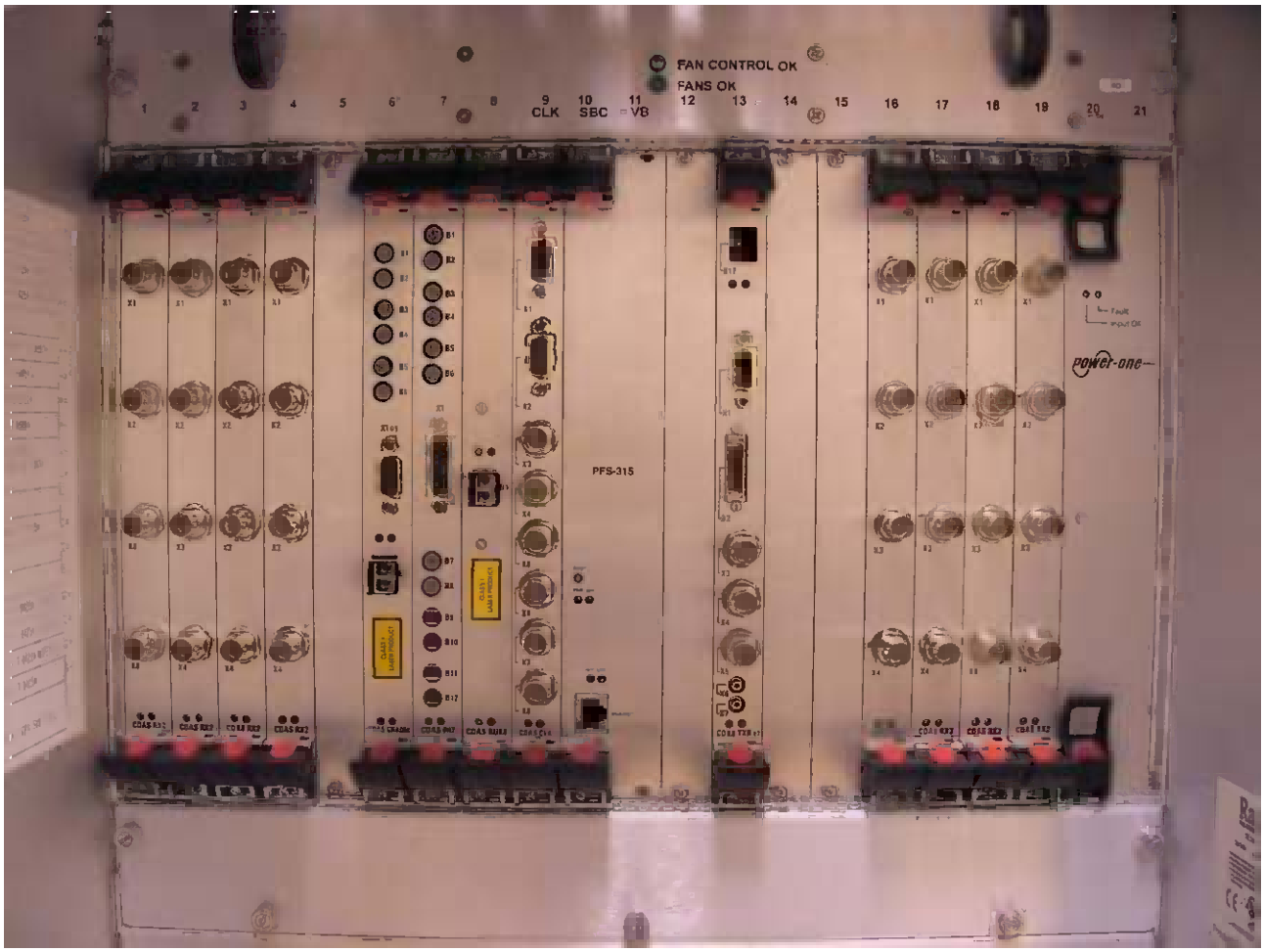
Faultfinding procedures CDAS & PFEI



Contents

1 PREFACE

1.1 PURPOSE OF THIS MANUAL

This document deals with what to do with the outcome of the CDAS self-test.
The following outcomes are dealt with:

- CDAS TXR board test, result: **'Stopped'**
- PFEI tests, result: **'Errors'**
- CDAS TXR board test, result: **'Error'**
- CDAS RX board test, result: **'Error'**
- GCI2 board test, result: **'Error'**

In the corresponding chapters, you can find what to do when such a message appears. The information is given in the way of faultfinding procedures.

1.2 FAULTFINDING PROCEDURES

Please follow the faultfinding procedure in the relevant chapter carefully and give your feedback if you see possible improvements. Send your feedback to frans.speur@philips.com
Always check on InCenter if you use the latest version of this document.

The answer to a question in a cell of a faultfinding procedure can be "***Yes***" or "***No***".
Proceed according to your answer.

Tip: during faultfinding, mark the "***Yes***" or "***No***" after each answered question.
In this way, you record the steps in your faultfinding process. This can be important if you consult other engineers or have to escalate a problem to a next support level.

If you read 'problem solved' in one of the faultfinding procedures this means: the problem of that faultfinding procedure has been solved. So, the problem with which the faultfinding procedure starts has been solved.

In the faultfinding procedures in this document, the assumption is that only one problem occurs at the same time. If you solved one problem and another problem remains, use another relevant faultfinding procedure to solve this problem.

1.3 CDAS SELF-TEST

The CDAS self-test performs most CDAS and all PFEI board tests. The following boards are tested:

- CDAS-TXR (if applicable incl. multi-nuclei TXR) (the multi-nuclei TXR board is identical to the other TXR)
- CDAS-RX (all RX boards)
- CDAS-CLK
- PFEI-CFINT
- PFEI-MRX (both if applicable)
- PFEI-QDD/QBC control board
- PFEI-TRSW
- CDAS-GRADM
- GCI2
- CDAS-PAT
- The HOST-RECON simulation test is performed.

1.4 FAULTFINDING PHILOSOPHY

The faultfinding process is of major importance for corrective maintenance and could be approached as follows. Any user should like to have 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.

Faultfinding and consequently parts replacements and/or adjustment & verification, are essential elements in this process. For optimal continuity and cost effectiveness in the operation of the system, the 80-20 rule is be used.

In approximately 80% of the cases, the problems should be solved by field service. This should be done by the field service engineer (FSE) himself with the help of the available service documentation.
In approximately 20% of the cases, problems are not solvable and/or cannot be allocated within a limited period. These faults can only be allocated together with dedicated support and/or assistance of specialists.

The goal of this document is to provide faultfinding procedures for the problems that occur in 80% of the cases. The faultfinding procedures end with the replacement of an FRU, an adjustment or the advice to escalate the problem to a next support level.

1.5 COMPATIBILITY

This document applies to all systems with a CDAS and a PFEI,
however, not for CDAS PFEI boards with the multi-nuclei option.

Therefore, the faultfinding procedures in this document do **not** apply for:
- the multi nuclei receive boards in the slots 5 and 15
- the multi nuclei splitter in slot 12
- the multi nuclei coil-int board in the MMD slot of the PFEI

1.6 ABBREVIATIONS AND DEFINITIONS

Abbreviation	Explanation
ADC	Analog to Digital Converter (A/D)
CDAS	Control and Data Acquisition System
CFINT board	Control Fiber INTerface board
CLK board	Clock board
DHCP server	Dynamic Host Configuration Protocol
FRU	Field Replaceable Unit
FSE	Field Service Engineer
FTP	File Transfer Protocol
GCI I/O	Gradient Control Interface Input/Output board
GCI2	Gradient Control Interface (version 2)
GRADM	GRADient and Magnet (control board)
HOST-RECON	Host computer to Reconstructor computer
MRX	Multi Receiver board
PAT	Patient (board / interface)
Patsup board	Patient Support board
PFEI	PZN Front End Interface
PH	Philips Healthcare
PMS	Philips Medical Systems
PWR	Power
QBC	Quad Body Coil
QDD	Quad Detune Driver
RX board	Receive board
SBC board	Single Board Computer
TFTP	Trivial File Transfer Protocol
TRSW	Transmit/Receive SWitch
TXR board	Transmit board

1.7 MANUAL HISTORY

Date	Version	Name	Reason of changes
2008-04-07	8.0	F. Speur, J. Moors	Initial version
2008-07-15	8.1	F. Speur, J. Moors	• Changes of the procedure in chapter 2. • Adding of the chapters 9, 10, 11 and 12. • Several minor changes.
2009-12-01	9.0	F. Speur	Update of several procedures, are marked yellow

2 REQUIRED LEVEL OF CDAS AND PFEI BOARDS

For certain software versions/option types, the CDAS and PFEI boards have to be of certain 12 NCs, see table below.
For CDAS and PFEI boards not in the table below, there are no requirements.

Table 1 - Required 12 NCs for CDAS and PFEI boards

Software version / option type	Board	Required 12 NC of board
Software ≥ Rel.1.8 and <2.0	GRADM-V2	4522 117 9587.x
Software ≥ Rel.2.0 and <2.6.3	SBC	4522 150 3425.**3** or 4522 150 4347.x
Software ≥ Rel.2.6.3	SBC	4522 150 3425.**3** or 4522 150 4347.x
	GRADM-V2	4522 117 9587.x
Multi Nuclei option	MRX-3 or MRX-4	4522 137 0038.x or 4522 137 0039.x
	CFINT-3 or CFINT-4	4522 117 9660.x or 4522 117 9812.x
	SBC	4522 150 3425.**3** or 4522 150 4347.x
	GRADM-V2	4522 117 9587.x
32 Channel option	SBC	4522 150 3425.**3** or 4522 150 4347.x
	GRADM-V2	4522 117 9587.x

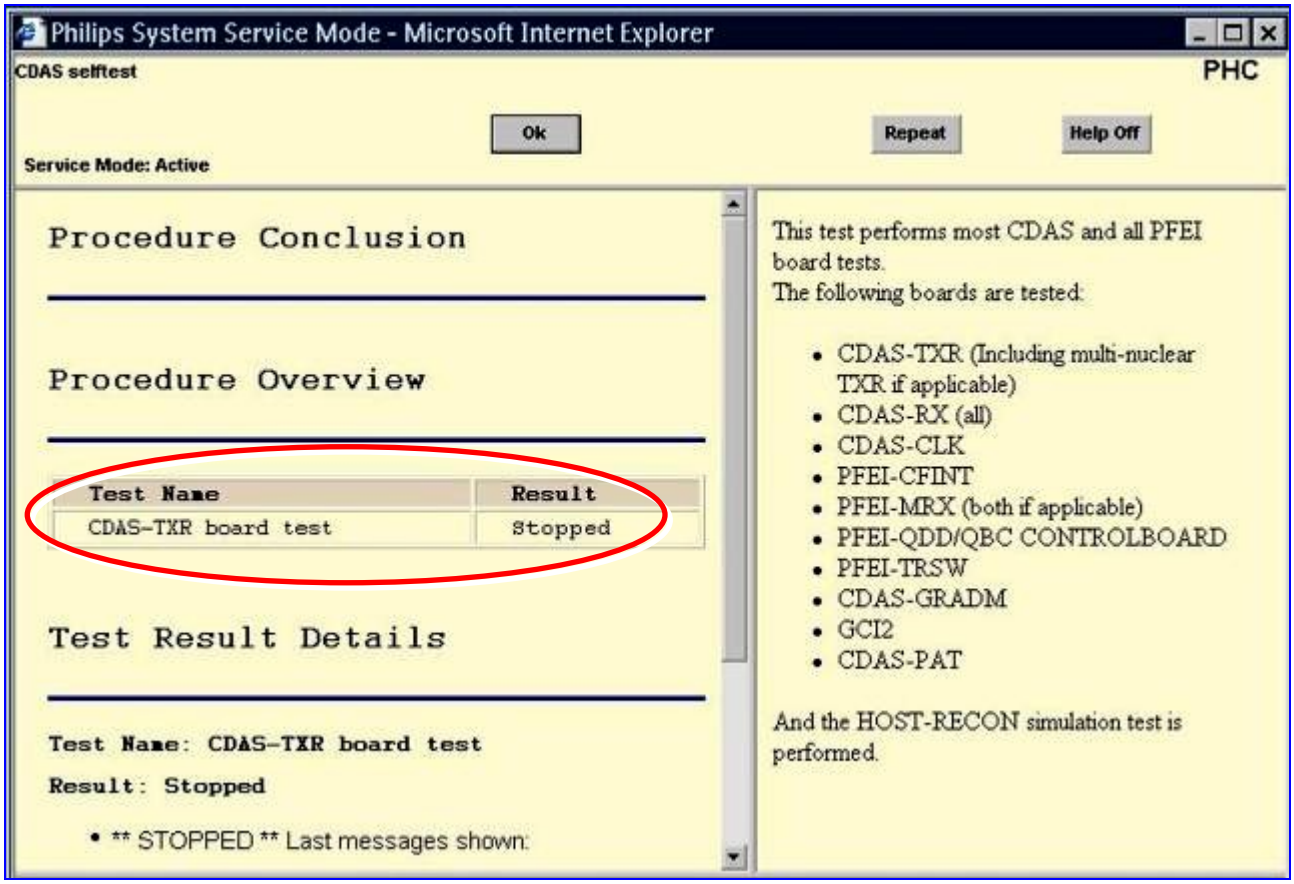
NOTE

There is a change that the "old type" GRADM (4522-117-9410.x) will function properly when software ≥ R2.6.3 is installed.

