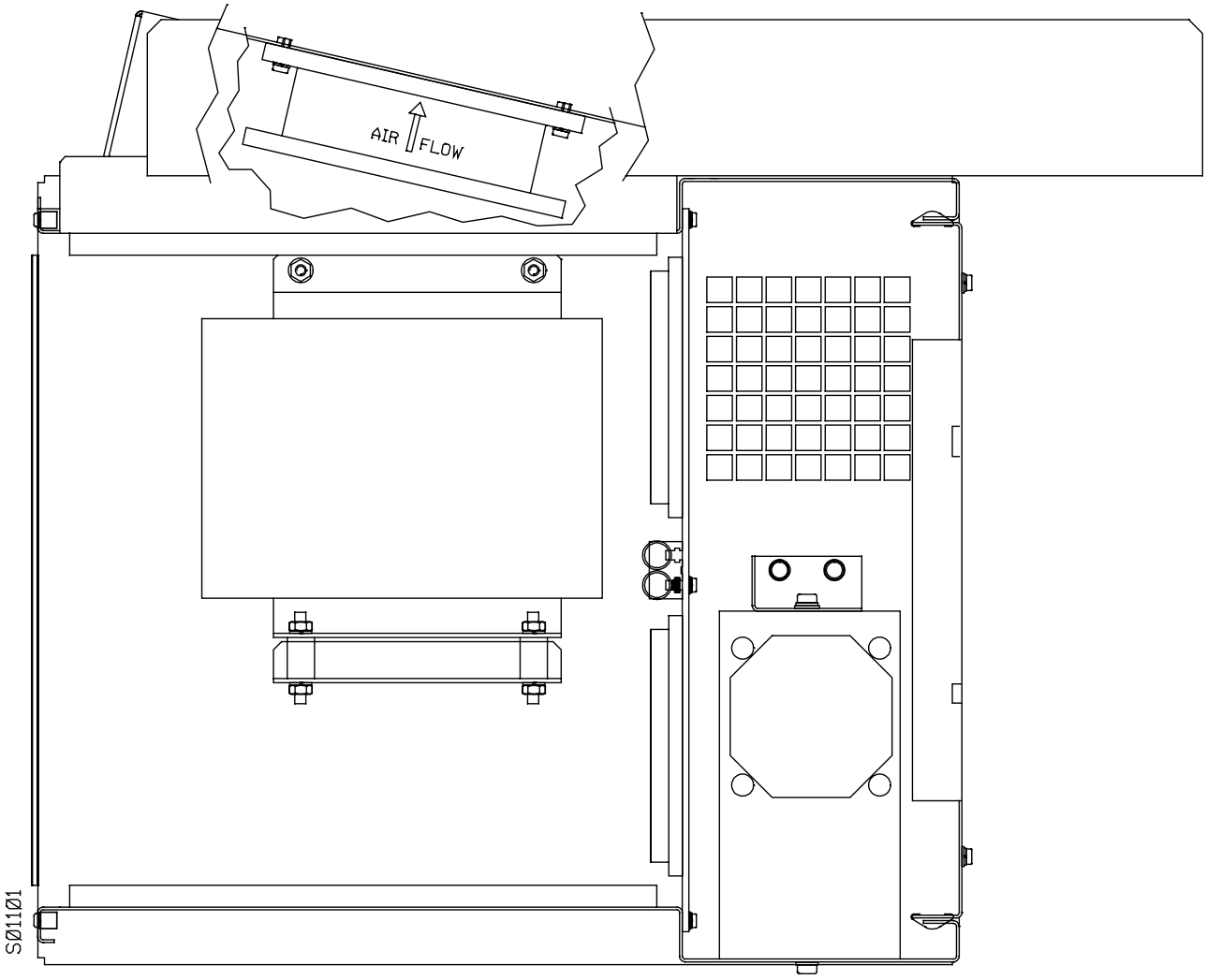
Power supply of the back panel



The procedure to remove the back panel is as follows.

- Remove the rear cover of the MVS;
- Loosen the left and right screws on the lower retaining plate;
- Open the front cover of the MVS;
- Disconnect all connections / cables to allow removal of the rack;
- Pull the rack out;
- Loosen and remove all PCB's from the board rack;
- Remove power supply unit; refer to Chapter replacement power supply unit;
- Loosen and remove all screws from lower rim of back panel;
- Loosen and remove all screws from upper rim of back panel;
- Remove back panel;
- Mounting will be in reversed order;

3.7.2. COOLING UNIT



1 Functional aspect

The DFI is cooled through forced air of 3 fans; the power supply comes from the MCU. Each fan can be replaced individually. The cooling unit is mounted on top of the DFI and assembled during production. The support plate must not be removed at any time.

2 LED's

None

3 Fuses

None

4 Jumper settings

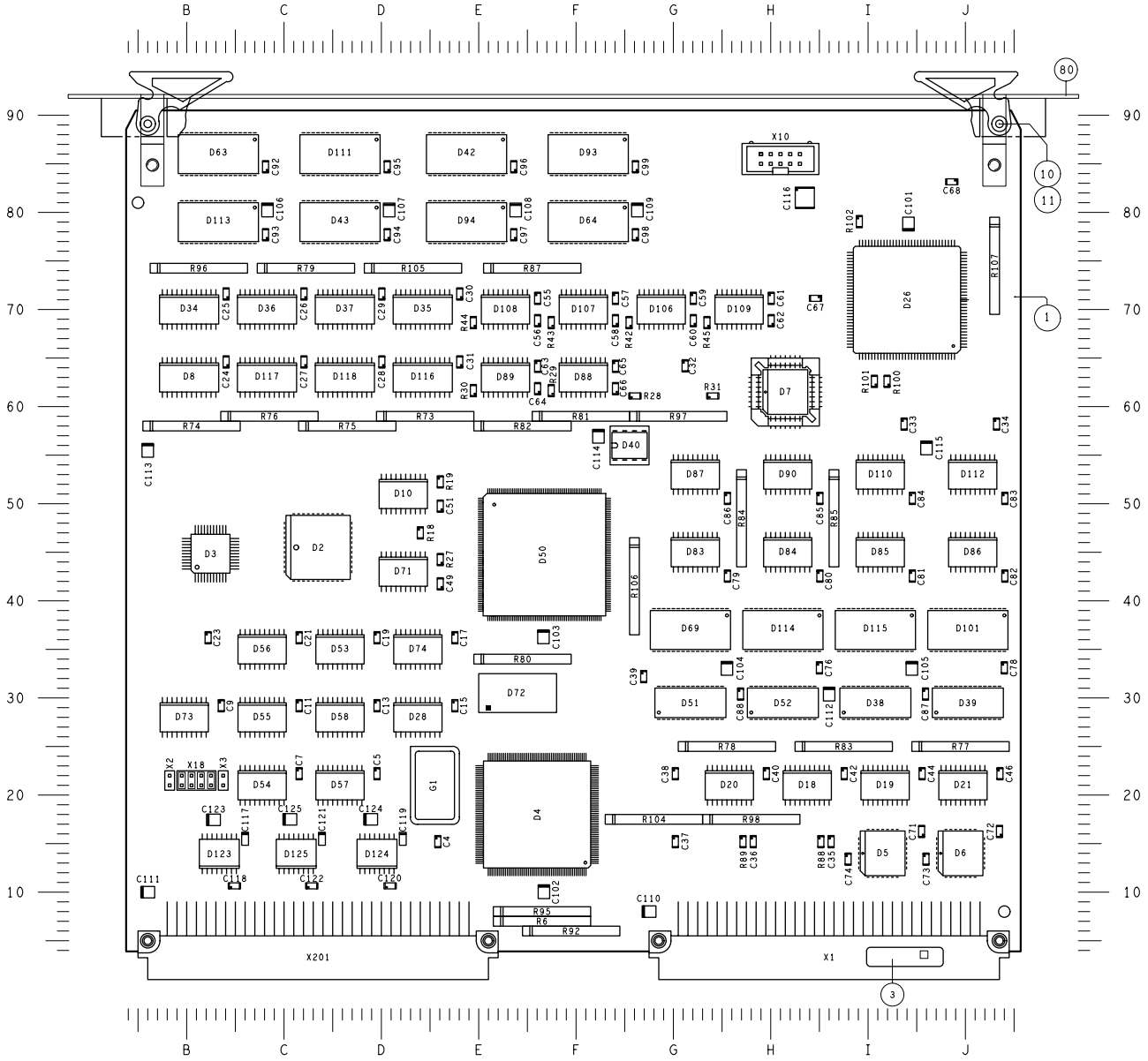
None

5 Replacement

The procedure to remove the cooling unit is as follows.

- Disconnect the power supply unit from the mains;
- Ensure that the cooling unit is facing upwards;
- Select a fan, loosen and remove the retaining bolts of the fan with an Allen key;
- Remove the fan unit;
- Replace the fan unit;
- Place the bolts in position and tighten each bolt with an Allen key;
- Place the board rack in the original position (the hard disk should remain on the left hand side of the PCB's;
- Connect the power supply unit to the mains;
- Start the cooling unit for testing;
- Check air flow in an upward direction;

3.7.3. TBUF BOARD [TRANSFER BUFFER, PB 2]



1 Functional aspects

The functions of the TBUF board are: to store X-ray images incl. attributes in buffer for saving on disk, to retrieve X-ray images incl. attributes from disk to buffer for display and processing, software access on X-ray image buffer for zoom, test patterns etc, software access on the general purpose buffer which can be used to store image attributes or for storage / retrieval of files from disk.

2 LED's

None

3 Fuses

None

4 Jumper settings

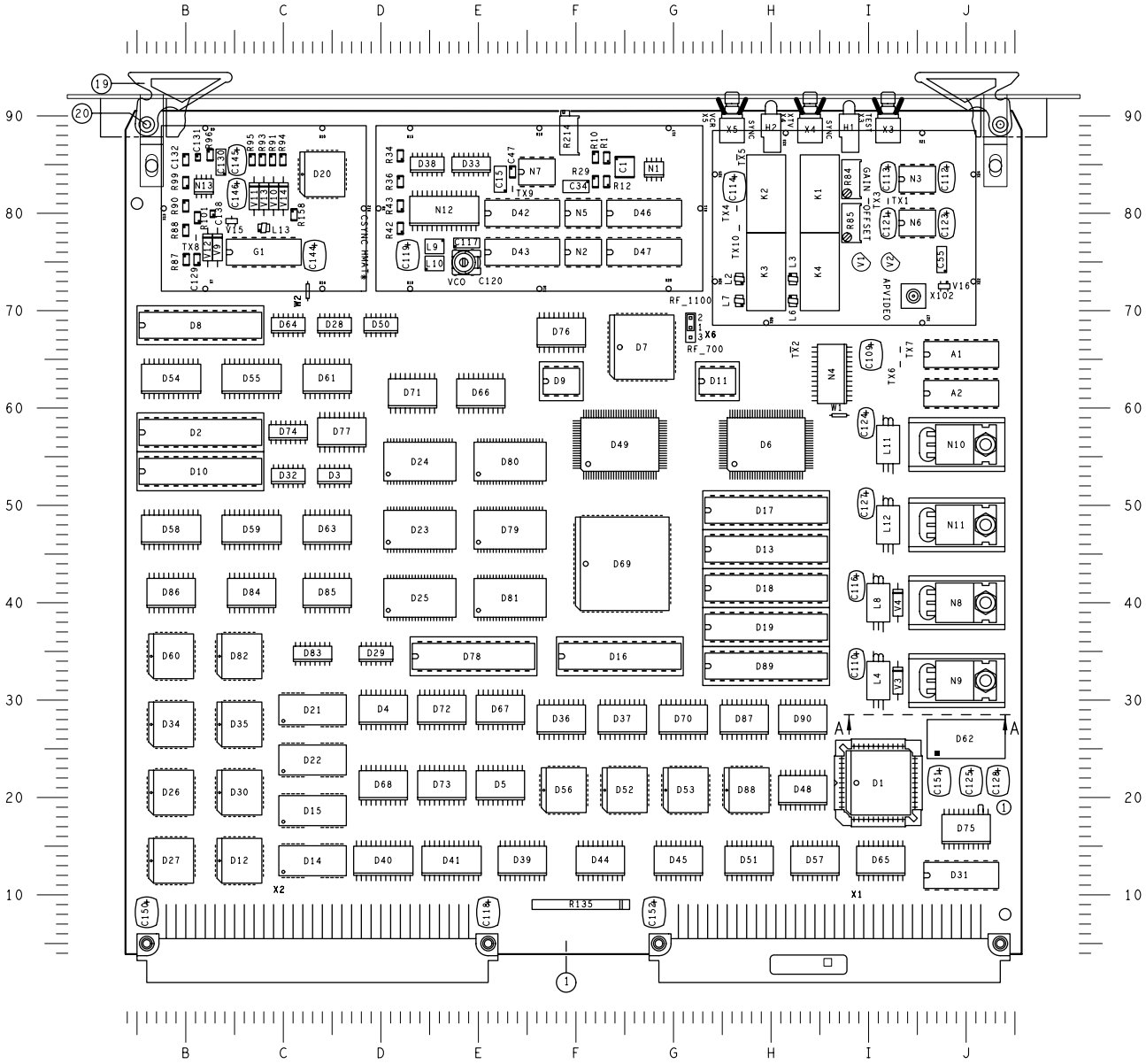
None

5 Replacement

The procedure to remove the TBUF board is as follows.

- Switch OFF power
- Put on a wrist strap
- Remove the TBUF board
- Check jumper settings at TBUF [replacement] board
- Insert TBUF [replacement] board
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the TBUF board again if BIST provides message "defect" and repeat BIST

3.7.4. ADNR BOARD [ANALOGUE/DIGITAL NOISE REDUCTION, PB 4]



1 Functional aspects

The ADNR board provides the following functional blocks: analogue processing, analogue to digital conversion, digital processing, video synchronisation processing, timing and control circuit, X-bus interface, power supply processing, system interface logic.

2 LED's

Position of ADNR LED's and its functionality.

