2. Click on the HOST **Site Name Edit** button (see Figure 3-6). The **Site Name** pop-up screen will open as shown in Figure 3-7. Enter a unique name for the HOST. The name may be up to 32 characters long and must not contain any spaces. The name may include numbers, punctuation, and upper or lower case letters and must always begin with a letter. Click on **OK** to close the screen and make the changes take effect.

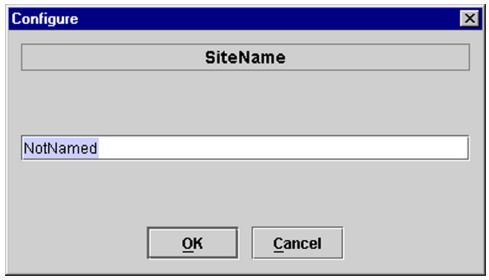


Figure 3-7. HOST Site Name Pop-Up Screen

3. Click on the HOST **Site Number Edit** button (see Figure 3-6). The **Site Number** pop-up screen will open. Enter any number (must be unique) between 1 and 24 and then click on **OK** to close the screen and make the changes take effect.
4. Check the REMOTE **Site Number** field (see Figure 3-6). The REMOTE Site Number does not have to be entered. When the HOST Site Number is entered, the system will automatically enter the same number for the REMOTE Site Number.
5. Click on the REMOTE **Site Name Edit** button (see Figure 3-6). The **Site Name** pop-up screen will open. Enter a unique name for the REMOTE. The name may be up to 32 characters long and must not contain any spaces. The name may include numbers, punctuation, and upper or lower case letters and must always begin with a letter. Click on **OK** to close the screen and make the changes take effect.
6. Open the Tools menu at the top of the main window and then select Refresh Catalog to make the new Host and Remote site names appear in the View menu.

2.5 Enter Host Forward Attenuation

The HU internal forward path attenuator setting determines the maximum composite output signal level at the STM antenna port. The appropriate attenuation value for any particular system is based on the number of channels the system is transporting and the signal level of the composite forward path signals input at the host units RF IN ports. By default, the forward path attenuator is set to 31 dB.

The maximum output power that can be provided by the system is 43.4 dBm (22 Watts). The total forward path gain that is provided by the system (with host and remote forward attenuators set to 0 dB) is 85 dBm. Use the following procedure to set the forward path attenuation to provide the maximum composite output signal level:

1. Click on the HOST **RF** tab. The HOST **RF** display will open within the EMS main window as shown in Figure 3-8.

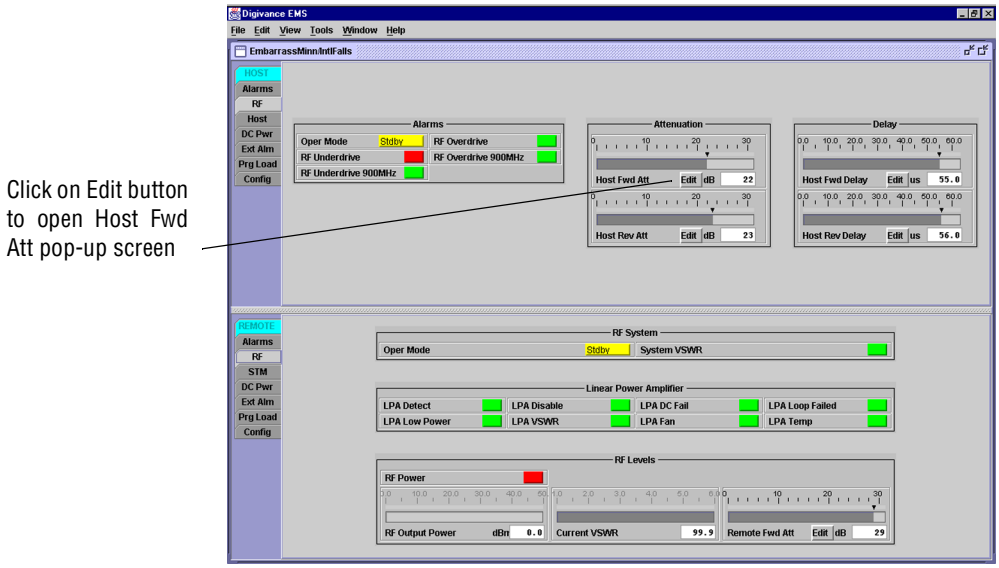


Figure 3-8. HOST RF Display

2. Click on the **Host Fwd Att Edit** button (see Figure 3-8). The **Host Fwd Att** pop-up screen will open as shown in Figure 3-9.

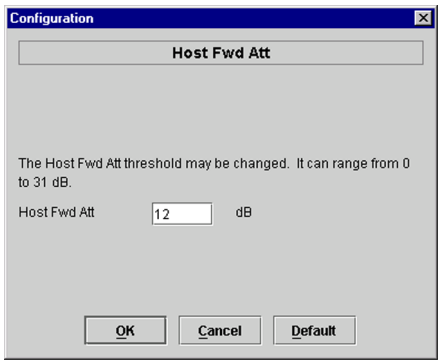


Figure 3-9. Host Fwd Att Pop-Up Screen

3. Obtain the value of the total composite input signal level as determined in step 11 of Section 2.3.
4. Determine the appropriate value to enter for the Host forward path attenuator by subtracting the required system output level (per system design plan) from the system gain (85 dB) and then adding the composite input signal level. The result (see sample calculation) is the amount of attenuation required.

   Atten = (System Gain) – (Required System Output Power) + (Composite Input Power)
5. Enter the attenuation value and click OK to close the pop-up screen and to make the changes take effect.

2.6 Determine Output Signal Level at STM Antenna Port

The RF output signal level should be measured at the STM ANTENNA port to verify that maximum composite signal level is at the required level. Use the following procedure to determine the power level:

1. Verify that RF ON/OFF switch on the LPA is in the **OFF** position.
2. Disconnect the antenna cable from the STM ANTENNA port.
3. Connect a spectrum analyzer or RF power meter to the STM ANTENNA port. (Check the input rating of the test equipment. Insert a 30 dB 100 W attenuator if necessary.)
4. Place the RF switch on the LPA in the **ON** position.
5. If using a spectrum analyzer, proceed to step 6. If using a power meter, measure the composite signal power from the STM and then proceed to step 8.
6. Measure the RF level of a single carrier, such as the control channel, in dBm. Make sure the resolution bandwidth of the spectrum analyzer is 30 kHz.
7. Calculate the total composite signal power using the following formula:

   $P_{tot} = P_c + 10\text{Log } N$

   Where,

   P_{tot} is the total composite power in dBm

   P_c is the power per carrier in dBm as measured in step 6, and

   N is the total number of channels.
8. Record the result measured in step 5 or calculated in step 7.
9. Place the RF switch on the LPA in the **OFF** position.
10. Disconnect the spectrum analyzer or RF power meter from the STM ANTENNA port.
11. Re-connect the antenna cable to the STM ANTENNA port.

Note: To comply with Maximum Permissible Exposure (MPE) requirements, the maximum composite output from the antenna cannot exceed 1000 Watts EIRP and the antenna must be permanently installed in a fixed location that provides at least **6 meters** (20 feet) of separation from all persons.

2.7 Enter Remote Forward Attenuation

The STM internal forward path attenuator setting is used to reduce the power level of the composite output signals at the STM antenna port. The maximum composite output signal level at the STM antenna port is set using the Host internal forward attenuator (see Section 2.5). However, component variations may result in the output power at the STM antenna port being slightly above or below the required power per channel. If this is the case, the STM forward attenuator may be used in conjunction with the Host forward attenuator to add or remove attenuation to produce the required output signal level. If less power is required, the STM forward attenuator may be used to reduce the power level. The default setting is 31 dB. Use the following procedure to change the STM forward attenuation:

1. Click on the REMOTE **RF** tab. The REMOTE **RF** display will open within the EMS main window as shown in Figure 3-10.

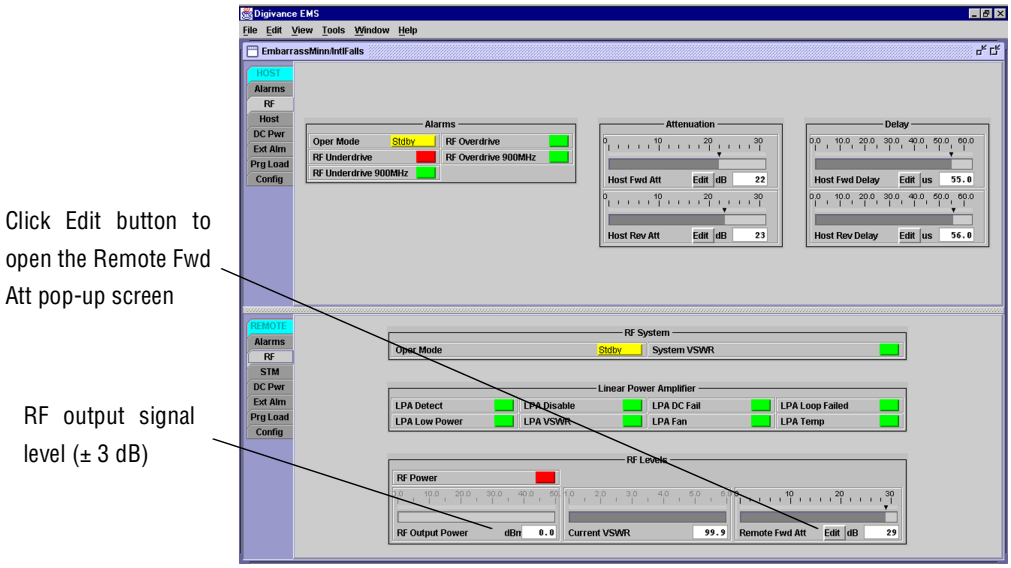


Figure 3-10. REMOTE LPA Display

2. Check the level of the RF output signal (as determined in Section 2.6) against the system design plan specifications. Table 3-2 shows the output signal level required to provide 5 watts per channel for systems with 1 to 4 channels. The maximum output signal level permitted for the system is 43.4 dBm (22 Watts).

