Installation & Operation

EDACS® Power Monitor Unit

ERICSSON ≋

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(Continued)

NOTICE!

This Manual covers Ericsson and General Electric products manufactured and sold by Ericsson Inc.

NOTICE!

NOTICE!

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SPECIFICATIONS

PMU:
    Mechanical:
        Width .... 19 in. (482.6 mm)
        Height.. 3.5 in. (88.9 mm)
        Depth... 6 in. (152.4 mm)
        Weight.. < 5 lb. (2.27 kg)
    Environmental:
        Temperature Range .... 0° to 60° C (32° to 140° F)
        Relative Humidity .... 0 to 95%
    Power Requirements:
        External .... 12 Watts (max.) at 12 Vdc (nominal)
        RAM Battery Life .... 3 years

Power Sensors:
    19C336861P2 - Unidirectional
        Frequency Range.. 450 to 1000 MHz
        Maximum Power.. 1000 Watts
    19C336861P3 - Bi-directional
        Frequency Range.. 450 to 1000 MHz
        Maximum Power.. 1000 Watts
    19C336861P4 - Bi-directional
        Frequency Range.. 66 to 325 MHz
        Maximum Power.. 1000 Watts

Data Interfaces:
    Site Controller Computer:
        Baud Rate... 9600
        Data Bits.. 8
        Parity Bit .... None
        Stop Bit 1
        Flow Control .... None
    RS-232 CRT Terminal (or PC):
        Baud Rate... 9600
        Data Bits.. 8
        Parity Bit .... None
        Stop Bit 1
        Flow Control .... None

INTRODUCTION

This manual describes the installation and operation of the Decibel Products DB8860-based PMU (Power Monitor Unit) for non-simulcast EDACS (Enhanced Digital Access Communications System) repeater sites that use a VAX computer for the Site Controller. This manual covers only those features of the Decibel Products DB8860 that are required for this application.

The user must provide an RS232 CRT terminal (or PC with terminal emulation software) for installation and maintenance.

DESCRIPTION

The PMU (Power Monitor Unit) is used to quickly identify damaged transmitters, transmit combiners, transmit antennas, and connecting cables so that the damaged equipment can be quickly removed from service and repaired. The PMU is a microprocessor-driven power monitoring and reporting device that receives power measurements from the power sensors, receives monitoring instructions from the Site Controller computer, and reports alarm conditions back to the Site Controller computer.

A unidirectional power sensor is placed at the output of each transmitter to send forward power measurements to the PMU. A bi-directional power sensor is placed at the output of each transmitter combiner to send forward and reflected power measurements to the PMU.

The Site Controller computer tells the PMU which power sensors to monitor and when, by telling the PMU when each transmitter is keyed, and about to be unkeyed.

The PMU reports an alarm for a specific transmitter when the output power measurement for that transmitter exceeds the upper or lower power limit. The Site Controller computer then takes that transmitter channel out of service.

The PMU reports an alarm for a specific antenna number when the input power measurement for that antenna exceeds the upper or lower power limit, or the SWR calculation exceeds the upper limit.

Figure 1 shows the locations of the PMU-related components in a standard 20-channel EDACS installation. Each standard EDACS repeater cabinet includes the unidirectional power sensors, power sensor cables, power sensor module, and cabinet interconnect cable. The cable between the Site Controller computer and the PMU, the cables between the PMU and the Power Sensor interface module, the Power Sensor interface module, and the bi-directional (antenna) power sensor(s) are installed with the PMU.

If the PMU is to replace an older PMU at an EDACS site without EDACS Interface Panels, adapter cables are installed with the PMU to adapt to the existing cables and equipment (see the Installation section in this manual for details).
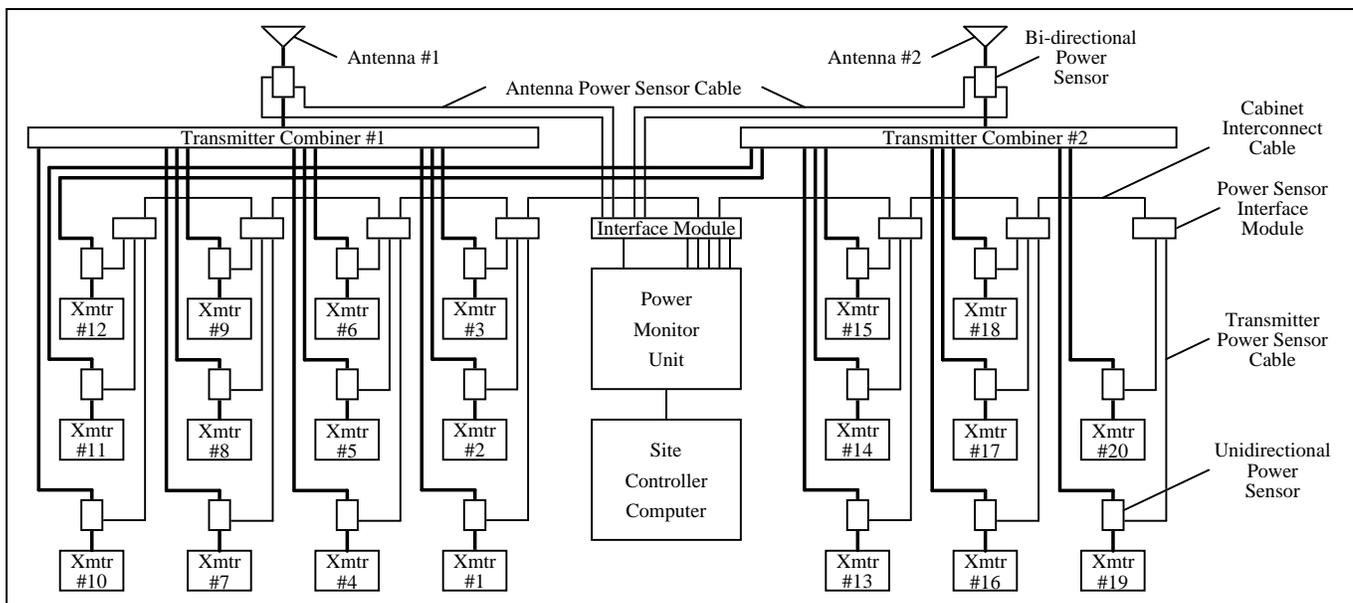
Figure 1 - Location of PMU Components

APPLICATION NOTES

VAX SITE CONTROLLER COMPUTER

Make sure that the Site Controller computer, at the location where this PMU is to be installed, is a VAX model or a PDP model that has been upgraded to a VAX model. To determine if a PDP model has been upgraded internally to a VAX model, you must look inside the PDP system chassis and see which cards are installed. PDP models that have been upgraded to a VAX model will have their cards arranged in the card cage as shown in Figure 2.

KA620-BA	
MS630-BB	
MRV11-D	H3656-00
CQ1610#1	
CQ1610#2	
EMPTY	
EMPTY	
EMPTY	

Figure 2 - Card Layout for PDP Upgraded to VAX

APPLICATION SOFTWARE PROMS

The Site Controller computer's Application Software PROMs <u>must</u> be marked 344A3265Gx, where x = 6 or higher. (Application Software PROMs with x = 5 or lower will not work for the new PMU.) If new Application Software PROMs are needed, make sure they are ordered with the new PMU.

PERSONALITY PROMS

The Site Controller computer's Personality PROMs <u>must</u> be replaced when installing the new PMU, even if the system currently has an old PMU and a System Manager. When ordering the new PMU, you must provide the correct information to the factory about the system in which the PMU is to be used. The following five parameters directly affect the operation of the PMU (don't assume that the person taking the order will know what you want, need, or the recommendations given here):

Channel Fault Tolerance Threshold - This parameter defines what percentage of channels must fail due to one cause (i.e. PMU, Test Unit, Local Telephone Interconnect, etc.) before the Site Controller computer considers those alarms bogus. This parameter <u>is not</u> System Manager re-configurable. Default is 50 %.

PMU Enable - This parameter set (mask) defines (for each channel) if that channel number is to be monitored by the PMU. This parameter <u>is not</u> System Manager re-configurable and therefore all equipped channels <u>must</u> be enabled. It is recommended that all 20 channels be enabled (equipped or not).

Power Monitor Unit - This parameter can be set to "Off" (if you want the PMU option disabled) or "On" (if you want the PMU option enabled). This parameter is System Manager re-configurable, but <u>must</u> be set to "On" if the site is being operated without a System Manager. It is recommended that this parameter be set to "On", even if the site is being operated with a System Manager.

PMU Model - This parameter can be set to "Old-8843" (PMU protocol set to 2400 Baud for Decibel Products DB8843 based old PMU) or "New-8860" (PMU protocol set to 9600 Baud for Decibel Products DB8860 based new PMU). This parameter <u>is not</u> System Manager re-configurable and therefore <u>must</u> be set to "New-8860".

PMU Power Levels - This parameter defines the lower power level limit for all transmitters (one limit is applied to all). This parameter is System Manager re-configurable, but <u>must</u> be set to some power level lower than rated power if the site is being operated without a System Manager. It is recommended that this parameter be set to 50% of the rated power, even if the site is being operated with a System Manager.

> --- **NOTE** ---
>
> If this PMU option is being installed in the field, these Personality PROMs <u>must</u> be changed, even if the system currently has an old PMU and a System Manager.

DUPLEXER APPLICATION

If a duplexer is being used, the antenna power sensor <u>MUST</u> be inserted between the transmitter combiner and the duplexer (<u>NOT</u> between the duplexer and the antenna) to avoid the possibility of introducing intermod products into the receiver.

INSTALLATION

SITE CONTROLLER HARDWARE

Verify that the Site Controller computer is a VAX model, or a PDP model that has been upgraded to a VAX model (see the VAX Site Controller heading in the Applications Notes section). If you find that the Site Controller computer is a PDP model, upgrade kits are available through Ericsson Service Parts. Alternatively, the PDP model may be replaced with the current 19A149302P9 VAX model.

SITE CONTROLLER SOFTWARE

The Site Controller computer contains a set of 14 Application Software PROMs and a set of two Personality PROMs. Both sets are located on the PROM card. Access to the PROM card in the latest VAX version of the Site Controller computer is through the back using the following procedure:

1. Turn off the Site Controller computer.

2. Loosen the two fastener screws holding the back panel to the chassis (see Figure 3).
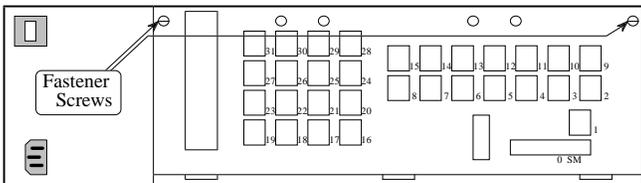
Figure 3 - Location of Fastener Screws on Computer

3. Rotate the back panel down and out of the way (be careful not to damage the ribbon cables).
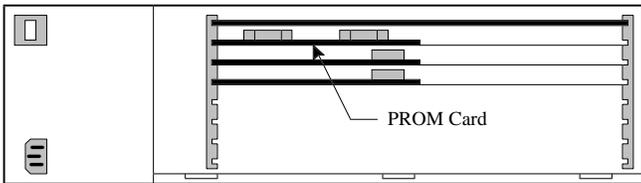
Figure 4 - Location of PROM Card in Computer

4. Remove the PROM Card (see Figure 4) by pulling on the two tabs fastened to the front edge of the card. (Observe standard handling practices for static sensitive components.)

Access to the PROM card in previous VAX versions and older PDP versions that were upgraded to a VAX version is through the top using the following procedure:

1. Turn off the Site Controller computer.

2. Pull the Site Controller computer chassis all the way forward on its slide-out track.

3. Pull up the top cover and the attached card cage.

4. Remove the PROM Card (see Figure 5) by pulling on the two tabs fastened to the front edge of the card. (This is a three-handed operation - observe standard handling practices for static sensitive components.)
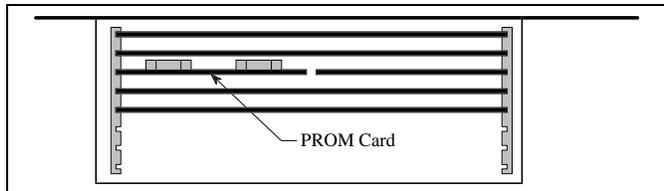
Figure 5 - Location of PROM Card in Older Computer
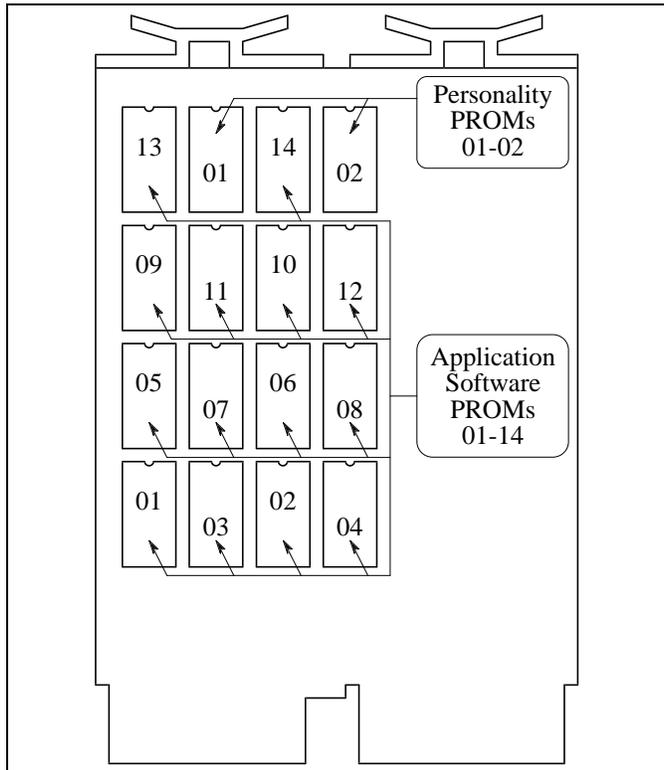
Figure 6 - Location of PROMs on PROM Card

The location of the Application Software and Personality PROMs on the PROM card is shown in Figure 6. When replacing PROMs, be sure to get each new PROM in the correct location, and with the notched end as shown. Be especially careful of location numbers 01 and 02 since these numbers are used for both sets of PROMs.