H1 A	Green	Indicator	XTV synchronisation active
H1 B	Green	Indicator	XTV video (running) selected
H2 A	Green	Indicator	VCR synchronisation active
H2 B	Green	Indicator	VCR (running) selected

3 Fuses

None

4 Jumper settings

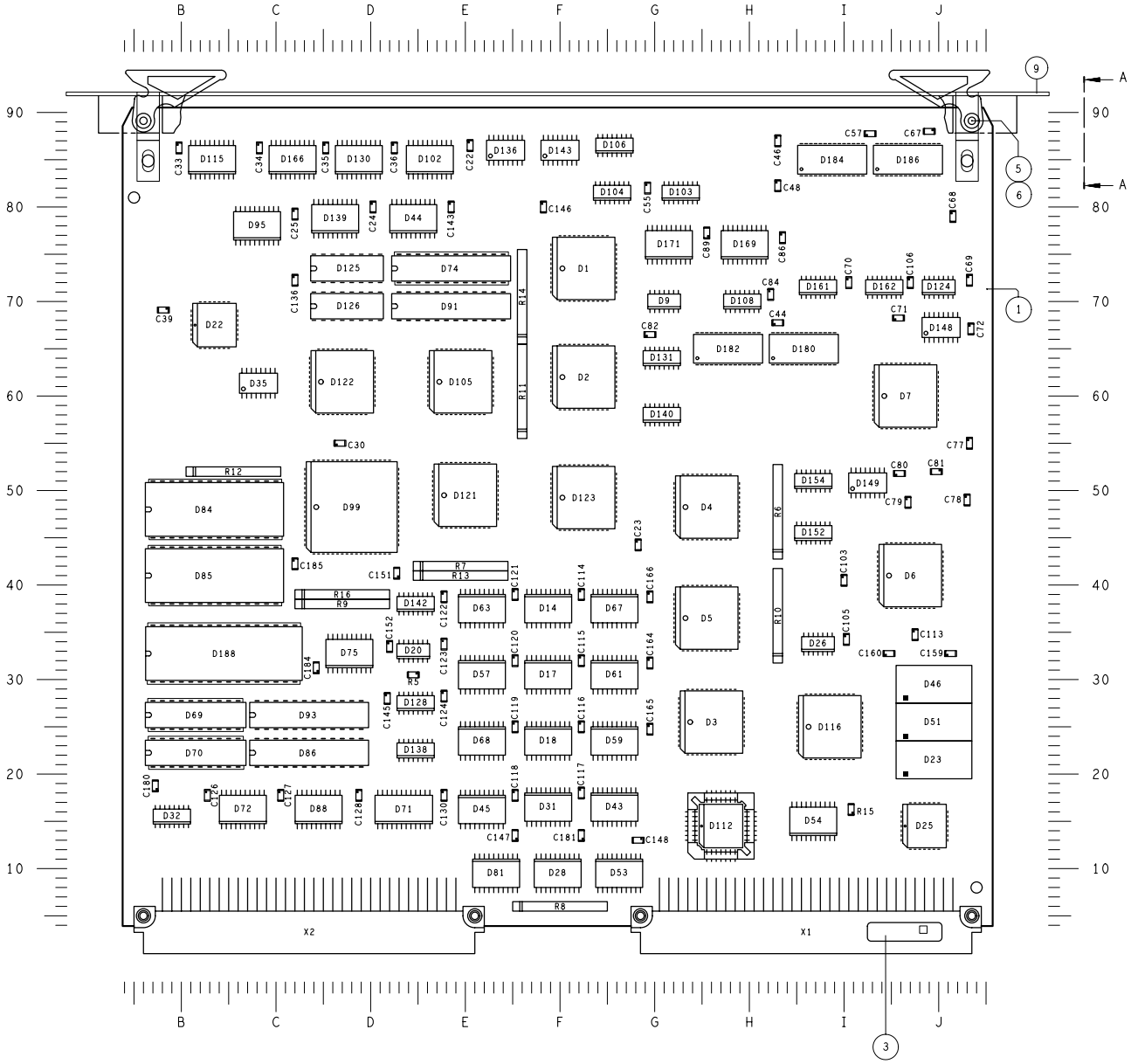
X6	RF_700 mV	Jumper in position 1-3

5 Replacement

The procedure to remove the ADNR is as follows.

- Switch OFF power
- Put on a wrist strap
- Disconnect cables
- Remove the ADNR board
- Check jumper settings at ADNR [replacement] board
- Insert ADNR [replacement] board
- Connect cables
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the ADNR board again if BIST provides message "defect" and repeat BIST

3.7.5. OPROC BOARD [OPTIONAL PROCESSING, PB 10]



1 Functional aspects

The functions of the OPROC board are: subtraction, landmarking; part of the masked image is added to the result of subtraction, pixel shift; a technique applied during subtraction to compensate for small geometric differences between the mask and the input image.

2 LED's

None

3 Fuses

None

4 Jumper settings

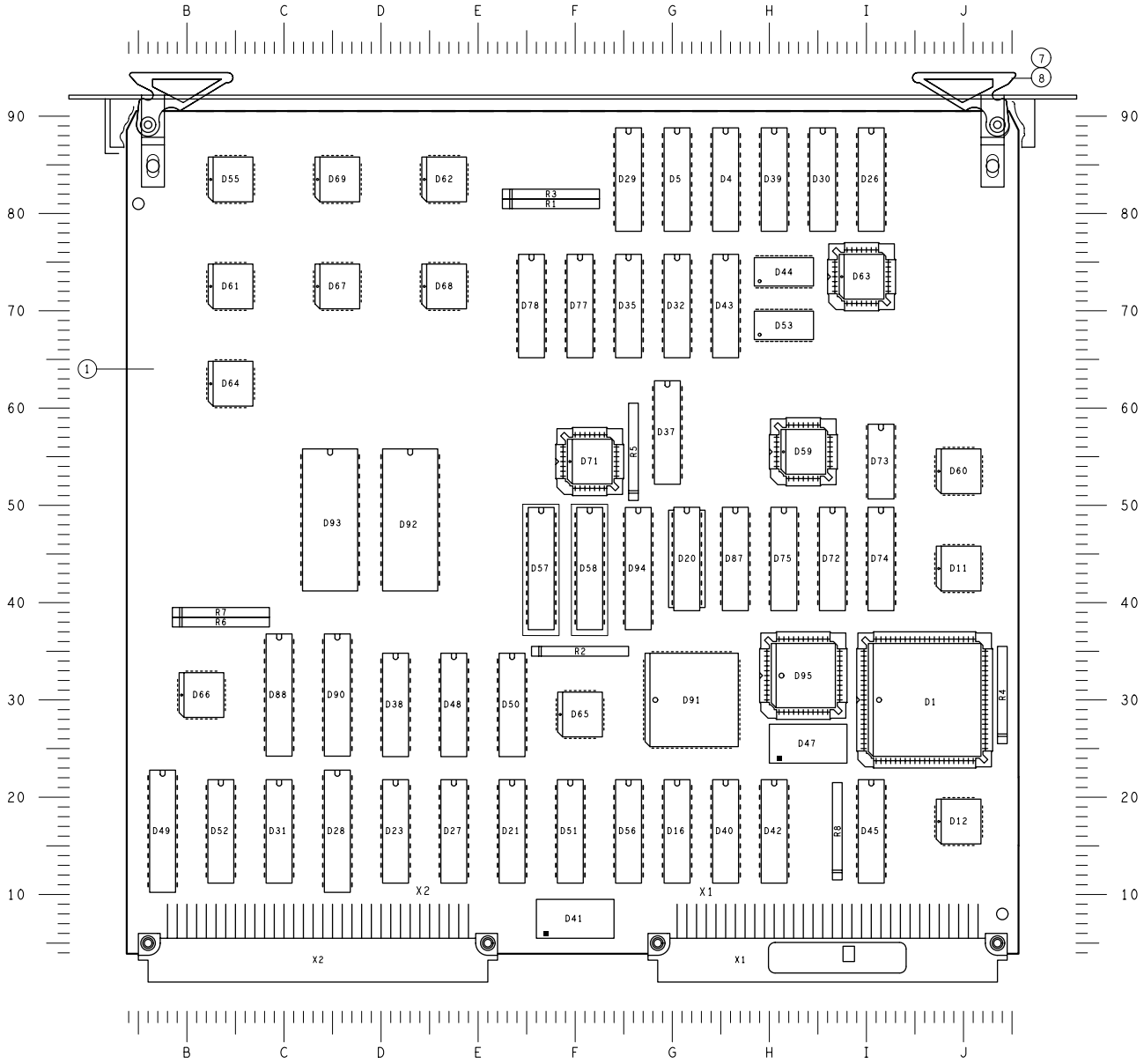
None

5 Replacement

The procedure to remove the OPROC board is as follows.

- Switch OFF power
- Put on a wrist strap
- Remove the OPROC board
- Check jumper settings at OPROC [replacement] board
- Insert OPROC [replacement] board
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the OPROC board again if BIST provides message "defect" and repeat BIST

3.7.6. SPROCE BOARD [STANDARD PROCESSING, PB 11]



1 Functional aspects

The SPROC board provides the standard operating functions in DFI: adaptive edge enhancement, contrast / brightness / invert LUT, blanking LUT.

2 LED's

None

3 Fuses

None

4 Jumper settings

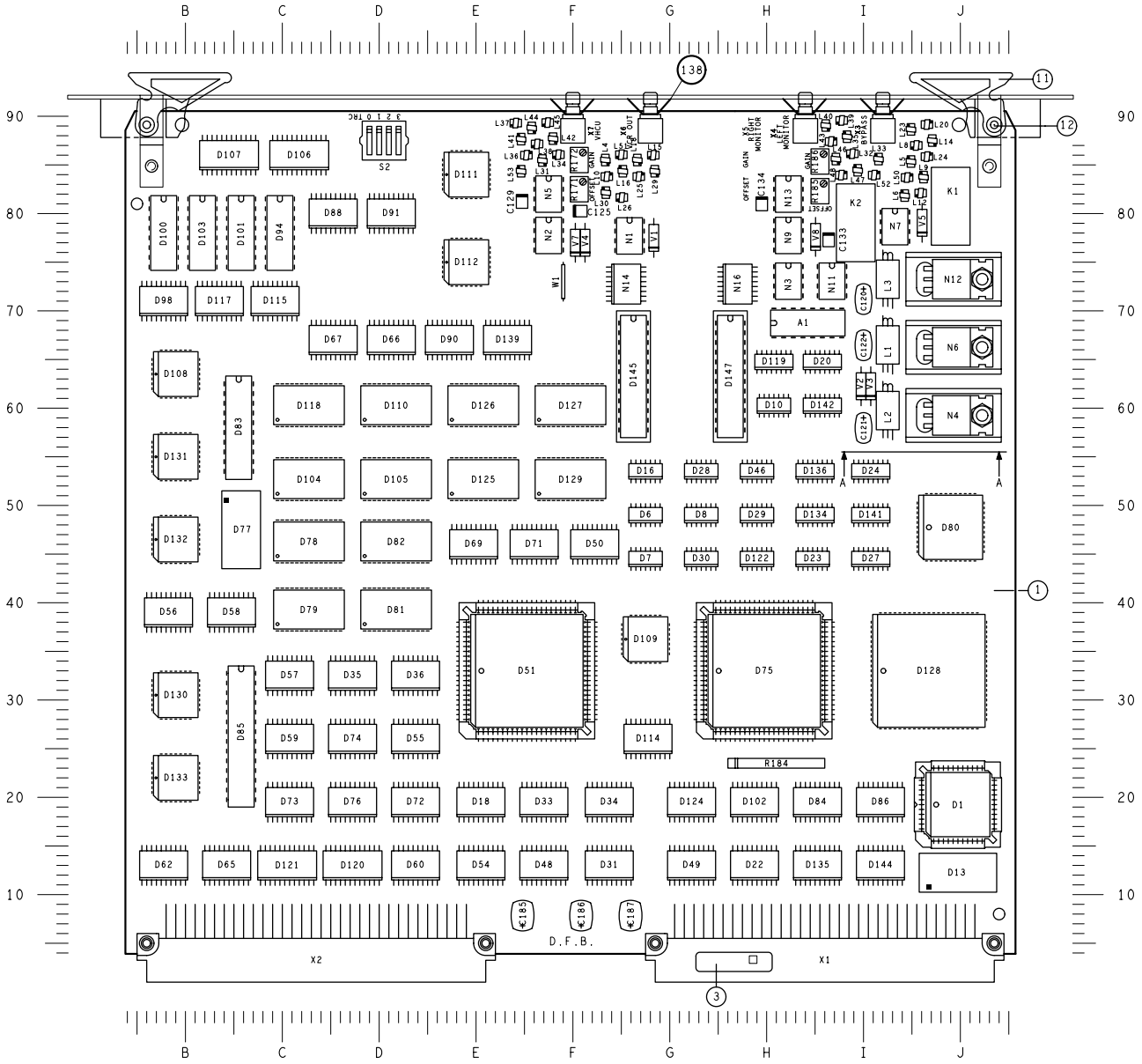
None

5 Replacement

The procedure to remove the SPROC board is as follows.

- Switch OFF power
- Put on a wrist strap
- Remove the SPROC board
- Check jumper settings at SPROC [replacement] board
- Insert SPROC [replacement] board
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the SPROC board again if BIST provides message "defect" and repeat BIST

3.7.7. DFB BOARD [DUAL FRAME BUFFER, PB 12]



1 Functional aspects

The DFB board provides analogue video outputs for the external video, the DICOM connectivity option, the VCR option, the VCDR option and the video paper/transparency printer. Outputs can be either standard line rate [SLR] video, 625-lines, 50 Hz, 2:1 or 525-lines, 60 Hz, 2:1 format. The signal levels are set to 700 mV. The DFB provides facilities for adding graphics to images, freezing images, providing field repetition and displaying images in mosaic.

2 LED's

None

3 Fuses

None

4 Jumper settings

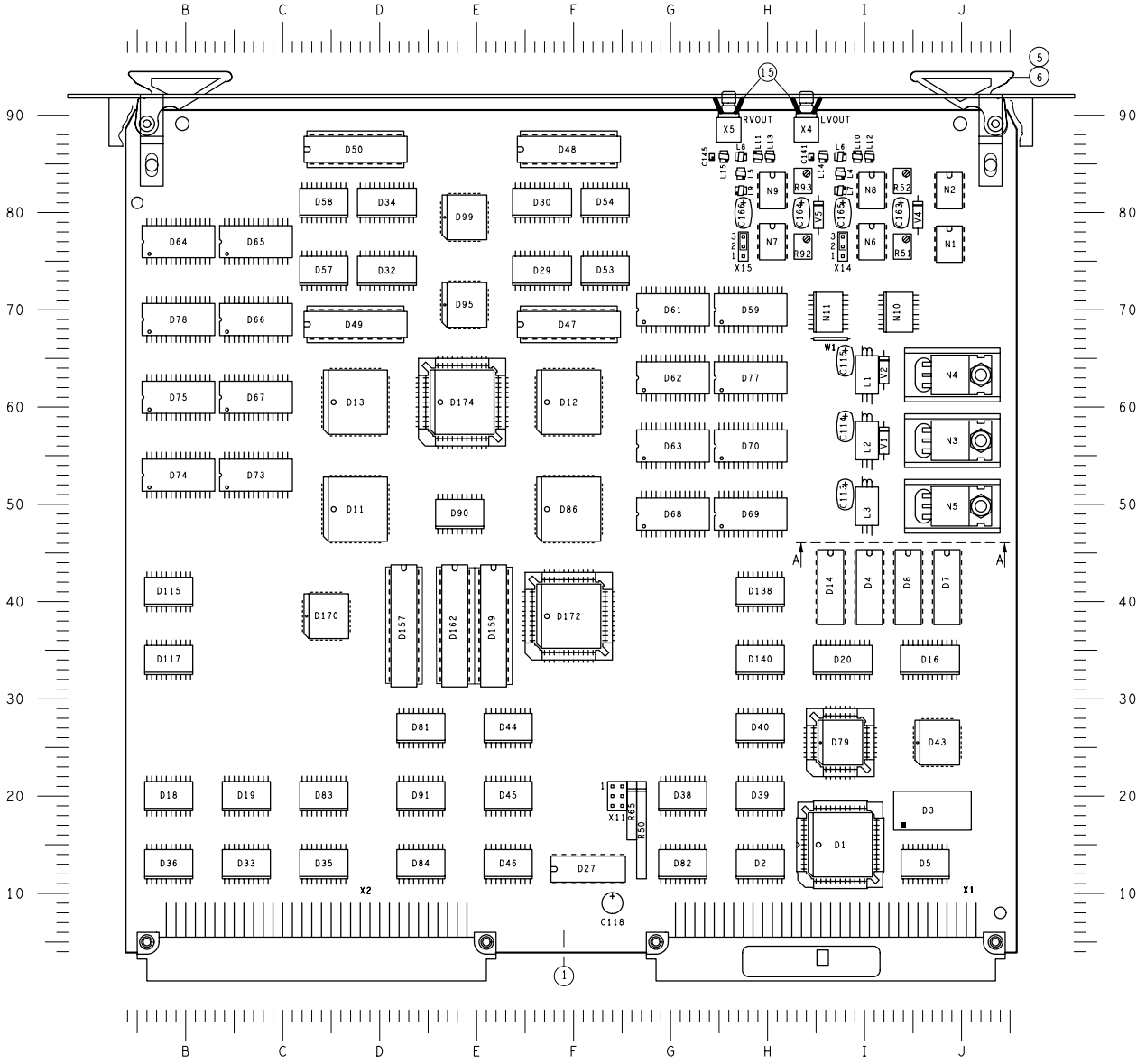
SW1	Farest position from front panel
SW2	Farest position from front panel
SW3	Closest position from front panel
SW4	Closest position from front panel

5 Replacement

The procedure to remove the DFB board is as follows.

