

2.1 Turn-Up Procedure

Use the following procedure to turn-up the system:

1. Temporarily disconnect the external alarm system or notify the alarm system provider that testing is in progress.
2. If turning-up multiple HU and RU systems that have not been configured for operation before, temporarily disconnect the CAN cables from the NET IN and NET OUT ports of each HU.
- **Note:** By default, all HU's and RU's are programmed with the same site number and name. This can cause problems for the Digivance EMS if multiple HU's with the same site number and site name are networked together through the CAN interface. It is therefore advisable to temporarily disconnect the CAN interface cables from the HU until a unique site number and name can be entered for each HU and its corresponding RU.
3. Determine if the forward path composite input signal level at the Host Unit FORWARD RF IN port is between -10 and -40 dBm and adjust level by installing an **external attenuator** if required. Refer to [Section 2.3](#) for the calculation and adjustment procedure.
4. Connect the EMS computer (if not already connected) to the SERVICE connector on the HU or STM front panel. If necessary, a separate laptop computer loaded with the EMS software can be temporarily connected and used to initially configure the system.
5. Place the ON/OFF switch on the HU in the **ON** position (press **I**).
6. Place the ON/OFF switch on the STM in the **ON** position (press **I**).
7. Wait 6 to 8 seconds for the HU and the RU modules to initialize and then observe the LED indicators on the HU, STM and LPA. Refer to Section 5 for the troubleshooting procedures if the indicators do not respond as specified.

HOST UNIT	SPECTRUM TRANSPORT MODULE	LINEAR POWER AMPLIFIER
POWER – Green	AC POWER – Green	FAIL – Off
STANDBY – Off	STANDBY – Off	SHUTDOWN – Red
HOST UNIT – Green	HOST UNIT – Green	Digital Display – FORCED SHUTDOWN
REMOTE UNIT – Green	STM – Green	
DRIVE – Green, Yellow, or Red	PA – Green	
PORT 1/PORT 2 – Green	VSWR – Green	
PORT 3 – Green (diversity unit only)	PORT 1/PORT 2 – Green	
	PORT 3 – Green (diversity unit only)	

8. Start up the Digivance EMS software program. The EMS main window will open as shown in [Figure 4-1](#). Note: The EMS software should be installed on a PC-type computer and the PC's COM port should be configured to interface with the HU. For information about installing the EMS software and configuring the PC's COM port, refer to the Digivance Element Management System Software User Manual (ADCP-75-125).