Table 3-2. Composite Output Signal Levels

NUMBER OF CHANNELS	OUTPUT SIGNAL LEVEL REQUIRED TO PROVIDE 5 WATTS PER CHANNEL
1	37 dBm
2	40 dBm
3	42 dBm
4	43 dBm

3. Determine if more or less attenuation is required to produce the required output signal level.
4. Click on the **Remote Fwd Att** field **Edit** button (see Figure 3-10). The **Remote Fwd Att** pop-up screen will open as shown in Figure 3-11.

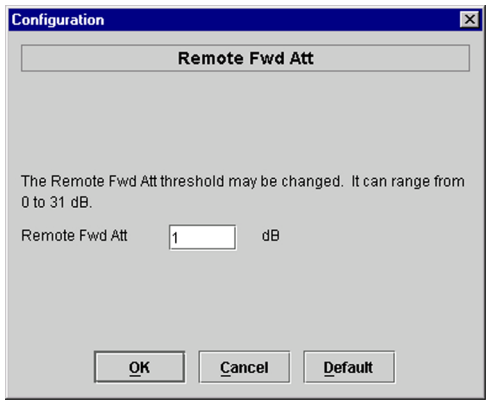


Figure 3-11. Remote Fwd Att Pop-Up Screen

5. Enter the required attenuation value and click OK to close the pop-up screen and to make the changes take effect.
6. Verify that the appropriate RF output signal level appears in the **RF Output Power** field (see Figure 3-10). This is primarily a reference value and should not take the place of external test equipment when determining the power level of the composite RF output signal. Depending on the modulation type and number of channels, the EMS software may report a power level that is higher or lower (± 3 dB) than the actual RF output signal.

Note: To comply with Maximum Permissible Exposure (MPE) requirements, the maximum composite output from the antenna cannot exceed 1000 Watts EIRP and the antenna must be permanently installed in a fixed location that provides at least **6 meters** (20 feet) of separation from all persons.

2.8 Enter Host Reverse Attenuation

The level of the RF signal that should be input to the EBTS will vary depending on the type of EBTS, the receive distribution, and the number of channels present. To interface with the EBTS, the reverse path signal level must be adjusted to provide the signal level required by the EBTS. The HU provides from –1 to +30 dB of gain in the reverse path. By default, the host reverse attenuator is set to –31 dB of attenuation which provides –1 dB of gain. Use the following procedure to set the reverse path gain:

1. Check the EBTS manufacturer's specifications to determine the composite signal level required at the 806–824 MHz and 896–901 MHz reverse path input ports.
2. Determine the overall gain and loss imposed on the signal by the antenna, antenna cable, and by the cables that connect the HU to the EBTS.
3. Determine the amount of gain required to raise the reverse path signal to the level required at the EBTS.
4. Click on the HOST **RF** tab. The HOST **RF** display will open within the EMS main window as shown in Figure 3-12.

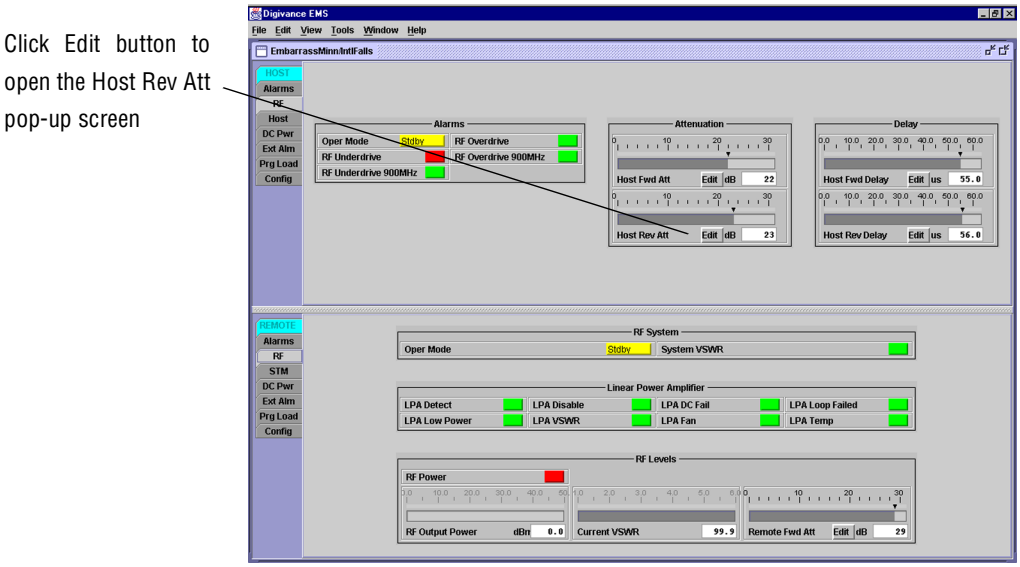


Figure 3-12. HOST RF Display

5. Click on the **Host Rev Att** field **Edit** button (see Figure 3-12). The **Host Rev Att** pop-up screen will open as shown in Figure 3-13.

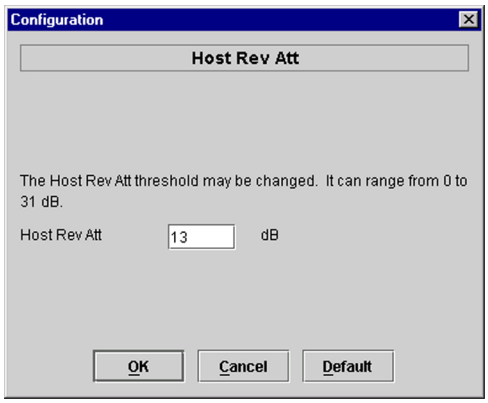


Figure 3-13. Host Rev Att Pop-Up Screen

6. Enter the attenuation value that will provide the required gain. Refer to Table 3-3 for the attenuation values and the corresponding gain (nominal) values.
7. Click **OK** to close the pop-up screen and to make the changes take effect.

Table 3-3. Reverse Path Attenuation Setting and Nominal Gain Provided

ATTENUATION SETTING	GAIN PROVIDED	ATTENUATION SETTING	GAIN PROVIDED	ATTENUATION SETTING	GAIN PROVIDED
0 dB →	30 dB	11 dB →	19 dB	22 dB →	8 dB
1 dB	29 dB	12 dB	18 dB	23 dB	7 dB
2 dB	28 dB	13 dB	17 dB	24 dB	6 dB
3 dB	27 dB	14 dB	16 dB	25 dB	5 dB
4 dB	26 dB	15 dB	15 dB	26 dB	4 dB
5 dB	25 dB	16 dB	14 dB	27 dB	3 dB
6 dB	24 dB	17 dB	13 dB	28 dB	2 dB
7 dB	23 dB	18 dB	12 dB	29 dB	1 dB
8 dB	22 dB	19 dB	11 dB	30 dB	0 dB
9 dB	21 dB	20 dB	10 dB	31 dB	–1 dB
10 dB	20 dB	21	9 dB		

2.9 Enter Host Forward and Reverse Delay

The forward and reverse delay function allows entry of from 0 to 63 µsec of delay in the forward and reverse paths. This feature is used when multiple systems are used to transport the same channel and there is a significant difference in the path delay between systems. Additional delay may be entered to balance the overall system delay. The amount of delay required must be calculated by the RF engineer and should be included in the system design plan. The default setting is 0 µsec. Use the following procedure to change the forward and reverse path delay:

1. Click on the HOST **RF** tab. The HOST **RF** display will open within the EMS main window as shown in Figure 3-14.
2. Click on the **Host Fwd Delay** field **Edit** button (see Figure 3-14). The **Host Fwd Delay** pop-up screen will open as shown in Figure 3-15.
3. Obtain the value of the forward delay as specified in the system design plan. The delay is adjustable in 0.1 µsec steps.
4. Enter the forward path delay value and click **OK** to close the pop-up screen and to make the changes take effect.
5. Repeat the process for reverse delay by right-clicking on the appropriate delay section (see Figure 3-14) and then entering the required delay value in the pop-up screen.
6. Click **OK** to close each pop-up screen and to make the changes take effect.