- Switch OFF power
- Put on a wrist strap
- Disconnect cables
- Remove the DFB board
- Check jumper settings at DFB [replacement] board
- Insert DFB [replacement] board
- Connect cables
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the DFB board again if BIST provides message "defect" and repeat BIST

3.7.8. DHIRES BOARD [DUAL HIGH RESOLUTION, PB 13]



1 Functional

The DHIRES board provides the facilities to convert a standard line video signal to 100/120 Hz interlaced.

2 LED's

None

3 Fuses

None

4 Jumper settings

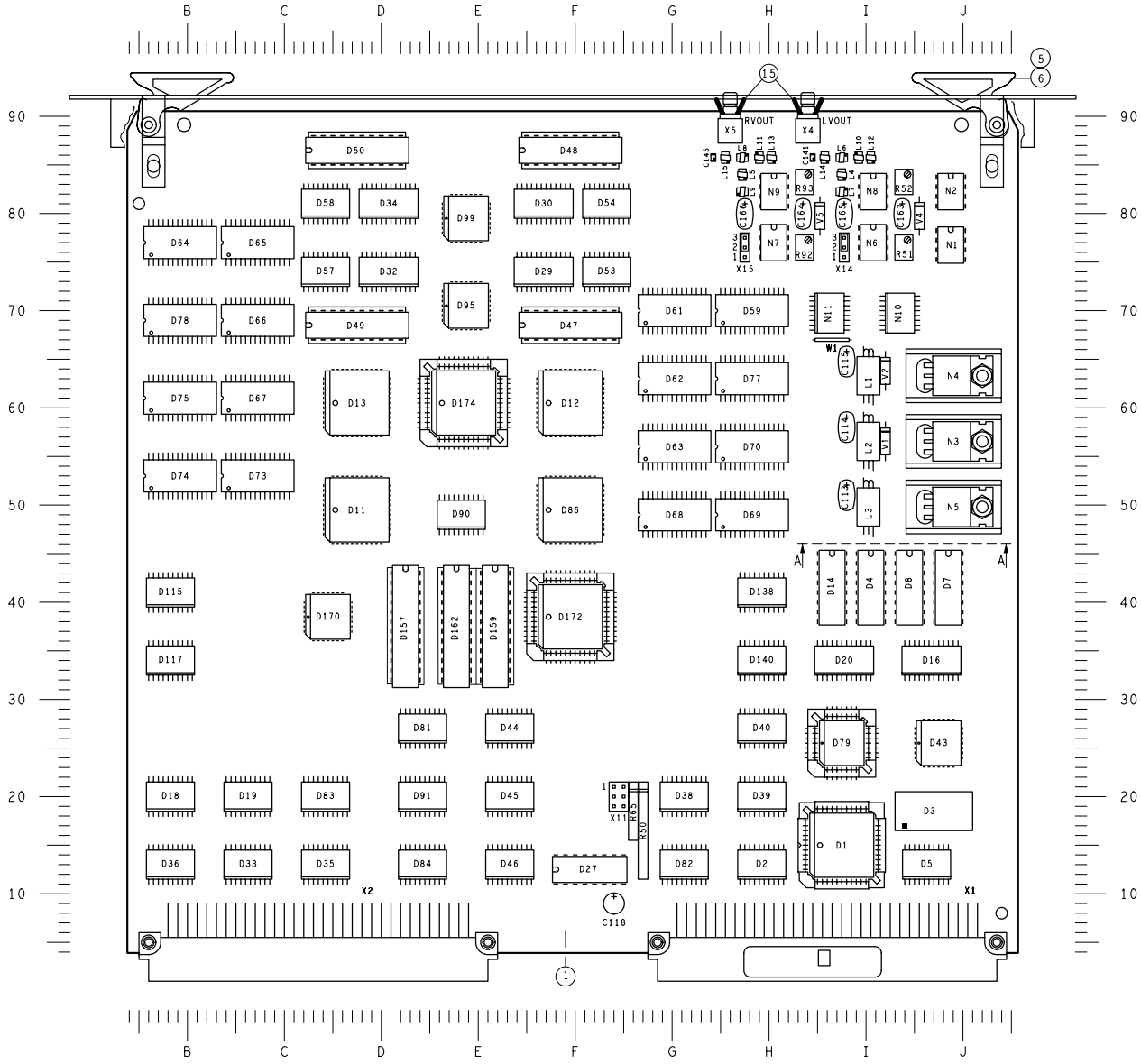
X11	Jumper 1 in position 3-4
	Jumper 2 in position 5-6

5 Replacement

The procedure to remove the DHIRES board is as follows.

- Switch OFF power
- Put on a wrist strap
- Disconnect cables
- Remove the DHIRES board
- Check jumper settings at DHIRES [replacement] board
- Insert DHIRES [replacement] board
- Connect cables
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the DHIRES board again if BIST provides message "defect" and repeat BIST

3.7.9. VIEWMASTER BOARD [PB 13]



1 Functional

The VIEWMASTER board provides the facilities to convert a standard line video signal to 75/90 Hz Non-interlaced.

2 LED's

None

3 Fuses

None

4 Jumper settings

X11	Jumper 1 in position 3-4
	Jumper 2 in position 5-6

5 Replacement

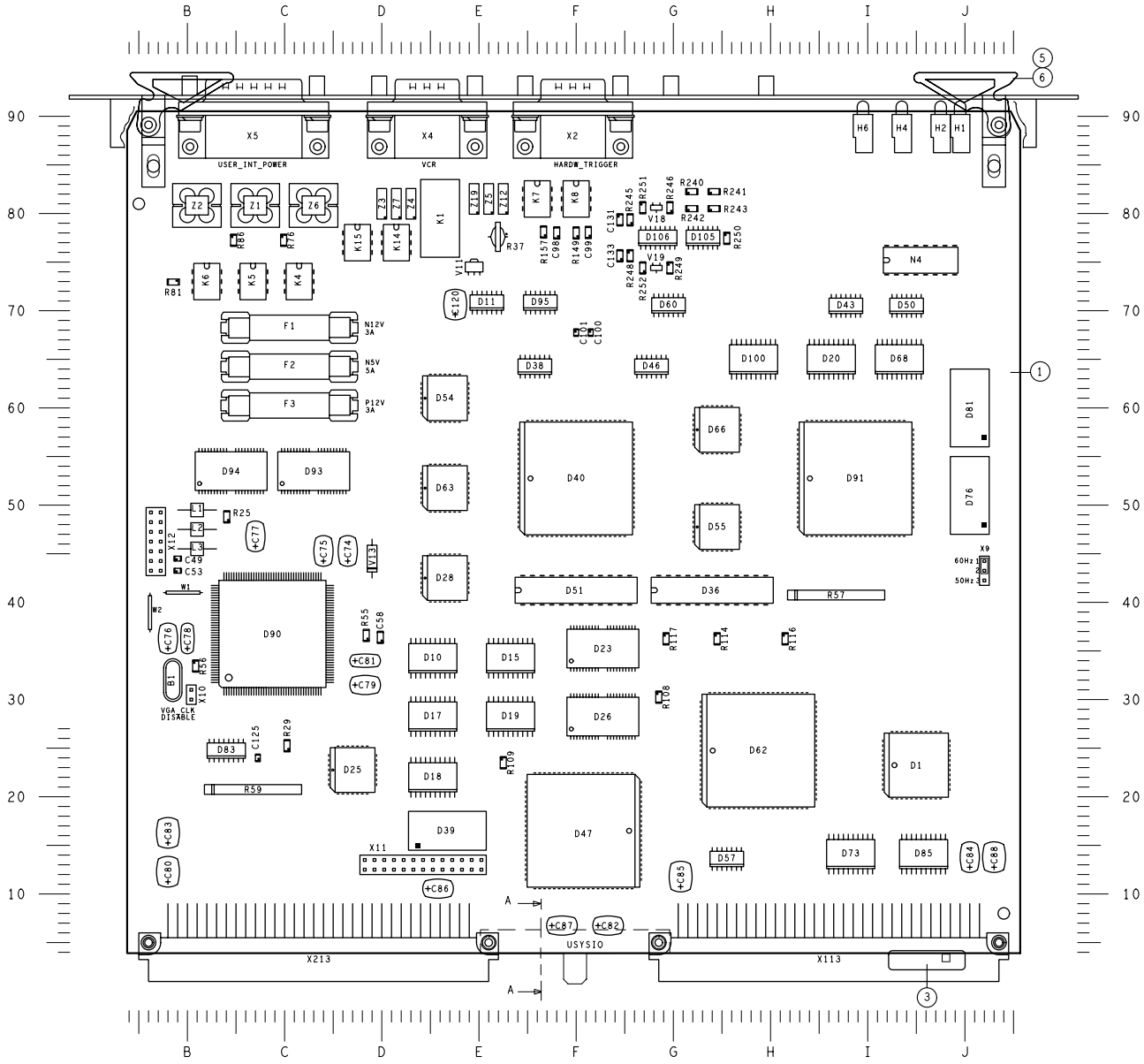
The procedure to remove the VIEWMASTER board is as follows.

- Switch OFF power
- Put on a wrist strap
- Disconnect cables
- Remove the VIEWMASTER board
- Check jumper settings at VIEWMASTER [replacement] board
- Insert VIEWMASTER [replacement] board
- Connect cables
- Remove wrist strap
- Switch ON power
- Perform a BIST
- Replace the VIEWMASTER board again if BIST provides message "defect" and repeat BIST

3.7.10. USYSIO BOARD [USER AND SYSTEM I/O, PB 14]

NOTE

Upon replacement, the USYSIO board should be set to allocate 50 or 60 Hz, depending on the systems video frequency; this should be done by setting the appropriate jumper setting in a position to meet the value required;



1 Functional aspects

The USYSIO board generates and synchronises [VGA] graphics. It provides central address selection for the AMS bus and a fluoroscopy extension with single fault detection, the interface with the SUCO and the power supply to the TRUIF of the MVS console. It also selects system settings and circuit resets.

2 LED's

Position of USYSIO LED's and its functionality.

Row A		***Row B***	
Green, power indicator	Power indicator, -12 volt supply to TRUIF of MVS-console is active	Green, power indicator	+12 volt supply to TRUIF of MVS console active
Green	R/F enabled	Green, power indicator	+ 5 volt supply to TRUIF of MVS console active
	Not used		Not used
Yellow	Image availability	Yellow	Fluo command
	Not used		Not used
Yellow	DFI 50 Hz configured	Yellow	VCR active
	Not used		Not used
	Not used		Not used
	Not used		Not used

3 Fuses

F1	3 A
F2	5 A
F3	3 A

4 Jumper settings

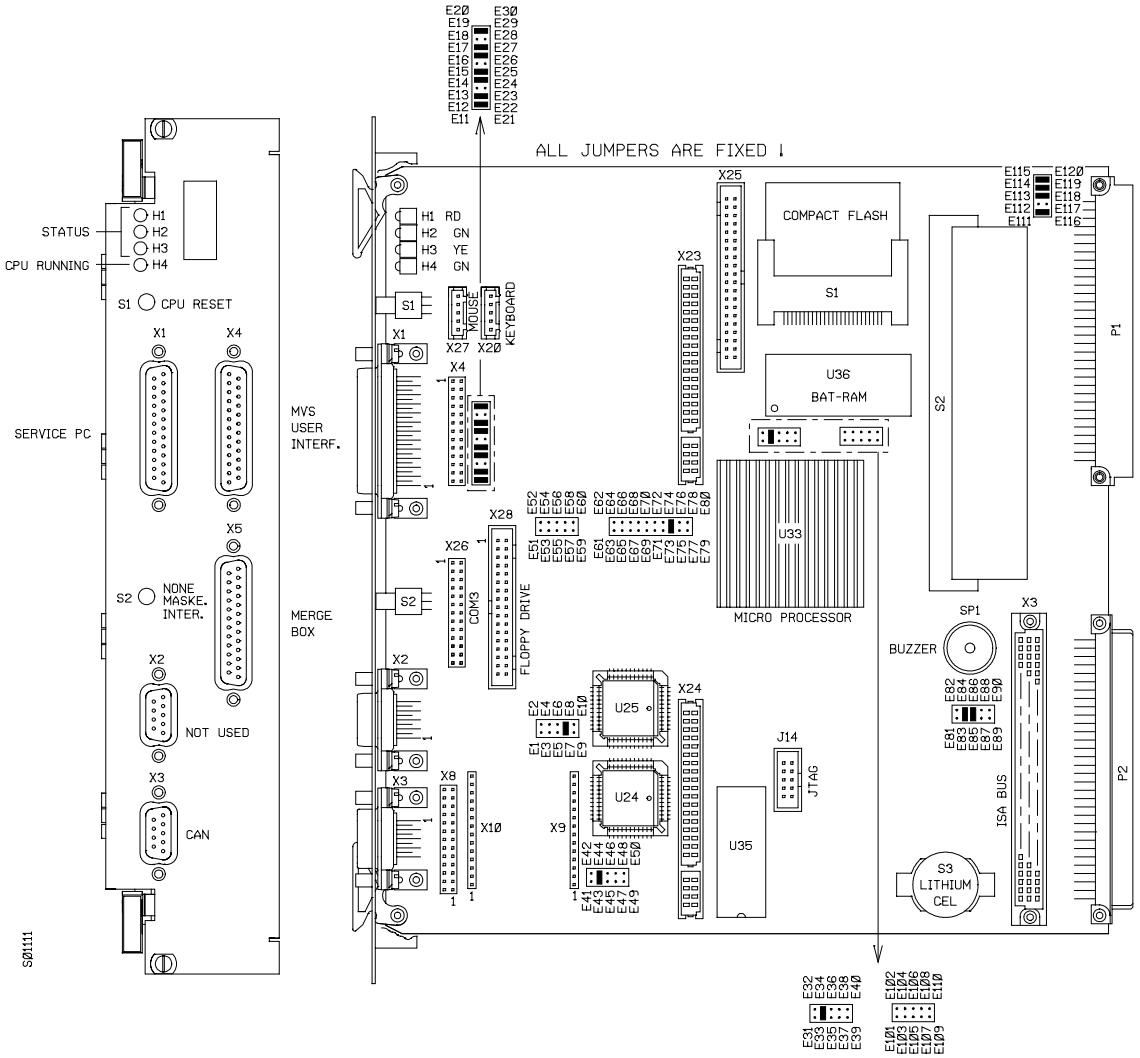
X9	50 Hz / 60 Hz	Jumper in position 2-3, 50 Hz
X9	50 Hz / 60 Hz	Jumper in position 1-2, 60 Hz

5 Replacement

The procedure to remove the USYSIO is as follows.

- Switch off the power
- Put on a wrist strap
- Disconnect connectors
- Remove the USYSIO board
- Check jumper settings on [USYSIO] replacement board
- Insert [USYSIO] replacement board
- Connect connectors
- Remove wrist strap
- Switch on power
- Perform a BIST
- Replace the USYSIO board again if BIST provides message "defect" and repeat BIST

3.7.11. COMBO [COMPUTER BOARD, PB 15]



NOTE

The DFI COMBO has a unique identification, the host ID. The host ID is factory defined/specified and programmed into the Flash PROM. With a new system the host ID and the system ID are the same. The software license key is encrypted by using a system ID, making the software options user specific. The DFI will automatically transfer the system ID when: 1- a new COMBO is inserted, by restarting the system; 2- a hard disk is replaced, by restarting the system;

CAUTION

Installing a new COMBO includes a new BATRAM. The old BATRAM contains the [SUCO] calibration data. A copy of the [SUCO] calibration data must be downloaded to the [DFI] COMBO BATRAM in the setting to work procedure;

---

1 Functional

The COMBO is the central computer board of the DFI. These computer board controls all the other boards. The DFI application software runs on the COMBO. The COMBO also contains the [serial] ports for interfacing towards external devices.