Application Software PROMs

Check the revision number marked on the Application Software PROMs. Each of the 14 Application Software PROMs must be marked 344A3265Gx, where x = 6 or higher. (Application Software with x = 5 or lower will not work for the new PMU option.) Figure 7 shows where to find the software revision number and the PROM location number on a typical Application Software PROM label. Replace all 14 Application Software PROMs if required.
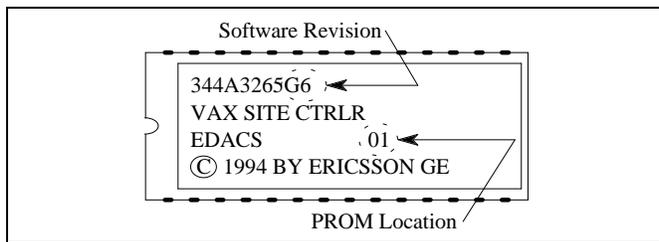
Figure 7 - Application Software PROM Label

Personality PROMs

Replace the two Personality PROMs, even if a PMU was previously installed with this Site Controller computer. Figure 8 shows a typical Personality PROM label. (See the Application Notes section if you need to order new Personality PROMs.)
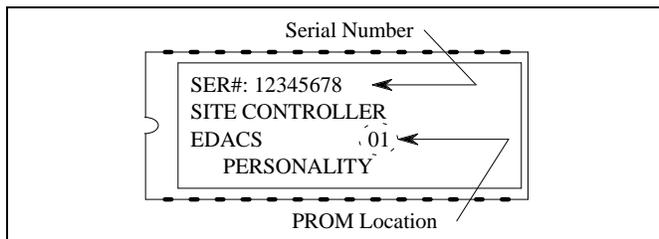
Figure 8 - Personality PROM Label

PMU HARDWARE

There are three procedures for the installation of the PMU hardware. The procedure you should use will depend upon whether or not the Site Controller cabinet presently contains EDACS Interface Panels and/or an old PMU. The EDACS Interface Panels are located in the back of the cabinet, near the top. Each panel consists of a 5 1/4 inch X 19 inch frame containing one or more interface modules (boards with connectors). Use Table 1 to select the right PMU hardware installation procedure for your system.

Table 1 - Selection of Installation Procedure

INTERFACE PANEL	OLD PMU	HARDWARE INSTALLATION PROCEDURE
Yes	No	A. Addition from No PMU
	Yes	B. Upgrade from Old PMU
No	Yes	C. Adaptation from Old PMU

The table and the procedures assume that the equipment that presently exists in the Site Controller cabinet is one of the previous standard configurations. Regardless of which procedure is used, it is very important to know exactly what equipment presently exists, review what has to be done, and be sure you have all the parts you will need before you start the installation.

A. Addition from No PMU

Use this procedure only if your Site Controller cabinet has EDACS Interface panels, but doesn't have a PMU.

This procedure consists of adding the PMU, Power Monitor interface module, cables between the PMU and the Power Monitor interface module, cable between the PMU and the Site Controller computer, and DC power wires to the PMU, all in the Site Controller cabinet. It also consists of adding the antenna power sensor(s) in the RF Equipment cabinet(s), and the antenna power sensor cables between the antenna power sensor(s) in the RF Equipment cabinet(s) and the Power Monitor interface module in the Site Controller cabinet.

Parts Required

Before you start this procedure, be sure you have all the parts on hand. The parts for this procedure are shown in Table 2.

Table 2 - Parts for Addition from No PMU

QTY	PART #	DESCRIPTION
1	19D903880P100 or	Cable - DILOG Panel to PMU
	19D903880P101	Cable - Site Controller computer to PMU
1	350A1380P1	Decibel Products DB8860-based PMU Unit
1	19D903880P150	DC power cable for PMU
1	188D6466P1	Cable - PMU to Power Sensor interface module
5	188D6466P2	Cable - PMU to Power Sensor interface module
1	19C852632G1	Power Sensor interface module
1	19C852677P3	Cable - Power Sensor interface module to Antenna power sensor(s)
1 or 2	19C336861P3 or	Antenna power sensor (450 - 1000 MHz)
	19C336861P4	Antenna power sensor (66 - 325 MHz)

Procedure

The following steps involve equipment in the Site Controller cabinet, except as noted:

1. Turn off the main 12V power supply for the cabinet.

2. Replace the 5 1/4 inch blank panel just above the Downlink GETC (called Trunking Card in some older installations) with the PMU. There will be a half rack unit space (7/8 inch) both above and below the PMU.

3. Connect the spade terminal end of the red wire of the 19D903880P150 DC power cable to TB10-7 on the back of the Downlink GETC shelf. Connect the other end to the terminal on the back of the PMU labeled "+" after cutting the wire to length (leave a little slack).

4. Connect the spade terminal end of the black wire of the 19D903880P150 DC power cable to TB10-6 on the back of the Downlink GETC shelf. Connect the other

end to the terminal on the back of the PMU labeled "–" after cutting the wire to length (leave a little slack).

5. Mount the new 19C852632G1 Power Sensor interface module on the left-hand end of the upper EDACS Interface Panel in the upper rear of the cabinet, using the four thread forming screws provided with it. (You will need a T15 Torx-head screwdriver.) If an old Power Sensor interface module is mounted there, replace it with the new 19C852632G1 interface module.

    This interface module contains two 19C852379G1 Power Sensor Termination Boards, each containing 12 shorting jumpers. The board plugged into J1 is used to short any unused power sensor circuit for Transmitter channels #1 through #12. The board plugged into J2 is used to short any unused power sensor circuit for Transmitter channels #11 through #20.

6. Remove the 19C852379G1 Power Sensor Termination Board from J1 on the Power Sensor interface module (installed in step 5), and connect a 25-pair cabinet interconnect cable in its place. Connect the other end of the 25-pair cabinet interconnect cable to J14 or J15 on the Power Sensor interface module in the EDACS Repeater cabinet containing the transmitter for channel #1). If the two cabinets are next to each other in the same row, use a 5-ft 19D903880P120 cable. If the two cabinets are across from each other in different rows, use a 15-ft 19D903880P121 cable.

7. Starting with the cabinet containing the transmitter for channel #1, follow the daisy chain of 25-pair cabinet interconnect cables connected to J14 and J15 on the Power Sensor interface module in each EDACS Repeater cabinet until an empty J14 or J15 connector is found. Plug the 19C852379G1 Power Sensor Termination Board (removed in the previous step) into this empty connector.

8. Remove the shorting jumper for each transmitter channel # equipped with a power sensor (P# corresponds to transmitter channel #).

    Note that there is a shorting jumper for transmitter channels #11 and #12 on each of the 19C852379G1 Power Sensor Termination Boards. Therefore, if transmitter channel #11 or #12 is equipped with a power sensor, a jumper must be removed from each of the two Power Sensor Termination Boards.

9. If the system does not have any additional EDACS Repeater cabinets not included in the daisy chain in the previous step, go to step 11.

If the system has additional EDACS Repeater cabinets not included in the daisy chain in the previous step, remove the 19C852379G1 Power Sensor Termination Board from J2 on the Power Sensor interface module (installed in step 5), and connect a 25-pair cabinet interconnect cable in its place. Connect the other end of the 25-pair cabinet interconnect cable to J14 or J15 on the Power Sensor interface module in the EDACS Repeater cabinet containing the transmitter for channel #11 or #13). If the two cabinets are next to each other in the same row, use a 5-ft 19D903880P120 cable. If the two cabinets are across from each other in different rows, use a 15-ft 19D903880P121 cable.

10. Starting with the cabinet containing the transmitter for channel #11 or #13, follow the daisy chain of 25-pair cabinet interconnect cables connected to J14 and J15 on the Power Sensor interface module in each EDACS Repeater cabinet until an empty J14 or J15 connector is found. Plug the 19C852379G1 Power Sensor Termination Board (removed in the previous step) into this empty connector.

11. Remove a shorting jumper in the 19C852379G1 Power Sensor Termination Board for each transmitter channel # equipped with a power sensor (P# plus 12 corresponds to transmitter channel #). Note that the P# corresponds to a different transmitter channel # in this case.

    Note that there is a shorting jumper for transmitter channels #11 and #12 on each of the 19C852379G1 Power Sensor Termination Boards. Therefore, if transmitter channel #11 or #12 is equipped with a power sensor, a jumper must be removed from each of the two Power Sensor Termination Boards.

12. Connect the five new 188D6466P2 cables from J3 through J7 on the Power Sensor interface module in the upper EDACS Interface Panel, to Port 1 through Port 5 respectively on the back of the PMU.

13. Connect the new 188D6466P1 cable from J8 on the Power Sensor interface module in the upper EDACS Interface Panel, to PORT 7 on the back of the PMU.

14. If the Site Controller computer has modular RJ11-8 connectors on its back panel, connect the new 19D903880P101 cable from the right-hand VDT Interface on the back of the PMU, to Port 29 on the back of the Site Controller computer.

If the Site Controller computer does not have modular RJ11-8 connectors on its back panel, connect the new 19D903880P100 cable from the right-hand VDT Interface on the back of the PMU to connector #13 on the right-hand (B) DILOG panel (above the Site Controller computer).

15. Install the 19C336861P3 or P4 antenna power sensor(s) at the output of the transmitter combiner(s) in the RF Equipment cabinet(s).

16. Install the 19C852677P3 antenna power sensor cable from J9 on the Power Sensor interface module in the Site Controller cabinet, to the antenna power sensor(s) in the RF equipment cabinet(s) as shown in Figure 9. If the system has only one antenna, tack solder a jumper (tip to shield) on each of the unused phono plugs to short the forward and reflected power sensor circuits for antenna #2.
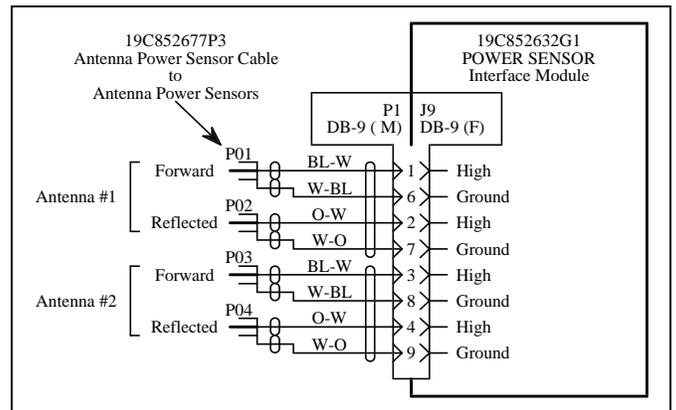
Figure 9 - Antenna Power Sensor Connections

17. Double check the installation using the interconnection diagram shown in Figure 10.

18. Set the power switch on the back of the PMU to the "Off" position.

19. Turn on the main 12V power supply for the cabinet.
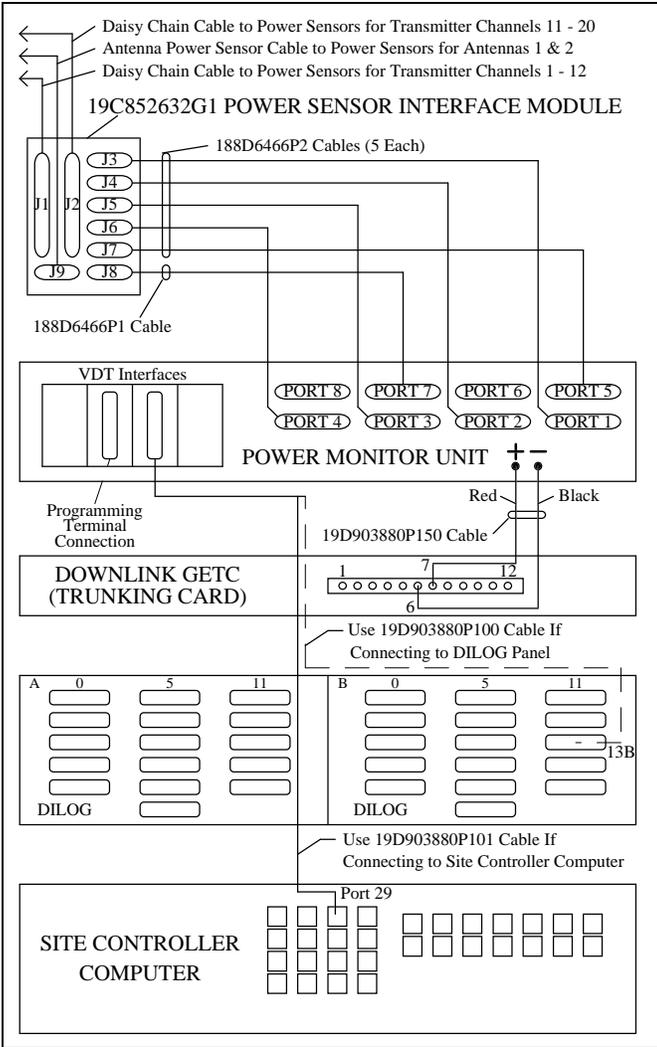
Figure 10 - Connections for Addition from No PMU

B.   Upgrade from Old PMU

Use this procedure only if your Site Controller cabinet has EDACS Interface panels and an old PMU.

This procedure consists of upgrading the Site Controller by replacing the old PMU, replacing the old Power Sensor interface module, and replacing the cables between them.

Parts Required

Before you start this procedure, be sure you have all the parts on hand. The parts for this procedure are shown in Table 3.

Table 3 - Parts for Upgrade from Old PMU

QTY	PART #	DESCRIPTION
1	350A1380P1	Decibel Products DB8860-based PMU Unit
1	188D6466P1	Cable - PMU to Power Sensor interface module
5	188D6466P2	Cable - PMU to Power Sensor interface module
1	19C852632G1	Power Sensor interface module

Procedure

The following steps involve equipment in the Site Controller cabinet only:

1. Turn off the main 12V power supply for the cabinet.

2. Mark "+" on the wire going to the screw terminal marked "+" on the back of the old PMU. Then disconnect this wire at the PMU end.

3. Mark "–" on the wire going to the screw terminal marked "–" on the back of the old PMU. Then disconnect this wire at the PMU end.

4. Mark "RS-232" on the cable going to the DB-25 connector marked "RS-232" on the back of the old PMU. Then disconnect this cable at the PMU end.

5. Disconnect any cables going to the connectors marked "Antennas 1-4", "Transmitters 1-9", "Transmitters 10-18", and "Transmitters 19-20" on the back of the old PMU. (There is no need to label these cables since they will not be used with the new PMU.)

6. Replace the old PMU with the new PMU. There will be a half rack unit space (7/8 inch) both above and below the new PMU.

7. Connect the existing wire labeled "+" in step 2 to the terminal labeled "+" on the back of the new PMU.

8. Connect the existing wire labeled "–" in step 3 to the terminal labeled "–" on the back of the new PMU.

9. Connect the existing cable labeled "RS232" in step 4 to the right-hand VDT interface on the back of the new PMU (see Figure 7).