3 CDAS TXR BOARD TEST, RESULT: STOPPED

This chapter describes the faultfinding procedure to be performed when the CDAS-TXR board test reports **'Stopped'** (Figure 1). If the test CDAS-TXR board test ONLY reports **'Error'**, see chapter 4.

Figure 1 – CDAS-TXR board test 'Stopped' as result of CDAS selftest



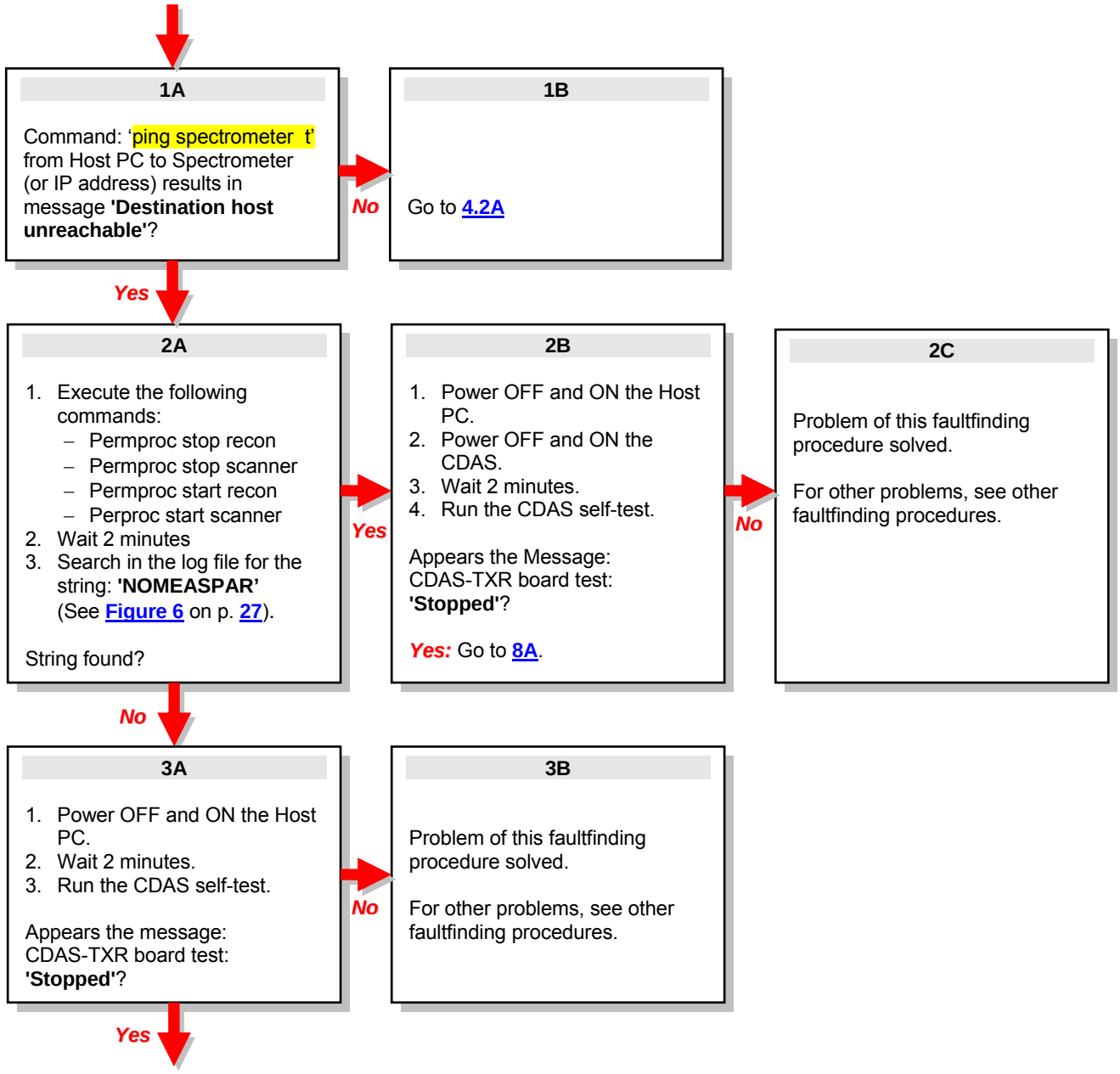
NOTE

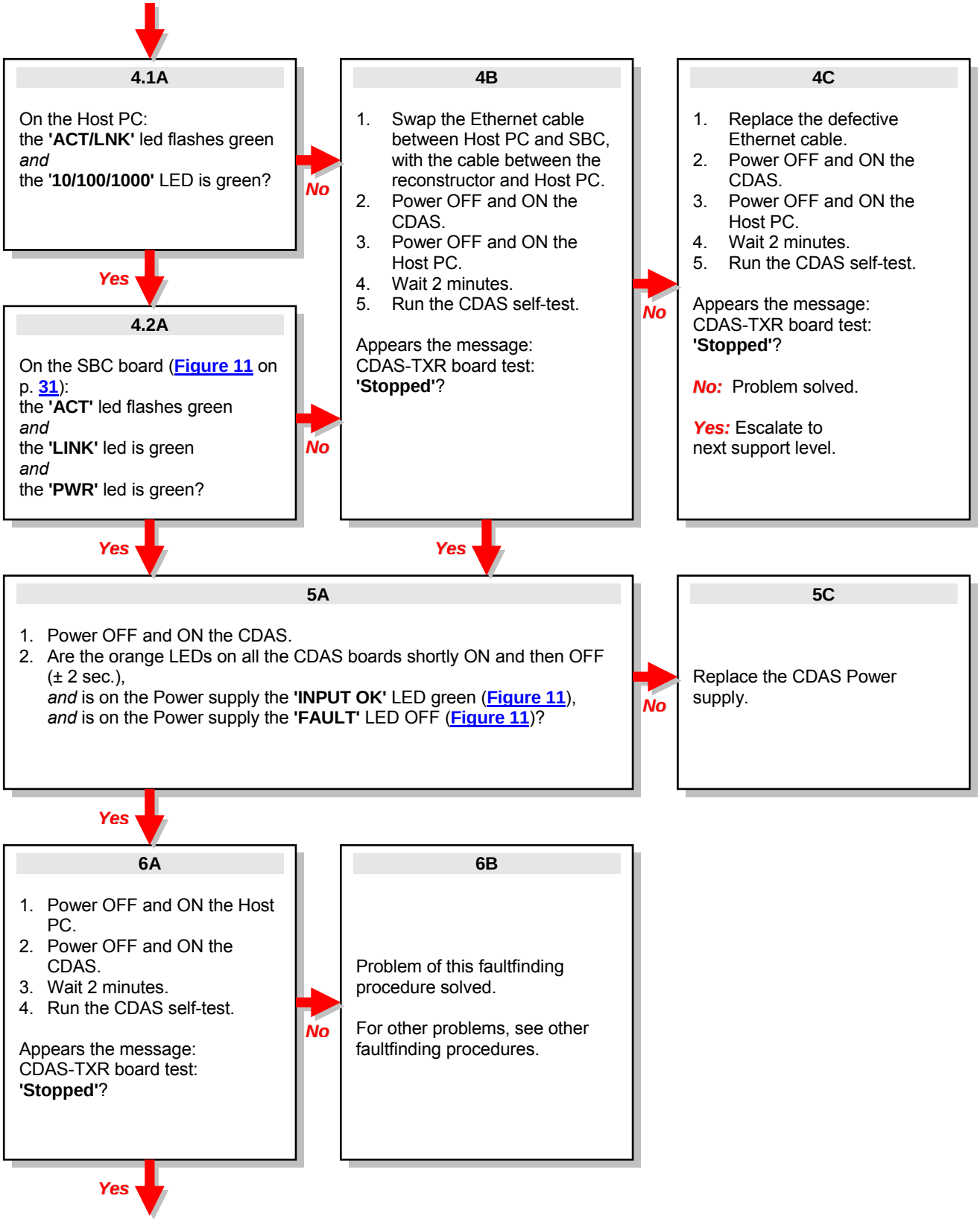
The CDAS self-test has to be performed approximately 2 minutes after the CDAS has been powered OFF and ON.

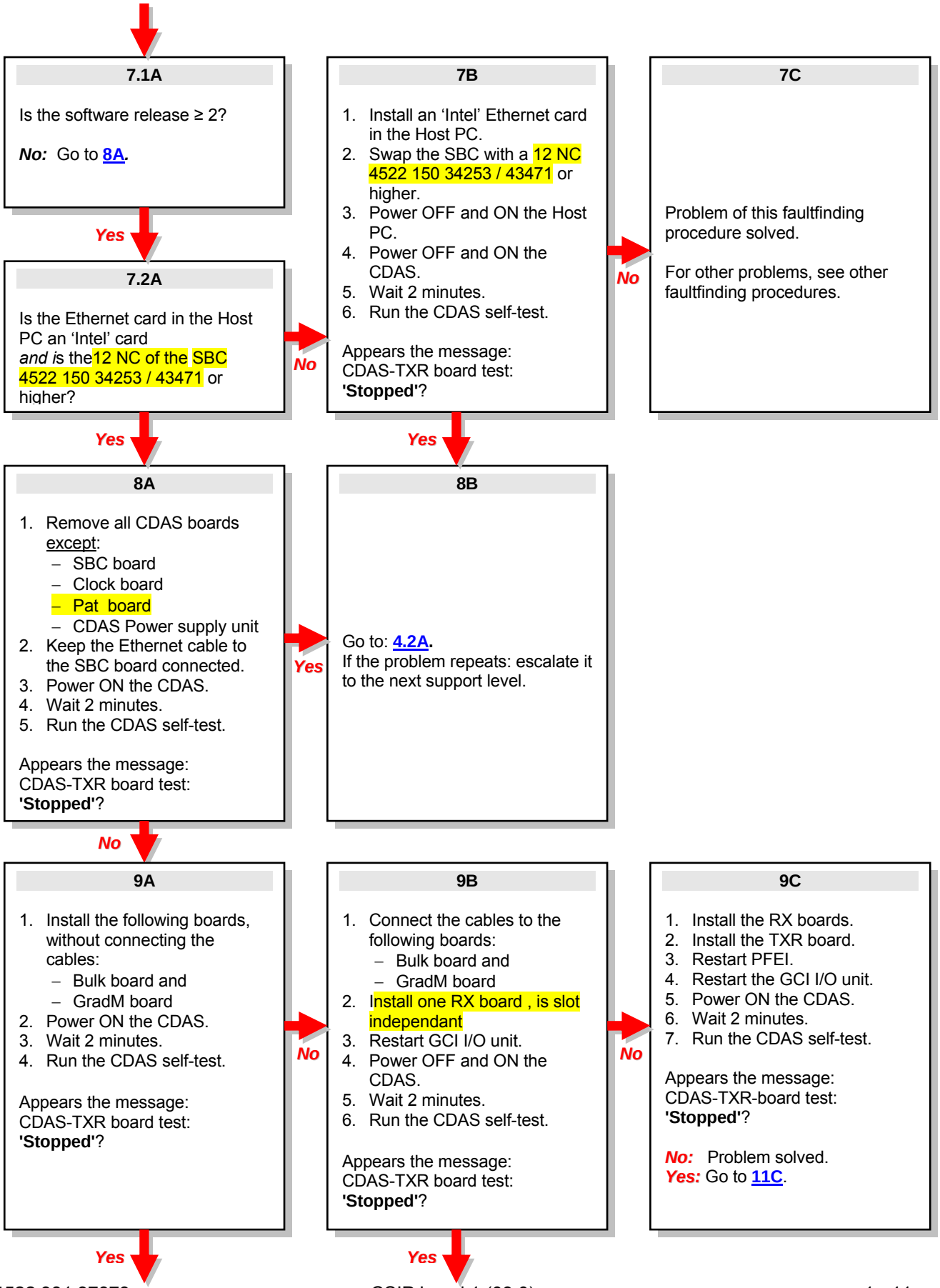
NOTE

The system has to be cabled according to the TPD and has to be powered ON completely before performing the CDAS self-test.