2 LED's

H4	Red	Selftest not OK
H2	Green	Selftest OK
H3	Yellow	COMBO board ready
H1	Green	Run indicator, showing DFI bus activity

H4 [red]	***H2 [green]***	***H3 [yellow]***	***Event***
Off	Off	Off	Power off / hardware malfunction
Off	Off	On	Unused code
On	Off	Off	BIST [or EBIST] failure
On	Off	On	Default after reset/failure processor halted
Off	On	Off	BIST [or EBIST] ok / application running
Off	On	On	BIST [or EBIST] ok / application not running or error
On	On	Off	BIST [or EBIST] in progress / additional information via H3
On	On	On	BIST [or EBIST] in progress / additional information via H3

3 Fuses

None

4 Jumper settings

All Factory pre-installed.

5 Replacement

The procedure to remove the COMBO is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connectors
- Remove COMBO
- Check jumper settings at COMBO [replacement]
- Insert COMBO [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace COMBO again if POST provides message: “defect”, repeat POST
- Load DFI application software (do not format the harddisc)
- Load IP sets
- Check program manual settings (licence, video frequency etc)
- Backup calibration data (from the SUCO)

If there is already a system ID on the DFI Batram that is not identical with the Harddisc then there will be a message on the monitor:

DFI not started
System configuration inconsistent
Contacts the service organisation

Connect the service PC to the service terminal (com 1 of DFI)
Go to Faultfinding in X-scope and resets the system
After start-up a question will appear:

Changes in system configuration detect
Did you replace the Combo Board or the SCSI Disk? [c= Combo / d=Disk]:

You must give a valid answer (c or d), the system will ask for conformation:

Are you sure you replaced the Combo board? [y= Yes / n= No]

The system will not start before a right answer is given (make sure you changed the right part)

6 Connectors

- X1: RS 232 serial interface for service
- X2: CAN interface
- X3: CAN interface
- X4: RS 232 serial interface for TRUIF (separate cable)
- X5: RS 232 serial interface (DICOM option, if present; separate cable)

4. DFI HARD DISK

4.1. GUIDANCE FOR HARD DISK TROUBLESHOOTING

Start up the DFI subsystem and perform a BIST as described earlier in this Section. Check that all PCBs are "OK" before continuing with troubleshooting. The contents of the logged data files may not only assist in the identification of a problem, but may also indicate what action is required.

NOTE

Before you undertake any form of troubleshooting, start X-Scope and select the following from the X-Scope menu: Faultfinding, Logging, select the type(s) of logged data you require; scroll or print the log file. Also note the name(s) and serial number(s) of the equipment under investigation.

Hardware

Problem Description	Remedy
LED's not illuminated on the back panel or on PCBs	Check that the mains power supply is on. Check the fuses on the back panel. Check the USYSIO board connectors. Check the back panel.

Application software

Problem Description	Remedy
unable to access application software	Restart the system. Download the DFI software via X-Scope. Check the hard disk for failure. Check the LED's on the hard disk. Perform a POST.
Modified settings in configuration or IP set not active when applied is pressed	Reset with F5 to apply modified configuration.

Hard disk failure

Problem Description	Remedy
attached SCSI disk as formatted device FAILED	Check the SCSI disk cables and the terminators.
unable to format the hard disk	Attempt to format the hard disk once more (high/low level via X-Scope). Still unable to format the hard disk. Check the jumper settings/terminators. Replace the hard disk.
unable to access the hard disk	Check the SCSI cabling.
unable to access directories and/or files	Check that the DFI software has been loaded.
hard disk failure	Perform a low level format (refer to Section 4, Replacements)

Suspected database

Problem Description	Remedy
unable to access image database	Re-initialise the database; (the present database will be lost). also ipsets have to be reloaded High level format required (the present database will be lost). Low level format required (the present database + all application software will be lost).
Fault messages from database after start-up DFI error	At this point servicing is not possible. The logging facility is only active after pressing the reset button. It may be necessary to reload the software.

Image

Problem Description	Remedy
no picture on monitor	Check that the power cord is properly connected. Check that the power is ON. Check the coax cabling on the DHIRES (VIEWMASTER) and ADNR boards. Check the brightness, contrast, horizontal hold and vertical hold on the monitor. Check camera connections and/or VCR connection(s).
Picture scrambled	Check the coax cabling on the DHIRES (VIEWMASTER) and ADNR boards. Perform a BIST. Check the DFI subsystem options. Check if the images are accepted; if so run images from a previous examination.

Compatibility

The DFI sub-system [COMBO V3] is compatible with the following systems in the BV series.

- XTV8-HPA 50/60 Hz
- BV Family Systems

4.2. DFI HARD DISK [PICO BELLO, PBHD 1]

1 Functional aspects

The hard disk of the DFI contains the image database.

2 LED's

None

3 Fuses

None

4 Jumper settings

For IBM DDYS – T 09170 only.

Block 1 (2 x 7p)		Block 2 (2 x 7p)	
7		G	Enable auto spin
6		F	
5	Force SE (single ended)	E	
4		D	Disable parity
3		C	TI sync nego
2		B	
1		A	

5 Formatting

CAUTION

High level formatting means that only the file allocation tables [FAT] are updated;

The hard disk will be formatted as follows:

[Select X-scope path]: **Faultfind - Power on Monitoring – [**reset DFI**] – [**press**] shift S** [for DFI Service menu];

NOTE

The disk will be high level formatted now. It will take approx. 1 minute to format the disk. After formatting the hard disk,

---

NOTE

High level formatting will perform FAT updates;

Refer to Section "Software installation" for the complete procedure of hard disk formatting.

6 Replacement

- switch the power off;
- remove the rear cover of the DFI trolley;
- loosen the left and right screws located on the lower retaining plate;
- open the front cover of the DFI trolley;
- disconnect all connections / cables to allow free forward movement of the rack;
- pull the rack forward.
- remove the SCSI and power cable connections from the hard disk;
- remove the TBUF board from the DFI rack (if necessary remove other PCBs from the DFI rack) ;
- unscrew and remove the 2 upper nuts which retain the hard disk;
- remove one of the upper bolts to allow the remaining bolt to retain the hard disk temporarily;
- unscrew and remove the lower 2 nuts and bolts which retain the hard disk;
- support the hard disk and remove the last upper bolt;
- remove the hard disk from the DFI rack;
- remove the nuts and bolts from the hard disk retaining plate;
- remove the retaining plate from the hard disk;
- retain all spacing rings;
- check that the jumper settings on the new hard disk are correct (refer to later paragraphs in this chapter);
- place the spacing rings in their respective positions on the new hard disk;
- position the retaining plate on top of the new hard disk;
- position the bolts on the retaining plate;
- place the nuts on to their bolts and tighten;
- ensure that all hard disk cables do not interfere with other accessories;
- attach the retaining bolts to the hard disk retaining plate;
- position the nuts and tighten them
- place the TBUF board in its correct position;
- switch the power on;
- perform a high-level format on the hard disk
- install the DFI software. The procedure to install DFI target software is described in the DFI Software Release Bulletin.

If there is already a system ID on the Harddisc that is not identical with the DFI Batram then there will be a message on the monitor:

DFI not started
System configuration inconsistent
Contacts the service organisation

Connect the service PC to the service terminal (com 1 of DFI)
Go to Faultfinding in X-scope and resets the system
After start-up a question will appear:

Changes in system configuration detect
Did you replace the Combo Board or the SCSI Disk? [c= Combo / d=Disk]:

You must give a valid answer (c or d), the system will ask for conformation:

Are you sure you replaced the SCSI disk? [y= Yes / n= No]

The system will not start before a right answer is given (make sure you changed the right part)

4.2.1. HARD DISK FAILURE

NOTE

In the case of a hard disk failure, perform a high level format. Refer to Hard disk formatting. In case of failure contact Helpdesk;

Problem description	***Remedy***
Attached SCSI disk as formatted “FAIL”.	Check SCSI disk cable and terminators.
Unable to format harddisk.	Attempt to format hard disk again (via X-scope high level). Check jumper settings & terminators. Replace hard disk.
Unable to access hard disk.	Check SCSI cabling.
Unable to access directories and/or files.	Check DFI software loaded.
Hard disk failure	Perform hard disk high level format.

4.2.2. SUSPECTED DATABASE

Problem description	***Remedy***
Unable to access image database	Re-initialise database. See caution High level formatting required. See caution
Fault message(s) from database after start DFI, Error …..	No servicing possible. Logging facility is active after a reset. It might be necessary to re-load software.

CAUTION

High level formatting does not affect the patient database;

5. SUCO FAULT FINDING PROCESS AND REPLACEMENTS

Faultfinding is based on the fact that problems in the SUCO are hardware related. This means that hardware tests are used to show malfunction of a single and well-defined FRU. Software problems mean a re-installation of the existing – available – software or patching a software bug. A software patch is issued for the “Installed Base” to enable to resolve the software problem and a release bulletin is published to communicate the solution to field service and the relevant group of BV Family System users.

The SUCO consists of several PCB’s. Fault finding of the SUCO takes place at board level and not at component level. A major instrument to test the SUCO is the SUCO self tests. A COMBO Power-on self-test (POST) and a (restricted) Built in self test (BIST). The POST is testing the COMBO and some configuration aspects of the other PCB’s automatically after any re-start of the system. With the BIST the PCB’s can be tested. The BIST will start up automatically after the application has been started up.

The SUCO is controlling the CAS sub systems comprising:

- Tank;
- Generator;
- Energy Storage Unit;
- Collimator;
- Stuco;
- II/TV chain;

5.1. STATUS LED INDICATORS

H4 [red]	***H2 [green]***	***H3 [yellow]***	***Event***
Off	Off	Off	Power off / hardware malfunction
Off	Off	On	Unused code
On	Off	Off	Self test failure
On	Off	On	Default after reset/failure processor halted
Off	On	Off	BIST ok / application running
Off	On	On	BIST ok / application not running or error
On	On	Off	BIST in progress / additional information via H3
On	On	On	BIST in progress / additional information via H3

5.2. SERVICE MENU MONITORING & LOGGING

5.2.1. SERVICE MENU

[Select X-scope path]: **Faultfind** – **Power-on Monitoring** – [reset SUCO] - [press] **shift S** [for SUCO Service Menu];

SUCO Service Menu
==========
0 Start full application
1 Display BIST result
2 Log BATRAM data
3 Reset BATRAM data
4 Set package log level
5 List error table
6 Start FIFTH only
7 Demo mode
8 Start application only
9 Generator control

Example; give choice: **1**

SUCO COMBO BIST failed, POST error,
SUCO COMBO BIST failed, ROM error,
SUCO COMBO BIST failed, VPP error,
SUCO COMBO BIST failed, DPM error,
SUCO COMBO BIST failed, PWM timer error,
SUCO COMBO BIST failed, CAN error,
SUCO COMBO BIST failed, LAN error,
SUCO COMBO BIST failed, unknown error <ddd>,

Example / Give choice: **2**

Log BATRAM data
==========

1 Log calibration data
2 Log examination [APF] data
3 Log anabelle data
4 Log dose rate data
5 Log SUCO logfile
6 Return to main menu

5.2.2. [X-SCOPE] LOGGING

[Select X-scope path]: **Faultfind** – [Select DFI or **SUCO**] – **Logging** [give choice 1/2/3/4]: **1** – **Logfile**

with the alternative choices.

1 Logfile
2 Tank history
3 Energy storage unit history
4 Calibration data

The maximum logging time is limited to 15 minutes

The following data has been logged and could be retrieved:

- Input events from stand console and SUCO;
- Start up events;
- Self test results;
- Input events from X-scope;
- Errors;
- Service updates of IP set data and configuration data;

NOTE

The errors numbers are linked to the numbering scheme of the PCB's [0 to4] in the SUCO rack;

system messages & errors come up in a structured way.

Error range	Type of error
000-099	COBO, DFI, Software
100-199	STUCO board
200-299	Pulse Master board
300-399	XGC board
400-499	BLD board

5.3. COMBO POWER ON SELF TEST

5.3.1. POST

The [COMBO] Power on self-test is started up automatically each time the power is switched ON. The POST is checking:

1. Type, version and correct location of COMBO and via COMBO the PCB's;
2. Read and write checks of COMBO;

Sub 1-

SUCO COMBO
|
XGC Pulse
|
XGC
|
PulseMaster
|
Beam limiting device
|
STUCO

Sub 2- All memories and register(s) that offer read / write functions will be verified. The results are "Passed" in case of success or "Failed" in case of problems.

A check on the POST results has to carried out in case of not passing the test results.

5.4. BUILT IN SELF TEST

5.4.1. BIST

A SUCO BIST selftest is built in for 2 reasons:

a- to prove system correctness (towards users of the BV Family System);
b- to localise system malfunctioning;

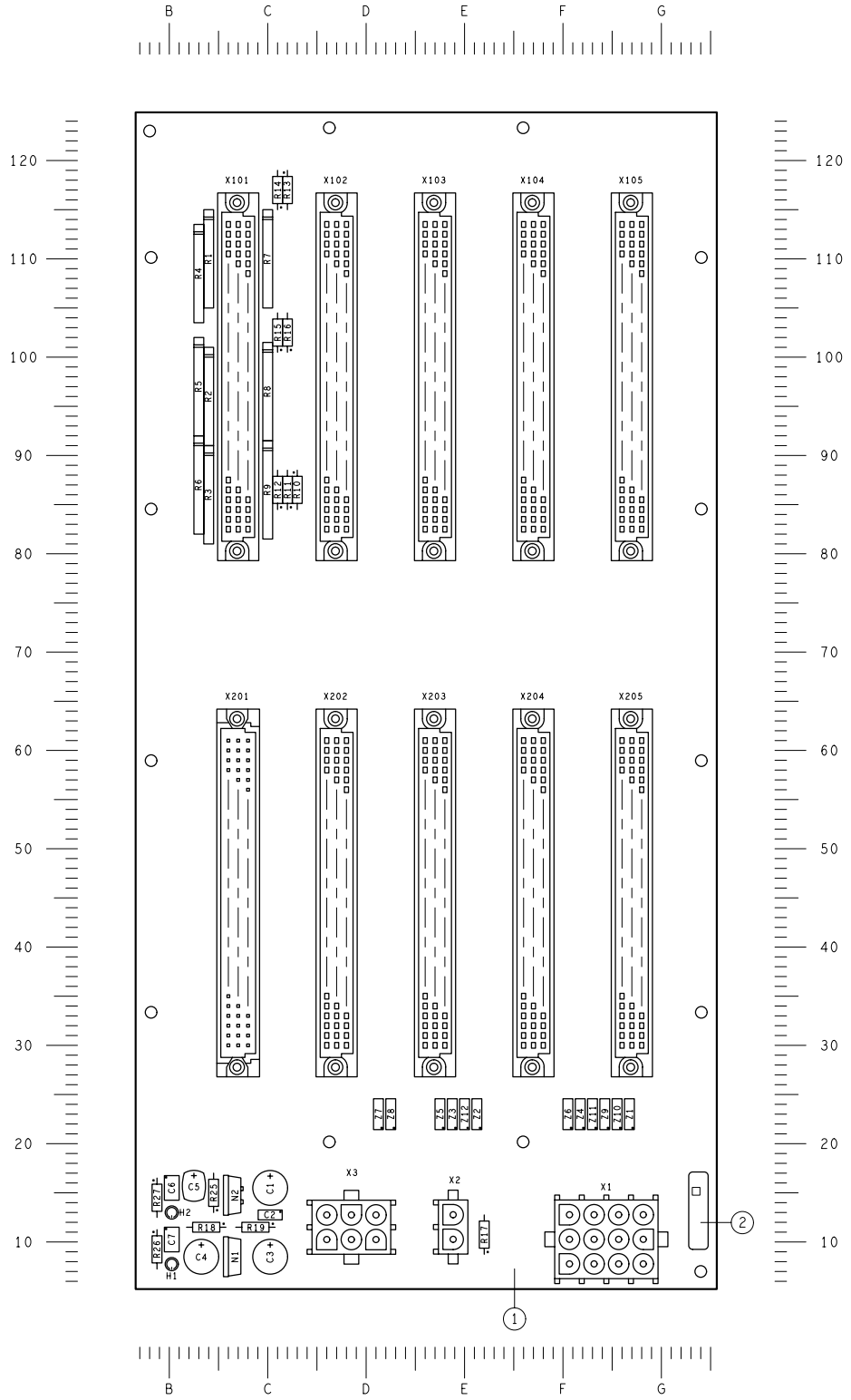
Sub a- System correctness will be dealt with in the Section Performance testing of the System Manual Installation.