10. Find the Power Sensor interface module mounted in the left end of the upper EDACS Interface Panel in the upper rear of the cabinet. If a cable is connected to the

Power Sensor interface module connector marked "J1", label the cable "J1" and disconnect it from the Power Sensor interface module.

11. If a cable (or an existing 19C852379G1 Power Sensor Termination Board) is connected to the Power Sensor interface module connector marked "J2", label the cable (or board) "J2" and disconnect it at the Power Sensor interface module.

12. Find the cables (or group of cables) connected to the Power Sensor interface module connectors marked "J6" and "J7", determine which cable (or group of cables) goes to some point outside the cabinet, label this cable (or group of cables) "J9" (the connector number on the new Power Sensor interface module is different), and disconnect this cable (or group of cables) at the Power Sensor interface module.

13. Remove the old 19C852213G1 Power Sensor interface module and all cables still connected to it (all cables still connected to it should have been disconnected at their other end in step #5).

14. Mount the new 19C852632G1 Power Sensor interface module in the space vacated by the old module.

15. Connect the existing cables (or board) labeled "J1", "J2", and "J9" in steps 10-12 to the connectors marked "J1", "J2", and "J9" respectively on the new Power Sensor interface module.

16. Connect the 5 new 188D6466P2 cables from J3 through J7 on the new Power Sensor interface module to Port 1 through Port 5, respectively, on the back of the new PMU.

17. Connect the new 188D6466P1 cable from J8 on the new Power Sensor interface module to Port 7 on the back of the new PMU (skip Port 6).

18. Double check the installation using the interconnection diagram shown in Figure 11.

19. Set the power switch on the back of the PMU to the "Off" position.

20. Turn on the main 12V power supply for the cabinet.

C. Adaptation from Old PMU

Use this procedure only if your Site Controller cabinet doesn't have EDACS Interface panels, but does have an old PMU.
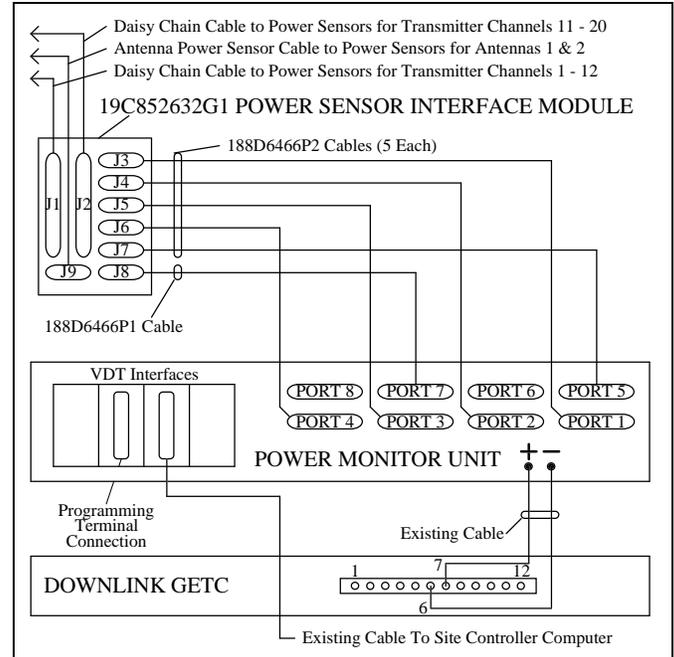
Figure 11 - Connections for Upgrade from Old PMU

This procedure consists of replacing the old PMU with the new PMU, adding an adapter cable between the existing transmitter power sensor cables and the new PMU, and adding an adapter cable between the existing antenna power sensor cable and the new PMU. The existing RS232 data link to the Site Controller computer and the two DC power wires can be re-connected directly to the new PMU. This procedure upgrades the system to the extent that it adds the new PMU, but uses adapter cables instead of upgrading to the EDACS Interface Panel configuration.

Parts Required

Before you start this procedure, be sure you have all the parts on hand. The parts for this procedure are shown in Table 4.

Table 4 - Parts for Adaptation from Old PMU

QTY	PART #	DESCRIPTION
1	350A1380P1	Decibel Products DB8860-based PMU Unit
1	188D6451P1	Adapter Cable - Transmitter power sensor circuits
1	188D6496P1	Adapter Cable - Antenna power sensor circuits

Procedure

The following steps involve equipment in the Site Controller cabinet, except as noted:

1. Mark the cables and wires going to the old PMU as follows:

    • Mark "Antennas 1-4" on the cable going to the DB-15 connector on the back of old PMU marked "Antennas 1-4".

    • Mark "Transmitters 1-9" on the cable going to the DB-37 connector on the back of the old PMU marked "Transmitters 1-9".

    • Mark "Transmitters 10-18" on the cable going to the DB-37 connector on the back of the old PMU marked "Transmitters 10-18".

    • Mark "Transmitters 19-20" on the cable going to the DB-25 connector on the back of the old PMU marked "Transmitters 19-20".

    • Mark "RS-232" on the cable going to the DB-25 connector on the back of the old PMU marked "RS-232".

    • Mark "+" on the wire going to the screw terminal marked "+".

    • Mark "–" on the wire going to the screw terminal marked "–".

2. Turn off the main 12V power supply for the cabinet.

3. Disconnect the cables and wires from the old PMU.

4. Replace the old PMU with the new PMU. There will be a half rack unit space (7/8 inch) both above and below the PMU.

5. Connect the 188D6451P1 adapter cable as follows:

    • Connect the two DB-37 connectors on the adapter cable marked "P2" and "P3" to the existing cables (disconnected from the old PMU) marked "Transmitters 1-9" and "Transmitters 10-18" respectively.

    • Connect the single DB-25 connector on one end of the adapter cable marked "P4" to the existing cable (disconnected from the old PMU) marked "Transmitters 19-20".

    • Connect the five DB-25 connectors on the other end of the adapter cable marked "P5", "P6", "P7", "P8", and "P9" to Port 1 through Port 5 respectively on the back of the new PMU.

6. Connect the 188D6496P1 adapter cable as follows:

    • Connect the DB-15 connector on the adapter cable marked "P2" to the existing cable (disconnected from the old PMU) marked "Antennas 1-4".

    • Connect the DB-25 connector on the adapter cable marked "P3" to Port 7 on the back of the new PMU.

7. Connect the existing cable (disconnected from the old PMU) marked "RS-232" to the right VDT Interface connector on the back of the new PMU.

8. Connect the existing wires (disconnected from the old PMU) marked "+" and "–" to the screw terminals on the back of the new PMU marked "+" and "–" respectively.

9. Double check the installation using the interconnection diagram shown in Figure 12.
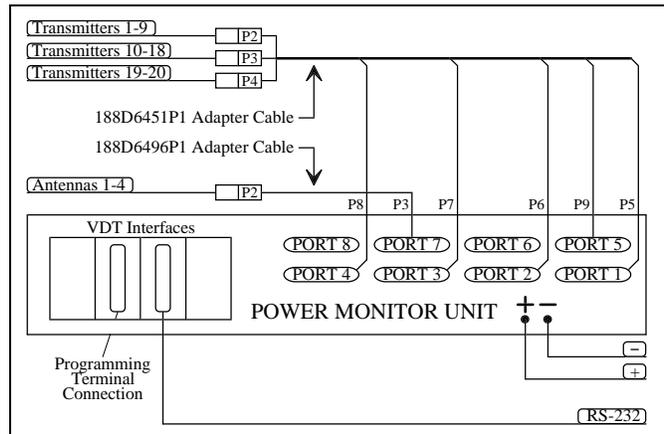
Figure 12 - Connections for Adaptation from Old PMU

10. Set the power switch on the back of the PMU to the "Off" position.

11. Turn on the main 12V power supply for the cabinet.

INITIAL POWER-UP

After the PMU equipment has been mounted and checked, you are ready for the initial power-up of the PMU.

1. Temporarily disconnect the data link cable to the Site Controller computer from the right-hand VDT Interface

on the back of the PMU (this cable will be re-connected later in the installation).

2. Switch the On/Off switch on the back of the PMU to the "On" position.

3. Verify that the "PWR" indicator on the front panel of the PMU stays on continuously.

4. Verify that the three other indicators on the front panel of the PMU are flashing in a repeating sequence. The "MUX" indicator should flash once every 250 milliseconds; first by itself, next with the "DATA" indicator, and then with the "ALARM" indicator.

PMU PROGRAMMING

The PMU's operational program will use factory default values for its operational parameters unless re-configured by the user. The user-configurable parameters may be changed by using an RS232 CRT terminal (or PC with terminal emulation software) connected to the PMU.

CAUTION

Changing parameters not covered in this manual may lead to unsatisfactory operation of the PMU option.

Terminal Setup

The following initial steps are required to set up the terminal and access the PMU.

1. Connect the RS232 CRT terminal to the left-hand VDT Interface connector on the <u>back</u> of the PMU (see Figure 12). (DO NOT plug into the front of the PMU.) If the RS232 CRT terminal has a male DB-25 port, connect per Figure 13. If the terminal has a male DB-9 port, connect per Figure 14.

CAUTION

DO NOT plug the RS232 CRT terminal into the front panel of the PMU (damage to terminal may result). This connnector is for another device in another application.
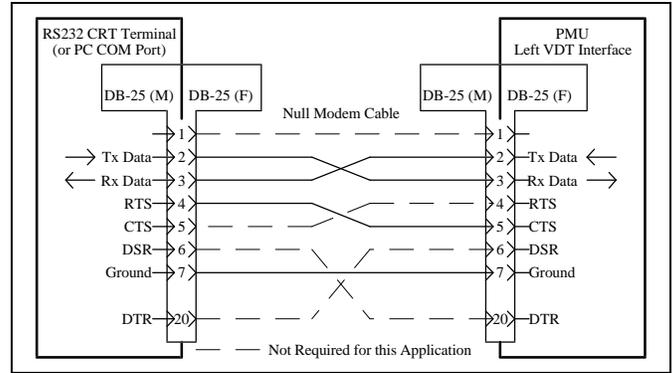
Figure 13 - DB-25 Terminal Connections
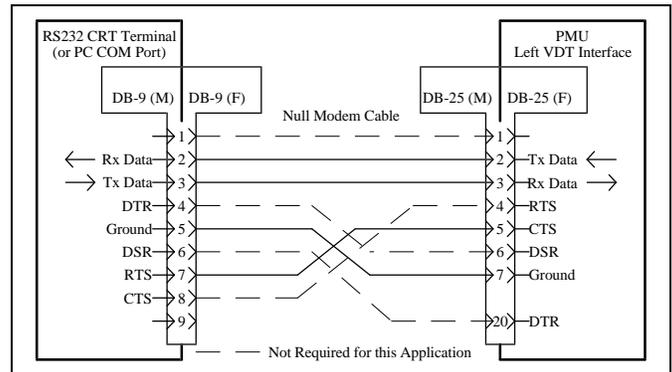
Figure 14 - DB-9 Terminal Connections

2. Turn the terminal on and set the communications protocol per Table 5.

Table 5 - Terminal Communications Protocol

PARAMETER	VALUE
Baud Rate	9600 BPS
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

3. Press the Enter key one or more times until the "Disconnected - Hit Any Key To Connect" prompt appears on the terminal:

Software Revision Check & Initialization

Before you attempt to re-configure any user-configurable parameter in the PMU, the revision of the software should be verified and all user-configurable parameters should be returned to the factory default values. This will assure a known starting point. The following

procedure is used to verify the software revision and to initialize the user-configurable parameters in the PMU to the factory default values:

4. Type 8860 and press the Enter key. The Operation Select Menu should then appear on the terminal as shown in Figure 15. If the PMU does not respond to this entry, the password may have been re-configured from its factory default value. See the Erase All Programming heading in the Maintenance section for the procedure to return all parameters to the factory default values (including the password). Then go back to step 3.

5. With the Operational Select Menu shown on the terminal, verify that "SENTRY PMU REV" is followed by the revision number 8.6 (or higher).

If the revision number is exactly 8.6, the default value of the Alarm Delay parameter has deliberately been re-configured from the factory default value of 3 to a value of 8 to reduce the probability of a transmitter alarm being reported when it shouldn't. Therefore, if the revision number is exactly 8.6, skip steps 7 through 11 for initializing the PMU (initializing the PMU will return this parameter to its factory default value). If for some reason the PMU is initialized, see the Alarm Delay heading in the Maintenance section for the procedure to re-configure this parameter. This only applies if the revision number is exactly 8.6.

6. With the Operational Select Menu shown on the terminal, type 4 (for item #4 - Setup) and press the Enter key. The Setup Selection Menu should then appear on the terminal as shown in Figure 16.

```
SENTRY 8860 COPYRIGHT 1987-1994 DECIBEL PRODUCTS
PATENT 4,823,280


OPERATION SELECT MENU       SENTRY PMU REV 8.6 12/07/94

 1. DISCONNECT
 2. REPORTS
 3. MANUAL CONTROL
 4. SETUP
 5. HARDWARE STATUS
 6. SOFTWARE STATUS
 7. RESET     ***WARNING - FOR EMERGENCY ONLY***
ENTER SELECTION:
```

Figure 15 - Operation Select Menu (Main Menu)

```
          SETUP SELECTION MENU

 1. RETURN TO OPERATION SELECT MENU
 2. SITE DATA #1
 3. SITE DATA #2
 4. ANALOG INPUT CHANNEL
 5. DIGITAL INPUT CHANNEL
 6. ANALOG PSEUDO CHANNEL
 7. DIGITAL PSEUDO CHANNEL
 8. RELAY OUTPUTS
 9. INPUT CONVERSION TABLE
10. ERASE ALL PROGRAMMING
11. db TEST CONFIGURATION
12. db TOWER LIGHTS CONFIGURATION

ENTER SELECTION: _
```

Figure 16 - Setup Selection Menu

7. With the Setup Selection Menu shown on the terminal, type 10 (for item #10 - Erase All Programming) and press the Enter key.

8. At the "Enter Y to Continue, Any Other Character to Abort:" prompt (after the warning message), type Y and press the Enter key.

9. At the "Enter Site Password" prompt, type 8860 and press the Enter key.

10. At the "Enter Site ID" prompt, type 1234 and press the Enter key. You will be given a 4-second countdown and then a flashing "Sentry Initialized" message.

11. Finally the Setup Selection Menu should appear on the terminal.

Time, Date, & Password

The following procedure to set the time, date, and password is optional and has no affect on the performance of the PMU. The time and date are used by the Alarm History Report Screen, described in the Maintenance section, and the password can be used for programming security, if needed.

12. With the Setup Selection Menu shown on the terminal, type 2 (for item #2 - Site Data #1) and press the Enter key. The Site Data #1 screen should then appear on the terminal as shown in Figure 17.