↓ **START** faultfinding procedure after the message: **'Stopped'** as a result of the TXR board test. (After the CDAS selftest).







10B

1. Power OFF the GCI I/O unit (switch DG-X1, Figure 9) (in case of Copley 78X switch off the amplifier)
2. Power OFF and ON the CDAS.
3. Wait 2 minutes.
4. Run the CDAS self-test.

Appears the message: CDAS-TXR board test: **'Stopped'**?

Yes → **11B**

No → **10C**

10C

1. Install the RX boards.
2. Install the TXR board.
3. Restart PFEI.
4. Power ON the CDAS.
5. Wait 2 minutes.
6. Run the CDAS self-test.

Appears the message: CDAS-TXR-board test: **'Stopped'**?

No: Problem solved. Go to GCI2 test.

Yes: Escalate to next support level.

11B

1. Find out which of the connected cables of bulk and pat board is defect by removing them again and inserting them one by one and every time run the CDAS self-test.
2. Swap the defective cable.
3. Wait 2 minutes of powering on the CDAS.
4. Run the CDAS self-test.

Appears the message: CDAS-TXR board test: **'Stopped'**?

No: Problem solved. Power ON the GCI I/O unit.

Yes: Escalate to next support level.

11A

1. Find out which of the just added boards (Bulk, GradM or Pat) is defect by removing them again and inserting them one by one and every time run the CDAS self-test.
2. If no defect board has been found, find out if the CDAS rack is defect.
3. Swap the defective board, or the CDAS rack.
4. Wait 2 minutes of powering on the CDAS.
5. Run the CDAS self-test.

Appears the message: CDAS-TXR board test: **'Stopped'**?

No: Go to 9C.

Yes → **11C**

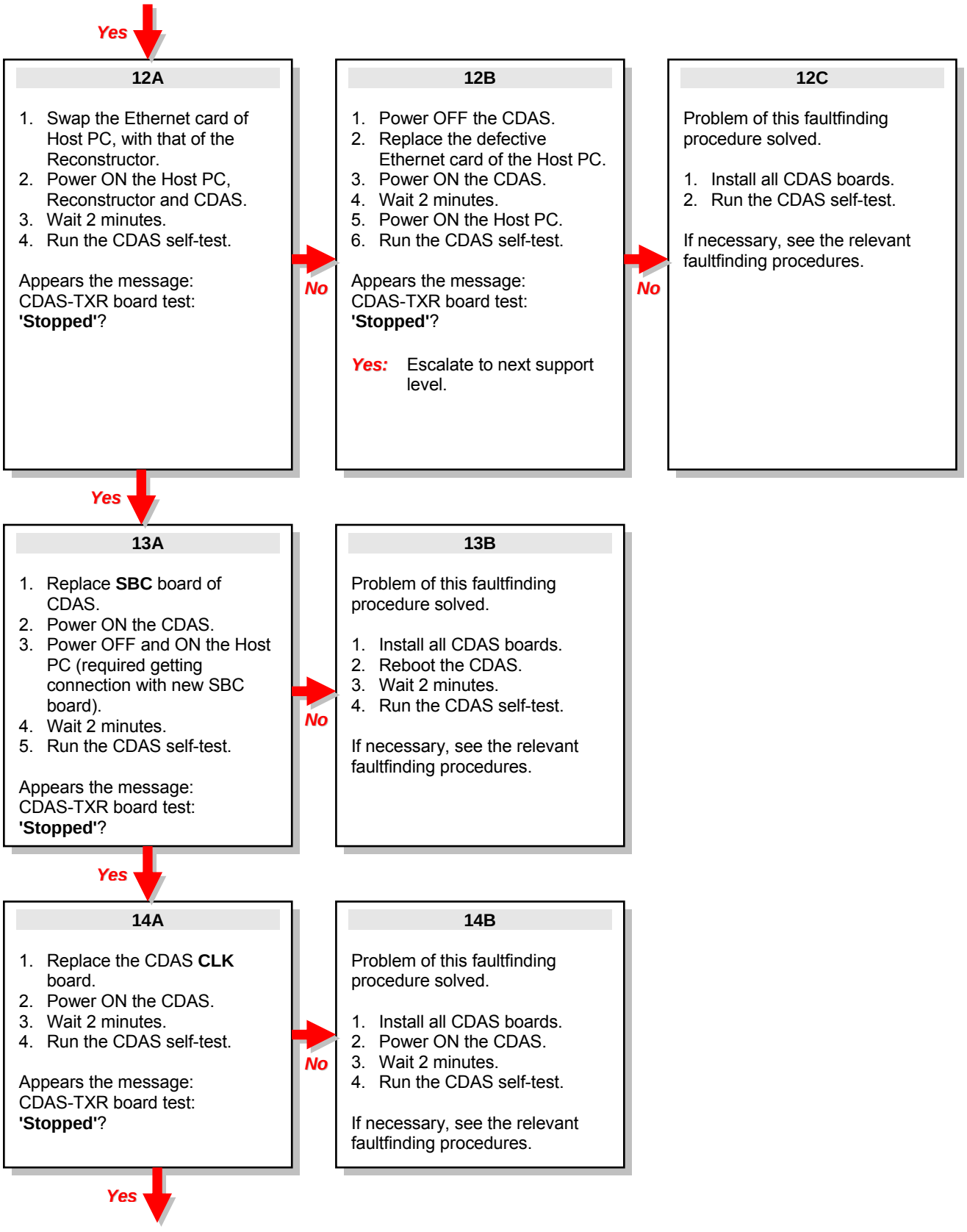
11C

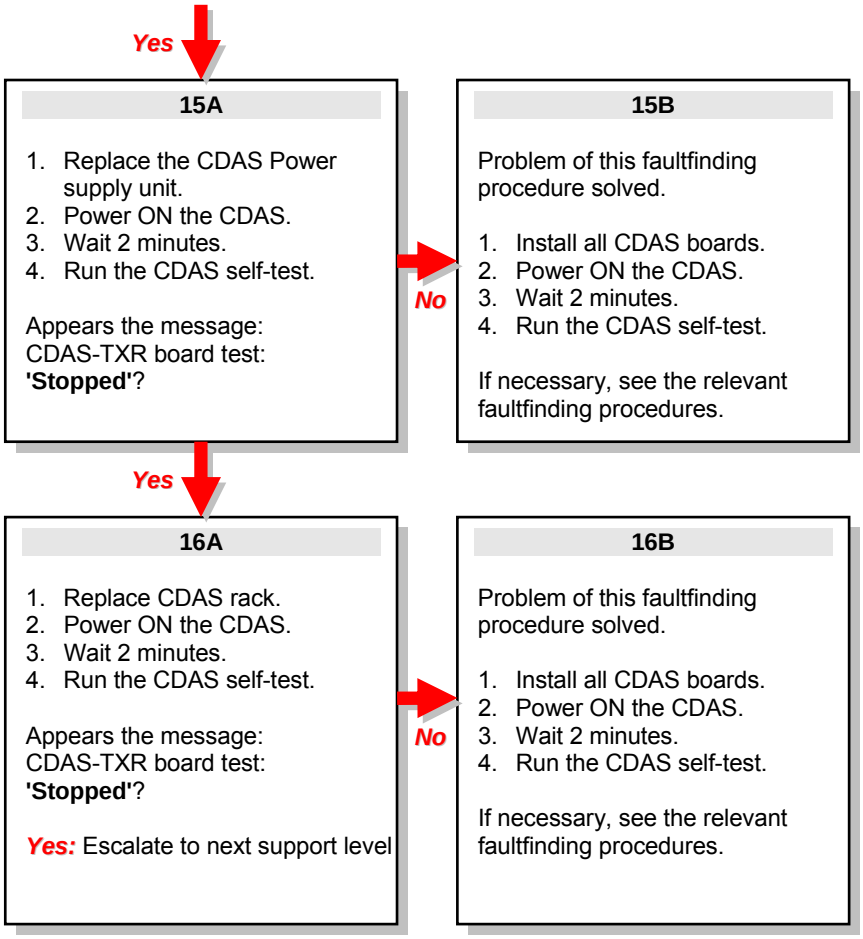
1. Find out which of the just added boards (RX or TXR) is defect by removing them again and inserting them one by one and every time run the CDAS self-test.
2. If no defect board has been found, find out if the CDAS rack is defect.
3. Swap the defective board or the CDAS rack.
4. Wait 2 minutes after powering on the CDAS
5. Run the CDAS self-test.

Appears the message: CDAS-TXR board test: **'Stopped'**?

No: Problem solved.

Yes: Escalate to next support level.

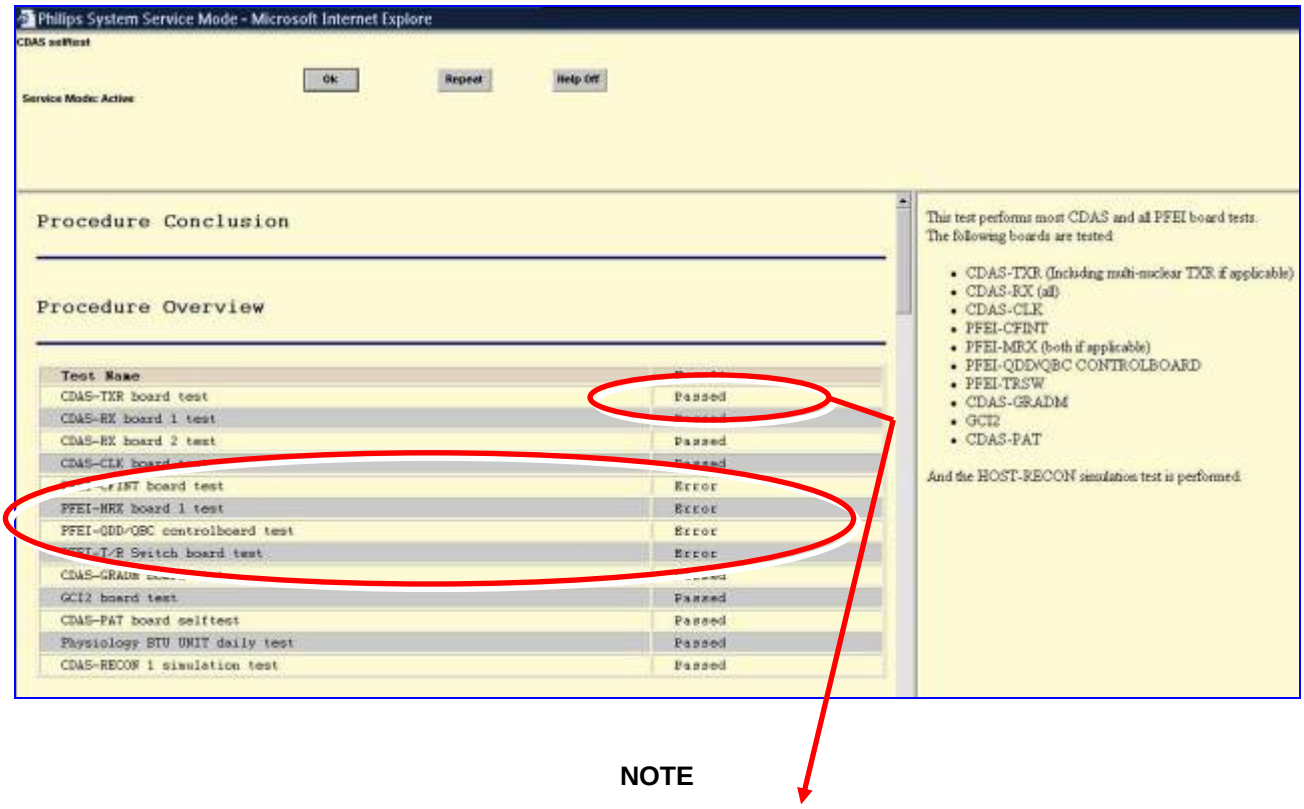




4 PFEI TESTS, RESULT: ERRORS

After the run of the CDAS self-test, the result of all PFEI tests (4 or 5x) is: **'Error'** (Figure 2).