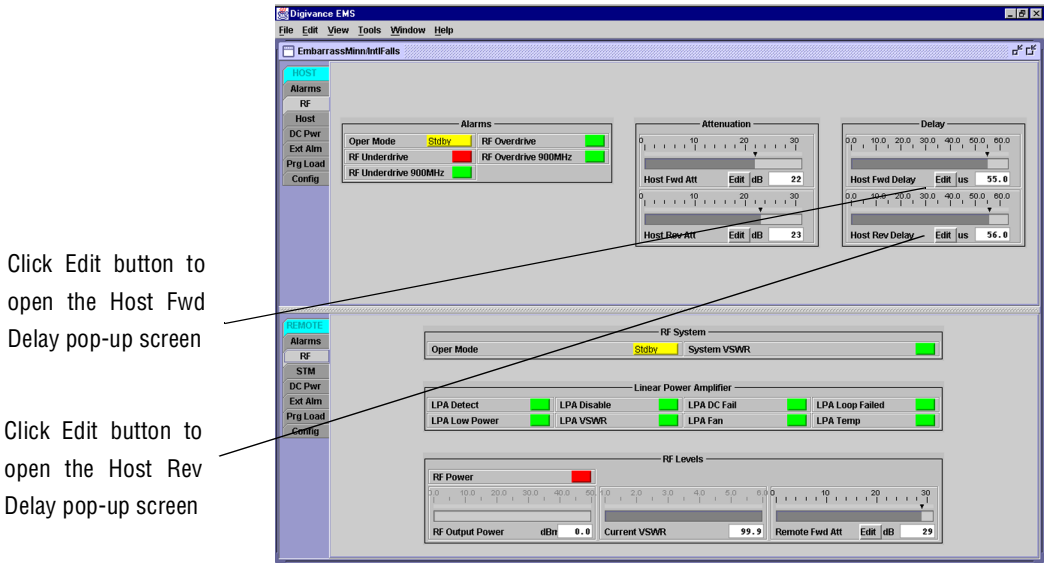


Figure 3-14. HOST RF Display

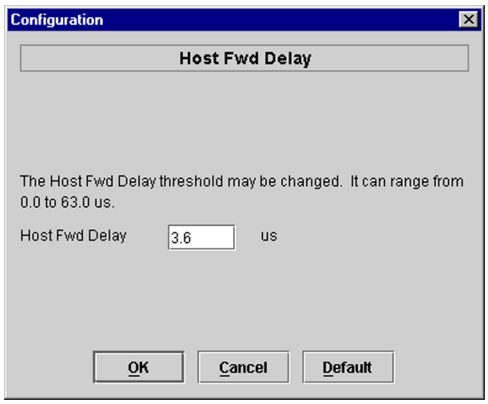


Figure 3-15. Host Fwd Delay Pop-Up Screen

SECTION 4: MAINTENANCE

1 SYSTEM MAINTENANCE OVERVIEW

This section explains the Digivance system fault detection and alarm reporting system, provides a method for isolating and troubleshooting faults, and provides test procedures. The Digivance system requires minimal regular maintenance to insure continuous and satisfactory operation. Components that require regular replacement, cleaning, or testing include the HU fans, STM fan, LPA fans, RU cabinet air-filter, and RU back-up battery.

Maintenance also includes diagnosing and correcting service problems as they occur. When an alarm is reported, it will be necessary to follow a systematic troubleshooting procedure to locate the problem. Once the source of the problem is isolated, the appropriate corrective action can be taken to restore service. The only internal components that can be replaced are the cooling fans which mount in the HU, RU, and LPA. The failure of any other internal component will require replacement of the entire unit.

1.1 Tools and Materials

The following tools and materials are required in order to complete the maintenance procedures specified in this section:

- ESD wrist strap
- IR filtering safety glasses
- Patch cords with SC connectors
- 15 dB in-line SC optical attenuators
- Optical power meter (1550 and 1310 nm)
- TORX screwdriver (with T10 bit)
- Battery maintenance tools (see PRC-SERIES OPERATING AND FIELD SERVICE MANUAL for tool recommendations)

2 FAULT DETECTION AND ALARM REPORTING

The Digivance LRCS on-board embedded software detects various unit and system faults which generate ether a Major or Minor alarm. A Major alarm indicates that the system has failed in a way that directly affects RF transport performance. When a major alarm occurs, all RF functions are disabled and the system is out of service. A Minor alarm means that system performance is not affected or in some cases, that the performance may no longer be optimal. When a minor alarm occurs, RF functions continue and the system remains in service.

The following means are used to report Major and Minor alarms:

- HU alarm contacts
- HU, STM, and LPA front panel LED's
- EMS software Graphical User Interface (GUI)
- Network Operations Center - Network Element Manager (NOC/NEM) interface
- SNMP interface

The HU is equipped with a set of both normally open (NO) and normally closed (NC) alarm contacts which may be used to report both Major and Minor alarms to an external alarm system. The alarm contacts summarize the inputs so that any Major or Minor alarm will trigger an alarm report to the external alarm system.

The HU, STM, and LPA front panel LED indicators show status and alarm information by displaying various colors: Green, Red, Yellow, and Off. In addition to LED indicators, the 35 Watt LPA is also equipped with a Digital Display that provides text messages. A description of the Host Unit, Spectrum Transport Module, and 35 Watt LPA LED indicators is provided respectively in Table 4-1, Table 4-2, and Table 4-3.

The EMS software GUI provides both a summary and a detailed list of alarm information that includes unit and module level faults, circuit faults, and measured value faults such as voltages, RF power, and temperature. A summary showing a list of all systems and their current alarm status is presented through the Alarm OverView display. A more detailed list of alarm information is presented through the HOST alarm display and the REMOTE alarm display. The various fault conditions that trigger a major or minor alarm report are shown in the HOST and REMOTE alarm displays.

The NOC/NEM interface provides the same summary and detailed listing of alarm information as the EMS software GUI but in an ASCII text string format. Sending the command GET ALARMSUMMARY produces a list of all systems and their current alarm status. Sending the command GET ALARM ALL for a specific system will produce a detailed list of alarm information for the specified system.

The SNMP interface provides alarm information to up to ten SNMP managers which must be registered with the SNMP agent. The SNMP interface allows the SNMP managers to receive the alarm and status information generated by the host and remote units. The presentation of the alarm information is dependent on the features of the SNMP manager.

Table 4-1. Host Unit LED Indicators

INDICATOR	COLOR	DESCRIPTION
POWER		**Indicates if the HU is powered or un-powered.**
	Green	The DC power source is on.
	Off	The DC power source is off.
STANDBY		**Indicates if the system is in the standby, normal, test, or program load mode.**
	Green (blinking)	The HU is in the standby mode.
	Yellow (blinking)	The HU is in the program load mode.
	Red (blinking)	The HU is in the test mode.
	Off	The HU is in the normal mode.
HOST UNIT		**Indicates if the HU is normal, over temperature, if an internal fault is detected, or if there is an equipment mis-match.**
	Green	The HU is normal.
	Yellow	The HU is over temperature or detects an internal fault.
	Red	The HU detects an internal fault or HU/RU band mismatch.
REMOTE UNIT		**Indicates if an alarm is detected at the RU.**
	Green	No alarms detected at the RU.
	Yellow	A minor alarm is detected at the RU.
	Red	A major alarm is detected at the RU.
DRIVE 851–869 and DRIVE 935–940		**Indicates if the specified forward path RF signal level is normal, above overdrive threshold, or below underdrive threshold.**
	Green	The RF signal level is normal
	Yellow	The RF signal level is below the underdrive threshold.
	Red	The RF signal level is above the overdrive threshold.
FWD/REV (PORT 1/PORT 2)		**Indicates if the reverse path optical signals from the STM are normal, if errors are detected, or if the optical signal is not detected.**
	Green	The reverse path optical signals are normal.
	Red	Excessive errors (see Note) are detected in the reverse path optical signals or the HU is not receiving a reverse path optical signal.

Note: Excessive errors means the Bit Error Rate (BER) has exceeded 10^{-6} (1 bit error per million bits).

Table 4-2. Spectrum Transport Module LED Indicators

INDICATOR	COLOR	DESCRIPTION
AC POWER		**Indicates if the STM is powered by the AC power source or the back-up battery system.**
	Green	The STM is powered by the AC power source.
	Red	The STM is powered by the back-up battery system.
STANDBY		**Indicates if the system is in the standby, normal, test, or program load mode.**
	Green (blinking)	The STM is in the standby mode.
	Yellow (blinking)	The STM is in the program load mode.
	Red (blinking)	The STM is in the test mode.
	Off	The STM is in the normal mode.
HOST UNIT		**Indicates if an alarm is detected at the HU.**
	Green	No alarms detected at the HU.
	Yellow	A minor alarm is detected at the HU.
	Red	A major alarm is detected at the HU.
STM		**Indicates if the STM is normal, over temperature, if a battery fault is detected, if an internal fault is detected, or if there is an equipment mismatch.**
	Green	The STM is normal.
	Yellow	The STM is over temperature due to high ambient temperature, the fan has failed, or detects an internal fault.
	Red	The STM detects an internal fault, the backup battery voltage is below threshold, or HU/RU band mismatch.
PA		**Indicates if the LPA is normal, over temperature, has a fan failure, has an internal fault, is shutdown, or not present.**
	Green	The LPA is normal.
	Yellow	The LPA is over temperature or the fan has failed.
	Red	Internal fault detected in the LPA, the LPA RF power output is shutdown, or the LPA is not present.
VSWR		**Indicates if the forward path VSWR is above or below the threshold.**
	Green	The VSWR is below the threshold.
	Red	The VSWR is above the threshold.
FWD/REV (PORT 1/PORT 2)		**Indicates if the forward path optical signals from the HU are normal, if errors are detected, or if the optical signal is not detected.**
	Green	The forward path optical signals are normal.
	Red	Excessive errors (see Note) are detected in the forward path optical signal or the STM is not receiving the forward path optical signal.