13. With the Site Data #1 screen shown on the terminal, type 1 (for item #1 - Time) and press the Enter key.

14. At the "Enter New Data:" prompt, type up to 4 numerical characters (do not type the colon, am, or pm) and press the Enter key. Use the following samples as a guide:

> Type 1 or 01 to get 1:00 am.
> Type 13 to get 1:00 pm.
> Type 130 to get 1:30 am.
> Type 1330 to get 1:30 pm.

15. With the Site Data #1 screen shown on the terminal, type 2 (for item #2 - Date) and press the Enter key.

16. At the "Enter New Data:" prompt, type 4 numerical characters (do not type the /) and press the Enter key. The first 2 numbers are for the month; the second 2 numbers are for the day of the month. Use the following samples as a guide:

```
        SITE DATA #1

 1. TIME =          0:01 am
 2. DATE =           1/01
 3. YEAR =          1994
 4. SITE NAME =   NOT PROGRAMMED
 5. SITE ID =      1234
 6. PASSWORD =     8860
 7. REPORT TIME =                      8. REPORT TIME =
 9. REPORT TIME =                     10. REPORT TIME =
11. PH #1 PRI=H                       12. PH #1 ALT=

13. RETRY INTERVAL #1 (min)=    10
14. PH #2 PRI=                        15. PH #2 ALT=

13. RETRY INTERVAL #2 (min)=    10
14. PH #3 PRI=                        15. PH #3 ALT=

13. RETRY INTERVAL #3 (min)=    10
14. PH #4 PRI=                        15. PH #4 ALT=

13. RETRY INTERVAL #4 (min)=    10

ENTER ITEM NUMBER TO CHANGE,
"H" FOR HELP MENU, "A" TO ABORT,
OR "E" TO END PROGRAMMING THIS CHANNEL:
```

Figure 17 - Site Data #1 Screen

Type 1 or 01 to get 1/00.
Type 12 or 120 to get 12/00.
Type 0120 to get 1/20.
Type 1201 to get 12/01.

17. With the Site Data #1 screen shown on the terminal, type 3 (for item #3 - Year) and press the Enter key.

18. At the "Enter New Data:" prompt, type all 4 characters for the year and press the Enter key.

19. With the Site Data #1 screen shown on the terminal, type 6 (for item #6 - Password) and press the Enter key.

20. At the "Enter New Data:" prompt, type up to 4 characters for the password and press the Enter key. Check the password shown on the Site Data #1 screen to be absolutely sure it is what you expected and want. If not, return to step #8 and redo the password. If you try to enter more than 4 characters, only the first 4 will be used. After you are satisfied with the password, go on to the next step.

21. Type E (to end programming this screen) and press the Enter key. The Setup Selection Menu should then appear on the terminal.

Antenna Mapping

Antenna Mapping tells the PMU which antenna is used by each transmitter. The factory defaults have AI025 (antenna #1) mapped for transmitters #1 through #10 and AI027 (antenna #2) mapped for transmitters #11 through #20. If any transmitter is connected to an antenna other than described by these default values, the Antenna Channel parameter must be re-configured.

The following steps must be repeated for each transmitter that is connected to a different antenna # than described by the PMU's factory defaults. Those transmitters for which the PMU's factory defaults are correct, may be skipped. Transmitters may be configured in any order, but starting with the lowest transmitter # and working your way up will probably be the easiest way to keep track of which ones have been done.

27. With the Setup Selection Menu shown on the terminal, type 4 (for item #4 - Analog Input Channel) and press the Enter key.

28. At the "Enter Channel Number" prompt, type the channel number of the transmitter and press the Enter key. The Analog Input Channel screen for that channel should then appear on the terminal (see Figure 18). (If item #10 - Channel Enable Method = 5, item #11 will not be present.)

29. With the Analog Input Channel screen shown on the terminal, type 1 (for item #1 - Channel Type) and press the Enter key.

30. At the "Enter New Data" prompt, type 3 and press the Enter key. The screen will be re-written to add item #11 (or #12) - Antenna Channel (see Figure 19).

31. Type 11 or 12 (whichever corresponds to the Antenna Channel) and press the Enter key.

32. At the "Enter New Data" prompt, type AI025 for antenna #1 or AI027 for antenna #2, and press the Enter key. The screen will be re-written to show the new value. (Note that AI are both alpha characters - standing for Analog Input - and the next three are numeric characters corresponding to an analog input circuit number.)

33. Type E (to End programming this channel) and press the Enter key. The Setup Selection Menu should then appear on the terminal.

This completes the configuration of the Antenna Channel parameter for the selected transmitter. If this parameter needs to be changed for another transmitter, repeat the last seven steps for that transmitter. When this parameter is satisfactory for all transmitters, go on to the next step.

34. With the Setup Selection Menu shown on the terminal, type 1 (for item #1 - Return To Operation Select Menu) and press the Enter key.

35. The Operation Select Menu should then be shown on the terminal. Type 1 (for item #1 - Disconnect) and press the Enter key.

36. The "Disconnected - Hit Any Key To Connect" prompt should then appear on the terminal.

```
        ANALOG INPUT CHANNEL 1

1.   CHANNEL TYPE (0-13) =                    0
2.   DESCRIPTION =                            TX01
3.   UNIT ID =                                AI01
4.   MEASUREMENT UNITS =                      Watts
5.   ALARM DELAY (1/4 sec) =                  3
6.   LOWER ALARM LIMIT =                 0.0
7.   UPPER ALARM LIMIT =               125.0
8.   ALARM REPORT TYPES (1,2,3,4) =
9.   ALARM RELAY NUMBER =                     0
10.  CHANNEL ENABLE METHOD (0-5) =            0
11.  CHANNEL ENABLE THRESHOLD =          0.0


ENTER ITEM NUMBER TO CHANGE,
"H" FOR HELP MENU, "A" TO ABORT,
OR "E" TO END PROGRAMMING THIS CHANNEL:
```

Figure 18 - Analog Input Channel Screen

```
        ANALOG INPUT CHANNEL 1

1.   CHANNEL TYPE (0-13) =                    3
2.   DESCRIPTION =                            TX01
3.   UNIT ID =                                AI01
4.   MEASUREMENT UNITS =                      Watts
5.   ALARM DELAY (1/4 sec) =                  3
6.   LOWER ALARM LIMIT =                 0.0
7.   UPPER ALARM LIMIT =               125.0
8.   ALARM REPORT TYPES (1,2,3,4) =
9.   ALARM RELAY NUMBER =                     0
10.  CHANNEL ENABLE METHOD (0-5) =            0
11.  CHANNEL ENABLE THRESHOLD =          0.0
12.  ANTENNA CHANNEL =                   AI025


ENTER ITEM NUMBER TO CHANGE,
"H" FOR HELP MENU, "A" TO ABORT,
OR "E" TO END PROGRAMMING THIS CHANNEL: _
```

Figure 19 - Analog Input Channel Screen Showing Antenna Channel Parameter

POWER SENSOR CALIBRATION

The power sensor provides a DC voltage output representing the power through it. This calibration method uses an in-line wattmeter to read the power going through the power sensor, a DC voltmeter to measure the DC voltage out of the power sensor, and a conversion table to simulate the PMU's calculation of power from this DC voltage. This DC voltage is then adjusted (using the 20-turn potentiometer mounted in the power sensor) until the power read from the conversion table agrees with the power read on the power meter.

An alternative (but more difficult) method is to use the Channel Monitor Screen to monitor the power calculated by the PMU (in place of the DC voltmeter and conversion table). The use of this screen is described under the Diagnostic Screens heading in the Maintenance section.

Unidirectional Power Sensors

Use the following procedure to calibrate the unidirectional power sensors used at the output of each transmitter. Start with the transmitter for channel #1. The location of the calibration screw is shown in Figure 20.
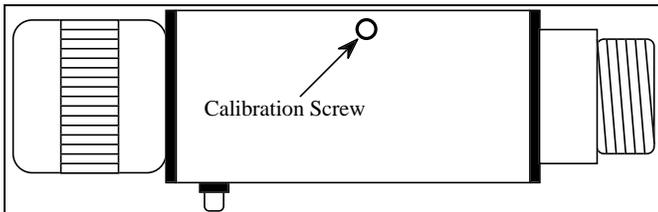
Figure 20 - Unidirectional Power Sensor Calibration Screw

1. Turn off the 12V station power supply for the transmitter.

2. Disconnect the coax (from the power sensor to the combiner) at the power sensor end, and insert an in-line wattmeter (make sure the wattmeter is rated high enough to handle the power from the transmitter).

3. Disconnect the power sensor cable from the phono connector on the power sensor, and attach the DC voltmeter in its place (center pin is positive). (An alternate method is to disconnect the power sensor cable at the PMU - see interconnection diagram at end of manual - and attach the DC voltmeter to the end of the cable.)

4. Turn on the 12V station power supply for the transmitter.

5. Manually key the transmitter using the switch marked "REM KEY", or press and hold the PTT switch on a hand-held microphone plugged into the transmitter.

6. Measure the DC voltage on the meter, look up this voltage in Table 6 (V in volts) to get the corresponding power (P in watts), and compare with the actual power measurement on the power meter. Because the table does not contain all values of V and P, you may need to interpolate to get the values you need.

7. Turn the calibration screw (clockwise if the measured power is lower than the power from the table) and repeat steps 6 and 7 until the measured power is the same as the power from the table.

8. Turn off the 12V station power supply for the transmitter.

9. Disconnect the DC voltmeter from the phono connector on the power sensor, and re-connect the power sensor cable in its place.

10. Remove the wattmeter from between the power sensor and the coax to the combiner, and re-connect the coax to the power sensor.

11. Turn on the 12V station power supply for the transmitter.

12. Repeat steps 1 through 11 for the next transmitter until each transmitter has had its power sensor calibrated.

Bi-directional Power Sensors

Use the following procedure to calibrate the bi-directional power sensors used at the output of each combiner. Start with the combiner that feeds antenna #1. The locations of the calibration screws are shown in Figure 21.
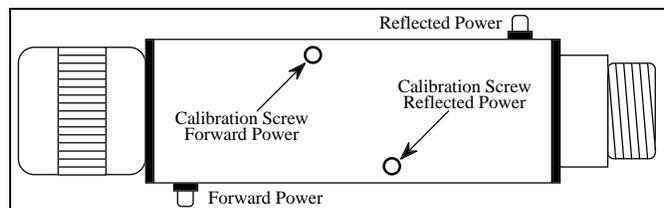
Figure 21 - Bi-directional Power Sensor Calibration Screws

1. Disconnect the coax (from the power sensor to the antenna) at the power sensor end, and insert an in-line wattmeter set to measure forward power (make sure the wattmeter is rated high enough to handle the power from all the transmitters feeding the combiner).

2. Disconnect the power sensor cable from the phono connector for the forward power on the power sensor, and attach the DC voltmeter in its place (center pin is positive). (An alternate method is to disconnect the power sensor cable at the PMU - see interconnection diagram at end of manual - and attach the DC voltmeter to the end of the cable.)

3. Manually key the transmitter using the switch marked "REM KEY", or press and hold the PTT switch on a hand-held microphone plugged into the transmitter.

4. Measure the DC voltage on the meter, look up this voltage in Table 6 (V in volts) to get the equivalent power calculation (P in watts), and compare with the actual power measurement on the power meter.

5. Turn the calibration screw (clockwise if the measured power is lower than the power from the table) and repeat steps 4 and 5 until the measured power is the same as the power from the table.

6. Disconnect the DC voltmeter from the phono connector on the power sensor, and re-connect the power sensor cable in its place.

7. Set the in-line wattmeter to measure reflected power.

8. Disconnect the power sensor cable from the phono connector for the reflected power on the power sensor, and attach the DC voltmeter in its place (center pin is positive).

9. Manually key the transmitter using the switch marked "REM KEY", or press and hold the PTT switch on a hand-held microphone plugged into the transmitter.

10. Measure the DC voltage on the meter, look up this voltage in Table 6 (V in volts) to get the equivalent power calculation (P in watts), and compare with the actual power measurement on the power meter.

11. Turn the calibration screw (clockwise if the measured power is lower than the power from the table) and repeat steps 10 and 11 until the measured power is the same as the power from the table.

12. Disconnect the DC voltmeter from the phono connector on the power sensor, and re-connect the power sensor cable in its place.

13. Remove the wattmeter from between the power sensor and the coax to the antenna, and re-connect the coax to the power sensor.

14. Repeat steps 1 through 13 for the other combiner (if two transmit antennas are used).

FINAL CHECK

Before the installation is complete, the Site Controller computer must be re-connected and the PMU option given a final operational check.

1. Re-connect the data link cable from the Site Controller computer to the right-hand VDT Interface connector on the back of the PMU (cable was temporarily disconnected for initial power-up and antenna mapping).

2. Verify that the "PWR" indicator on the front panel of the PMU stays on continuously.

3. Verify that the three other indicators on the front panel of the PMU are flashing in a repeating sequence. The "MUX" indicator should flash once every 250 milliseconds; first by itself, next with the "DATA" indicator, and then with the "ALARM" indicator.