Figure 2 - CDAS Self-test menu



NOTE

*The message of the CDAS TXR board test is **not** relevant for this faultfinding procedure.*
It can be: Passed or Error.

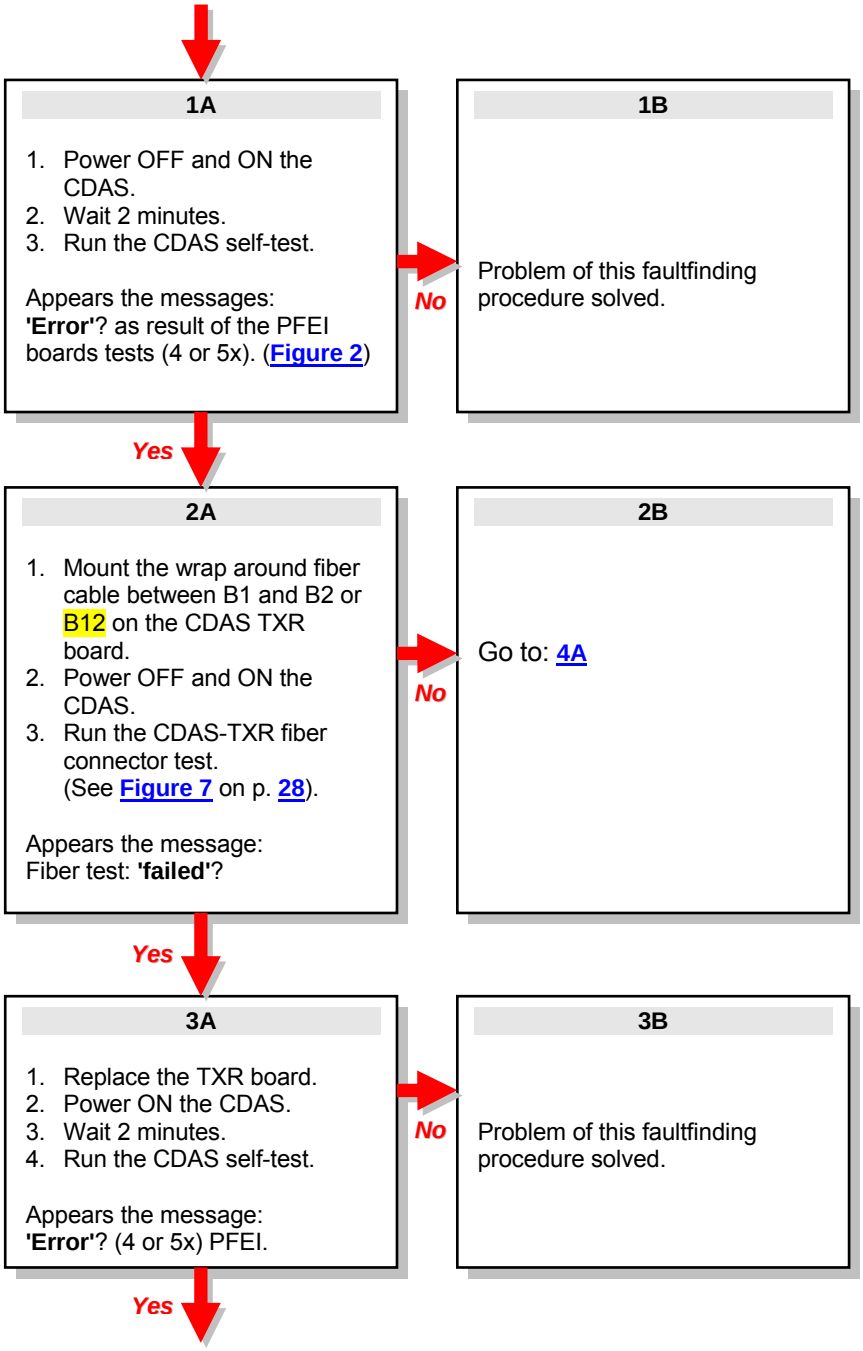
NOTE

The CDAS self-test has to be performed approximately 2 minutes after the CDAS has been powered OFF and ON.

NOTE

The system has to be cabled according to the TPD and has to be powered ON completely before performing the CDAS self-test.

↓ **START** faultfinding procedure after the message **'Error'** as result of PFEI board tests (4 or 5x). (After CDAS self-test).



Yes

4A

Test the long fiber cable:
1. Disconnect the fibers B1 and B2 or B10 from the CF_INT board.
2. Connect the wrap around fiber connector to the disconnected fibers.
3. Power OFF and ON CDAS.
4. Wait 2 minutes.
5. Run the CDAS-TXR fiber connector test.

Appears the message:
Fiber test: **'failed'**? **See note 4A**

No

4B

Go to: 6A.

Yes

5A

1. Replace the long fiber.
2. Power OFF and ON CDAS.
3. Wait 2 minutes.
4. Run the CDAS self-test.

Appears the message: **'Error'** 4 times?

No

5B

Problem of this faultfinding procedure solved.

Yes

6A

1. Check all voltages of PFEI unit, for specifications see chapter 11

Are all PFEI voltages within specifications?

No

6B

1. Powersupply in system filter box is suspected. Check
2. Remove PFEI board one by one.

Yes

7A

1. Remove all PFEI boards except the CFINT board.
2. Power OFF and ON CDAS.
3. Wait 2 minutes.
4. Run the CDAS self-test.

Appears the message: **'Error'** 4 times?

No

7B

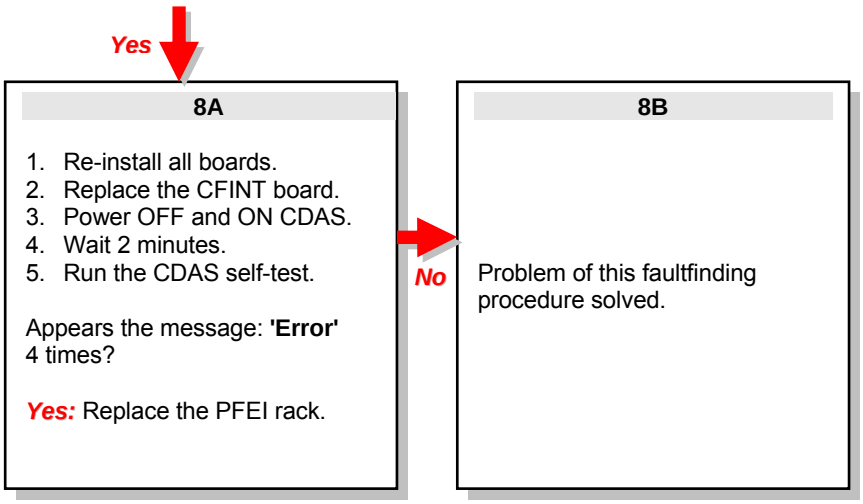
One of the removed PFEI boards is suspected (defect).

Yes

Note 4A

The fiber test is unreliable for this type of fibers:

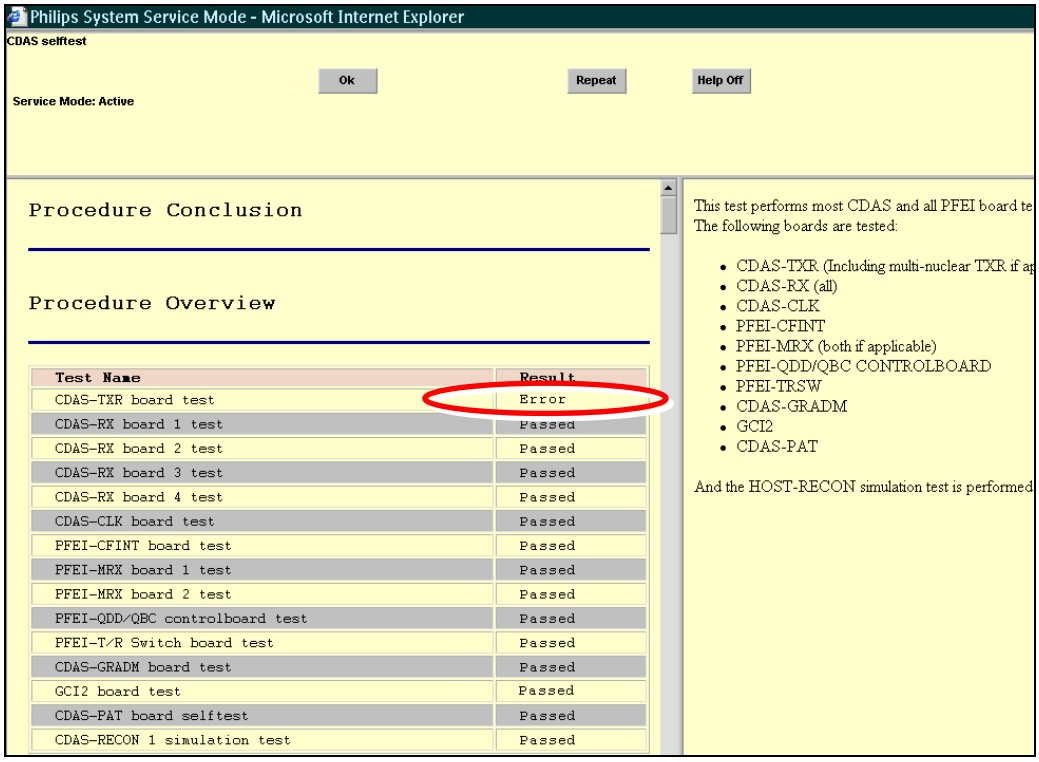
If test failed check fiber with a flashlight , if passed, fiber is ok



5 CDAS TXR BOARD TEST, RESULT: ERROR

After the run of the CDAS self-test, the result of the CDAS-TXR board test is: **'Error'** (Figure 3).

