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1- ANALOG PROCESSOR BOARD CIRCUIT TEST POINTS AND FACTORY ADJUSTMENTS

The envelope feedback circuit is adjusted at the factory by means of the potentiometers R311 (Body Gain adjust) and R2 and R4 for body mode such that an RF input of 0 dBm yields a flat output pulse at 73 dBm (69 dBm for a 1.0T).

For head mode, R310 (Head Gain adjust) and R1 and R3 are adjusted at the factory such that an RF input of 0 dBm yields a flat output pulse at 63 dBm (59 dBm for a 1.0T).

If any of the interlock LEDs on the rear of the APB are on, there is a loss of 50 ohm termination as seen by that port. Terminating the port corrects this problem.

If the board does not power up, verify that the correct voltages are present at the power supply test points T3–T9. These voltages come from the Communications Manager / Power Monitor Board via connector J100.

2- PIN SWITCH DRIVER DIAGNOSTICS AND FACTORY ADJUSTMENTS

2-1 Potentiometer & Jumper Settings

The following potentiometers and jumpers are set at the factory, and perform the functions listed below:

R129 Multicoil negative 5 volt output adjustment (–5 ± 0.05 volts)
R130 Multicoil positive 5 volt output adjustment (+5 ± 0.05 volts)
R26 Head TR positive output level adjustment (+8 ± 0.1 volts)
R13 Body TR positive output level adjustment (+4 ± 0.1 volts)
R18 Spectro positive output level adjustment (+6 ± 0.1 volts)
JP57 Pins 5 and 6 connected (Multicoil drive 1 software control)
JP58 Pins 5 and 6 connected (Multicoil drive 2 software control)
P59 Pins 5 and 6 connected (Multicoil drive 3 software control)
JP60 Pins 5 and 6 connected (Multicoil drive 4 software control)
JP3 Pins 2 and 3 connected (Body coil High Pass mode)
JP87 Pins 5 and 6 connected (TR drive software control mode)
JP1Pins 1 and 2 connected 1.0T (500V Body coil bias voltage)
JP1 Pins 2 and 3 connected 1.5T (1000V Body coil bias voltage)
JP2 Installed (High voltage Body coil bias supply enabled)

2-2 Field-adjusted Potentiometers

The following potentiometers are field adjusted:

R147 body coil 1 open circuit detection threshold (1 volt less than output while sinking current)
R207 direct drive open circuit detection threshold (1 volt less than output while sinking current)
R228 body coil 2 open circuit detection threshold (1 volt less than output while sinking current)

2-3 Pin Switch Driver Board Failures

Pin Switch Driver Board failures can basically be divided into two main categories:

- Improper or missing output drive
- Improper fault reporting

2-4 Output Drive Problems

Improper or missing output drive can have a number of causes. The best way to troubleshoot is to trace the discrepancy through the appropriate drive chain starting with verification of the /UNBLNK signal. Each of the three main drive outputs (TRs, multicoils, and body coils) are covered separately.

For TR drive problems:

Confirm that TP43 is unblanking. Confirm the proper position of JP87.

Confirm voltage levels of TP9, TP16, TP21. If no voltage exists, look at TP6, TP15, and TP5 respectively.

For multicoil drive problems:

Confirm that JP57 through JP60 are in the Normal Mode position and that the correct signal exists at those jumper locations.

Confirm that there is a signal at TP2, TP14, TP20, and TP26. If there is no output, the problem is probably in the circuitry connecting the jumper and corresponding test point.

Note

The jumper signal is the inversion of the test point signal.

For body coil problems:

Confirm that JP5 is in normal mode, JP 3 is in the correct position, JP2 is installed and HV-ON LED (located on the RFSC power supply) is lit.

Confirm the correct output of TP31, TP38, and TP46. If the output does not exist, look at TP53 and confirm that it is approximately 0V for voltage source mode, and approximately +15V for current sink mode.

If you are in voltage source mode, but TP53 is incorrect, look at TP62. If TP62 is approximately 0V, then one of the current sink loop IGBTs is probably shorted.

2-5 Improper Fault Reporting

Improper fault reporting can have a number of causes. The best troubleshooting method is to trace the discrepancy through the appropriate drive chain starting with verification of the associated PAL signals. Each of the three main drive outputs (TRs, multicoils, and body coils) are covered separately.

Improper TR faults:

If you are in transmit mode, the voltage at TP1, TP13, and TP18 should be greater than 5V. If this is true, there is most likely a problem with the PAL reporting. If any of these voltages is <5V, an open circuit condition or current sensing problem is the most likely cause.