Table 6 - Power Sensor Voltage-to-Power Conversion Table

V	P	V	P	V	P	V	P	V	P	V	P	V	P	V	P
0.00	0.0	0.62	25.5	1.25	80.6	1.87	164.4	2.50	276.7	3.13	417.2	3.76	585.9	4.38	782.7
0.01	0.6	0.64	26.8	1.27	82.8	1.89	167.5	2.52	280.6	3.15	422.0	3.77	591.6	4.40	789.3
0.03	1.0	0.66	28.1	1.28	85.0	1.91	170.6	2.54	284.6	3.17	426.9	3.79	597.4	4.42	795.9
0.05	1.4	0.68	29.5	1.30	87.2	1.93	173.7	2.56	288.6	3.19	431.8	3.81	603.1	4.44	802.5
0.07	1.8	0.70	30.8	1.32	89.5	1.95	176.9	2.58	292.7	3.22	436.7	3.83	608.9	4.46	809.2
0.09	2.2	0.72	32.2	1.34	91.8	1.97	180.1	2.60	296.8	3.23	441.7	3.85	614.8	4.48	815.9
0.11	2.7	0.74	33.6	1.36	94.1	1.99	183.3	2.62	300.9	3.25	446.7	3.87	620.6	4.50	822.7
0.13	3.2	0.76	35.1	1.38	96.5	2.01	186.5	2.64	305.0	3.27	451.7	3.89	626.5	4.52	829.4
0.15	3.7	0.77	36.6	1.40	98.8	2.03	189.8	2.66	309.2	3.28	456.7	3.91	632.4	4.54	836.2
0.17	4.3	0.79	38.1	1.42	101.3	2.05	193.1	2.68	313.3	3.30	461.8	3.93	638.4	4.56	843.0
0.19	4.9	0.81	39.6	1.44	103.7	2.07	196.4	2.70	317.5	3.32	466.9	3.95	644.4	4.58	849.9
0.21	5.5	0.83	41.2	1.46	106.2	2.09	199.8	2.72	321.8	3.34	472.0	3.97	650.4	4.60	856.8
0.23	6.1	0.85	42.8	1.48	108.7	2.11	203.2	2.74	326.1	3.36	477.2	3.99	656.4	4.62	863.7
0.25	6.8	0.87	44.4	1.50	111.2	2.13	206.6	2.75	330.4	3.38	482.3	4.01	662.4	4.64	870.6
0.27	7.5	0.89	46.0	1.52	113.7	2.15	210.0	2.77	334.7	3.40	487.5	4.03	668.5	4.66	877.6
0.28	8.3	0.91	47.7	1.54	116.3	2.17	213.5	2.79	339.0	3.42	492.8	4.05	674.6	4.68	884.5
0.30	9.1	0.93	49.4	1.56	118.9	2.19	217.0	2.81	343.4	3.44	498.0	4.07	680.8	4.70	891.5
0.32	9.9	0.95	51.2	1.58	121.5	2.21	220.5	2.83	347.8	3.46	503.3	4.09	686.9	4.72	898.6
0.34	10.7	0.97	52.9	1.60	124.2	2.23	224.1	2.85	352.2	3.48	508.6	4.11	693.1	4.74	905.7
0.36	11.6	0.99	54.7	1.62	126.9	2.25	227.6	2.87	356.7	3.50	514.0	4.13	699.3	4.76	912.7
0.38	12.5	1.01	56.5	1.64	129.6	2.27	231.2	2.89	361.2	3.52	519.3	4.15	705.6	4.77	919.9
0.40	13.4	1.03	58.4	1.66	132.4	2.28	234.9	2.91	365.7	3.54	524.7	4.17	711.9	4.79	927.0
0.42	14.4	1.05	60.3	1.68	135.1	2.30	238.5	2.93	370.3	3.56	530.2	4.19	718.2	4.81	934.2
0.44	15.3	1.07	62.2	1.70	137.9	2.32	242.2	2.95	374.8	3.58	535.6	4.21	724.5	4.83	941.4
0.46	16.4	1.09	64.1	1.72	140.8	2.34	245.9	2.97	379.4	3.60	541.1	4.23	730.8	4.85	948.6
0.48	17.4	1.11	66.1	1.74	143.6	2.36	249.7	2.99	384.0	3.62	546.6	4.25	737.2	4.87	955.9
0.50	18.5	1.13	68.0	1.76	146.5	2.38	253.5	3.01	388.7	3.64	552.1	4.27	743.6	4.89	963.2
0.52	19.6	1.15	70.1	1.77	149.4	2.40	257.3	3.02	393.4	3.66	557.7	4.28	750.1	4.91	970.5
0.54	20.7	1.17	72.1	1.79	152.4	2.42	261.1	3.05	398.1	3.68	563.3	4.30	756.5	4.93	977.8
0.56	21.9	1.19	74.2	1.81	155.3	2.44	264.9	3.07	402.8	3.70	568.9	4.32	763.0	4.95	985.2
0.58	23.1	1.21	76.3	1.83	158.3	2.46	268.8	3.09	407.6	3.72	574.5	4.34	769.5	4.97	992.6
0.60	24.3	1.23	78.4	1.85	161.3	2.48	272.7	3.11	412.4	3.74	580.2	4.36	776.1	4.99	

OPERATION

OVERVIEW

The PMU performs the following operations:

- Monitors the detector output voltages from the transmitter and antenna power sensors under the direction of the Site Controller computer.

- Converts the detector output voltages to power and SWR levels.

- Compares the power and SWR levels to user-configurable alarm threshold limits.

- Sets the power alarm status for each monitored transmitter and antenna.

- Reports the power alarm status of each transmitter and antenna to the Site Controller computer.

The Site Controller computer performs the following operations:

- Tells the PMU which transmitter channels to monitor.

- Tells the PMU when each transmitter starts and stops transmitting.

- Uses the power alarm status to help determine which transmitter channels are useable.

- Uses the power alarm status to control the ANT PWR FAIL and CHN PWR FAIL indicators on the Alarm and Control Unit (if present in the system).

- Uses the power alarm status to direct Test Calls by the Test Unit (if present in the system).

- Reports the power alarm status to the System Manager (if present in the system).

STARTUP

Directions from the Site Controller computer to the PMU, and reports of power alarm status from the PMU to the Site Controller computer, are sent over the serial data link connecting the two.

Polling Recovery

As soon as the Site Controller computer is operating (power on and initialization complete) and the parameter that enables the PMU option is enabled (initialized from the Personality PROMs or re-configured from the System Manager), it should start sending a poll message to the PMU once each second (even if the PMU doesn't reply or isn't connected).

As soon as the PMU is operating (power on), it should start looking for messages from the Site Controller computer (even if the Site Controller computer isn't sending a poll message or isn't connected). As soon as it receives a poll message, it should reply with a status message within one second.

EDACS Configuration Setup

After receiving five consecutive status message responses (each within one second) to five consecutive poll messages, the Site Controller computer should send the EDACS Configuration Setup information to the PMU. This information consists of which transmitter channel numbers are PMU enabled, and the low alarm limit for each transmitter channel number.

After receiving the EDACS Configuration Setup information, the PMU should be ready to monitor the transmitter and antenna power sensors under the direction of the Site Controller computer. The Site Controller computer should continue to send a poll message to the PMU once each second, and the PMU should continue to reply with a status message within one second of each poll message.

Polling Failure

If at any time the PMU fails to reply to a poll message within one second, or the Site Controller computer is initialized (by reset or power-up), the Site Controller computer must again receive five consecutive replies and send the EDACS Configuration Setup information before the PMU is again ready to monitor the power sensors.

MONITOR

Power Sensor Monitoring

When the PMU is ready to monitor the power sensors, the Site Controller computer sends a message to the PMU

each time a transmitter is keyed or unkeyed. The message tells the PMU which transmitters are keyed (transmitting), and which are not. From the EDACS Configuration Setup information and the user-configured PMU parameters, the PMU determines which keyed transmitter channel numbers are PMU enabled, which sensors to monitor, what calculations to make, and what alarm limits to use.

Every 250 milliseconds the PMU should measure all analog inputs associated with all PMU enabled keyed transmitters, make all the required power and SWR calculations, and compare all measurements and calculations to the applicable high and low alarm limits. Only alarm conditions that are measured 750 milliseconds or more after the associated transmitter is keyed are used to send an alarm to the Site Controller computer. This gives the transmitter time to reach full power and avoid false alarms.

These messages also tell the PMU when each transmitter is about to be unkeyed (about to stop transmitting). This advance warning will prevent the PMU from making measurements while or after the associated transmitter is unkeyed, again to avoid false alarms.

Power Measurements

The PMU makes power measurements by measuring the dc voltages from the power sensors connected to its Analog Inputs. Each dc voltage measurement is translated into a power level by using a table of equivalents that was empirically derived from the typical characteristic of a 1000 watt power sensor. This table, shown in Table 7, contains only certain discrete power levels. Therefore, power measurements made by the PMU can only be one of these discrete power levels, nothing between.

Any specific power level (P) given in the table represents a range of dc voltages (V) from the sensor. The lower limit of this range is the voltage shown in the same row of the table as the power. The upper limit of this range is the voltage shown in the next lower row of the table. Because voltage ranges and a look-up table are used to determine a power level (as opposed to using an actual mathematical calculation), a voltage measurement that is teetering on the dividing line between two voltage ranges will appear to be jumping as much as 2.5 watts at the 100 watt level (98.8 to 101.3) and give the impression that the power level is unsteady when it isn't. If one of these power levels is within the alarm limits and the other is out, you may see this as an intermittent alarm.

When the PMU is told by the Site Controller computer that a specific transmitter is keyed, the PMU measures the dc voltage from the power sensor installed in that transmitter's output circuit, determines the power using the values shown in Table 7, and compares the power to the high and low alarm limits for this transmitter. If the power is within the limits, nothing more happens. If the power is not within the limits, an alarm for this transmitter is sent to the Site Controller computer (see the Alarms heading).

When the PMU is told by the Site Controller computer that a specific transmitter is keyed, the PMU also measures the forward power dc voltage from the power sensor installed in the input circuit for the antenna used by this transmitter, determines the power using the values shown in Table 7, and compares the power to the high and low alarm limits for this antenna. If the power is within the limits, nothing more happens. If the power is not within the limits, the alarm is sent to the Site Controller computer (see the Alarms heading).

SWR Calculations

Antenna SWR calculations are based on the two dc voltages (one for forward power and one for reflected power) from the bi-directional power sensor installed in the antenna's input circuit. The dc voltages are translated into power levels as described under the Power Measurements heading. The PMU then calculates SWR using the following formula:

$$SWR = (1 + p) / (1 - p)$$

Where: SWR = standing wave ratio
p = the square root of (Pr/Pf)
Pr = reflected power
Pf = forward power

When the PMU is told by the Site Controller computer that a specific transmitter is keyed, the PMU measures the forward and reflected power dc voltages from the power sensor installed in the input circuit for the antenna used by this transmitter, determines the forward and reflected power using the values shown in Table 7, calculates the SWR, and compares the calculated SWR to the high and low alarm limits for this antenna. If the SWR is within the limits, nothing more happens. If the SWR is not within the limits, the alarm is sent to the Site Controller computer (see the Alarms heading).

ALARMS

A transmitter alarm indicates that the upper or lower alarm limit for the output power has been exceeded. An antenna alarm indicates that the upper or lower alarm limit for the input power, or the upper limit for the SWR, has been exceeded.

When the Site Controller computer receives an alarm from the PMU, it only receives the transmitter channel number or the antenna number for the alarm - not which limit was exceeded. (To know which limit has been exceeded, look at the Alarm History Report screen on a terminal connected to the PMU. For more information, look under the Diagnostic Screens heading in the Maintenance section.)

Alarm Reporting

The PMU reports alarms to the Site Controller computer in the status message replies to the on-channel messages. The status message may contain no alarms, or one or more alarms.

Transmitter Alarms

When the Site Controller computer receives a transmitter alarm from the PMU, the Site Controller computer takes the following action:

- Stops assigning that transmitter channel number for system calls (fails the channel).

- Continues to assign that transmitter channel for test calls (if the system has a Test Unit), or simulates a limited test call just to key the transmitter (if the system has no Test Unit).

- Sends information to the System Manager indicating a PMU alarm for that channel number.

- Sends information to the Alarm and Control Unit to turn on the " GETC FAIL" and " CHN PWR FAIL" indicators.

However, if three or more transmitter alarms are reported in the same status message, the Site Controller computer will disregard the alarms in that status message. It is felt that this condition is more likely to be a mistake than the truth (it would require three transmitters to be keyed almost at the same instant and all three transmitters to indicate a power problem). If any of these alarms really are valid, they will be reported the next time the associated transmitters are assigned.

As soon as the PMU no longer reports a transmitter alarm during a regular or limited test call to a channel previously failed due only to a PMU transmitter alarm, the Site Controller computer takes the following action:

- Resumes assigning that transmitter channel number for system calls.

- Continues to assign that channel for test calls (if the system has a Test Unit).

- Sends information to the System Manager indicating the PMU alarm cleared for that channel number.

- Sends information to the Alarm and Control Unit to turn off the " GETC FAIL" and " CHN PWR FAIL" indicators.

There may be a noticeable delay between when the problem is corrected and the System Manager sees the transmitter alarm indication cleared, because the alarm condition is not considered cleared until a successful test call has been placed to that channel. This delay may be reduced by doing one of the following:

- Switch the 12 VDC power supply for the channel off and back on. This will stimulate a test call to that channel.

- Turn the channel off and back on from the System Manager, screen 20 (Site Reconfiguration - Channel). This also will stimulate a test call to that channel.

Antenna Alarms

When a status message from the PMU contains an antenna alarm, the Site Controller computer takes the following action:

- Counts the reported alarms for this antenna and the number of polling cycles.

- Sends information to the System Manager indicating a PMU alarm for that antenna number if two or more alarms are received for this antenna during any three consecutive polling cycles.

- Sends information to the Alarm and Control Unit to turn on the "ANT PWR FAIL" indicator.

As soon as a status message from the PMU contains no antenna alarms, the Site Controller computer takes the following action:

- Sends information to the System Manager to clear the PMU alarm for that antenna number.

- Sends information to the Alarm and Control Unit to turn off the "ANT PWR FAIL" indicator.

If only one alarm is received for this antenna during any three consecutive polling cycles, the Site Controller

computer will only send an alarm cleared message to the System Manager, so that the momentary PMU antenna alarm can be noted on the alarm report.

Excessive Alarms

If the quantity of transmitter channels that are failed (due to PMU transmitter alarms) exceeds the Channel Fault Tolerance Threshold parameter in the Site Controller computer's personality (default is 50% of the total number of equipped transmitter channels), the Site Controller computer takes the following action:

- Stops using PMU transmitter alarms to fail channels and resumes assigning each channel previously failed due to a PMU transmitter alarm. (If other alarms exist on the channel, it will remain failed.)

- Continues to assign all channels to test calls.

- Continues to send alarm status information to the System Manager, each time additional channel failures are reported from the PMU.

The Site Controller computer will continue to assign channels regardless of PMU transmitter alarms until no PMU transmitter alarms are reported by the PMU. When no transmitter alarms are received in a status message from the PMU, the Site Controller computer takes the following action:

- Resumes using PMU transmitter alarms to fail channels.

- Continues to assign all channels to test calls.

- Sends the alarm status information to the System Manager, indicating that all channel failures have been fixed and the PMU device is no longer failed.

PARAMETERS

The PMU option parameters covered in this manual are shown in Table 7. The first column lists the parameters. The next three columns represent the three locations where the parameter must be set or may be re-configured. Parameters may go by slightly different names in different locations.

```
  ╭─────────────────╮
  │    CAUTION      │
  ╰─────────────────╯
┌───────────────────────────────┐
│ Changing  parameters  not  covered  in  this │
│ manual may lead to unsatisfactory operation of │
│ the PMU option.                │
└───────────────────────────────┘
```

Channel Fault Tolerance Threshold

This parameter defines what percentage of channels must fail due to one cause (i.e. PMU, Test Unit, Local Telephone Interconnect, etc.) before the Site Controller computer considers those alarms bogus. This parameter is only configurable in the Site Controller computer's Personality PROMs by the factory. Default is 50 %.