Figure 3 – CDAS-TXR board test Error as result of CDAS selftest



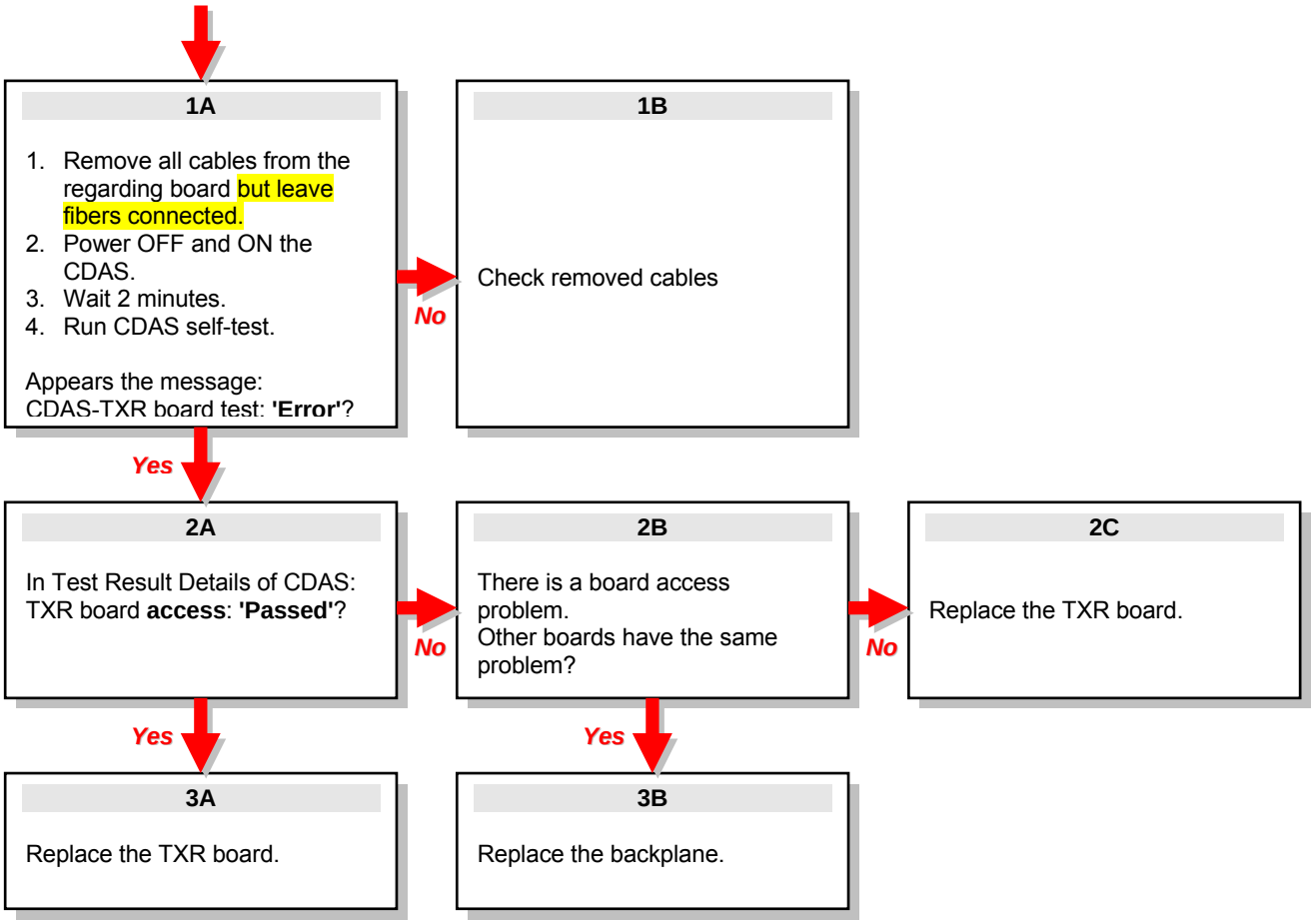
NOTE

The CDAS self-test has to be performed approximately 2 minutes after the CDAS has been powered OFF and ON.

NOTE

The system has to be cabled according to the TPD and has to be powered ON completely before performing the CDAS self-test.

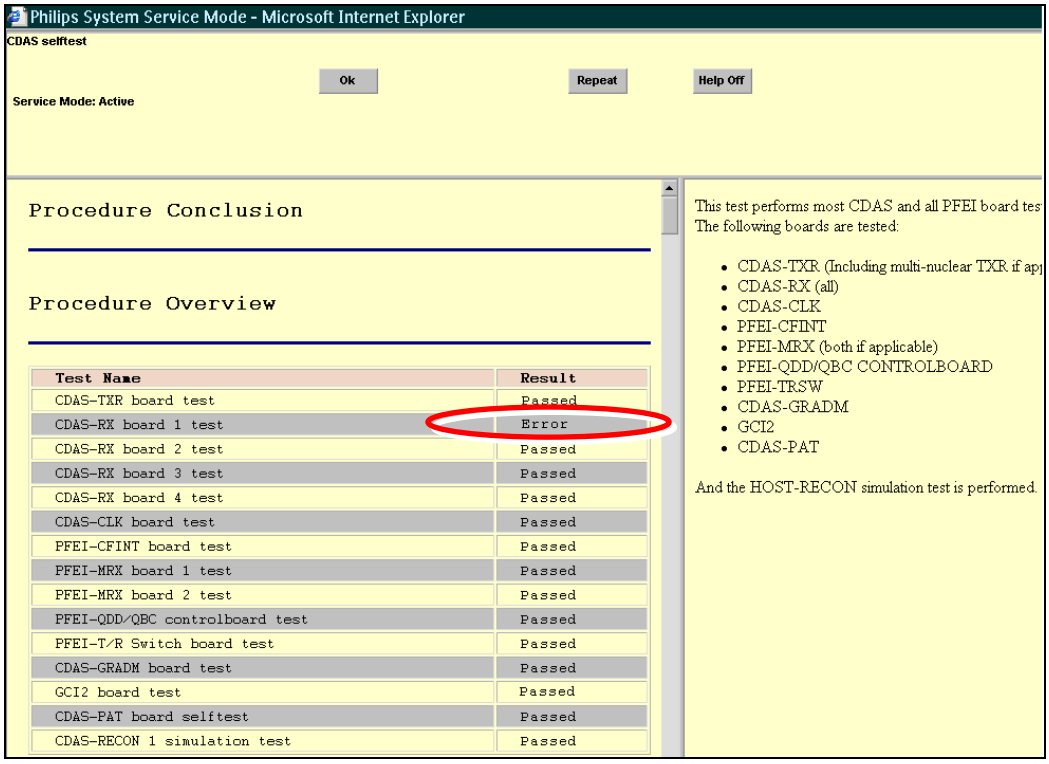
↓ **START** faultfinding procedure after the message **'Error'** as a result of the CDAS TXR board test. (After CDAS self-test)



6 CDAS RX BOARD TEST, RESULT: ERROR

After the run of the CDAS self-test, the result one of the CDAS-RX board tests is: **'Error'** (Figure 4).

Figure 4 – CDAS-RX board 1 test Error as result of CDAS selftest



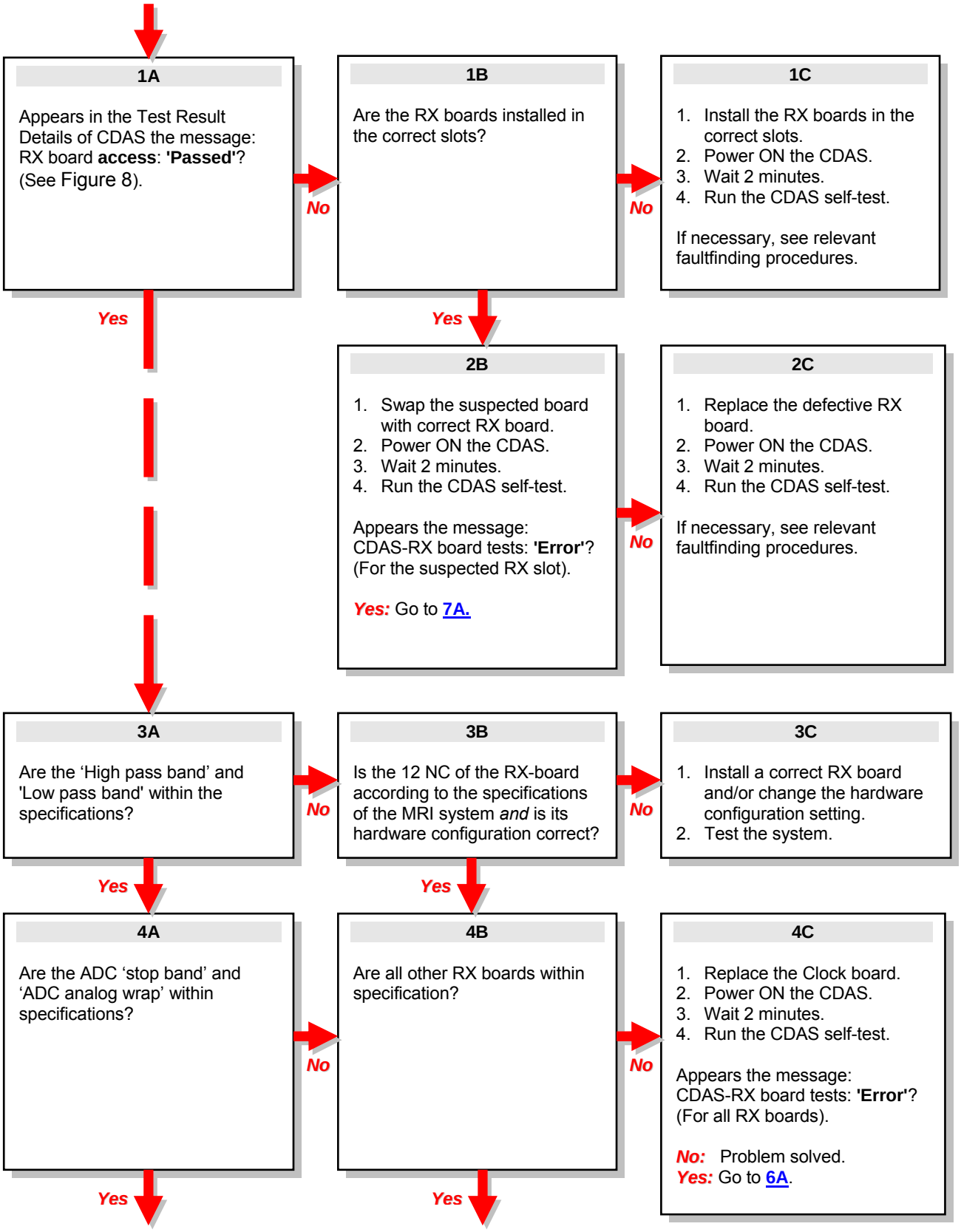
NOTE

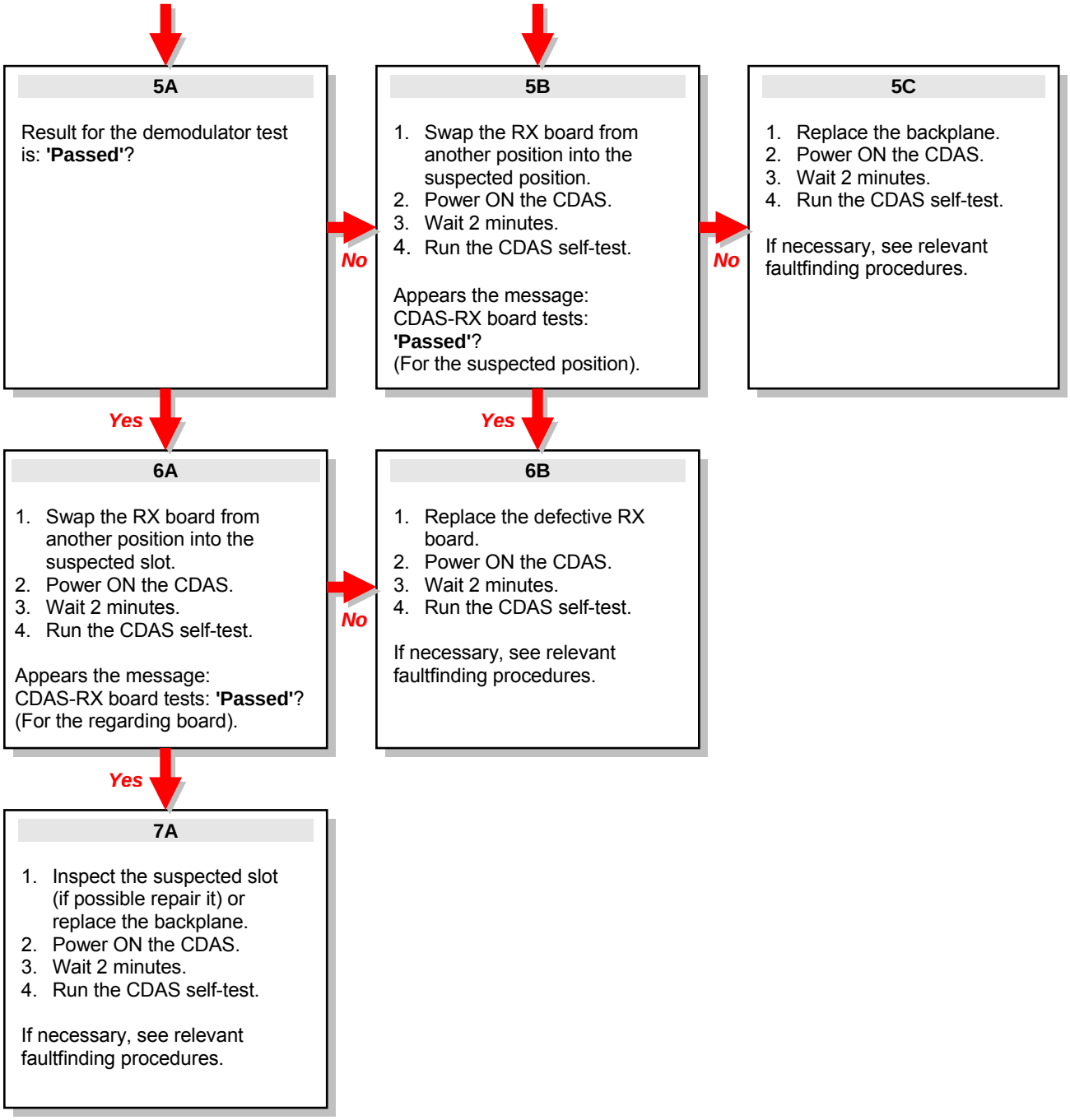
The CDAS self-test has to be performed approximately 2 minutes after the CDAS has been powered OFF and ON.