Note: Excessive errors means the Bit Error Rate (BER) has exceeded 10^{-6} (1 bit error per million bits).

Table 4-3. 35 Watt LPA LED Indicators and Digital Display

INDICATOR	COLOR	DESCRIPTION
FAIL		**Indicates if the LPA is normal or faulty.**
	Off	The LPA is normal.
	Yellow	Internal fault detected in the LPA.
SHUTDOWN		**Indicates if the LPA has an RF output or if the RF output is shutdown.**
	Off	The LPA RF output is on.
	Red	The LPA RF output is shutdown.
DISPLAY MESSAGE 1ST LINE		**DESCRIPTION**
PA Initializing		The LPA is initializing itself and is not ready for operation.
Normal Operation		The LPA is enabled and transmitting RF.
Internal Shutdown		The LPA is disabled due to a major fault and is not transmitting RF.
Forced Shutdown		The LPA is disabled by the front panel control switch or through the EMS.
DISPLAY MESSAGE 2ND LINE		**DESCRIPTION**
Over Power		The LPA maximum RF output rating has been exceeded.
Over Temperature		The LPA maximum operating temperature has been exceeded.
VSWR		The voltage standing wave ratio is greater than 3:1.
DC Fail		The LPA internal DC power supply is out of specification.
Low Gain		The LPA internal amplifier gain is too low.
Alarm: OK		The LPA does not detect any faults that would cause an alarm.
Loop Fail		The LPA internal loop gain in out of range.
Fan Fail		One or both of the LPA cooling fans has failed.

3 FAULT ISOLATION AND TROUBLESHOOTING

Alarm information may be accessed using the HU and STM front panel LED indicators, the EMS software GUI, the NOC-NEM interface, or the SNMP manager. When an alarm occurs, use the unit LED indicators and any one of the specified software tools to determine which Digivance system is affected, which unit (HU or STM) reported the alarm, and the fault that generated the alarm. Then refer to either Section 3.1 Host Unit Troubleshooting or Section 3.2 STM Troubleshooting to isolate the problem and to determine the corrective action required. If an LPA problem is reported by the STM, refer to Section 3.3 LPA Troubleshooting for the troubleshooting procedures that apply to the LPA.

When attempting to isolate a problem, always determine the initial fault that generated the alarm report. Some faults may cause additional faults to be reported which tends to obscure the initial reason for the alarm. To help isolate faults, the EMS GUI provides an AlarmOverview screen, shown in Figure 4-1, that indicates which Digivance system/unit is reporting the alarm.

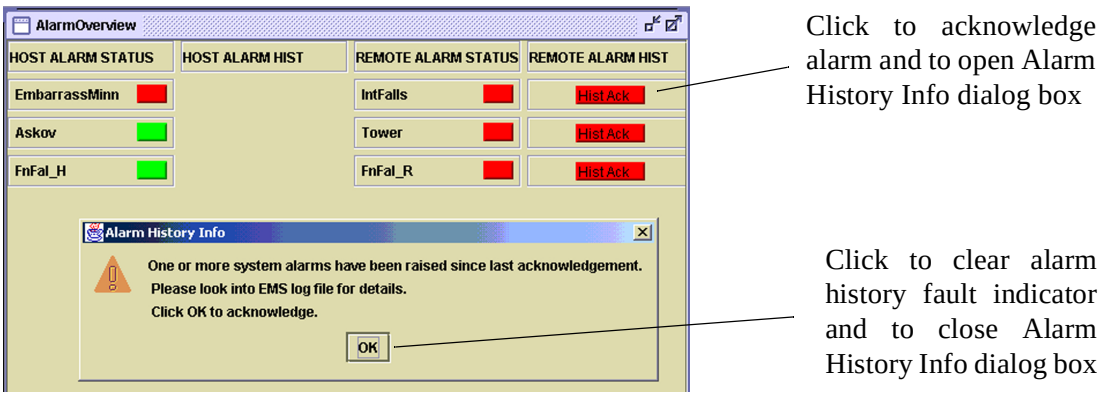


Figure 4-1. AlarmOverView Screen

The AlarmOverview screen includes an ALARM HIST indicator which the user should click to acknowledge that an alarm exists. Acknowledging the alarm opens the Alarm History Info dialog box (also shown in Figure 4-1) which directs the user to view the EMS Log file for details. The EMS Log file lists the various faults in the order in which they occurred. Clear each fault starting with the initial fault. In most instances, clearing the initial fault will also clear any remaining faults. For additional information on using the AlarmOverview screen, refer to the Digivance Element Management System Version 3.01 User Manual (ADCP-75-151).

Note: It is recommended that if there are alarms at both the HU and STM, the optical faults should be checked and cleared first. Because the HU and STM function as a system, a fault in the fiber optic link will cause alarms to be reported by both the HU and STM.

3.1 Host Unit Troubleshooting

Use this section to troubleshoot alarms that originate with the Host Unit. When a **Minor** alarm occurs, one (or more) of the Host Unit LED's with turn **yellow** and the EMS software will indicate a minor fault/alarm. When a **Major** alarm occurs, one (or more) of the Host Unit LED's will turn red and the EMS software will indicate a major fault/alarm**.** Locate the LED and the corresponding software fault/status indicator in Table 4-4 and then take the corrective action indicated.