Sub b- System malfunctioning/faultfinding will be described in this Section of the System Manual Corrective Maintenance.

The BIST will start up automatically after the [SUCO] application is started, a start up or reset of the SUCO.

5.5. SUCO FAULT FINDING AND [PCB] REPLACEMENTS

5.5.1. BACK PANEL



1 Functional

The back panel is the backbone of the [SUCO] PCB's. It serves as a router interconnecting all individual PCB's

2 LED's

None

3 Fuses

None

4 Jumper settings

None

5 Replacement

The procedure to remove the back panel is as follows.

- Remove the rear, right and left side covers of the CAS;
- Loosen the left and right screws on the lower retaining plate;
- Disconnect all connections / cables to allow removal of the rack;
- Pull the rack forwards;
- Loosen and remove all PCB's from the board rack;
- Loosen and remove all screws from lower rim of back panel;
- Loosen and remove all screws from upper rim of back panel;
- Remove back panel;
- Replace in reverse order

5.5.2. COMBO [COMPUTER BOARD, SHA 1]

1 Functional

The COMBO is the central board of the SUCO. This computer board controls the other boards. The SUCO application software runs on the COMBO. The COMBO also contains the serial ports for interfacing towards external devices. Basically the SUCO COMBO is identical to the DFI COMBO. The only difference is that the connectors not used are not on the front panel.

2 LED's

H1, red;
H2, green, microprocessor status indication;
H3, yellow;
H4, green, run indicator; [showing SUCO bus activity]

H [red]	*H2 [green]*	*H3 [yellow]*	*Event*
Off	Off	Off	Power off / hardware malfunction
Off	Off	On	Unused code
On	Off	Off	BIST failure
On	Off	On	Default after reset/failure processor halted
Off	On	Off	BIST ok / application running
Off	On	On	BIST ok / application not running or error
On	On	Off	BIST in progress / additional information via H3
On	On	On	BIST in progress / additional information via H3

These tables indicate the events which will cause individual LED's to illuminate.

3 Fuses

None

4 Jumper settings

All factory pre-installed.

5 Replacement

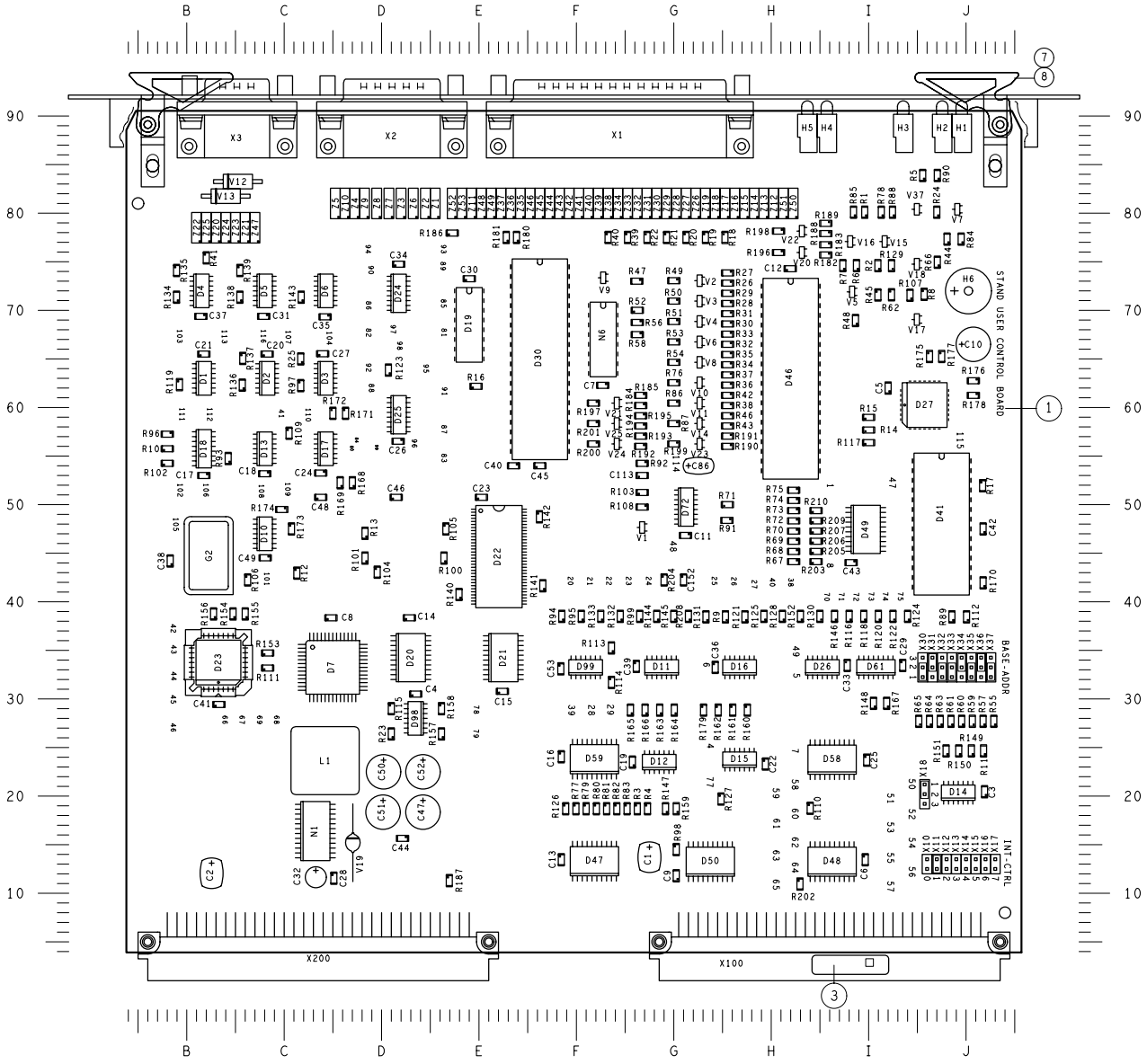
The procedure to remove the COMBO is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connecttors
- Remove COMBO
- Check jumper settings at COMBO [replacement]
- Insert COMBO [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace COMBO again if POST provides message: “defect”, repeat POST
- Load software
- Restore BATRAM data

6 Connectors

- X1: RS 232 serial interface for service
- X2: CAN interface
- X3: CAN interface

5.5.3. STUCO [STAND USER CONTROL, SHA 2]



1 Functional

The STUCO is the interface between the C-arm stand console (display) and the system lock.

2 LED's

None

3 Fuses

None

4 Jumper settings

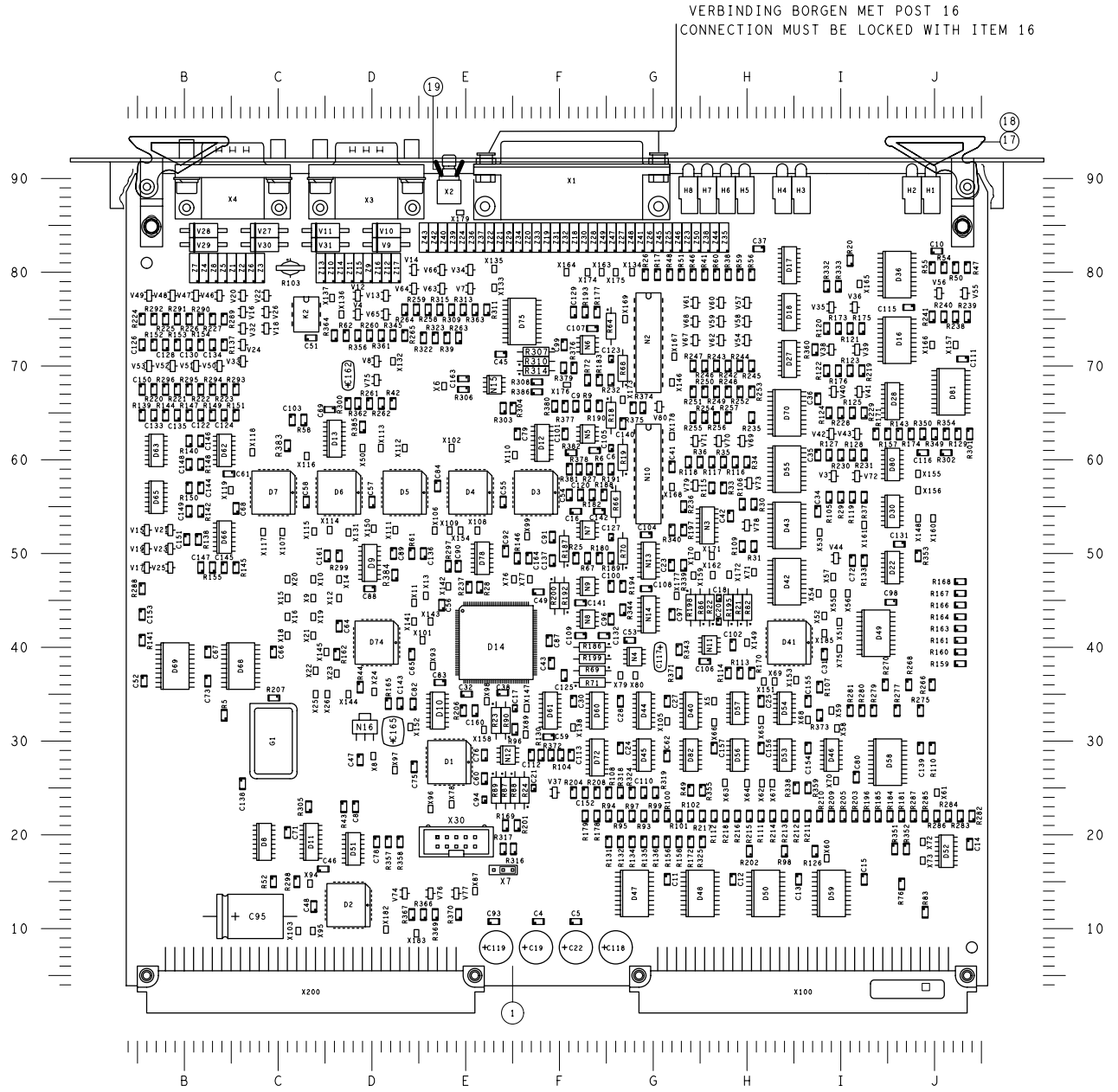
None

5 Replacement

The procedure to remove the STUCO board is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connectors
- Remove STUCO board
- Check jumper settings at STUCO board [replacement]
- Insert STUCO board [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace STUCO board again if POST provides message: "defect", repeat POST

5.5.4. PULSE MASTER BOARD [SHA 3]



1 Functional

The Pulse master board produces and controls the generation of pulses (intermittent / cardiac). It is the interface between the camera and hand switch and foot switch.

2 LED's

Identification	*Colour*	*Label*	*Explanation*
H1 A / B H2 A / B	Red Green	Error Run	Indication of test results during Power on
H3 A H3 B	Green Green	+5 V +24 V	ON = + 5 V DC present ON = + 24 V DC present
H4 A H4 B	Green Green	+15 V -15 V	ON = + 15 V DC present ON = - 15 V DC present
H5 A H5 B	Yellow Yellow	"SAFETY" "ECG trigger"	ON = hand/footswitch command active ON = ECG trigger command present (not used)
H6 A H6 B	Yellow Yellow	"CTRL X" "X ACT."	ON = control X-ray command active ON = X-ray actual command present
H7 A H7 B	Yellow Yellow	"IM AV" "ENKVAC"	ON = image available command present ON = enable kV automatic control
H8 A H8 B	Yellow Yellow	"FRTRSP" "DRCO"	ON = Frame transfer suppression command on ON = Dose rate correct command present

3 Fuses

None

4 Jumper settings

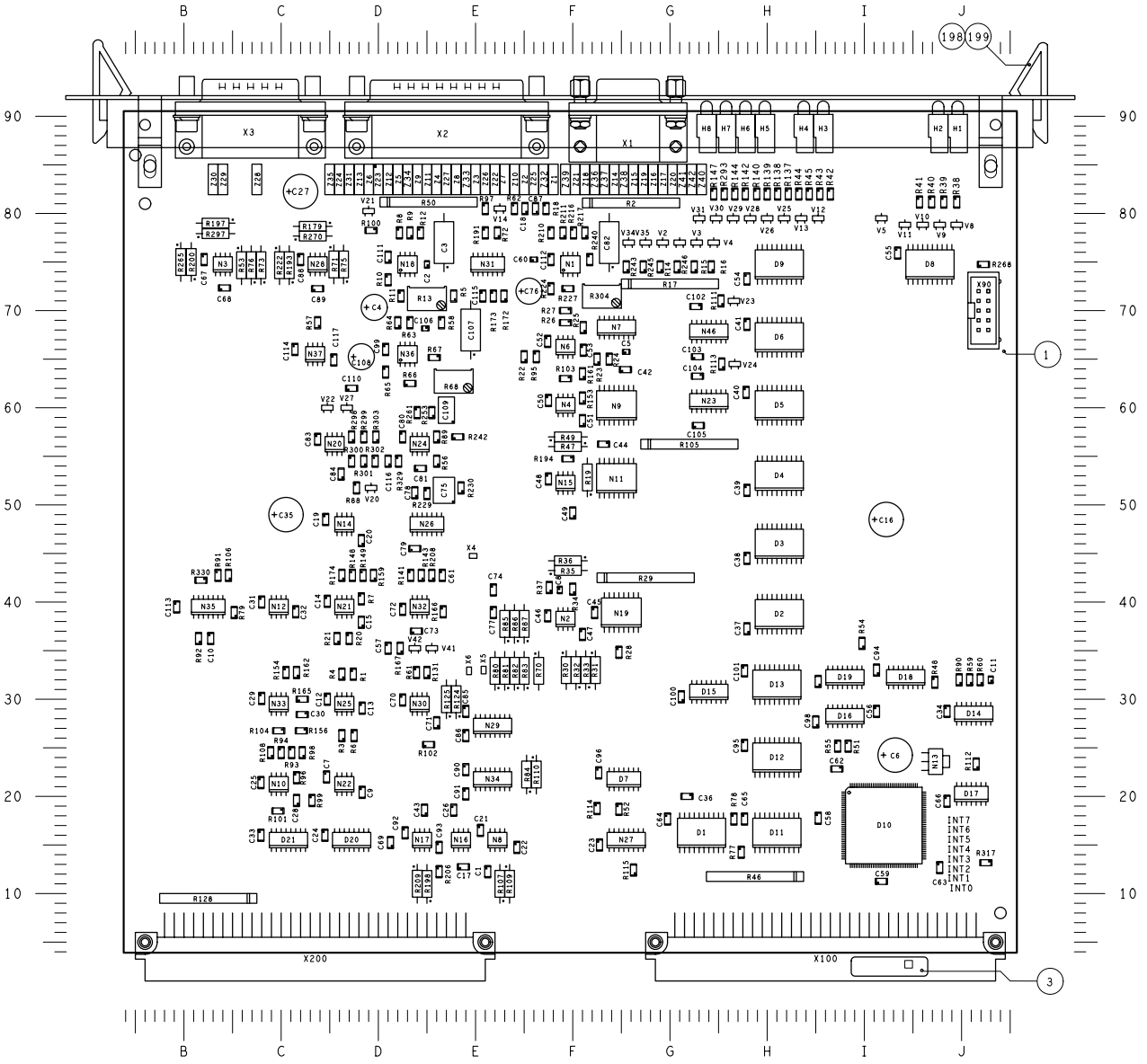
None

5 Replacement

The procedure to remove the Pulse Master board is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connectors
- Remove Pulse Master board
- Check jumper settings at Pulse Master board [replacement]
- Insert Pulse Master board [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace Pulse Master board again if POST provides message: "defect", repeat POST

5.5.5. XGC PULSE BOARD [BV PULSERA X-RAY GENERATOR CONTROL, SHA 4]



1 Functional

The XGC Pulse board is the counterpart of the XGC board on the rotating anode systems of the BV Pulsera and controls the X-ray generation.