Channel PMU Enable

This parameter set (one bit per channel) is used to enable or disable PMU monitoring of each transmitter channel on a channel-by-channel basis. It is only configurable in the Site Controller computer's Personality PROMs by the factory, and must be programmed as "Y" (enabled) for each channel you want the PMU to monitor. It is recommended that all 20 channels be enabled (equipped or not).

The factory-configured values for this parameter set in the Site Controller computer's Personality PROMs is used to configure the Site Controller computer's Active Configuration during power-up. This parameter set cannot be re-configured in the Site Controller computer's Active Configuration by the System Manager. This parameter set is sent to the PMU during the EDACS Configuration Setup, but is not re-configurable there either. This parameter set is used by the PMU to determine which transmitter channels to monitor.

Site PMU Enable

This parameter is used to enable or disable the PMU option as a whole. It is configured in the Site Controller computer's Personality PROMs by the factory, and can be re-configured in the Site Controller computer's Active Configuration through a System Manager. If the system is not equipped with a System Manager, this parameter must be programmed as "On" (enabled) in the Personality PROMs by the factory.

Table 7 - PMU Option Parameters

PARAMETER DESCRIPTION	SITE CONTROLLER COMPUTER PERSONALITY PROMS	SYSTEM MANAGER SITE DATABASE	PMU ACTIVE CONFIGURATION
Single parameter that defines what % of channels must fail due to one cause before the alarms are considered bogus.	**Channel Fault Tolerance Threshold** **(Failure Levels Screen)** <u>Must</u> be enabled here		
Parameter set that enables the PMU option on a <u>per-channel</u> basis (must also be enabled on a site-wide basis).	**PMU Enable** **(Channel Data screen)** <u>Must</u> be enabled here (set to Y for enabled).		
Single parameter that enables the PMU option on a <u>site-wide</u> basis (must also be enabled on a per-channel basis).	**Power Monitor Unit** **(PMU screen)** <u>Must</u> be set to On (without System Manager). <u>Should</u> be set to On (with System Manager).	**Power Monitor Unit Enabled** **(Site/Device Site Test Parameters screen)** <u>Can</u> be enabled here. (set to Y for enabled)	
Single parameter that identifies the PMU model.	**PMU Model** **(PMU screen)** <u>Must</u> be set to New-8860.		
Single parameter that sets the lower power limit (in watts) for transmitter output power. (First non-zero level applies to all channels.)	**PMU Power Levels** **(PMU screen)** <u>Must</u> be set here (without System Manager). <u>Should</u> be set here (with System Manager).	**PMU Power Level** **(Site/Device Site Test Parameters screen)** <u>Can</u> be re-configured here.	**Lower Alarm Limit** **(Analog Input Channel screen)** May <u>temporarily</u> be re-configured here with different limits for each channel.
Single parameters that define the transmitter upper power limit and the antenna lower upper power limits			**Other Pwr. Alarm Limits** **(Analog Input Channel screen)** <u>Can</u> be re-configured here with different limits for each channel or antenna.
Single parameters that define the upper and lower SWR limits for the antenna.			**SWR Alarm Limits** **(Analog Pseudo Channel screen)** <u>Can</u> be re-configured here with different limits for each antenna.
Antenna Mapping defines which antenna is used by each transmitter channel.			**Antenna Channel** **(Analog Input Channel screen)** See text.

The factory-configured value for this parameter in the Site Controller computer's Personality PROMs is used to initially configure the Site Controller computer's Active Configuration during power-up. The value of this parameter may then be re-configured in the Site Controller computer's Active Configuration through a System Manager. This parameter is not sent to (or used by) the PMU. When this parameter is disabled, the Site Controller computer will not send poll messages to the PMU.

PMU Model

This parameter is used to identify the PMU model. It is only configurable in the Site Controller computer's Personality PROMs by the factory, and must be programmed as "New-8860".

The factory-configured value for this parameter in the Site Controller computer's Personality PROMs is used to initially configure the Site Controller computer's Active Configuration during power-up. The value of this parameter cannot be re-configured in the Site Controller computer's Active Configuration through a System Manager. The value of this parameter is not sent to (or used by) the PMU. The value of this parameter is used by the Site Controller computer to determine what baud rate to use for communications with the PMU.

Transmitter Lower Alarm Limit

The value of this parameter is used by the PMU as the lower alarm limit for each transmitter's output power. A single value for this parameter (the same limit for all transmitter channels) is programmed into the Site Controller computer's Personality PROMs by the factory, and is used to initially configure the Site Controller computer's Active Configuration during power-up.

The value of this parameter may then be re-configured in the Site Controller computer's Active Configuration through a System Manager. It will seem as though the System Manager is able to re-configure a different limit for each transmitter. However, the first non-zero value (ascending channel number order) will apply to all transmitters. If the system is not equipped with a System Manager, a workable value of this parameter must be programmed into the Personality PROMs by the factory (as opposed to a default value). The recommended value for this parameter is 50% of the transmitter's full rated power output.

The value of this parameter is sent to the PMU during the EDACS Configuration Setup, where it is used by the PMU to determine if a transmitter's output power is too low. The value of this parameter may be temporarily changed in the PMU (a different value may be assigned for each transmitter channel). These values will remain in effect until the next EDACS Configuration Setup.

Transmitter Upper Alarm Limit

This parameter is used by the PMU as the upper alarm limit for each transmitter's output power. Its purpose is to detect when a transmitter or its power sensor is out of adjustment. The recommended value for this limit is 125% of the transmitter's set output power (note that set power may be substantially below full rated power).

This parameter is not programmed into the Site Controller computer's Personality PROMs and is therefore not re-configurable through a System Manager. The value of this parameter is only contained in the PMU.

A factory default value (125 watts) for this parameter has been programmed into the PMU. This factory default is used to configure the PMU's Active Configuration any time the PMU is initialized. The value of this parameter may be re-configured with an RS232 CRT terminal connected to the PMU. This re-configuration will last until you deliberately initialize the PMU. This re-configuration permits a different upper alarm limit for each transmitter.

Antenna Lower Alarm Limit

This parameter is used by the PMU as the lower alarm limit for each antenna's input power. Its purpose is to detect when the loss through the combiner is too high, or the antenna power sensor is damaged or out of adjustment. The recommended value for this limit is 25% of the set power output of a single transmitter.

This parameter is not programmed into the Site Controller computer's Personality PROMs and is therefore not re-configurable through a System Manager. The value of this parameter is only contained in the PMU.

A factory default value (0.0 watts) for this parameter has been programmed into the PMU. This factory default is used to configure the PMU's Active Configuration any time the PMU is initialized. The value of this parameter may be re-configured with an RS232 CRT terminal connected to the PMU. This re-configuration will last until you deliberately initialize the PMU. This re-configuration permits a different lower alarm limit for each antenna's input power.

Note that if the lower alarm limit for the antenna's input power is left at the factory default of 0.0 watts and both circuits of the antenna power sensor are disconnected from the PMU (or never were connected in the first place), the PMU will never report an alarm for this antenna.

Antenna Upper Alarm Limit

This parameter is used by the PMU as the upper alarm limit for each antenna's input power. Its purpose is to detect when the antenna power sensor is damaged or out of adjustment. The recommended value for this limit is 75% of rated power of a single transmitter multiplied by the number of transmitters using the antenna.

This parameter is not programmed into the Site Controller computer's Personality PROMs and is therefore not re-configurable through a System Manager. The value of this parameter is only contained in the PMU.

A factory default value (999.9 watts) for this parameter has been programmed into the PMU. This factory default is used to configure the PMU's Active Configuration any time the PMU is initialized. The value of this parameter may be re-configured with an RS232 CRT terminal connected to the PMU. This re-configuration will last until you deliberately initialize the PMU. This re-configuration permits a different upper alarm limit for each antenna's input power.

SWR Upper Limit

This parameter is used by the PMU as the upper alarm limit for each antenna's SWR. Its purpose is to detect when the antenna or coax to the antenna is damaged. The recommended value for this limit is 2.0, which is equivalent to about 11% reflected power.

This parameter is not programmed into the Site Controller computer's Personality PROMs and is therefore not re-configurable through a System Manager. The value of this parameter is only contained in the PMU.

A factory default value (2.0) for this parameter has been programmed into the PMU. This factory default is used to configure the PMU's Active Configuration any time the PMU is Initialized. The value of this parameter may be re-configured with an RS232 CRT terminal connected to the PMU. This re-configuration will last until you deliberately initialize the PMU. This re-configuration permits a different upper alarm limit for each antenna's SWR.

Antenna Mapping

Antenna Mapping is described under the PMU Programming heading in the Installation section.

ALARM LIMIT RE-CONFIGURATION

Alarm Limits As Installed

As installed per the Installation section, the alarm limits are as follows:

- Transmitter Upper Power Limit = 125.0 watts

- Transmitter Lower Power Limit = Determined by the Site Controller computer's Personality PROMs or the re-configured value with the System Manager.

- Antenna Upper Power Limit = 999.9 watts

- Antenna Lower Power Limit = 0.0 watts

- Antenna Upper SWR Limit = 2.00

These alarm limits may be changed in the PMU's Active Configuration with a terminal connected to the PMU. See the PMU Programming heading in the Installation section to set up the terminal and obtain programming access.

Transmitter Power Alarm Limits

The upper and lower alarm limits for each transmitter's output power may be re-configured as follows:

1. With the Operational Select Menu (main menu) shown on the terminal, type 4 (for item #4 - Setup) and press the Enter key.

2. With the Setup Selection Menu shown on the terminal, type 4 (for item #4 - Analog Input Channel) and press the Enter key.

3. At the "Enter Channel Number" prompt, type the channel number of the transmitter and press the Enter key. The Analog Input Channel screen for that transmitter channel should then appear on the terminal.

4. Type 6 (for item #6 - Lower Alarm Limit) and press the Enter key.

5. At the "Enter New Data" prompt, type the new value and press the Enter key. The screen should then be updated to show the new value. (This is a temporary configuration.)

6. Type 7 (for item #7 - Upper Alarm Limit) and press the Enter key.

7. At the "Enter New Data" prompt, type the new value and press the Enter key. The screen should then be updated to show the new value.

8. Type E (to End programming this channel) and press the Enter key. The Setup Selection Menu should then appear on the terminal.

This completes the re-configuration of the Upper and Lower Alarm Limit parameters for the selected transmitter channel number. If this parameter needs to be changed for another transmitter, repeat steps 2 through 8 for that transmitter. (Remember that the lower alarm limits you re-configure here are just temporary. These limits will be re-configured to the single value of this parameter in the Site Controller computer's Active Configuration each time the Site Controller computer sends the EDACS Configuration Setup to the PMU.)

Antenna Power Alarm Limits

The upper and lower alarm limits for the antenna's input power may be re-configured as follows:

1. With the Setup Selection Menu shown on the terminal, type 4 (for item #4 - Analog Input Channel) and press the Enter key.

2. At the "Enter Channel Number" prompt, type 25 for antenna #1 or 27 for Antenna #2 and press the Enter key. The Analog Input Channel screen for that antenna should then appear on the terminal.

3. Type 6 (for item #6 - Lower Alarm Limit) and press the Enter key.

4. At the "Enter New Data" prompt, type the new value and press the Enter key. The screen should then be updated to show the new value.

5. Type 7 (for item #7 - Upper Alarm Limit) and press the Enter key.

6. At the "Enter New Data" prompt, type the new value and press the Enter key. The screen should then be updated to show the new value.

7. Type E (to End programming this channel) and press the Enter key. The Setup Selection Menu should then appear on the terminal.

This completes the re-configuration of the Upper and Lower Alarm Limit parameters for the selected antenna channel number. If this parameter needs to be changed for the other antenna, repeat steps 1 through 7 for that antenna.

Antenna SWR Alarm Limit

The upper alarm limit for each antenna's SWR may be re-configured as follows:

1. With the Setup Selection Menu shown on the terminal, type 6 (for item #6 - Analog Pseudo Channel) and press the Enter key.

2. At the "Enter Channel Number" prompt, type 1 (for antenna #1) and press the Enter key. The Analog Pseudo Channel 1 screen should then appear on the terminal (see Figure 22).

3. Type 7 (for item #7 - Upper Alarm Limit) and press the Enter key.

4. At the "Enter New Data" prompt, type a new SWR upper limit (see Table 8) and press the Enter key. The screen should then be updated to show the new SWR upper limit.

5. Type E (to End programming this channel) and press the Enter key. The Setup Selection Menu should then appear on the terminal.

This completes the re-configuration of the SWR Upper Alarm Limit parameter for the selected antenna channel number. If this parameter needs to be changed for the other antenna, repeat steps 1 through 5 for that antenna.

```
          ANALOG PSEUDO CHANNEL 1

1.   CHANNEL TYPE (0-8) =                   1
2.   DESCRIPTION =                          ANT1
3.   UNIT ID =                              AP01
4.   MEASUREMENT UNITS =                    SWR
5.   ALARM DELAY (1/4 sec) =                3
6.   LOWER ALARM LIMIT =                0.00
7.   UPPER ALARM LIMIT =                 2.00
8.   ALARM REPORT TYPES (1,2,3,4) =
9.   ALARM RELAY NUMBER =                   0
10.  CHANNEL ENABLE METHOD (0-5) =       NOT USED
11.  "A" CHANNEL =                     AI025
12.  "B" CHANNEL =                     AI026
13.  CHANNEL SCALING EXPONENT =           2


ENTER ITEM NUMBER TO CHANGE,
"H" FOR HELP MENU, "A" TO ABORT,
OR "E" TO END PROGRAMMING THIS CHANNEL: _
```

Figure 22 - Analog Pseudo Channel Screen

Use the following procedure to disconnect the terminal when you are finished:

1. With the Setup Selection Menu shown on the terminal, Type 1 (for item #1 - Return To Operation Select Menu) and press the Enter key. The Operation Select Menu should then be shown on the terminal.

2. Type 1 (for item #1 - Disconnect) and press the Enter key. The "Disconnected - Hit Any Key To Connect" prompt should then appear on the terminal.

Table 8 - SWR Upper Limit

REFLECTED POWER (%)	SWR UPPER LIMIT
50	5.8
33	3.7
25	3.0
20	2.6
17	2.4
14	2.2
12	2.1
11	2.0
10	1.9

MAINTENANCE

POWER SENSOR CALIBRATION

It is recommended that the power sensors be re-calibrated every six months. Use the procedures under the Power Sensor Calibration heading in the Installation section to re-calibrate the power sensors.