Table 4-4. Host Unit Fault/Alarm Isolation Diagram

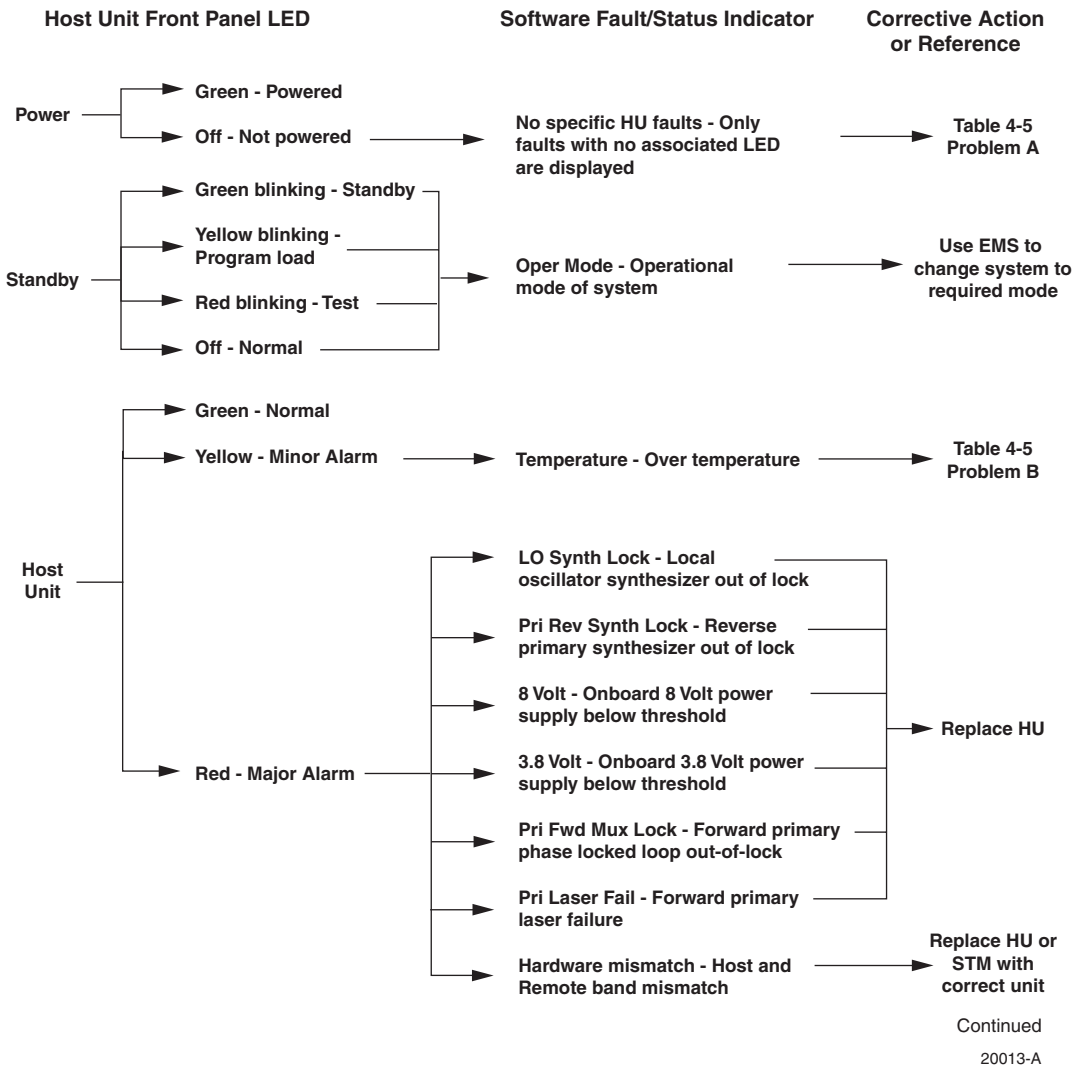


Table 4-4. Host Unit Fault/Alarm Isolation Diagram, continued

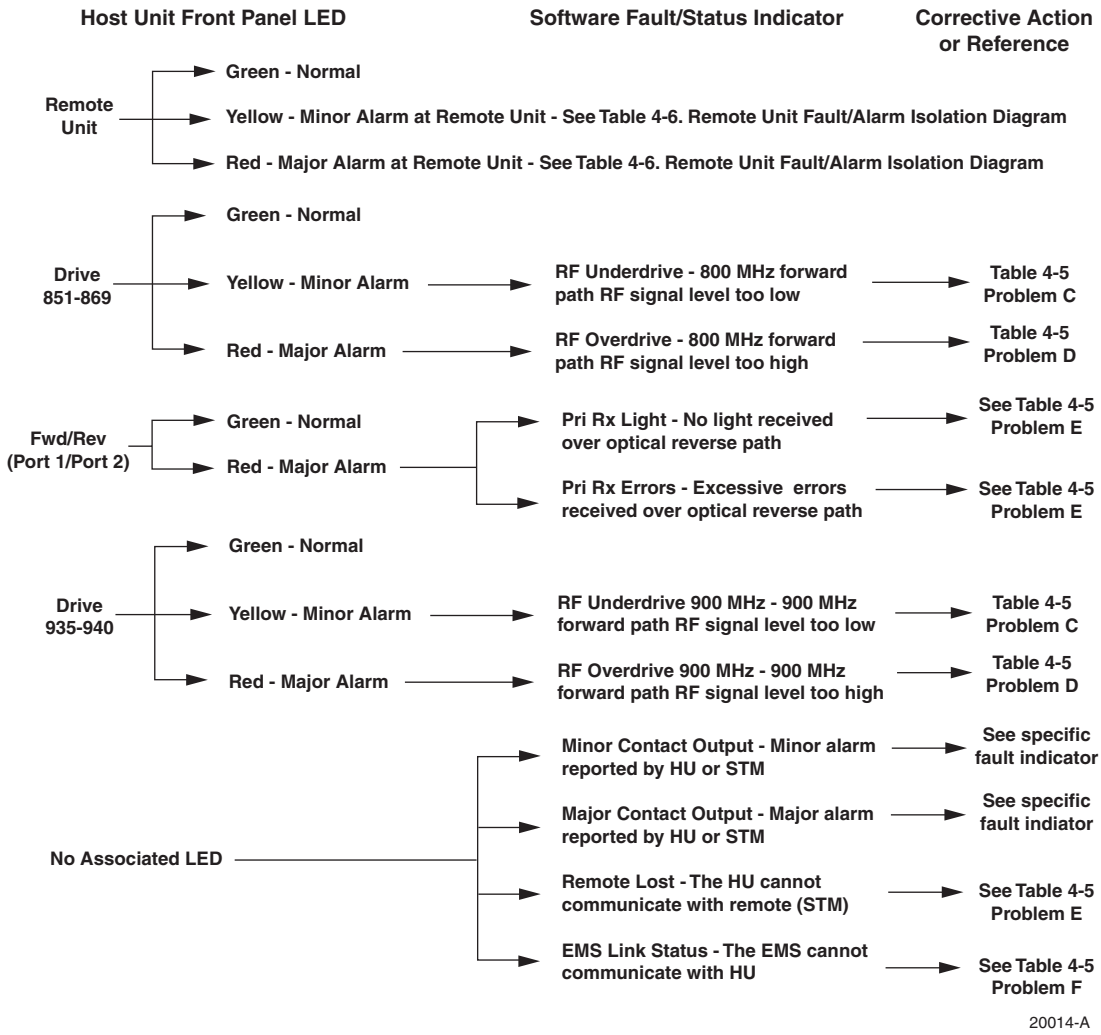


Table 4-5. Host Unit Fault/Alarm Corrective Action

PROBLEM A: The HU is not powered.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The HU is turned off.	1. Place On/Off switch in the On position.
2. The fuse is open/removed from the fuse panel or the DC power has failed.	2. Check DC power source, repair as needed, and replace or reinstall fuse at fuse panel.
PROBLEM B: The HU is overheating.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Air intake or exhaust opening to HU chassis is blocked	1. Remove cause of air-flow blockage.
2. Ambient temperature > 50º C/122º F.	2. Reduce ambient temperature.
3. Faulty fan.	3. Replace HU fan (See applicable manual).
4. The HU has failed.	4. Replace HU.

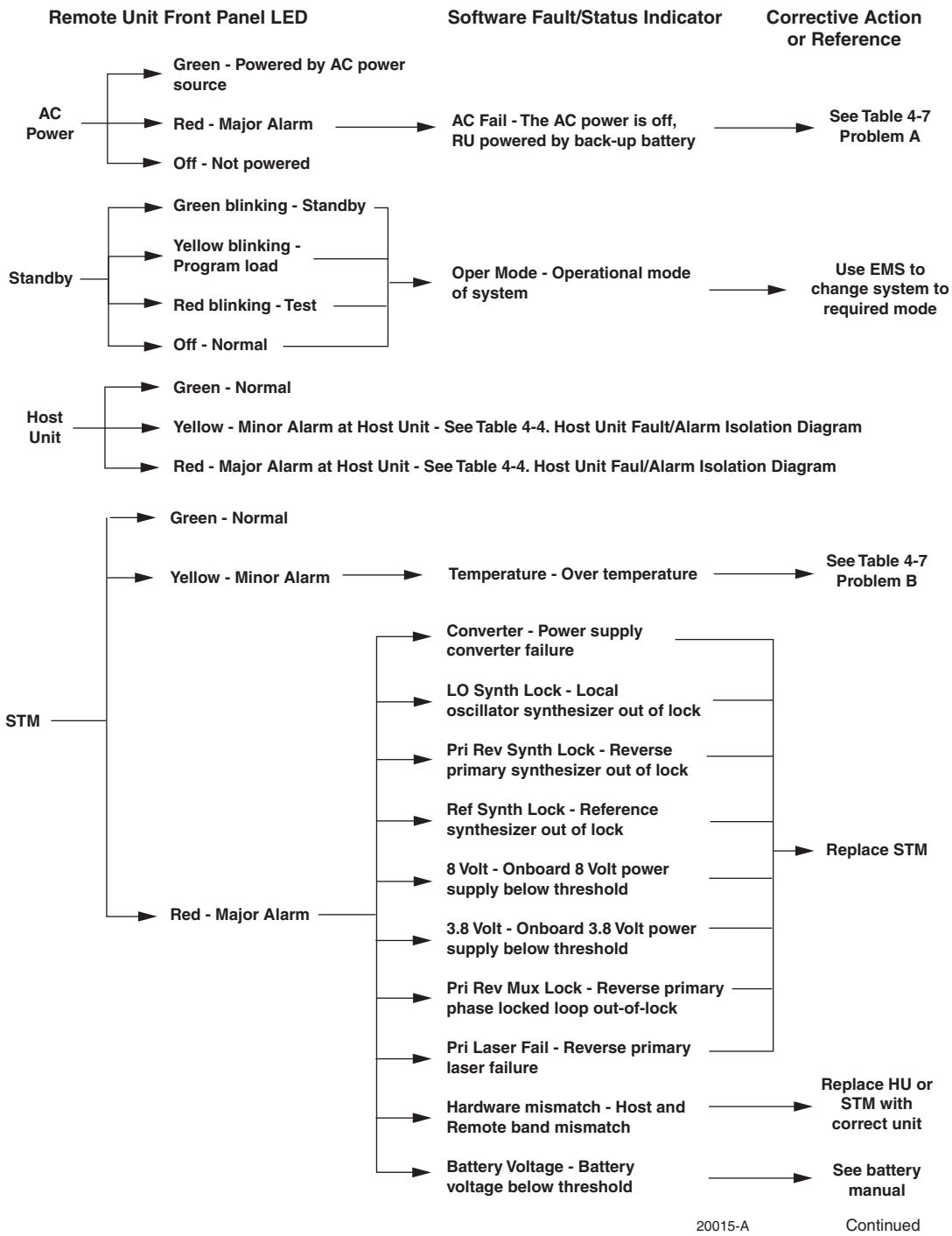
Table 4-5. Host Unit Fault/Alarm Corrective Action, continued

PROBLEM C: The RF input signal level is below the underdrive threshold.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Composite output signal from EBTS is too low.	1. Check EBTS composite output signal level and adjust if too low.
2. Faulty coaxial connection between the HU and the EBTS.	2. Correct EBTS cables if faulty.
3. Incorrect attenuation in forward path RF coaxial link.	3. Check Host Forward Attenuator setting and adjust if attenuation is too high.
PROBLEM D: The RF input signal is above the overdrive threshold.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Composite output signal level from EBTS is too high.	1. Check EBTS composite output signal level and adjust if too high.
2. Incorrect attenuation in forward path RF coaxial link.	2. Check Forward Attenuator setting and adjust if attenuation is too low.
PROBLEM E: No light received over the reverse path or excessive errors received over the reverse path	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Faulty reverse path optical fiber.	1. Test optical fiber. Clean connector if dirty. Repair or replace optical fiber if faulty. (See Section 4.1).
2. Faulty optical transmit port at the STM; or faulty optical receive port at the HU	2. Test optical ports. Replace HU or STM if port is faulty (See Section 4.2).
PROBLEM F: The HU does not respond to control or monitoring commands sent by the EMS.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The HU is not powered.	1. See Problem A this table.
2. The cable connection between the HU and the EMS computer is faulty.	2. Inspect EMS cable and repair or replace if faulty.
3. The CAN cable connections between the HUs in a multiple HU installation are faulty.	3. Inspect each CAN cable and repair or replace if faulty.