2 LED's

Identification	*Colour*	*Label*	*Explanation*
H1 A / B H2 A / B	Red Green	Error Run	Indication of test results during Power on
H3 A H3 B	Green Green	+ 5 V + 15 V	ON = + 5 V DC present ON = +3.3 V DC present
H4 A H4 B	Green Green	- 15 V - + 24 V	ON = - 15 V DC present ON = + 15 V DC present
H5 A H5 B	Yellow Yellow	"Safety" "En X sw"	ON = hand/footswitch command active ON = X-ray software command present
H6 A H6 B	Yellow Yellow	"HFSACM" "RD PR X"	ON = hand/footswitch safety command active ON = ready prepare X-ray command present
H7 A H7 B	Yellow Yellow	"CTRL X" "HVCOM"	ON = control X-ray command present ON = high voltage command present
H8 A H8 B	Yellow Yellow	"RADPR" "X ACT."	ON = radiation present ON = x-ray actual command present

3 Fuses

None

4 Jumper settings

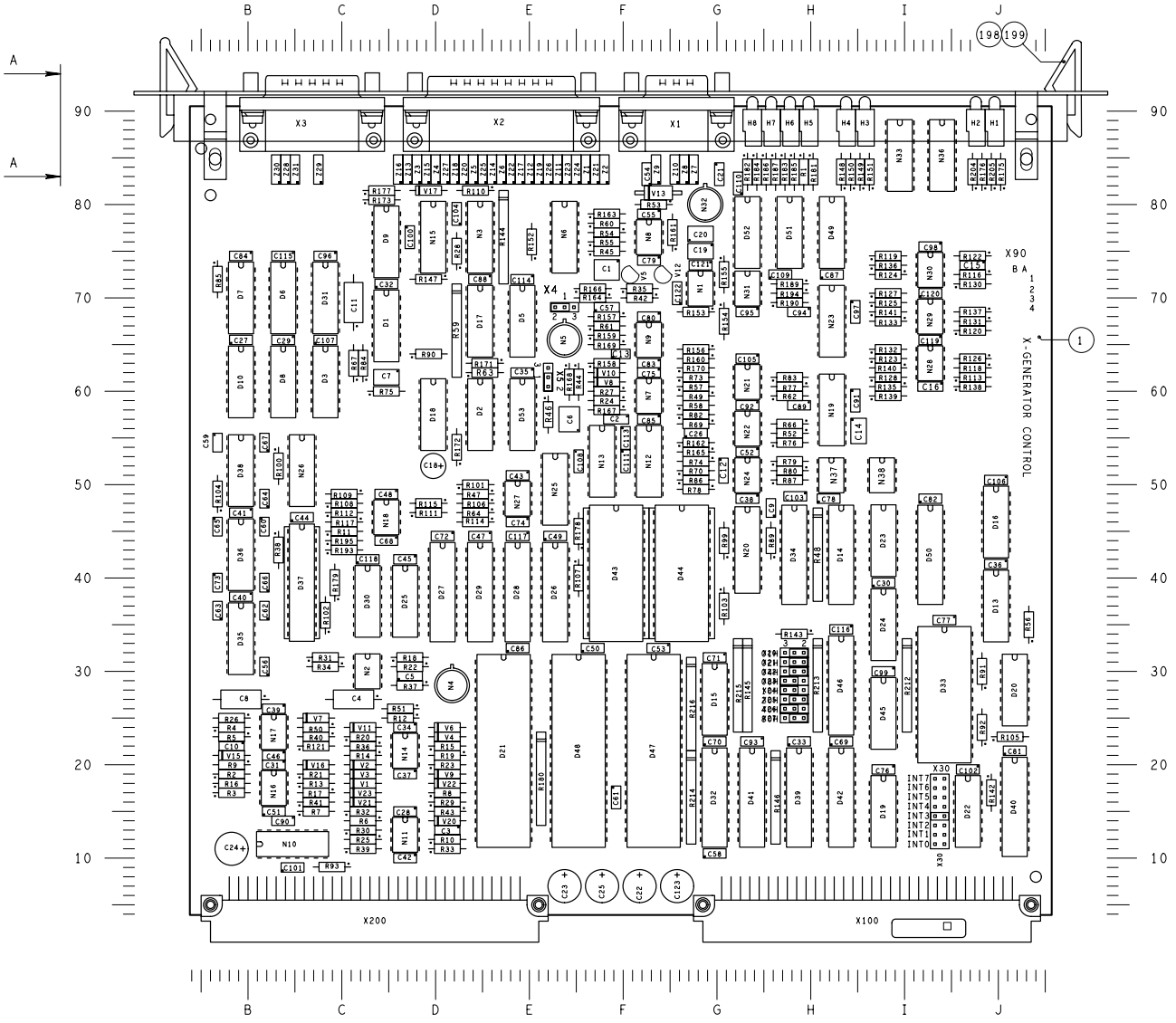
None

5 Replacement

The procedure to remove the XGC Pulse board is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connectors
- Remove XGC Pulse board
- Check jumper settings at XGC Pulse board [replacement]
- Insert XGC Pulse board [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace XGC Pulse board again if POST provides message: "defect", repeat POST

5.5.6. XGC BOARD [BV ENDURA X-RAY GENERATOR CONTROL, SHA4]



1 Functional

The XGC board is the counterpart of the XGC Pulse board on the fixed anode system of the BV Endura and controls the X-ray generation.

2 LED's

Identification	*Colour*	*Label*	*Explanation*
H1 A / B H2 A / B	Red Green	Error Run	Indication of test results during Power on
H3 A H3 B	Green Green	+ 5 V + 15 V	ON = + 5 V DC present ON = +3.3 V DC present
H4 A H4 B	Green Green	- 15 V + 24 V	ON = - 15 V DC present ON = + 15 V DC present
H5 A H5 B	Yellow Yellow	"SAFETY" "EN X SW"	ON = hand/footswitch command active ON = X-ray software command present
H6 A H6 B	Yellow Yellow	"HFSACM" "RD PR X"	ON = hand/footswitch safety command active ON = ready prepare X-ray command present
H7 A H7 B	Yellow Yellow	"CTRL X" "HVCOM"	ON = control X-ray command present ON = high voltage command present
H8 A H8 B	Yellow Yellow	"RADPR" "X ACT"	ON = radiation present ON = x-ray actual command present

3 Fuses

None

4 Jumper settings

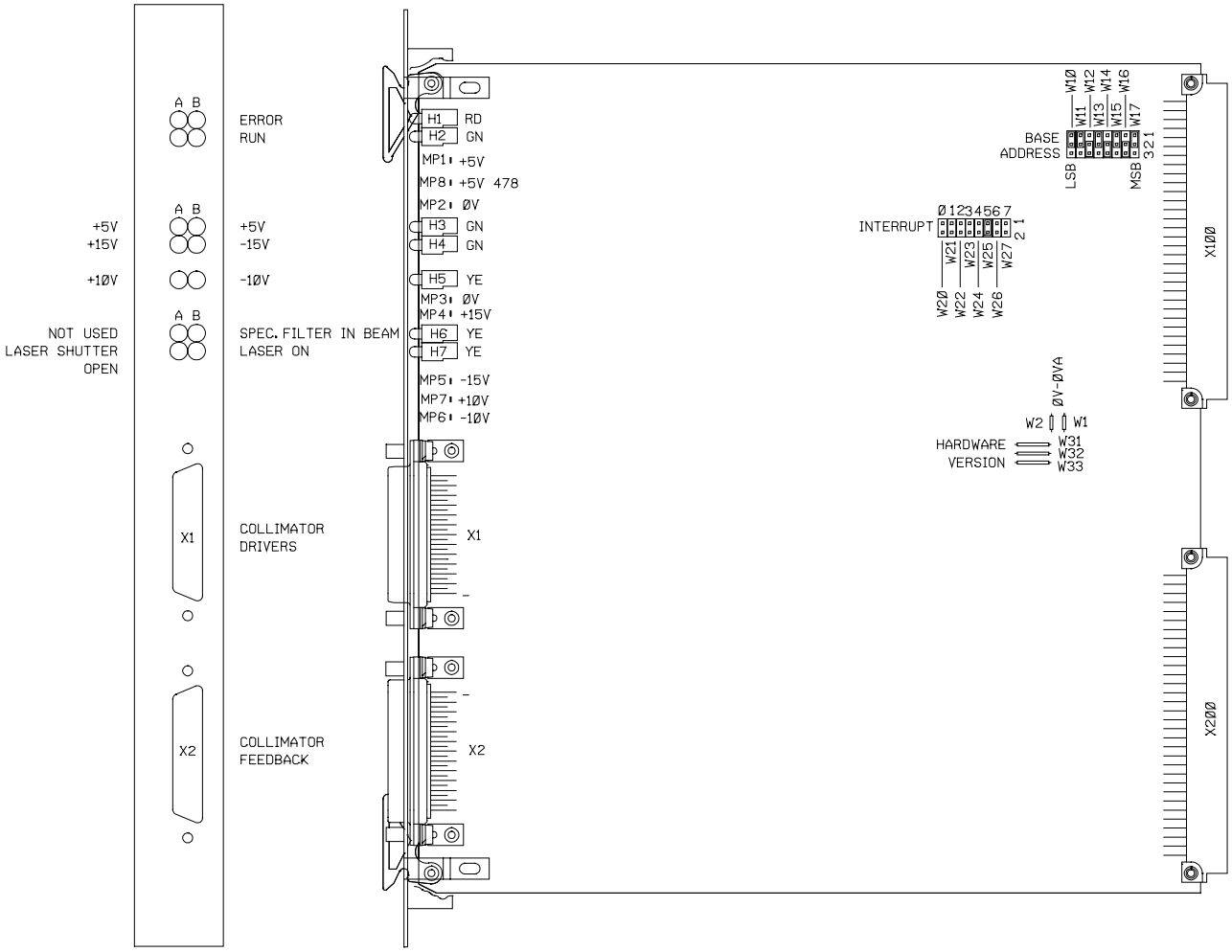
Identification	*Position*	*Explanation*
X4	1–2 (factory default) 1–3	mA set mA actual
X5	1-2 (factory default) 1-3	mA set + 0.7 V mA set – 0 V

5 Replacement

The procedure to remove the XGC board is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connectors
- Remove XGC board
- Check jumper settings at XGC board [replacement]
- Insert XGC board [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace XGC board again if POST provides message: "defect", repeat POST

5.5.7. X-RAY BEAM COLLIMATOR BOARD [SHA 5]



1 Functional

The X-ray beam collimator board (beam limiting device) controls the beam limiter on top of the X-ray tank and the [optional] tank LAT.

2 LED's

Identification	*Colour*	*Label*	*Explanation*
H1 A / B H2 A / B	Red Green	Error Run	Indication of test results during Power on
H3 A H3 B	Green Green	+ 5 V + 5 V	ON = + 5 V DC present ON = + 5 V DC present
H4 A H4 B	Green Green	+ 15 V - 15 V	ON = + 15 V DC present ON = - 15 V DC present
H5 A H5 B	Yellow Yellow	+ 10 V - 10 V	ON = + 10 V present (on board generated) ON = - 10 V present (on board generated)
H6 A H6 B	Yellow Yellow	Not used "SPEFIL"	ON = spectral filter moved into X-ray beam
H7 A H7 B	Yellow Yellow	"LASERSH" "LASER"	ON = laser shutter open ON = laser on

3 Fuses

None

4 Jumper settings

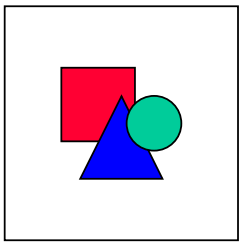
All factory fixed.

5 Replacement

The procedure to remove the Collimator board is as follows.

- Switch OFF power
- Put on wrist strap
- Disconnect connectors
- Remove Collimator board
- Check jumper settings at Collimator board [replacement]
- Insert Collimator board [replacement]
- Connect connectors
- Remove wrist strap
- Switch ON power
- Perform POST
- Replace Collimator board again if POST provides message: "defect", repeat POST

5.6. POWER SUPPLY BV ENDURA / BV PULSERA



1 Functional

2 LED's

H1	green	+ 5 V 478	ON when + 5 V at 478 present
H2	green	+ 5 V A1	ON when + 5 V at A1 present
H3	green	+ 5 V A2	ON when + 5 V at A2 present
H4	green	+ 5 V A3	ON when + 5 V at A3 present
H5	green	+ 24 V A1	ON when + 24 V at A1 present
H6	green	+ 24 V A2	ON when + 24 V at A2 present
H7	green	+ 15 V	ON when + 15 V present
H8	green	- 15 V	ON when - 15 V present
H9	green	+ 12 V	ON when + 12 V present
H10	green	- 12 V	ON when + 12 V present

3 Fuses

F1	10 A	+ 5 V 478
F2	5 A	+ 5 V A1
F3	5 A	+ 5 V A2
F4	5 A	+ 5 V A3
F5	3 A	+ 24 V A1
F6	3 A	+ 24 V A2
F7	5 A	+ 12 V [+15 V]
F8	5 A	- 12 V [- 15 V]
F9	5 A	Spares
F10	3 A	Spares

4 Jumper settings

W1	2 – 3	+ 5 V sense (RS = remote screen)
	1 - 2	non sense (LS = local screen)

5 Replacement

- Remove mains connector or switch stand OFF.
- Remove the rear and right sight plastic covers of the CAS.
- Disconnect all the connectors on the distribution board.
- Loosen the screws that secure the complete unit.
- Lift the unit and take it out.
- Place the new power supply unit.
- Secure the screws for the power supply unit.
- Fit the [4] connectors to the power supply unit.
- SUB X1 to X1
- SUB X2 to X2
- SUB X5 to X5
- SUB X8 to X8
- Check the jumper setting [default is RS] of power unit.
- Check that the system switches ON correctly.
- Refit the covers to the stand.