NOTE

The system has to be cabled according to the TPD and has to be powered ON completely before performing the CDAS self-test.

↓ **START** of faultfinding after the message **'Error'** (for CDAS RX board test) appears as a result of the CDAS self-test.

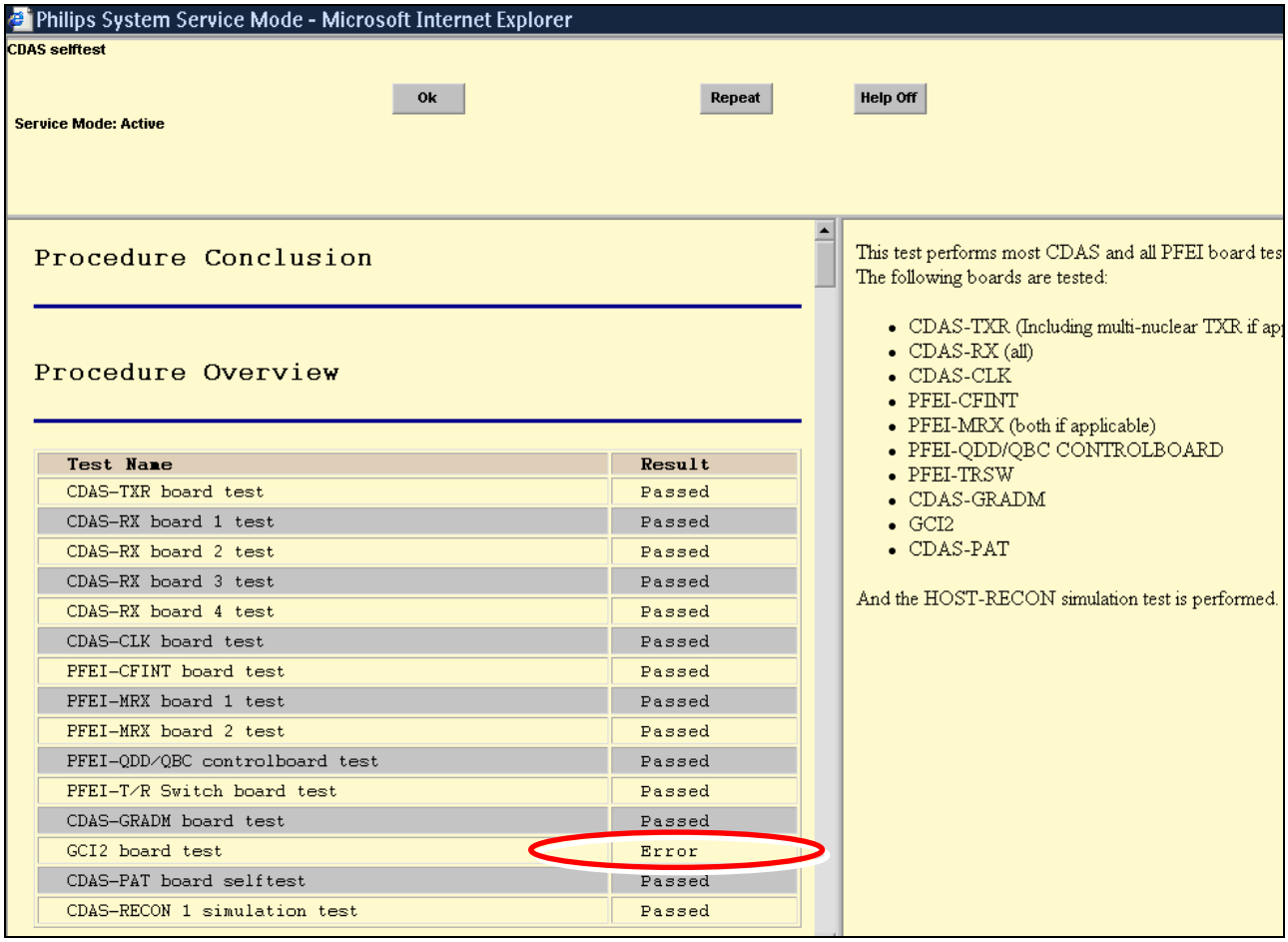




7 GCI2 BOARD TEST, RESULT: ERROR

After the run of the CDAS self-test, the result of the GCI2 board test is: **'Error'** (Figure 5).

Figure 5 – GCI2 board test Error as result of CDAS selftest



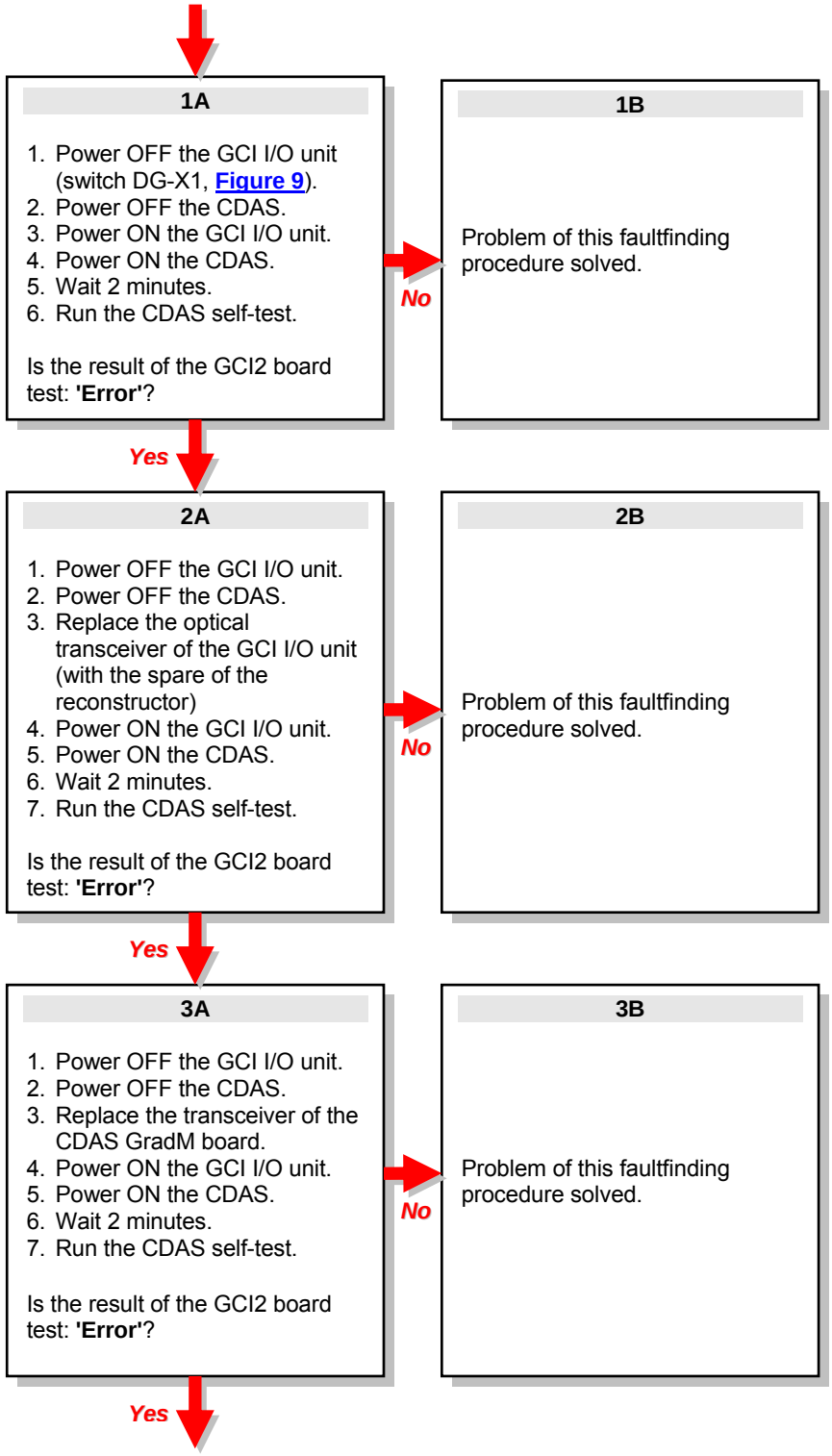
NOTE

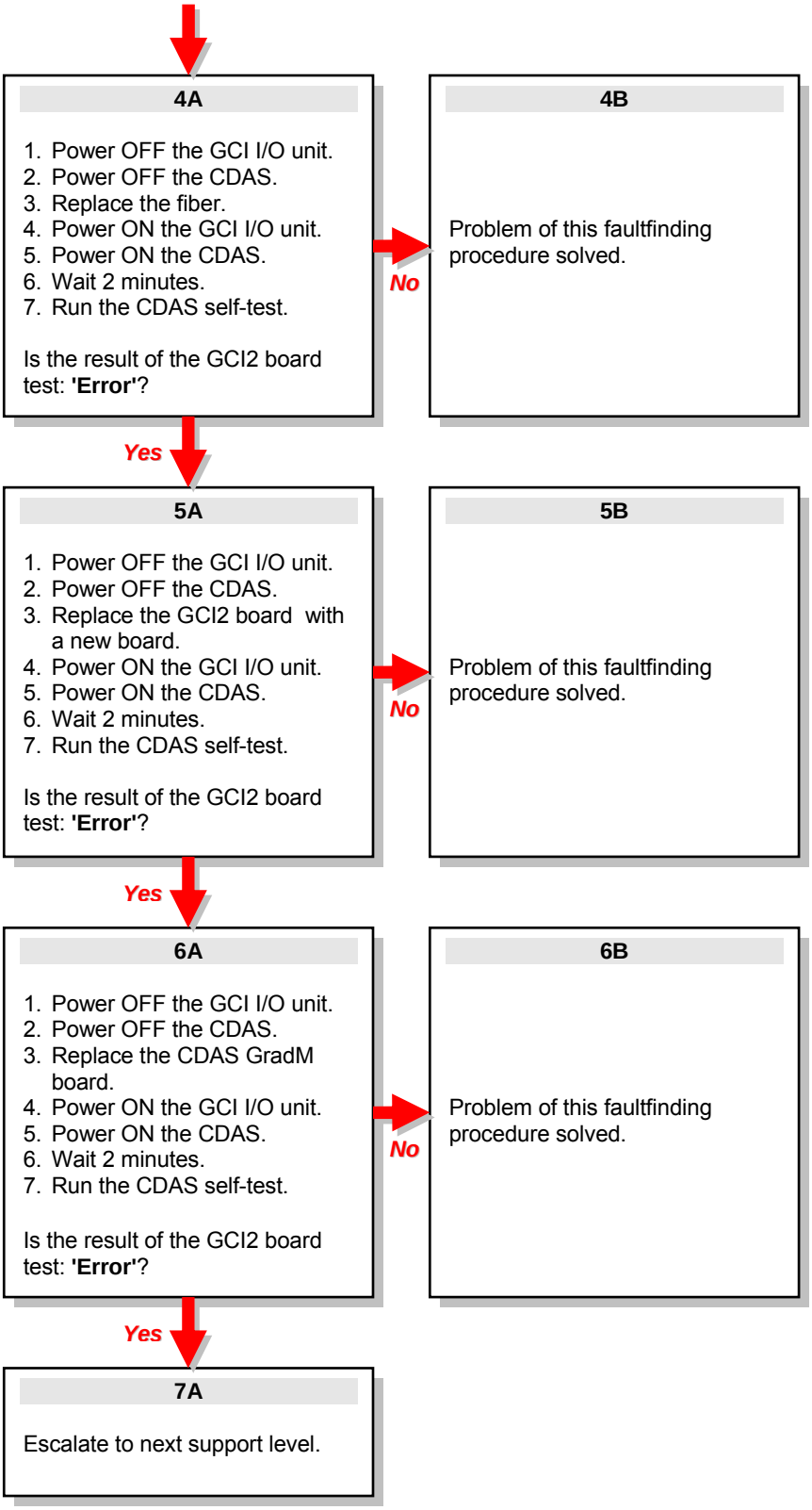
The CDAS self-test has to be performed approximately 2 minutes after the CDAS has been powered OFF and ON.