3.2 STM Troubleshooting

Use this section to troubleshoot alarms that originate with the STM. When a **Minor** alarm occurs, one (or more) of the STM LED's will turn **yellow** and the EMS software will indicate a minor fault/alarm. When a **Major** alarm occurs, one (or more) of the STM LED's will turn **red** and the EMS software will indicate a major fault/alarm**.** Locate the LED and the corresponding fault/status indicator in Table 4-6 and then take the corrective action indicated.

Table 4-6. Remote Unit Fault/Alarm Isolation Diagram



Continued

Table 4-6. Remote Unit Fault/Alarm Isolation Diagram, continued

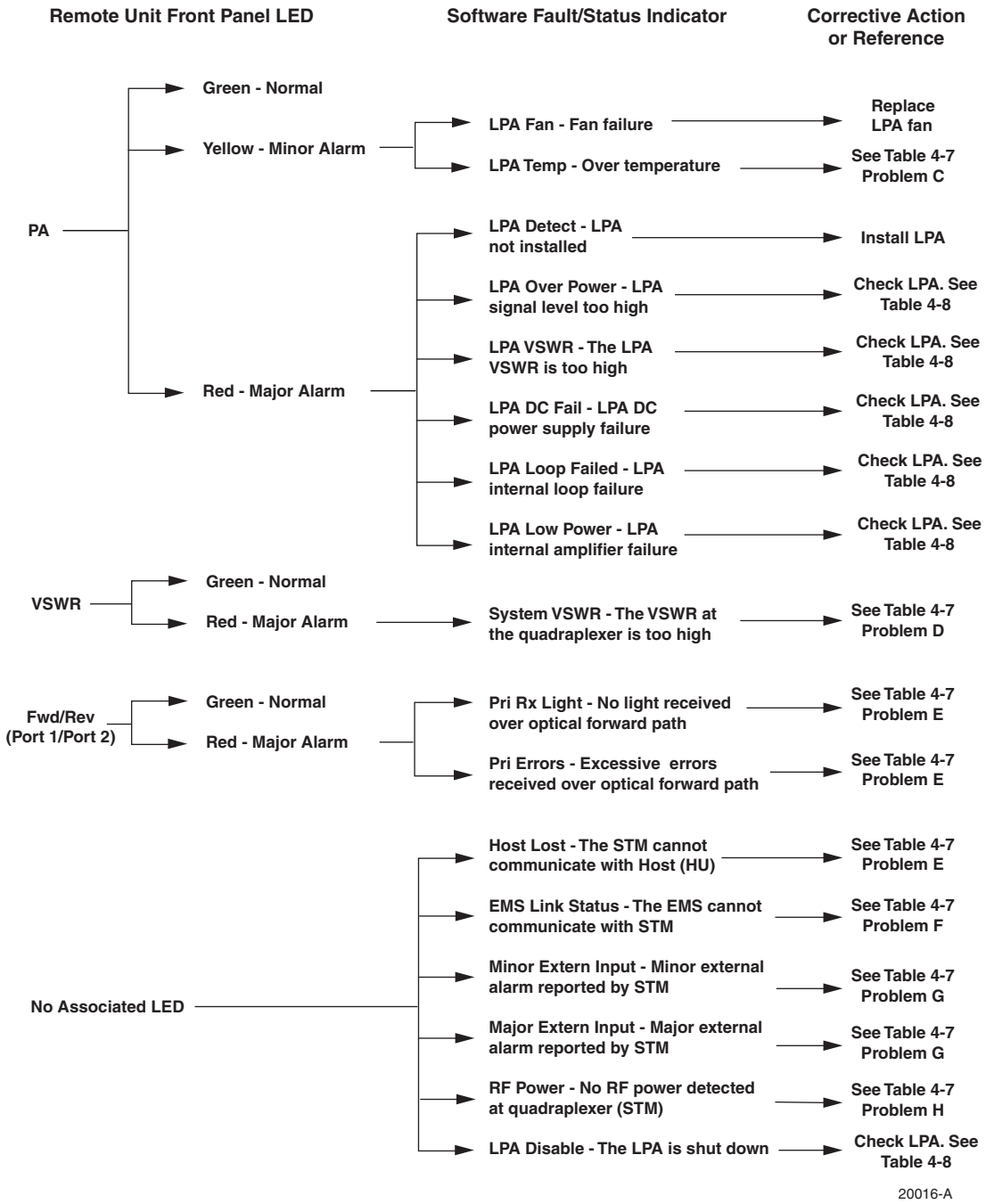


Table 4-7. STM Fault/Alarm Corrective Action

PROBLEM A: The RU is powered by the battery back-up system.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The AC power system circuit breaker is open or the AC power has failed.	1. Check the AC power system, repair as needed, and reset circuit breaker.
2. The STM has failed.	2. Replace the STM.
PROBLEM B: The STM is overheating.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Air intake or exhaust opening to the remote unit cabinet is blocked	1. Remove cause of air-flow blockage.
2. Ambient temperature > 50º C/122º F.	2. Reduce ambient temperature.
3. Faulty fan.	3. Replace STM fan (See applicable manual).
4. The STM has failed.	4. Replace STM.
PROBLEM C: The LPA is overheating.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Air intake or exhaust opening to the remote unit cabinet is blocked	1. Remove cause of air-flow blockage.
2. Ambient temperature > 50º C/122º F.	2. Reduce ambient temperature.
3. Faulty fan.	3. Replace LPA fan (See applicable manual).
PROBLEM D: The forward path VSWR is above threshold.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Faulty antenna or antenna system.	1. Check the antenna system for shorts or opens (including lightning protector).
2. Faulty antenna cable.	2. Check the antenna cable for faulty connections.
3. The STM qudraplexer has failed.	3. Replace the STM.
PROBLEM E: No light received over the forward path or excessive errors received over the forward path	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. Faulty forward path optical fiber.	1. Test optical fiber. Clean connector if dirty. Repair or replace optical fiber if faulty. (See Section 4.1).
2. Faulty optical transmit port at the HU; or faulty optical receive port at the STM.	2. Test optical ports. Replace HU or STM if port is faulty (see Section 4.2).
PROBLEM F: The STM does not respond to control or monitoring commands sent by the EMS.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The cable connection between the STM and the EMS computer is faulty.	1. Inspect EMS cable and repair or replace if faulty.
PROBLEM G: An external fault is detected at the Remote Unit.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The RU cabinet door is open.	1. Close RU cabinet door.
2. Customer specified external fault at RU	2. Check RU and correct specified external fault.

3.3 LPA Troubleshooting

During normal operation of the 35 Watt LPA, all LED's should be **Off**. When troubleshooting the LPA, always check the LPA front panel display for messages before initiating a reset or replacing the LPA. The display will generally indicate the reason for the alarm.

Table 4-8. 35 Watt LPA Fault Isolation and Corrective Action

LED: FAIL	**Color: Yellow**	**Alarm Type: Major**
PROBLEM: Internal fault detected in the LPA.		
POSSIBLE CAUSE		**CORRECTIVE ACTION/COMMENTS**
1. The STM to LPA connecting cable is faulty. 2. The LPA has failed.		1. Inspect cable and repair or replace if faulty. 2. Replace LPA
LED: SHUTDOWN	**Color: Red**	**Alarm Type: Major**
PROBLEM: The RF output from the LPA is shutdown.		
POSSIBLE CAUSE		**CORRECTIVE ACTION/COMMENTS**
1.The RF ON/OFF switch is in the OFF position 2. The LPA is in the forced shutdown mode (single front fan unit) or internal shutdown mode (dual front fan unit). 3. Breaker switch on LPA is open 4. The LPA is faulty.		1. Place RF ON/OFF switch in the ON position 2. Watch the LED Display and note reason for the forced shutdown. Refer to the Display Message section of this table for the recommended corrective action. 3. Reset breaker switch. 4. Replace LPA.
DISPLAY MESSAGE FORCED/INTERNAL SHUTDOWN		**Alarm Type: LOOP FAIL**
PROBLEM: Internal fault detected in the LPA.		
POSSIBLE CAUSE		**CORRECTIVE ACTION/COMMENTS**
1. The LPA has failed.		1. Replace LPA
DISPLAY MESSAGE FORCED/INTERNAL SHUTDOWN		**Alarm Type: DC FAIL**
PROBLEM: Internal fault detected in the LPA.		
POSSIBLE CAUSE		**CORRECTIVE ACTION/COMMENTS**
1. The LPA has failed.		1. Replace LPA
DISPLAY MESSAGE FORCED/INTERNAL SHUTDOWN		**Alarm Type: LOW POWER ALARM**
PROBLEM: Internal fault detected in the LPA.		
POSSIBLE CAUSE		**CORRECTIVE ACTION/COMMENTS**
1. The LPA has failed.		1. Replace LPA
DISPLAY MESSAGE FORCED/INTERNAL SHUTDOWN		**Alarm Type: FANFAIL**
PROBLEM: Internal fault detected in the LPA.		
POSSIBLE CAUSE		**CORRECTIVE ACTION/COMMENTS**
1. Both LPA fans have failed.		1. Replace both LPA fans. To reset, use EMS to place Digivance system in standby mode and then place system back in normal mode.