If you are in receive mode, the voltage at TP9, TP16, and TP21 should be approximately –13V. If this is true, there is most likely a problem with the PAL reporting. If any of these voltages is <5V, a short circuit condition, or circuit problem is the most likely cause.

Improper multicoil faults:

Confirm that the voltage at TP7 is between the voltages seen at TP8 and TP10.
Confirm that the voltage at TP11 is between the voltages seen at TP3 and TP4.
Confirm that the voltage at TP22 is between the voltages seen at TP25 and TP23.
Confirm that the voltage at TP28 is between the voltages seen at TP24 and TP27.

If all of these are true, the problem is most likely in the PAL reporting. If any of these are not true, the problem is most likely in the multicoils external to the system, or the current detection circuits on the pin switch driver board.

Improper body coil faults:

If you are sourcing voltage, there should be no current draw. If you are getting a short circuit error, the signal is either coming from the coil (external to the cabinet), or the PAL reporting is malfunctioning.

If you are sinking current and the voltages at TP33, TP45, and TP47 are less than the voltages at TP34, TP44, TP48 respectively, the most likely causes are an open circuit condition, or the voltages at R147, R207, R228 were set incorrectly. If the voltages at TP33, TP45, TP47 are greater than the voltages at TP34, TP44, TP48 respectively, the most likely cause is in the PAL reporting.

3- MEPS DIAGNOSTICS AND FACTORY ADJUSTMENTS

3-1 High Current Power Supply

The factory adjusts the +38.5V docking motor/longitudinal regulated supply by means of potentiometer R38, the +12V bore light regulated supply by R61, and the +12.75V patient alignment light supply by means of R70.

If a regulated supply does not come up, the following procedures may help find the problem:

+38.5V regulated supply
Isolate MEPS module.
Measure 208Vac 3~ input voltage to MEPS module.
Check connections between Interface board and High Current board.
Check for operation of the +65Vdc supply. There should be approximately +65V across pin 2 of Q4 and ground.
Measure +15Vdc at TP2.

Determine if the TL494 PWM controller is operating and getting to the driver circuitry. Measure the dead time control at pin 4 of U6; it should be low. Measure the PWM signal at pin 3 of U7; it should be approximately 14V peak. The width of the pulse will vary, depending on the output voltage and load.

Check for driver supply voltage. There should be +15Vdc across pins 6 and 3 of the TC1426PA driver IC U8.

Check for pulse on gate of IRFP250. The PWM signal from pins 5 and 7 of U8 should be seen on the gate of Q4 FET.

Check for operation of the IRFP250 FET. A +65V peak copy of the PWM signal should be seen on the source of Q4 FET.

The +12V bore light and +12.75V PAL supplies are nearly identical, that only one explanation is needed. Both of these supplies require a minimum load to operate correctly in either on/off state.

Measure 208Vac 3~ input voltage to MEPS module.

Check connections between interface board and high current board.

Check for operation of the +15V_A supply. There should be approximately +15Vdc across pin 1 of D4 and ground.

Determine if the RS422 enable signals are present at the opto-isolator H11A5100. Should be low at pin 2 and high at pin 1 of U9 H11A5100 for the bore lights and U11 for the patient alignment lights if enabled. Vice versa if disabled.

Check for operation of the ±15V to U10 LF412 dual op amp. Should be +15V across pin 8 and gnd and –15V across pin 4 and gnd.

3-2 Low Current Power Supply

Power supply	Adjustment
PAC +15V	R1
PAC –15V	R4
PAC +9V	R5
PAC –8V	R2
SRI +24V	R6
SRI +12V	R7
SRI +8V	R3

The collection of power supplies on the low current board are nearly identical; only one explanation is needed.

Measure 208Vac 3~ input voltage to MEPS module.

Check for blown fuse on front panel.

Check connections in between interface board and low current board.

Measure 120Vac across pins 1 and 3 of J1 on low current board.

4- RF AMPLIFIER POWER CYCLE CAUSES COMMUNICATION ERROR MESSAGE

An MDS link broke error occurs if you only cycle power on the RF amp. The new RF/Pen cabinet requires all power switches on the rear of the cabinet to be cycled on at the same time to prevent this error from occurring.

5- RF AMPLIFIER FAULT CODES

RF amplifier fault codes can be found in the Procedure for RF Amp Diagnostics.

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	July 24, 1998	J. Saperstein	Initial conversion from Toolbook to Word.
1	Oct 13, 1999	M. Keber	Added correct proprietary heading to document.