NOTE

The system has to be cabled according to the TPD and has to be powered ON completely before performing the CDAS self-test.

↓ **START** of faultfinding after the message **'Error'** (for GCI2 board test) appears as a result of the CDAS self-test





8 SCREENSHOTS

Figure 6 - Message 'NOMEASPAR'

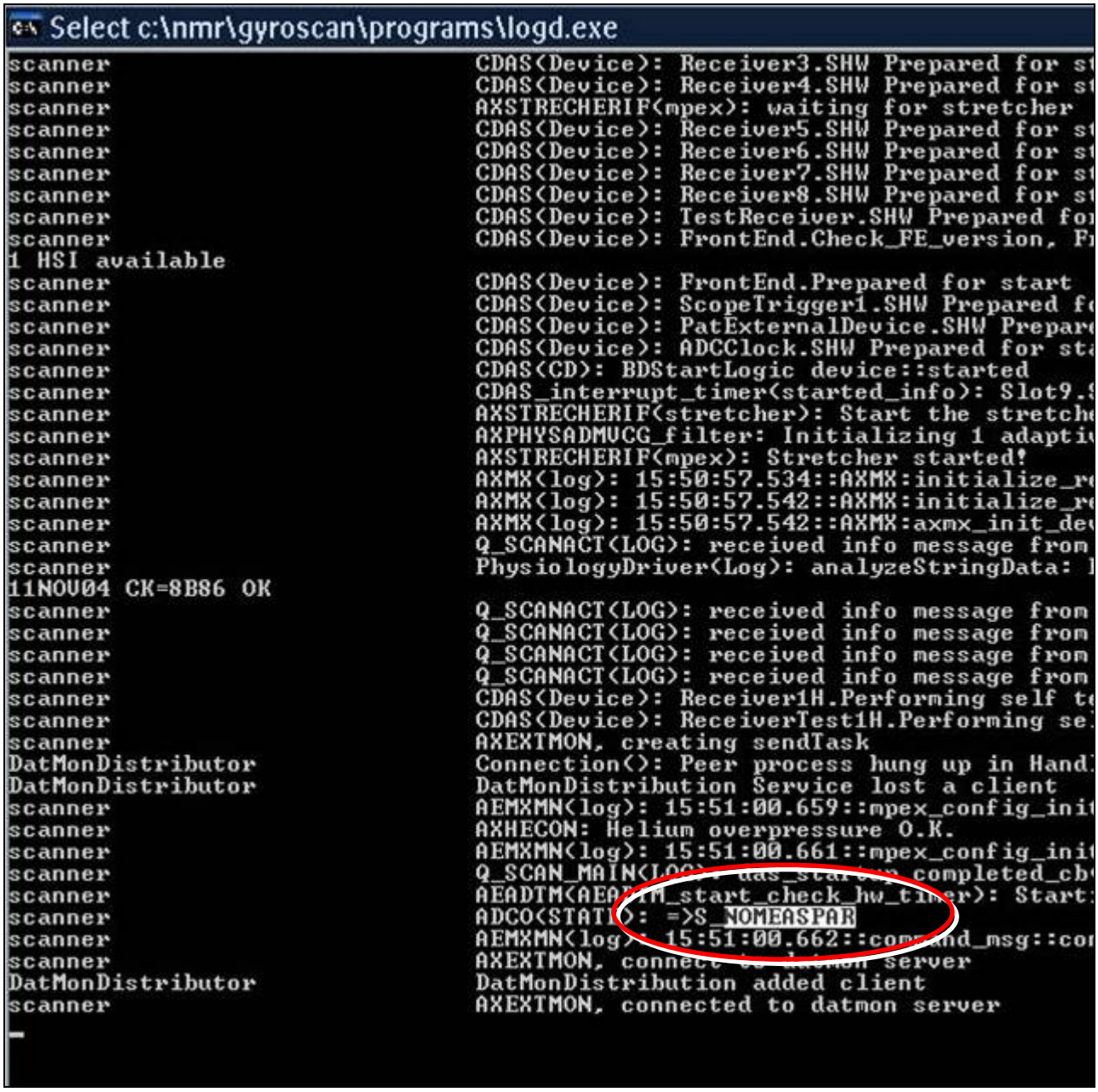


Figure 7 – CDAS-TXR fiber con. test (I)

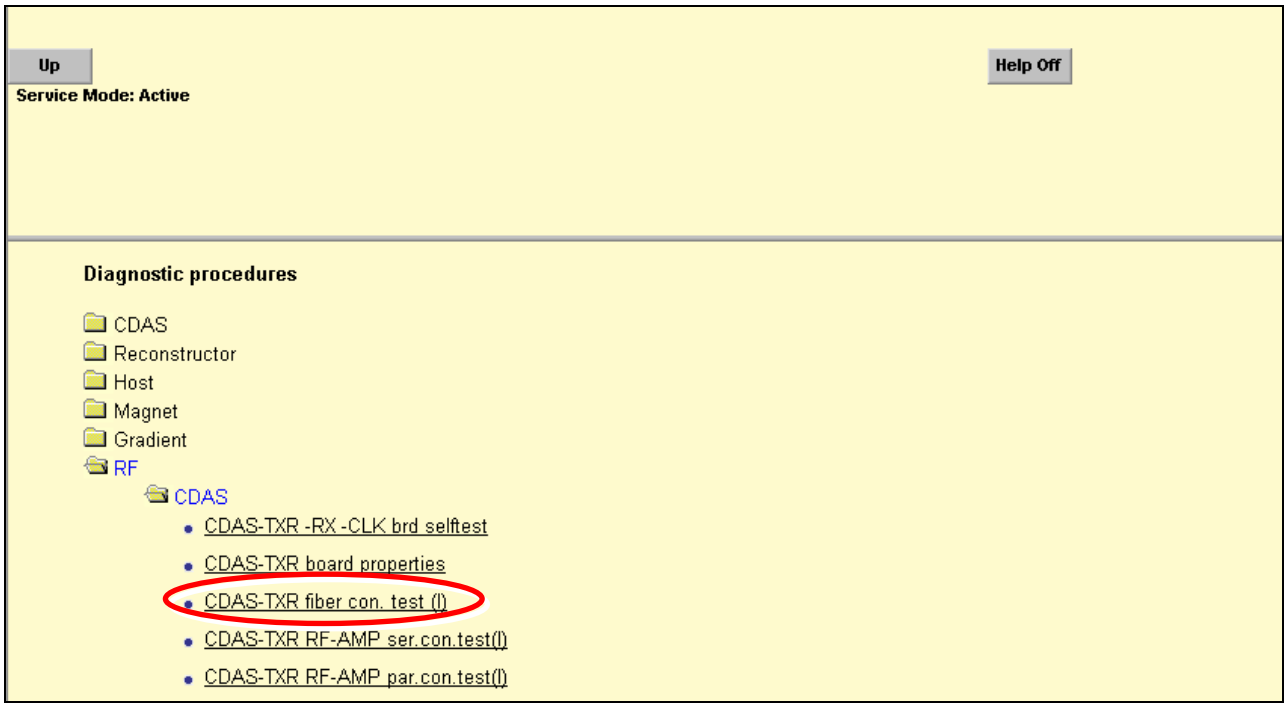
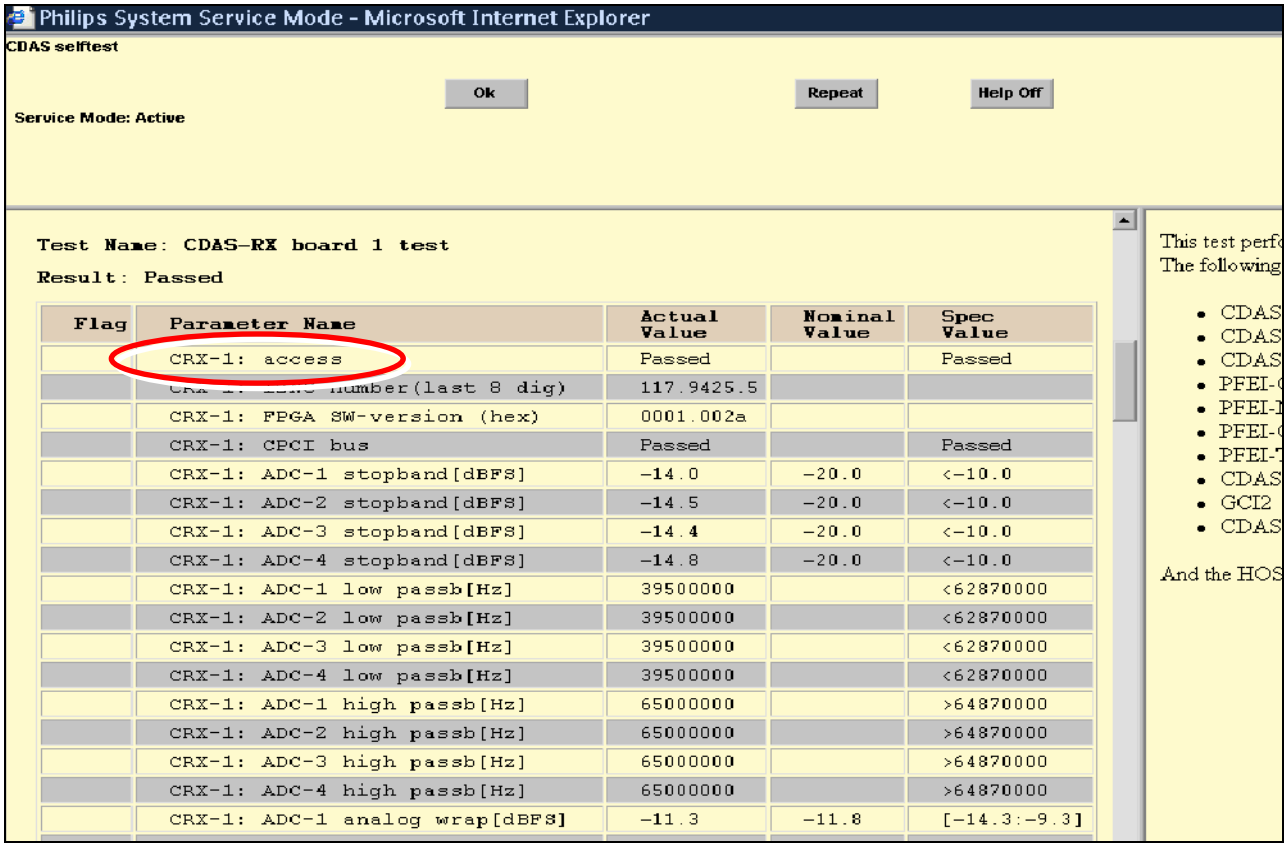


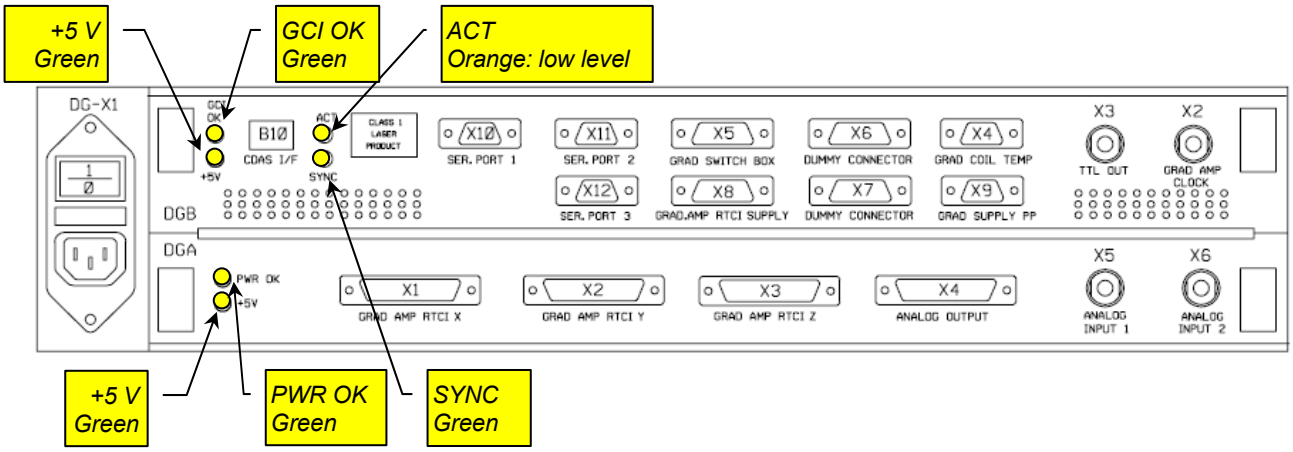
Figure 8 - Test result details (of CDAS self-test)



9 OVERVIEW OF LEDS

The figures below apply during **stand-by** of the scanner. During scanning other LEDs can lit as well.