Table 4-8. 35 Watt LPA Fault Isolation and Corrective Action, continued

DISPLAY MESSAGE FORCED/INTERNAL SHUTDOWN	Alarm Type: OVER POWER ALARM
PROBLEM: Output power from the LPA exceeds the maximum rating.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The power level of the RF forward path composite input signal at the HU is too high.	1. Check the power level of the RF composite input signal at the HU and adjust to correct level. To reset, use EMS to place Digivance system in standby mode and then place system back in normal mode.
2. The LPA has failed.	2. Replace LPA.
DISPLAY MESSAGE FORCED/INTERNAL SHUTDOWN	**Alarm Type: VSWR ALARM**
PROBLEM: The VSWR exceeds threshold setting of 3:1.	
POSSIBLE CAUSE	**CORRECTIVE ACTION/COMMENTS**
1. The interface cable between the LPA and STM is faulty or the interface cable connectors are faulty.	1. Inspect interface cable and connectors and repair or replace as needed.To reset, use EMS to place Digivance system in standby mode and then place system back in normal mode.
2. The antenna cable or antenna cable connectors are faulty.	2. Inspect antenna cable and connectors and repair or replace as needed.To reset, use EMS to place Digivance system in standby mode and then place system back in normal mode.
3. The antenna or antenna system is faulty.	3. Check the antenna circuit for shorts or opens (including lightning protector). To reset, use EMS to place Digivance system in standby mode and then place system back in normal mode.
4.The STM qudraplexer has failed.	4. Replace STM.
5. The LPA has failed.	5. Replace LPA

4 TEST PROCEDURES

This section provides procedures for common troubleshooting and maintenance tests. Refer to these procedures as needed when specified in the Fault/Alarm Isolation Diagrams in Section 3.

4.1 Optical Power Test

A break in an optical fiber or a fault with the optical connector will interrupt communications between linked components or generate excessive errors. Use the following procedure to isolate a problem with an optical fiber or connector.

Danger: *This equipment uses a Class 1 Laser according to FDA/CDRH rules. Laser radiation can seriously damage the retina of the eye. Do not look into the ends of any optical fiber. Do not look directly into the optical transmitter of any unit or exposure to laser radiation may result. An optical power meter should be used to verify active fibers. A protective cap or hood MUST be immediately placed over any radiating transmitter or optical fiber connector to avoid the potential of dangerous amounts of radiation exposure. This practice also prevents dirt particles from entering the connector.*

1. Put on the IR filtering safety glasses.
2. Notify the NOC or alarm monitoring system operator that the system is going offline.
3. At the HU **and** at the STM, place the On/Off switches in the **OFF** position (press **0**).

Note: Turning off the HU and STM disables the respective lasers which is necessary in order to safely inspect and clean the optical connectors.

4. Disconnect the optical fiber connectors for the fiber to be tested at the HU **and** the STM.
5. Inspect the optical connectors. Verify that connectors are clean and that no scratches or imperfections are visible on the fiber end. Clean and polish the optical connectors if necessary.
6. Connect the optical power meter to the **output** (receiver) end of the optical fiber as shown in Figure 4-2. If an attenuator was included in the fiber link, make sure the attenuator is installed.

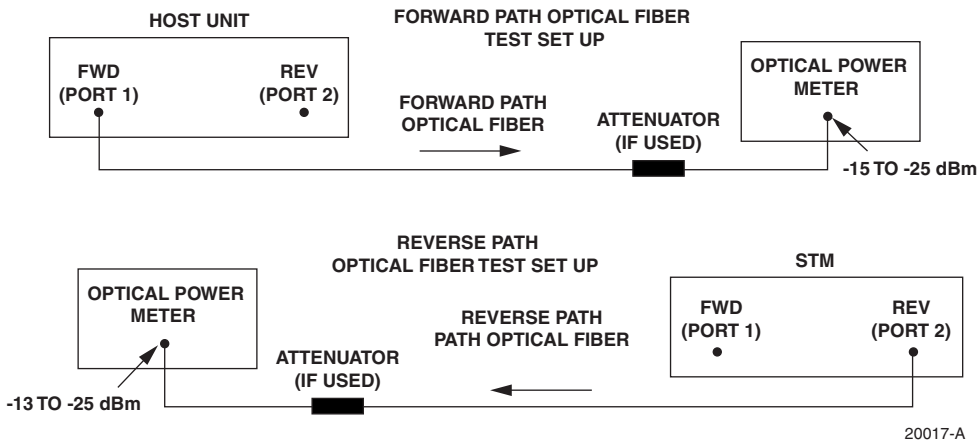


Figure 4-2. Forward and Reverse Path Optical Fiber Test Set Up

7. Connect the **input** (transmitter) end of the optical fiber to the **transmitting** HU or STM (see Figure 4-2).
8. At the **transmitting** HU or STM, place the On/Off switch in the **ON** position (press **I**).
9. Using the **transmitting** HU or STM as an optical light source, measure the optical power at the **receiver** end of the optical fiber. The power level of the optical input signal at the HU or STM must fall within the following ranges:

   Forward Path Signal at the STM: –15 to –25 dBm (with attenuator installed)

   Reverse Path Signal at the HU: –13 to –25 dBm (with attenuator installed)

   If the power level of the received optical signal is within the specified range, the optical fiber and the far end unit are good. If the power level of the received signal is not with the specified range, either the optical fiber is faulty or the far end unit optical transmitter is faulty. Continue with test procedure to isolate the problem

10. At the **transmitting** HU or STM, place the On/Off switch in the **OFF** position (press **O**).
11. Disconnect the optical power meter from the **receiver** end of the optical fiber.
12. Use a 1 meter patch cord to connect the optical power meter to the **transmitting** HU or STM as shown in Figure 4-3.

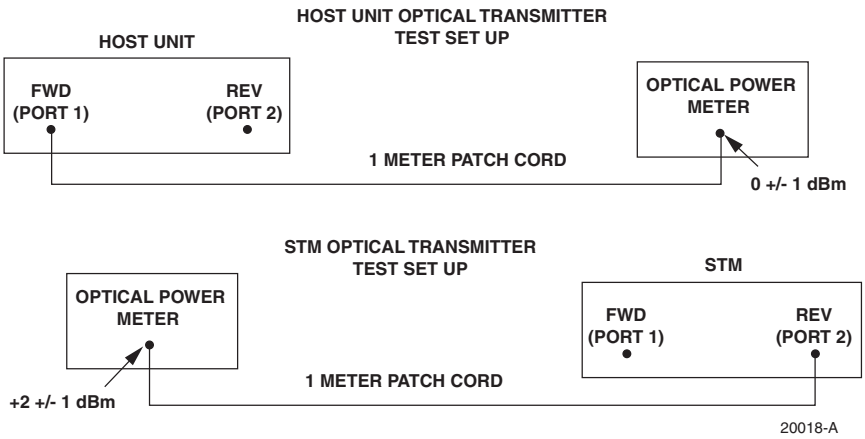


Figure 4-3. Host Unit and STM Optical Transmitter Test Set Up

13. At the **transmitting** HU or STM, place the On/Off switch in the **ON** position (press **I**).
14. Measure the optical output power of the **transmitting** HU or STM. The power level of the optical output signal from the HU or STM must meet the following specification:

    Forward Path Signal at the HU: 0 $\pm$ 1 dBm

    Reverse Path Signal at the STM: +2 $\pm$ 1 dBm

    If the power level of the optical output signal is within specifications with a 1 meter patch cord installed, the fiber optic link is faulty. If the power level of the optical signal is not within specifications, the far end HU or STM optical transmitter is faulty.

15. At the **transmitting** HU or STM, place the On/Off switch in the **OFF** position (press **O**).
16. Disconnect the optical power meter from the **receiver** end of the optical fiber.
17. Reconnect the optical fibers to the **receiving** HU or STM.
18. Repeat steps 3 through 17 for each optical fiber that requires testing.
19. When ready to put the system back into service, place the On/Off switch in the **ON** position (press **I**) at both the HU and STM.
20. Notify the NOC or alarm monitoring service that the system is going back online.

4.2 Optical Loopback Test

The following procedures provide tests to determine if an optical port fault exists with the Host Unit or with the STM.