5.7. POWER SUPPLY BV LIBRA

1 Functional

2 LED's

None

3 Fuses

None

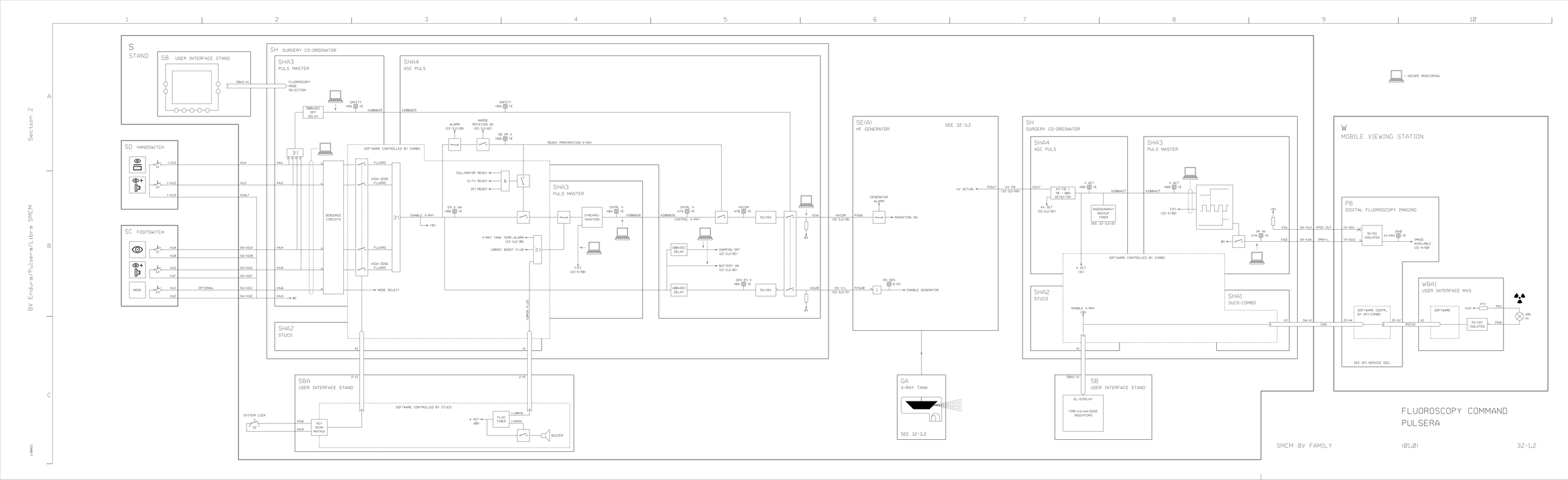
4 Jumper settings

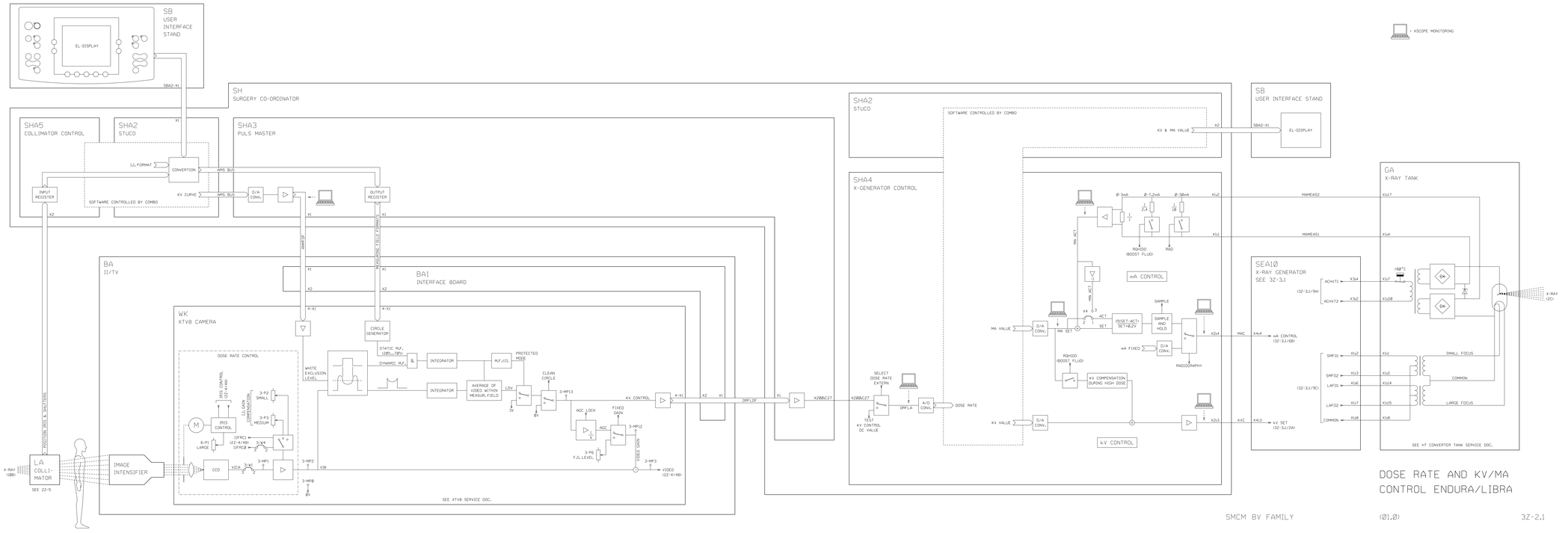
None

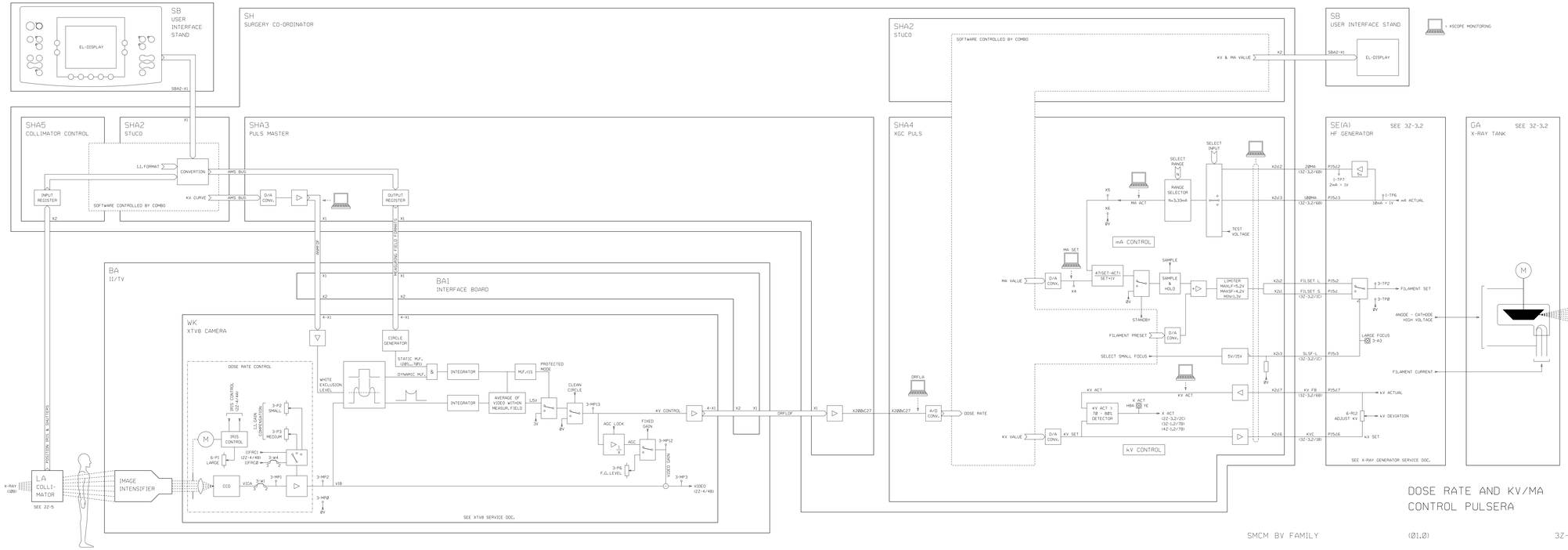
5 Replacement

- Remove mains connector or switch stand OFF.
- Remove the rear and right sight plastic covers of the CAS.
- Remove EMC cover over the powersupply
- Disconnect all the connectors and wires on the power supply unit.
- Loosen the screws that secure the complete unit.
- Lift the unit and take it out.
- Place the new power supply unit.
- Secure the screws for the power supply unit.
- Fit the connectors and wires to the power supply unit.
- SUB X904 to X904
- Pink wire on +
- Yellow wire on -
- From cable SUB X1 blue wire on L
- From cable SUB X1 brown wire on N
- From cable SUB X1 earth wire on earth
- Check that the system switches ON correctly.
- Refit the covers to the stand.


S
STAND
SB USER INTERFACE STAND
SD HANDSWITCH
SC FOOTSWITCH
SH SURGERY CO-ORDINATOR
SHA3 PULS MASTER
SHA4 X-GENERATOR CONTROL
SHA3 PULS MASTER
SHA2 STUCO
SEA10 GEN300 BACKPANEL
SEA2 FET POWER CONTROL
SBA USER INTERFACE STAND
SOFTWARE CONTROLLED BY STUCO
SH SURGERY CO-ORDINATOR
SHA4 X-GENERATOR CONTROL
SHA3 PULS MASTER
SHA2 STUCO
SHA1 SUCO-COMBO
SOFTWARE CONTROLLED BY COMBO
SB USER INTERFACE STAND
W MOBILE VIEWING STATION
PB DIGITAL FLUOROSCOPY IMAGING
WBA1 USER INTERFACE MVS
FLUOROSCOPY COMMAND
ENDURA/LIBRA
SMCM BV FAMILY
(01.1)
3Z-1.1

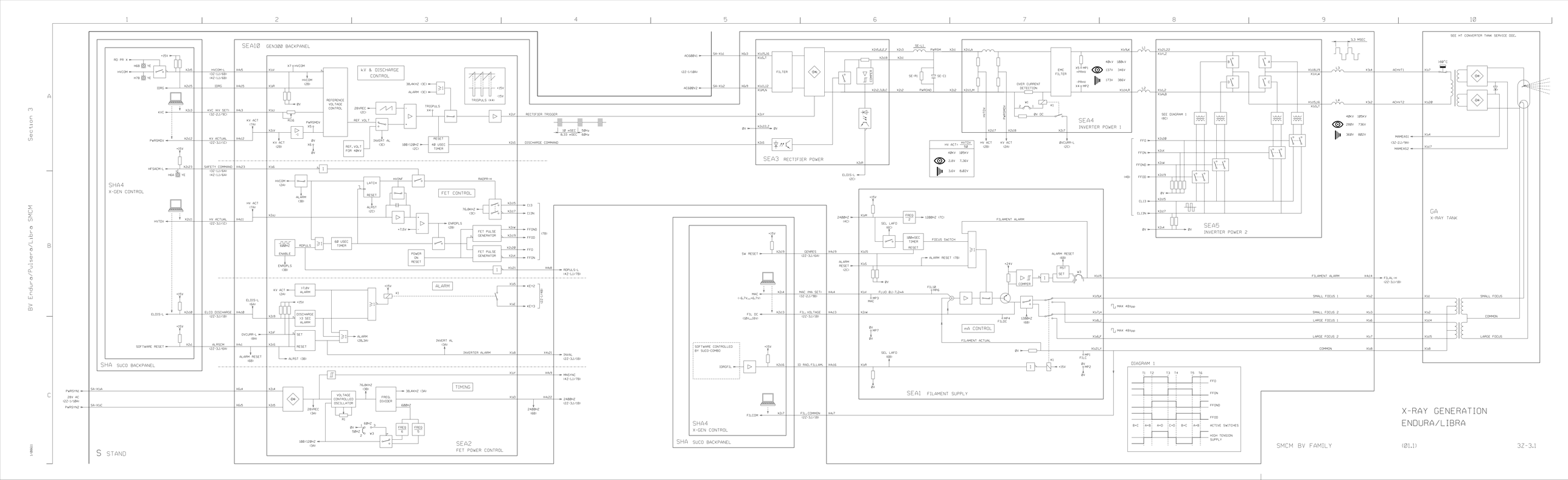

S
STAND
SB USER INTERFACE STAND
SBA2-X1
FLUOROSCOPY MODE SELECTION
SH SURGERY CO-ORDINATOR
SHA3 PULS MASTER
SHA4 XGC PULS
SAFETY H5A YE
X20BN825
500mSEC OFF DELAY
SAFETY H5A
ALARM (2Z-3.2/2B)
ANODE ROTATION OK (3Z-3.2/6C)
RO PR X H6B YE
READY PREPARATION X-RAY
SD HANDSWITCH
S1
1-X1.1
1-X1.2
1-X1.3
X1.4
X1.2
X1.6,7
SC FOOTSWITCH
S1
S2
S3
X1.A
X1.B
X1.C
X1.E
X1.F
OPTIONAL
MODE
SA-X2.A
SA-X2.B
SA-X2.C
SA-X2.E
SA-X2.F
SOFTWARE CONTROLLED BY COMBO
DEBOUNCE CIRCUITS
X4.1
X4.2
X4.4
X4.5
X4.6
X4.3
8V
FLUORO
HIGH DOSE FLUORO
MODE SELECT
ENABLE X-RAY
(1C)
COLLIMATOR READY
II/TV READY
DFI READY
EN X SW H5B YE
X-RAY TANK TEMP. ALARM (2Z-3.2/3B)
>225EC BOOST FLUO
DFI (2Z-4/5B)
SHA3 PULS MASTER
SYNCHRO-NISATION
CNTRL X H6A YE
X20BN826
CNTRL X H7A
CONTROL X-RAY
120mSEC DELAY
DAMPING OFF (2Z-3.2/8C)
BATTERY ON (2Z-3.2/8C)
HVCOM H7B YE
5V/15V
X2x6
8V
X2x9
EN X-L (3Z-3.2/1C)
P15x9
EN GEN X H6A YE
EN GEN 6-A3
SHA2 STUCO
X1
SBA USER INTERFACE STAND
2-X1
SOFTWARE CONTROLLED BY STUCO
SYSTEM LOCK
S2
X5x8
X5x9
KEY SCAN MATRIX
X ACT (8B)
FLUO TIMER >>1SMIN
BUZZER
SE(A) HF GENERATOR
SEE 3Z-3.2
HVCOM (3Z-3.2/3B)
P15x6
GENERATOR ALARM
RADIATION ON
EN GEN
ENABLE GENERATOR
GA X-RAY TANK
SEE 3Z-3.2
kV ACTUAL
P15x7
kV FB (3Z-3.2/6B)
X2d7
kV FB > 70 : DEL DETECTOR
kV SET (3Z-3.2/8C)
X ACT H6A YE
X20BN827
RADIOGRAPHY BACKUP TIMER
SEE 2Z-3.2/2E
SH SURGERY CO-ORDINATOR
SHA4 XGC PULS
SHA3 PULS MASTER
X ACT H6A YE
X20BN827
F3FI (2Z-4/5B)
+5V
8V
IM AV H7A YE
X3d
X3x2
SOFTWARE CONTROLLED BY COMBO
X ACT (3C)
SHA2 STUCO
SHA1 SUCO-COMBO
ENABLE X-RAY (3B)
X1
X3
SA-X1
CAN
+ XSCOPE MONITORING
W
MOBILE VIEWING STATION
PB
DIGITAL FLUOROSCOPY IMAGING
14-X2d
14-X2z
5V/5V ISOLATED
12V/0 14-mAb YE
IMAGE AVAILABLE (2Z-4/6B)
SA-X3x2
SA-X3x4
VPOS OUT
IMAV-L
WBA1
USER INTERFACE MVS
I5-X4
I5-X2
SOFTWARE CONTR. BY OFI-COMBO
RS232
X2
SOFTWARE
+12V
PTC
X5d
5V/12V ISOLATED
X5d
WBL HI
SEE OFI SERVICE DOC.
FLUOROSCOPY COMMAND
PULSERA
SMCM BV FAMILY
(Ø1.Ø)
3Z-1.2
BV Endura/Pulsera/Libra SMCM
Section 2
1MN81