Figure 9 – Front view gradient chain interface



or

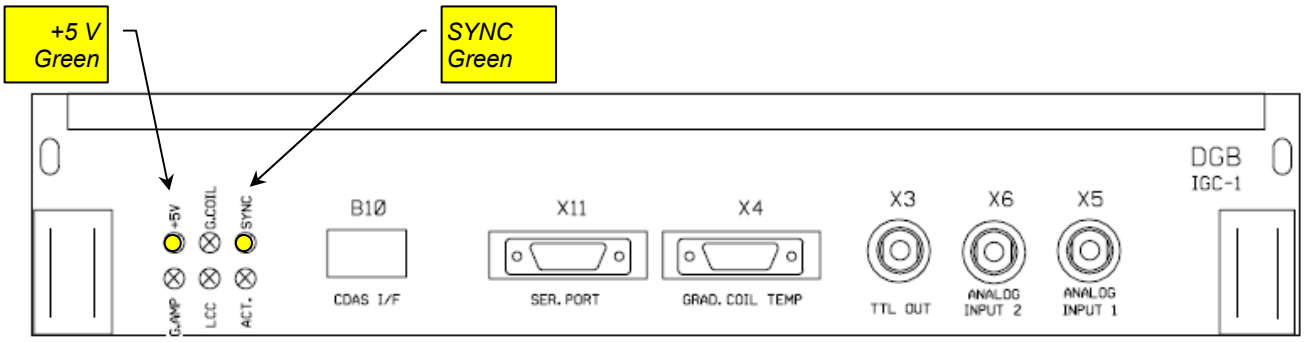


Figure 10 – Front view PFEI unit

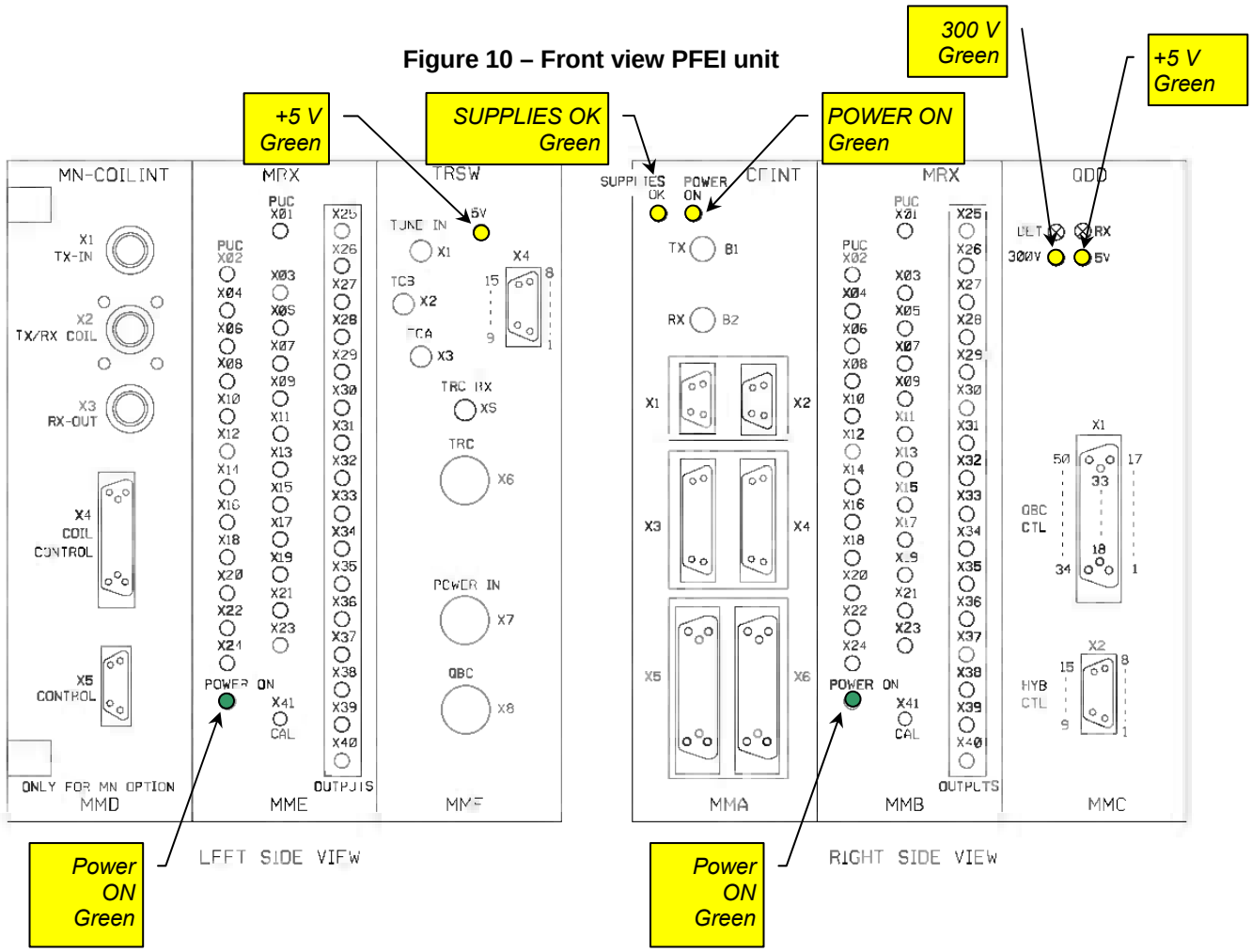
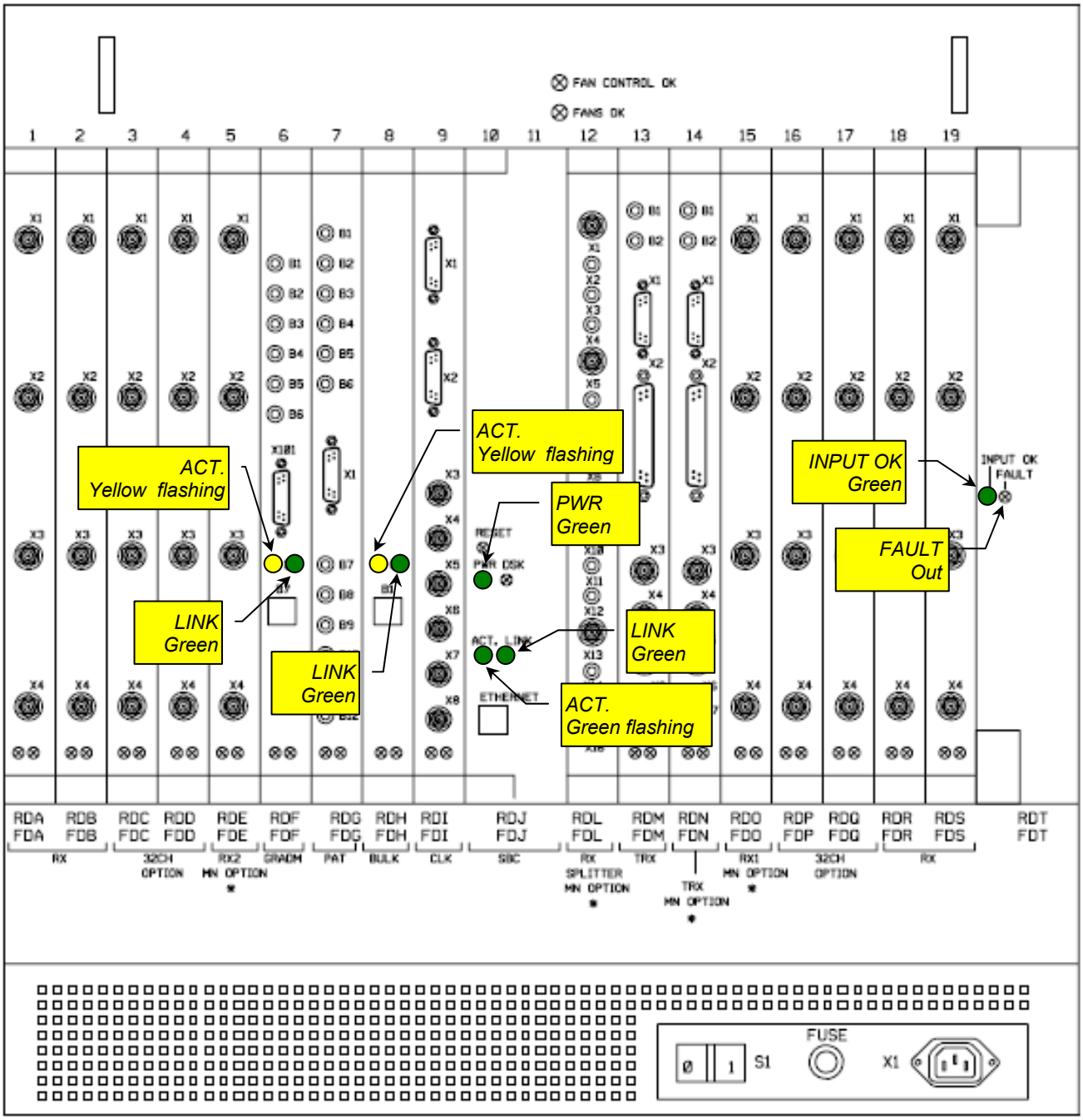


Figure 11 – Front view CDAS rack



10 MINIMUM START-UP CONFIGURATION OF CDAS AND PFEI

Table 2 - Boards minimally required to start-up the CDAS or PFEI

Component(s) to start	Boards required to start-up
CDAS	SBC, Clockboard, PAT board and CDAS power supply.
PFEI	CFINT

11 VOLTAGE SPECIFICATIONS OF PFEI

NOTE

The voltage on the PFEI must be the value of the nominal voltage, even in standby mode of the system. Only when the voltage is within the required range, it can be measured on the service connector of the PFEI.

Table 3 – Voltages of PFEI

Nominal Voltage	Required Voltage range
-5 VA	- 5.1…....-4.6 V
-5 VB	- 5.1..... -4.6 V
+5 V	4.8…… 5.4 V
-12 V	- 12.5.....-11.3 V
+12 V	11.3 ..... 12.5 V
+30 V	28.4 ..... 30.5 V
+300 V	287…….310 V

12 CDAS START-UP STEPS AND MNEMONICS IN LOG FILE

Table 4 – CDAS steps, actions and mnemonics in log file

Step no.	Action of CDAS	Text / mnemonics in log file
1.	Reading out the SBC BIOS version.	AEADMN(adco_init): SBC BIOS Version: 1.00.03
2.	Reading of the configuration files from the host, using the FTP connection with the host.	CFG(Conditional): Reading configuration files
3.	Starting of check of the boards, if necessary downloading of the correct version of the FPGA code.	CDAS_board(fpga_code): Board with ID: 1179533.7 in slot 1 contains FPGA v1 b11
4.	Starting all drivers, beginning with a complete reset of all CDAS boards.	CDAS(Device): ResetLogic.SignalResetOnJ3 performed
5.	Starting the time critical devices.	AXSTRECHERIF(stretcher): Start the stretched hardware
6.	Finishing of driver installation.	AXMX(log): 11:06:28.916::AXMX:axmx_init_devs() done
7.	Starting of self-tests.	CDAS(Device): Receiver1H.Performing self test.
8.	CDAS ready for scanning.	ADCO(STATE): =>S_NOMEASPAR