⚠ **Danger:** *This equipment uses a Class 1 Laser according to FDA/CDRH rules. Laser radiation can seriously damage the retina of the eye. Do not look into the ends of any optical fiber. Do not look directly into the optical transmitter of any unit or exposure to laser radiation may result. An optical power meter should be used to verify active fibers. A protective cap or hood MUST be immediately placed over any radiating transmitter or optical fiber connector to avoid the potential of dangerous amounts of radiation exposure. This practice also prevents dirt particles from entering the connector.*

1. Put on the IR filtering safety glasses.
2. Notify the NOC or alarm monitoring system operator that the system is going offline.
3. At the HU or STM (whichever unit is being tested), place the On/Off switch in the **OFF** position (press **O**).
4. Disconnect the optical fiber connectors from the FWD (PORT 1) and REV (PORT 2) optical ports and place a dust cap over each connector.
5. Plug a 15 dB in-line optical attenuator into the FWD (PORT 1) optical port as shown in Figure 4-4.

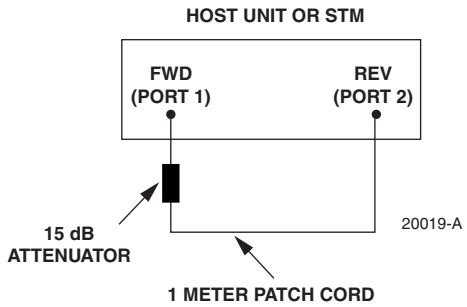


Figure 4-4. Host Unit and STM Loopback Test

6. Connect a 1 meter patch cord between the optical attenuator and the REV (PORT 2) optical port.
7. Place the On/Off switch in the **ON** position (press **I**) and observe the FWD/REV (PORT 1/ PORT 2) LED indicator.
8. The FWD/REV (PORT 1/PORT 2) LED indicator will turn either red or green. If the LED turns red, either the FWD (PORT 1) optical transmitter or the REV (PORT 2) receiver is faulty. If the LED turns green, both the FWD (PORT 1) and the REV (PORT 2) optical ports are good.
9. Place the On/Off switch in the **OFF** position (press **0**).
10. Remove the dust caps from the optical fiber connectors.
11. Clean each connector (follow connector supplier's recommendations) and then insert each connector into the appropriate optical port.
12. When ready to put the unit back into service, place the On/Off switch in the **ON** position (press **I**).
13. Notify the NOC or alarm monitoring service that the system is going back online.

5 SCHEDULED MAINTENANCE REQUIREMENTS

Table 4-9 specifies the system maintenance requirements and the recommended maintenance interval for each maintenance task. Refer to the manual specified in the table for the required maintenance procedure.

Table 4-9. Scheduled Maintenance

INTERVAL	ITEM	REQUIREMENT
1 month	Battery*	Check float voltage. Check system ambient temperature. Check system float current.
6 months	Battery*	Perform 1 month scheduled maintenance tasks. Check individual battery terminal temperature. Check individual battery float voltages.
12 months	Battery * RU cabinet filter**	Perform 1 and 6 month scheduled maintenance tasks Complete detailed physical inspection. Re-torque terminal connections. Perform general system maintenance. Perform cabinet maintenance. Remove and clean the RU cabinet filter. Refer to the appropriate Remote Unit Installation and Maintenance Manual (see Related Manuals section) for the required procedures.
24 months	Battery*	Perform 1, 6, and 12 month scheduled maintenance tasks. Test battery system for rated capacity.
60 months	HU Fans STM Fan LPA Fans	Remove and replace the cooling fans in the HU, STM, and LPA. Refer to the appropriate Installation and Maintenance Manual (see Related Manuals section) for the required procedures.
* Refer to the PRC-SERIES OPERATING AND FIELD SERVICE MANUAL (provided with the back-up battery system) for the specified battery maintenance procedures. **Though it is not recommended that the RU be installed in a salt-air environment, if done so, clean the cabinet filter on a **monthly** basis instead of on a 12 month basis. In addition, the RU should be inspected for corrosion due to salt, particularly near the fans and around the connectors. The MTBF of the RU may be impacted if the RU is exposed to salt-air.		

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SECTION 5: GENERAL INFORMATION

Content Page

1 WARRANTY/SOFTWARE

The Product and Software warranty policy and warranty period for all ADC Products is published in ADC's Warranty/Software Handbook. Contact the Technical Assistance Center at 1-800-366-3891, extension 73476 (in U.S.A. or Canada) or 952-917-3476 (outside U.S.A. and Canada) for warranty or software information or for a copy of the Warranty/Software Handbook.

2 SOFTWARE SERVICE AGREEMENT

ADC software service agreements for some ADC Products are available at a nominal fee. Contact the Technical Assistance Center at 1-800-366-3891, extension 73476 (in U.S.A. or Canada) or 952-917-3476 (outside U.S.A. and Canada) for software service agreement information.

3 REPAIR/EXCHANGE POLICY

All repairs of ADC Products must be done by ADC or an authorized representative. Any attempt to repair or modify ADC Products without written authorization from ADC voids the warranty.

If a malfunction cannot be resolved by the normal troubleshooting procedures, call the Technical Assistance Center at 1-800-366-3891, extension 73476 (in U.S.A. or Canada) or 952-917-3476 (outside U.S.A. and Canada). A telephone consultation can sometimes resolve a problem without the need to repair or replace the ADC Product.

If, during a telephone consultation, ADC determines the ADC Product needs repair, ADC will authorize the return of the affected Product for repair and provide a Return Material Authorization number and complete return shipping instructions. If time is critical, ADC can arrange to ship the replacement Product immediately. In all cases, the defective Product must be carefully packaged and returned to ADC.

4 REPAIR CHARGES

If the defect and the necessary repairs are covered by the warranty, and the applicable warranty period has not expired, the Buyer's only payment obligation is to pay the shipping cost to return the defective Product. ADC will repair or replace the Product at no charge and pay the return shipping charges.

Otherwise, ADC will charge a percentage of the current Customer Product price for the repair or NTF (No Trouble Found). If an advance replacement is requested, the full price of a new unit will be charged initially. Upon receipt of the defective Product, ADC will credit Buyer with 20 percent of full price charged for any Product to be Out-of-Warranty. Products must be returned within thirty (30) days to be eligible for any advance replacement credit. If repairs necessitate a visit by an ADC representative, ADC will charge the current price of a field visit plus round trip transportation charges from Minneapolis to the Buyer's site.

5 REPLACEMENT/SPARE PRODUCTS

Replacement parts, including, but not limited to, button caps and lenses, lamps, fuses, and patch cords, are available from ADC on a special order basis. Contact the Technical Assistance Center at 1-800-366-3891, extension 73476 (in U.S.A. or Canada) or 952-917-3476 (outside U.S.A. and Canada) for additional information.

Spare Products and accessories can be purchased from ADC. Contact Sales Administration at 1-800-366-3891, extension 73000 (in U.S.A. or Canada) or 1-952-938-8080 (outside U.S.A. and Canada) for a price quote and to place your order.

6 RETURNED MATERIAL

Contact the ADC Product Return Department at 1-800-366-3891, extension 73748 (in U.S.A. or Canada) or 952-917-3748 (outside U.S.A. and Canada) to obtain a Return Material Authorization number prior to returning an ADC Product.

All returned Products must have a Return Material Authorization (RMA) number clearly marked on the outside of the package. The Return Material Authorization number is valid for 90 days from authorization.

7 CUSTOMER INFORMATION AND ASSISTANCE

PHONE:

EUROPE
Sales Administration: +32-2-712-65 00
Technical Assistance: +32-2-712-65 42

EUROPEAN TOLL FREE NUMBERS
Germany: 0180 2232923
UK: 0800 960236
Spain: 900 983291
France: 0800 914032
Italy: 0800 782374

U.S.A. OR CANADA
Sales: 1-800-366-3891 Extension 73000
Technical Assistance: 1-800-366-3891
- Connectivity Extension 73475
- Wireless Extension 73476

ASIA/PACIFIC
Sales Administration: +65-6294-9948
Technical Assistance: +65-6393-0739

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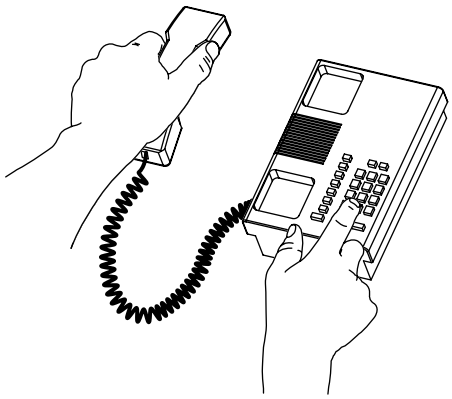
Sales Administration: +1-952-938-8080
Technical Assistance: +1-952-917-3475



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SINGAPORE 189702.

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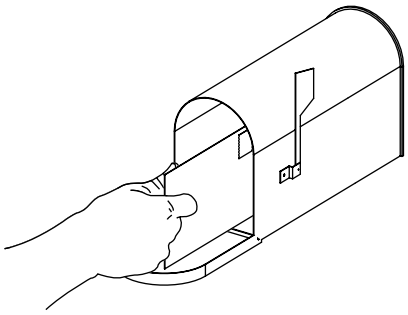
1930 ZAVENTEM, BELGIUM



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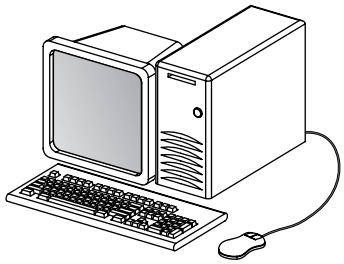

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