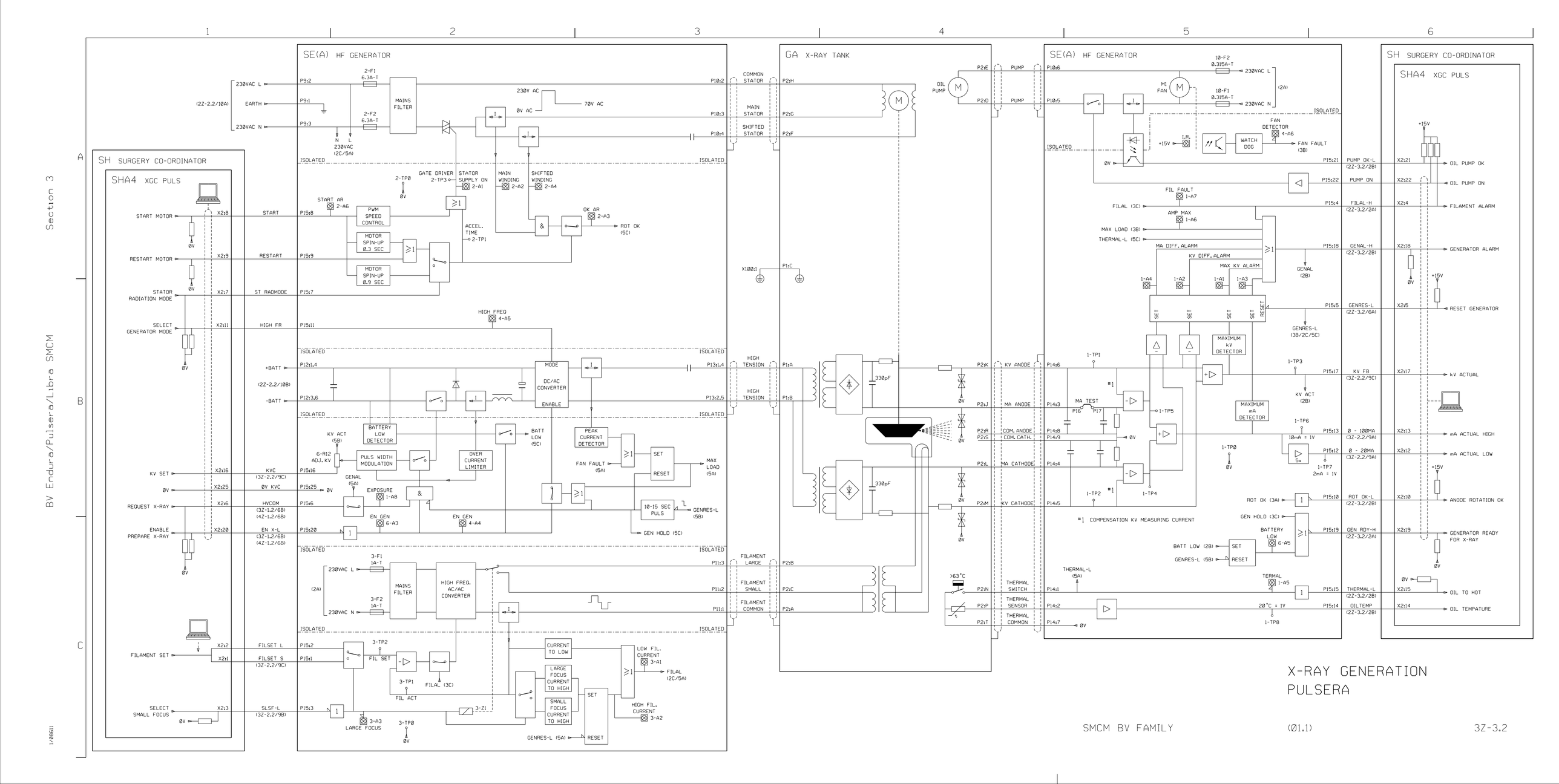

SB
USER INTERFACE STAND
EL-DISPLAY
SBA2-X1
SH
SURGERY CO-ORDINATOR
SHA5
COLLIMATOR CONTROL
SHA2
STUCO
SHA3
PULS MASTER
I.I.FORMAT
CONVERTION
AMS BUS
INPUT REGISTER
KV CURVE
D/A CONV.
OUTPUT REGISTER
SOFTWARE CONTROLLED BY COMBO
X1
X2
ANALOG
DIGITAL FIELD CHANGE
BA
I.I/TV
BA1
INTERFACE BOARD
WK
XTV8 CAMERA
CIRCLE GENERATOR
STATIC MLF.
DYNAMIC MLF.
INTEGRATOR
MLF.±1%
PROTECTED MODE
AVERAGE OF VIDEO WITHIN MEASUR.FIELD
1.5V
3V
8V
CLEAN CIRCLE
3-MP13
AGC LOCK
AGC
FIXED GAIN
3-MP12
3-P6
F.G.LEVEL
VIDEO GAIN
3-MP3
VIDEO (Z2-4/4B)
KV CONTROL
4-X1
DOSE RATE CONTROL
WHITE EXCLUSION LEVEL
IRIS CONTROL (Z2-4/4B)
I.I.GAIN COMPENSATION
3-P2 SMALL
3-P3 MEDIUM
IRIS CONTROL
(IIFIC1 Z2-4/4B)
(IIFIC2)
6-P1 LARGE
3-K4
3-K2
3-K1
3-MP1
CCD
VICA
3-MP2
VIB
3-MP8
8V
SEE XTV8 SERVICE DOC.
POSITION, IRIS & SHUTTERS
LA
COLLI-MATOR
SEE ZZ-5
X-RAY (I2B)
IMAGE INTENSIFIER
DMFLDF
X20BBC27
SHA2
STUCO
SOFTWARE CONTROLLED BY COMBO
KV & MA VALUE
SHA4
X-GENERATOR CONTROL
SELECT DOSE RATE EXTERN
DMFLR
A/D CONV.
DOSE RATE
TEST KV CONTROL DC VALUE
MA VALUE
MA SET
MA ACT
mA CONTROL
RQH100 (BOOST FLUO)
RAD
mA FIXED
SAMPLE AND HOLD
RADIOGRAPHY
MSET-(ACT) SET+8.2V
KV COMPENSATION DURING HIGH DOSE
KV VALUE
kV CONTROL
SB
USER INTERFACE STAND
EL-DISPLAY
SBA2-X1
CA
X-RAY TANK
MAMEAS2
MAMEAS1
SEA10
X-RAY GENERATOR
SEE 3Z-3.1
ACHVT1
ACHVT2
I3Z-3.1/9A
I3Z-3.1/9C
SMF01
SMF02
LAF01
LAF02
COMMON
MAC
mA CONTROL I3Z-3.1/6B
KVC
kV SET I3Z-3.1/2A
SMALL FOCUS
COMMON
LARGE FOCUS
SEE HT CONVERTER TANK SERVICE DOC.
X-RAY (I2C)
= XSCOPE MONITORING
DOSE RATE AND KV/MA CONTROL ENDURA/LIBRA
SMCM BV FAMILY
(Ø1.Ø)
3Z-2.1



DOSE RATE AND KV/MA CONTROL PULSERA

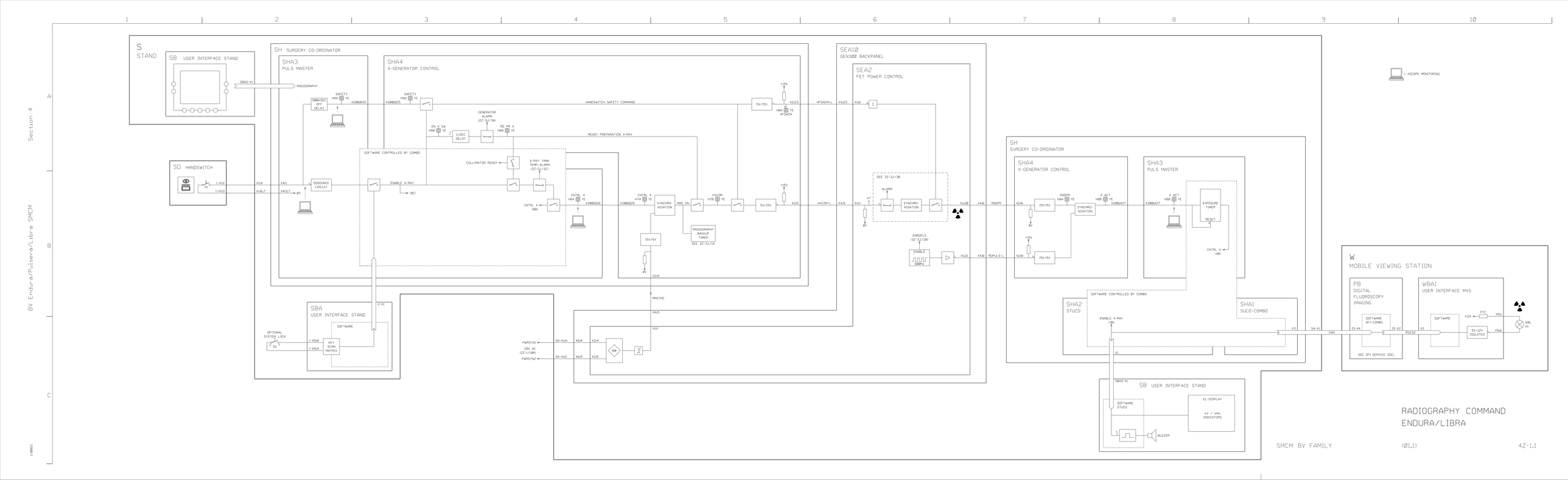
SMCM BV FAMILY (Ø1.Ø) 3Z-2.2

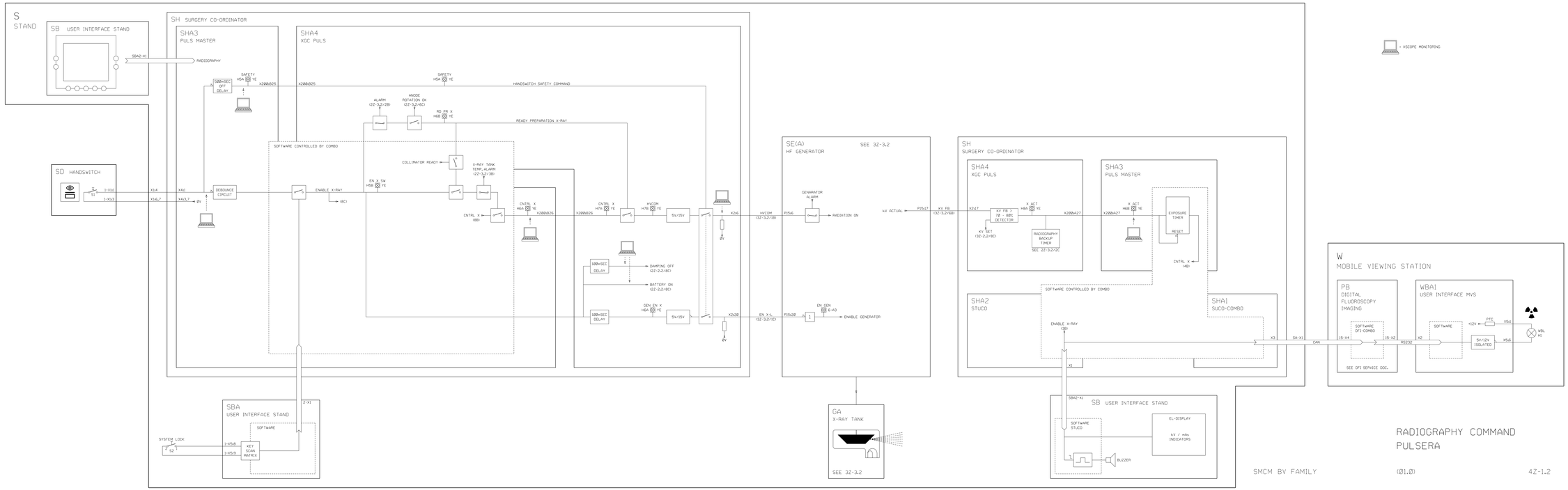

SEA10 GEN300 BACKPANEL
SHA4 X-GEN CONTROL
SHA SUCO BACKPANEL
S STAND
SEA2 FET POWER CONTROL
SEA3 RECTIFIER POWER
SEA4 INVERTER POWER 1
SEA5 INVERTER POWER 2
SEA1 FILAMENT SUPPLY
SHA4 X-GEN CONTROL
SHA SUCO BACKPANEL
GA X-RAY TANK
SEE HT CONVERTER TANK SERVICE DOC.
DIAGRAM 1
X-RAY GENERATION
ENDURA/LIBRA
SMCM BV FAMILY
(Ø1.1)
3Z-3.1
BV Endura/Pulsar/Libra SMCM
Section 3



X-RAY GENERATION PULSERA

SMCM BV FAMILY (Ø1.1) 3Z-3.2


S
STAND
SB USER INTERFACE STAND
SBA2-X1
RADIOGRAPHY
SD HANDSWITCH
S1
1-X1c
1-X1b
X1a4
X4a1
X4a3,7
0V
DEBOUNCE CIRCUIT
SH SURGERY CO-ORDINATOR
SHA3
PULS MASTER
SHA4
X-GENERATOR CONTROL
RAD=SEC OFF DELAY
SAFETY
HSA
YE
X2BNB25
SOFTWARE CONTROLLED BY COMBO
ENABLE X-RAY
(BC)
EN X SW
HSB
1.5SEC DELAY
GENERATOR ALARM
(Z2-3J/3A)
RD PR X
HEB
READY PREPARATION X-RAY
HANDSWITCH SAFETY COMMAND
COLLIMATOR READY
X-RAY TANK TEMP. ALARM
(Z2-3J/3C)
CNTRL X
HBA
X2BNB26
CNTRL X
(BB)
CNTRL X
H7A
SYNCHRO-NISATION
RAD_ON
H7B
HVCOM
5V/15V
15V/5V
RADIOGRAPHY BACKUP TIMER
SEE Z2-3J/3A
+15V
X2v23
HFSACM
HFSACM-L
SEA10
GEN300 BACKPANEL
SEA2
FET POWER CONTROL
X1v6
X4v23
X2v5
HVCOM-L
X4v5
X1v7
SEE 32-3J/3B
ALARM
SYNCHRO-NISATION
X1z8
X4v6
RADPR
ENPOPLS
(32-3J/2B)
ENABLE
6.66MHz
X1z1
X4v8
POPLS-L
SH
SURGERY CO-ORDINATOR
SHA4
X-GENERATOR CONTROL
SHA3
PULS MASTER
X2v6
RADPR
HBA
YE
15V/5V
SYNCHRO-NISATION
X ACT
HBB
X2BNA27
EXPOSURE TIMER
RESET
CNTRL X
(4B)
SHA2
STUCO
SHA1
SUCO-COMBO
SOFTWARE CONTROLLED BY COMBO
ENABLE X-RAY
X1
X3
SA-X1
CAN
SBA
USER INTERFACE STAND
SOFTWARE
OPTIONAL SYSTEM LOCK
S2
1-X5v8
1-X5v9
KEY SCAN MATRIX
2-X1
PWRSYN1
PWRSYN2
28V AC
(Z2-1/3BA)
SA-X1A
SA-X1C
X6v4
X6v5
X2v4
X2v5
MNSYNC
X4v9
X5v9
SBA2-X1
SB USER INTERFACE STAND
SOFTWARE STUCO
EL-DISPLAY
4/7 7-mths INDICATORS
BUZZER
W
MOBILE VIEWING STATION
PB
DIGITAL FLUOROSCOPY IMAGING
SOFTWARE DFI-COMBO
I5-X4
I5-X2
RS232
SEE DFI SERVICE DOC.
WBA1
USER INTERFACE MVS
SOFTWARE
X2
+12V
PTC
X5z1
5V/12V ISOLATED
X5z6
WBL H1
X SCOPE MONITORING
RADIOGRAPHY COMMAND
ENDURA/LIBRA
SMCM BV FAMILY
(Ø1.1)
4Z-1.1
BV Endura/Pulsera/Libra SMCM
Section 4
1
2
3
4
5
6
7
8
9
10
A
B
C



RADIOGRAPHY COMMAND PULSERA

SMCM BV FAMILY (Ø1.Ø) 4Z-1.2