TIME AND DATE ADJUSTMENT

It is recommended that the PMU's time and date be checked (and adjusted if necessary) to agree with the System Manager every six months. This will make it easier to correlate a specific alarm reported to the System Manager with a specific event on the PMU's Alarm History Report screen. Use the procedure under the PMU Programming heading in the Installation section to set the time and date.

DIAGNOSTIC SCREENS

When a terminal is connected to the PMU, as described under the PMU Programming heading in the Installation section of this manual, two screens are available that may be useful for diagnostic purposes. They are the Alarm History Report screen and the Channel Monitor screen.

Alarm History Report Screen

The Alarm History Report screen is a snapshot (at the time you select the screen) of the last 256 results of all monitoring that has <u>exceeded</u> an alarm limit, starting with the most recent first. This includes any monitoring that has exceeded an alarm limit during the initial delay period after a transmitter is keyed (which <u>is not</u> reported to the Site Controller computer as an alarm). Results of current monitoring that exceed an alarm limit <u>will not</u> be shown as

they occur. To see the results of any new monitoring, you must re-select the screen to get a new snapshot.

This screen shows the actual measured or calculated value - not just that it was a transmitter alarm for channel #8 or an antenna alarm for antenna #1 (as is reported to the Site Controller computer). Connect the terminal to the PMU and access the PMU as described under the PMU Programming heading in the Installation section of this manual. Then use the following procedure to access the Alarm History Report screen:

1. With the Operation Select Menu (main menu) shown on the screen, type 2 (for item #2 - Reports) and press the Enter key. The Report Selection Menu should then appear on the terminal as shown in Figure 23.

2. Type 3 (for item #3 - Alarm History) and press the Enter key. The Alarm History Report screen should then appear on the terminal as shown in Figure 24.

Channel Monitor Screen

The Channel Monitor screen is used to display the power calculated by a specific Analog Input Channel or the SWR calculated by a specific Analog Pseudo Channel, whether the value exceeds the alarm limits or not. The Channel Monitor screen has two parts. The first part is a snapshot of the calculated value at the time the screen is selected (see Figure 25). It is shown only briefly before going on to the second part of the screen.

The second part of the screen is a real time display of the calculated value. It may take a while to get used to the unlabeled format. Only one value is usually shown at a time. A number with one decimal place is a power calculation. A number with two decimal places is an SWR calculation. A number from 15 to 1 is the time remaining until screen times out.

```
         REPORT SELECTION MENU
1. RETURN TO OPERATION SELECT MENU
2. ALARM REPORT
3. ALARM HISTORY
4. CURRENT STATUS
5. CHANNEL MONITOR
6. CHANNEL-ON TIMERS
7. CHANNEL DUMP

ENTER SELECTION:
```

Figure 23 - Report Selection Menu

```
                    ALARM HISTORY REPORT

SITE - NOT PROGRAMMED
TIME   2:50pm   DATE  1/18


UNIT   CHANNEL    DESCRIPTION  VALUE          TYPE(S)  TIME    DATE

AI06   AI006   TX06              29.4 Watts F  L         2:49pm  1/18
AI25   AI025   ANT01              0.0 Watts F  L         2:49pm  1/18

Press any key to continue (Esc to abort)
```

Figure 24 - Alarm History Report Screen

Figure 25 - Channel Monitor Screen

Calculations are made every 250 milliseconds during the time the associated transmitter is keyed. This includes the first 750 milliseconds after a transmitter is keyed, when alarm conditions are not reported to the Site Controller computer. Therefore, you may briefly see a value that exceeds the alarm limit and notice that no alarm is sent to the Site Controller computer.

Connect the terminal to the PMU and access the PMU as described under the PMU Programming heading in the Installation section of this manual. Then use the following procedure to access the Channel Monitor screen:

1. With the Operation Select Menu (main menu) shown on the screen, type 2 (for item #2 - Reports) and press the Enter key. The Report Selection Menu should then appear on the terminal as shown in Figure 23.

2. Type 5 (for item #5 - Channel Monitor) and press the Enter key.

3. At the "Monitor Unit ID (Y/N)?" prompt, press the Enter key (you do not need to type Y or N).

4. At the "Enter Channel Number (Enter to begin monitoring):" prompt, type a channel number from Table 9 (note that the zeros between AI or AP and the number may be omitted as shown), <u>wait until the transmitter or antenna of interest is in use</u>, and then quickly press the Enter key <u>twice</u>.

5. If the message " *** Channel Not Programmed ***" appears on the line following your channel number entry, the transmitter or antenna selected was not in use. Repeat step 4 until the Channel Monitor screen is shown on the terminal.

The screen will automatically time out after 15 minutes and display the "press any key to continue monitoring" prompt. If you press any key within the 20 second grace period, the screen will continue for another 15 minutes. If you do nothing, the Report Selection Menu will appear at the end of the grace period. At any time you may press the Esc key to return to the Report Selection Menu.

Table 9 - Channel Numbers for Channel Monitor Screen

CHANNEL NUMBER	SENSOR LOCATION	CALCULATED VALUE
AI1	Transmitter #1	Forward Power
↕	↕	↕
AI20	Transmitter #20	Forward Power
AI25	Antenna #1	Forward Power
AI26	Antenna #1	Reflected Power
AI27	Antenna #2	Forward Power
AI28	Antenna #2	Reflected Power
AP1	Antenna #1	SWR
AP2	Antenna #2	SWR

SOFTWARE UPDATES

Don't forget to redo any necessary programming (including antenna mapping). See the Programming heading in the Installation section.

If it becomes necessary to update the system software in the PMU, use the following procedure. This will undo all programming by the user (including antenna mapping during installation).

1. Switch the PMU's On-Off switch to the off position.

2. Label and disconnect all cables and wires connected to the PMU.

3. Remove the PMU from the cabinet and remove the top cover.

4. Remove the board with the three PROMs labeled "D", "E", and "F" as shown in Figure 26.
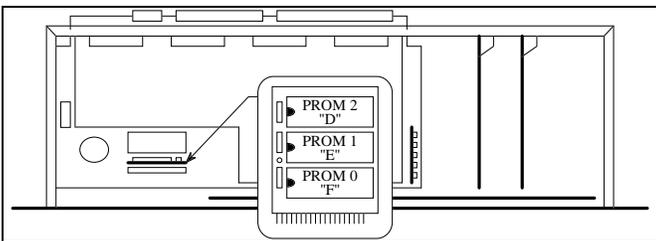
Figure 26 - Location of PMU Software

5. Replace the three PROMs, being careful to orient them correctly in the correct socket.

6. Return the board with the three PROMs to the second connector from the front of the PMU, with the components facing the back of the PMU.

7. Make sure that the program data in the PMU is set to the factory default values by performing a Hardware Reset (see next heading). Start at step #4 and continue to the end.

ERASE ALL PROGRAMMING

CAUTION

Performing a Hardware Reset (power-up), with DIP switch #1 in the on position, will return the PMU's parameters to the factory default values. This will erase all user programming (including antenna mapping during installation).

If the password has been changed from the factory default and you cannot remember it, you must erase all programming in order to regain programming access to the PMU. After erasing all programming, the password will be its default value of 8860. If you know the password and just want to return the PMU's parameters to the factory default values, use the Software Initialization process described in the Installation section (its much easier).

Use the following procedure to erase all programming. Note that this will undo all programming by the user (including antenna mapping during installation).

1. Switch the PMU's On-Off switch to the off position.

2. Label and disconnect all cables and wires connected to the PMU.

3. Remove the PMU from the cabinet and remove the top cover.

4. Set DIP switch #1 to the on position as shown in Figure 28.
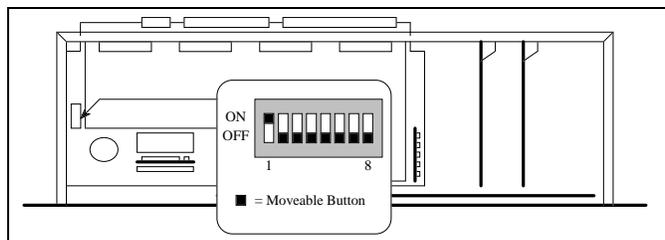

Figure 27 - Location of DIP Switches

5. Return the PMU to the cabinet and re-connect just the DC power wires.

6. Switch the PMU's On-Off switch to the on position for a few seconds, and then back to the off position.

7. Disconnect the DC power wires and remove the PMU from the cabinet.

8. Return DIP switch #1 to the off position. (If you forget to set DIP switch #1 back to the off position, user programming is erased <u>each</u> time it is powered on.)

9. Replace the top cover on the PMU, and re-mount the PMU in the cabinet.

10. Re-connect all wires and cables disconnected in step 2.

11. Switch the PMU's On-Off switch to the on position.

Don't forget to redo any necessary programming (including antenna mapping). See the Programming heading in the Installation section.

ALARM DELAY

The Alarm Delay parameter sets the delay between when the PMU first receives information that a transmitter is being keyed and when the PMU starts reporting an alarm (if there is an alarm for that transmitter). It's default value is 3. For PMU software revision number 8.6, this parameter should be re-configured to a value of 8 to reduce the probability of a transmitter alarm being reported when it shouldn't. For higher revision numbers of PMU software, this parameter should remain at its default value of 3.

To re-configure the value of this parameter, see the PMU Programming heading in the Installation section to set up the terminal and obtain programming access. Then use the following steps to re-configure this parameter for each equipped channel.

1. With the Operational Select Menu (main menu) showing on the terminal, type 4 (for item #4 - Setup) and press the Enter key.

2. With the Setup Selection Menu shown on the terminal, type 4 (for item #4 - Analog Input Channel) and press the Enter key.

3. At the " Enter Channel Number" prompt, type the channel number of the transmitter and press the Enter key. The Analog Input Channel screen for that transmitter channel should then appear on the terminal (see Figure 18).

4. Type 5 (for item #5 - Alarm Delay) and press the Enter key.

5. At the " Enter New Data" prompt, type 8 and press the Enter key. The screen should then be updated to show 8 for the Alarm Delay.

6. Type E (to End programming this channel) and press the Enter key.

This completes the re-configuration of the Alarm Delay parameter for the selected transmitter channel. Repeat steps 2 through 6 for each equipped transmitter channel.

TROUBLESHOOTING

After you think you have fixed a transmitter alarm problem, switch the transmitter off (12V power supply), then back on. This will cause the next test call to be placed to that transmitter and thereby speed up the check-out process and the transmitter's return to service.

Table 10 lists some of the possible causes and the corresponding corrective action for various symptoms that might be observed.

Table 10 - Troubleshooting Symptoms

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Constant antenna alarm for one antenna, but antenna appears to be OK.	Lower (power) Alarm Limit is set too high, Upper (power) Alarm Limit is set too low, or Upper (SWR) Alarm Limit is set too low.	Check (and re-configure if necessary) the alarm limit(s). See the Parameters heading in the Operation section.
	Power sensor at antenna input needs calibration or is defective.	Check (and re-calibrate if necessary) the power sensor. See the Power Sensor Calibration heading in this section.
	Cable from the power sensor to the PMU (can be many cables and connectors in series) is connected to the wrong point or is defective.	Check the continuity of the cable from the power sensor to the PMU (see the interconnection diagrams at the end of this manual).
	PMU input circuit is defective.	Apply a dc voltage (negative ground) to the power sensor end of the cable to the PMU (see Table 7 for the voltage to represent the expected power). If the alarm remains, the cable or the PMU input is defective.
Occasional antenna alarm for one antenna, but antenna appears to be OK.	Power sensor at antenna input needs calibration or is defective.	Check (and re-calibrate if necessary) the power sensor. See the Power Sensor Calibration heading in this section.
No antenna alarm is reported when the cables between the power sensor and the PMU are disconnected.	Lower Alarm Limit is set to zero.	Re-configure the Lower Alarm Limit parameter for the antenna to some non-zero value. See the Parameters heading in the Operation section.

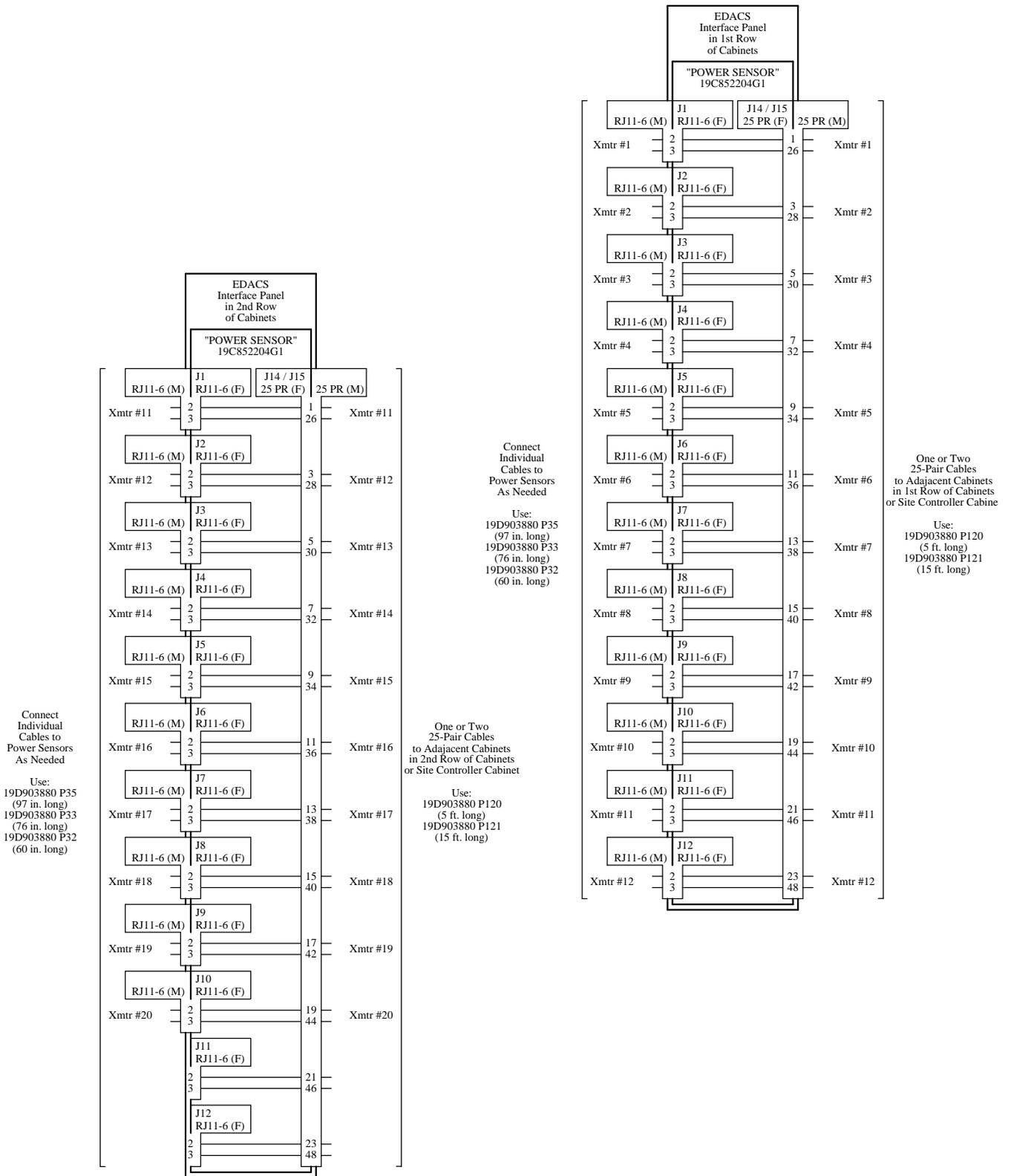(Continued)

Table 10 - Troubleshooting Symptoms (Continued)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Constant transmitter alarm for one transmitter, but transmitter's power is OK.	Lower Alarm Limit is set too high or Upper Alarm Limit is set too low.	Check (and re-configure if necessary) the alarm limit(s). See the Parameters heading in the Operation section.
	Power sensor at output of transmitter needs calibration or is defective.	Check (and re-calibrate if necessary) the power sensor. See the Power Sensor Calibration heading in this section.
	Cable from the power sensor to the PMU (can be many cables and connectors in series) is connected to the wrong point or is defective.	Check the continuity of the cable from the power sensor to the PMU. See the interconnection diagrams at the end of this manual.
	PMU input circuit is defective.	Apply a dc voltage (negative ground) to the power sensor end of the cable to the PMU (see Table 7 for the voltage to represent the expected power). Turn off transmitter at 12V power supply, turn back on, and wait for test call. If the alarm remains, the cable or the PMU input is defective.
Occasional transmitter alarm for one transmitter, but transmitter's power is OK.	Power sensor at output of transmitter needs calibration or is defective.	Check (and re-calibrate if necessary) the power sensor. See the Power Sensor Calibration heading in this section.
Occasional transmitter alarm for more than one transmitter, but each transmitter's power is OK.	Alarm Delay parameter is set too short (value too low).	Adjust the Alarm Delay parameter. See the Alarm Delay heading in the Installation section.
A transmitter alarm is not reported when a cable between the transmitter's power sensor and the PMU is disconnected.	Lower Alarm Limit is set to zero.	Re-configure the Lower Alarm Limit parameter for the transmitter to some non-zero value. See the Parameters heading in the Operation section.
	The transmitter channel is not PMU enabled in the Site Controller computer's Personality PROMs.	Replace the Site Controller computer's Personality PROMs with a new set that has all transmitter channels PMU enabled. See the Site Controller Software heading in the Installation section.
A transmitter alarm is reported to the System Manager and someone turns off that transmitter channel from the Site Reconfiguration Channel screen in the System Manager - then later turns back on, sees that the transmitter alarm is still being reported, yet also sees that the channel is being assigned to calls.	The fault tolerance level may have been exceeded (when the channel was turned off from the System Manager, reducing the number of total channels by one), causing the alarmed channel to be assigned as if normal. This is most likely to happen if the total number of channels is small.	Check the Alarm Control Display screen in the System Manager to see if a ♦ is shown to the right of Power Mntr indicating that the fault tolerance has been exceeded. If the fault tolerance has been exceeded, change the fault tolerance level or fix the alarmed transmitter.

GLOSSARY

Antenna Mapping..Antenna Mapping is the process of re-configuring the PMU's Antenna Channel parameter (through the use of an RS-232 CRT terminal or PC with terminal emulation software). The Antenna Channel parameter (one for each transmitter) tells the PMU which antenna power sensor should detect the power from that transmitter.

EDACS ....EDACS, a registered trademark of Ericsson Inc, is an acronym for Enhanced Digital Access Communications System.

EDACS Interface Panel ....An EDACS Interface Panel is a 19-inch wide panel mounted in the top rear of each EDACS Repeater and Site Controller cabinet. The panels are used as the connection point for all cables between adjacent EDACS Repeater and Site Controller cabinets.

Power Sensor ....The Power Sensor is the RF power-detecting device used by the PMU to monitor the power at a specific point in the RF transmit path. The power sensor may be unidirectional (senses power in one direction) or bi-directional (senses power in both directions).

Power Sensor Module ....The Power Sensor module is the name of the board used in the upper EDACS Interface Panel of a Site Controller cabinet containing the PMU option. Its sole function is to provide a connection point between cables going to the PMU (inside the cabinet) and cables going to the power sensors (outside the cabinet).

RS232 CRT Terminal ....CRT terminal with RS232 interface that can be used to communicate with and configure terminal-configurable software. Also includes PC operating in the terminal mode with terminal emulation software.

SWR...The Standing Wave Ratio is the ratio of the amplitude of a standing wave at an anti-node to the amplitude at a node.

VDT Interface...Both VDT Interfaces on the back of the PMU are RS232 ports with default baud rates of 9600 BPS. The left-hand VDT Interface is used for the connection to a programming terminal. The right-hand VDT Interface is used for the connection to the Site Controller computer.

EDACS
Interface Panel
in 1st Row
of Cabinets

"POWER SENSOR"
19C852204G1

RJ11-6 (M)	J1 RJ11-6 (F)	J14 / J15 25 PR (F)	25 PR (M)
Xmtr #1	2 3	1 26	Xmtr #1

RJ11-6 (M)	J2 RJ11-6 (F)		
Xmtr #2	2 3	3 28	Xmtr #2

RJ11-6 (M)	J3 RJ11-6 (F)		
Xmtr #3	2 3	5 30	Xmtr #3

RJ11-6 (M)	J4 RJ11-6 (F)		
Xmtr #4	2 3	7 32	Xmtr #4

RJ11-6 (M)	J5 RJ11-6 (F)		
Xmtr #5	2 3	9 34	Xmtr #5

RJ11-6 (M)	J6 RJ11-6 (F)		
Xmtr #6	2 3	11 36	Xmtr #6

RJ11-6 (M)	J7 RJ11-6 (F)		
Xmtr #7	2 3	13 38	Xmtr #7

RJ11-6 (M)	J8 RJ11-6 (F)		
Xmtr #8	2 3	15 40	Xmtr #8

RJ11-6 (M)	J9 RJ11-6 (F)		
Xmtr #9	2 3	17 42	Xmtr #9

RJ11-6 (M)	J10 RJ11-6 (F)		
Xmtr #10	2 3	19 44	Xmtr #10

RJ11-6 (M)	J11 RJ11-6 (F)		
Xmtr #11	2 3	21 46	Xmtr #11

RJ11-6 (M)	J12 RJ11-6 (F)		
Xmtr #12	2 3	23 48	Xmtr #12

Connect
Individual
Cables to
Power Sensors
As Needed

Use:
19D903880 P35
(97 in. long)
19D903880 P33
(76 in. long)
19D903880 P32
(60 in. long)

One or Two
25-Pair Cables
to Adajacent Cabinets
in 1st Row of Cabinets
or Site Controller Cabine

Use:
19D903880 P120
(5 ft. long)
19D903880 P121
(15 ft. long)

EDACS
Interface Panel
in 2nd Row
of Cabinets

"POWER SENSOR"
19C852204G1

RJ11-6 (M)	J1 RJ11-6 (F)	J14 / J15 25 PR (F)	25 PR (M)
Xmtr #11	2 3	1 26	Xmtr #11

RJ11-6 (M)	J2 RJ11-6 (F)		
Xmtr #12	2 3	3 28	Xmtr #12

RJ11-6 (M)	J3 RJ11-6 (F)		
Xmtr #13	2 3	5 30	Xmtr #13

RJ11-6 (M)	J4 RJ11-6 (F)		
Xmtr #14	2 3	7 32	Xmtr #14

RJ11-6 (M)	J5 RJ11-6 (F)		
Xmtr #15	2 3	9 34	Xmtr #15

RJ11-6 (M)	J6 RJ11-6 (F)		
Xmtr #16	2 3	11 36	Xmtr #16

RJ11-6 (M)	J7 RJ11-6 (F)		
Xmtr #17	2 3	13 38	Xmtr #17

RJ11-6 (M)	J8 RJ11-6 (F)		
Xmtr #18	2 3	15 40	Xmtr #18

RJ11-6 (M)	J9 RJ11-6 (F)		
Xmtr #19	2 3	17 42	Xmtr #19

RJ11-6 (M)	J10 RJ11-6 (F)		
Xmtr #20	2 3	19 44	Xmtr #20

	J11 RJ11-6 (F)		
	2 3	21 46	

	J12 RJ11-6 (F)		
	2 3	23 48	

Connect
Individual
Cables to
Power Sensors
As Needed

Use:
19D903880 P35
(97 in. long)
19D903880 P33
(76 in. long)
19D903880 P32
(60 in. long)

One or Two
25-Pair Cables
to Adajacent Cabinets
in 2nd Row of Cabinets
or Site Controller Cabinet

Use:
19D903880 P120
(5 ft. long)
19D903880 P121
(15 ft. long)

PMU Interconnection Diagram
EDACS Repeater Cabinet

PMU Interconnection Diagram
EDACS Site Controller Cabinet
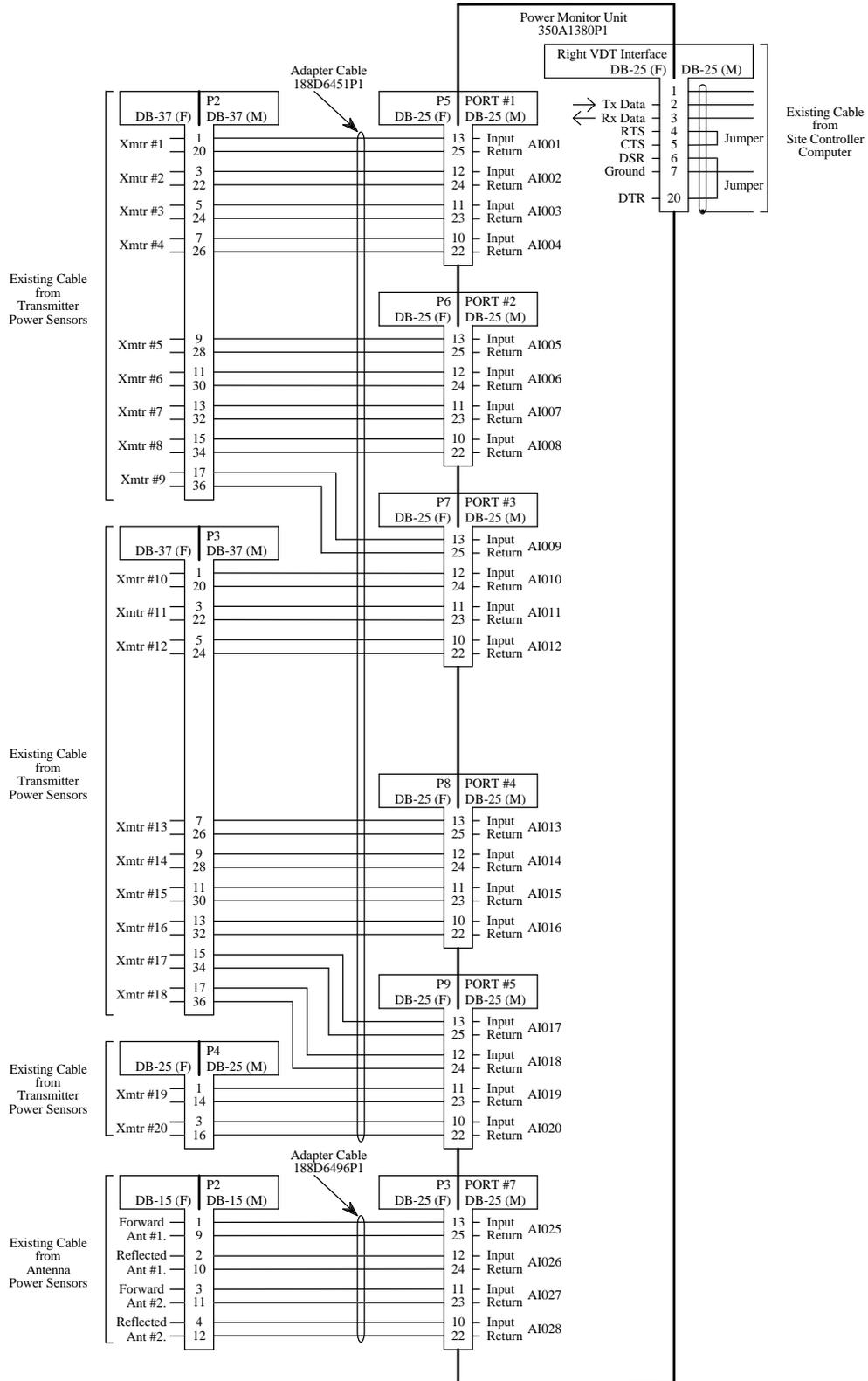
PMU Interconnection Diagram
EDACS Repeater Cabinet (Adaptation)

INSTALLATION CHECKLIST

Steps 1 through 7 parallel the main headings in the Installation section of this manual. This list is intended only as a review - to make sure you haven't skipped a step - not as a substitute for the Installation section. For details, see the heading that applies.

1. **SITE CONTROLLER HARDWARE** - Verify that the Site Controller computer is a VAX model, not a PDP model.

2. **SITE CONTROLLER SOFTWARE**

    • **Application Software PROMs** - Check to be sure that they are G6 or higher. Replace if needed.

    • **Personality PROMs** - Must be replaced.

3. **PMU HARDWARE** - Install supplied parts according to one of the following procedures:

    • **Addition from No PMU**

    • **Upgrade from Old PMU**

    • **Adaptation from Old PMU**

4. **INITIAL POWER-UP** - Verify that the indicators appear normal.

5. **PMU PROGRAMMING**

    • **Terminal Setup** - Make connection to terminal to be used for programming and setup communications protocol.

    • **Software Revision Check & Initialization** - Check revision number and initialize to factory defaults.

    • **Time, Date, & Password** - Optional changes that have no affect on the performance of the PMU.

    • **Antenna Mapping** - Check (and change if required) antenna number used by each transmitter.

6. **POWER SENSOR CALIBRATION**

    • **Transmitter Power Sensors** - Calibrate the forward power detector circuit.

    • **Antenna Power Sensors** - Calibrate the forward and reflected power detector circuits.

7. **FINAL CHECK** - Verify that the indicators appear normal.