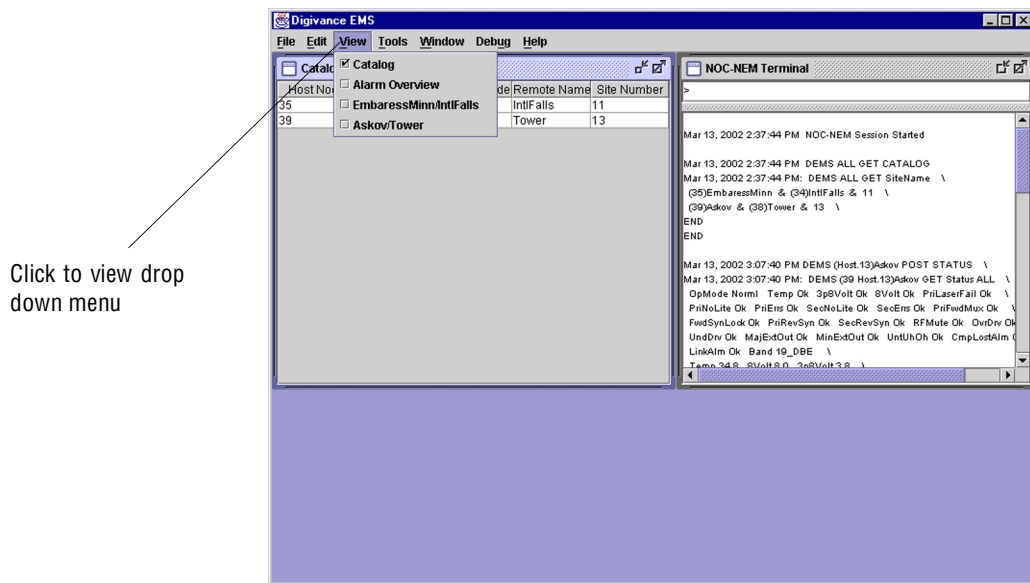


Figure 4-1. Digivance Element Management System Main Window

9. Open the **View** drop down menu and connect to the Host and Remote pair by selecting “NotNamed/NotNamed”. The HOST **Alarms** display and the REMOTE **Alarms** display will open within the main window as shown in [Figure 4-2](#).
10. Download the system software to both the Host and the Remote unit. Refer to Section 2.2 for details.

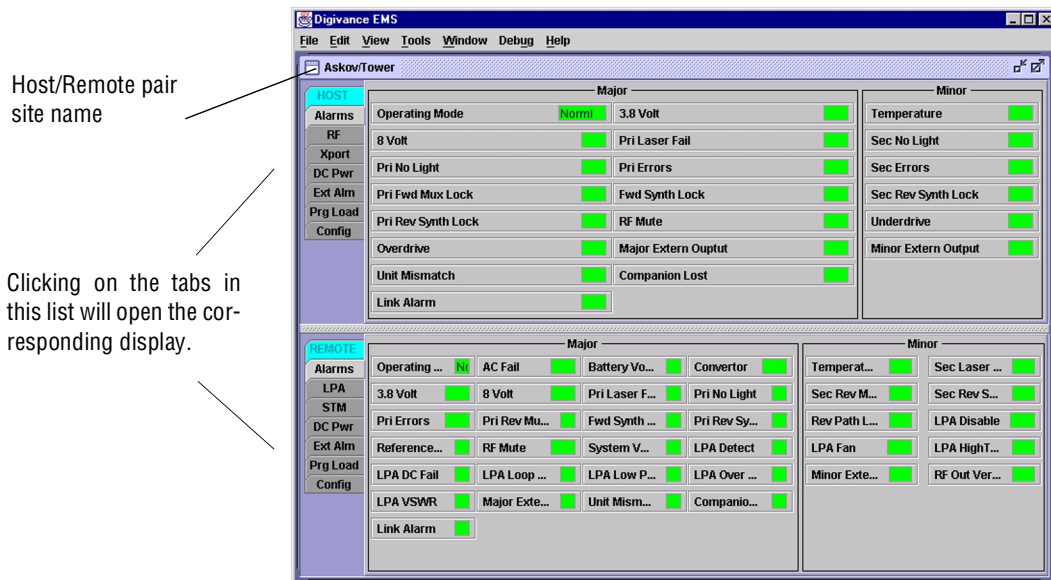


Figure 4-2. Selecting Display Tabs

11. Click on the **HOST Config** tab and on the **REMOTE Config** tab (see [Figure 4-2](#)). The **HOST Config** display and the **REMOTE Config** display will open within the main window.
 12. Enter the **Site Name** and **Site Number** for both the HOST and the REMOTE unit. Refer to [Section 2.4](#) for details.
 13. Reconnect the CAN cables to the HU's NET IN and NET OUT ports.
 14. Verify that no Major (except Major Extern Alarm) or Minor alarms are being reported in either the **HOST Alarm** displays and that all alarm fields (except Major Extern Alarm) are green.
 15. Click on the **HOST RF** tab (see [Figure 4-2](#)). The **HOST RF** display will open within the main window.
 16. Enter the **Host Fwd Att** (Forward Attenuation) values. This sets the forward input RF signal level at the HU. Refer to [Section 2.5](#) for details. By default, this value is set to 0 dB. If the DRIVE LED on the HU front panel was red, it should turn green when this step is completed.
 17. Determine if the RF output power at the STM ANTENNA is at the correct level per channel up to a composite maximum of 43.5 dBm. Refer to [Section 2.6](#) for details.
 18. Click on the **REMOTE LPA** tab (see [Figure 4-2](#)). The **REMOTE PA** display will open within the main window.
 19. Enter the **Remote Fwd Att** value. This adjusts the RF output signal level at the STM ANTENNA port. Refer to [Section 2.7](#) for details. By default this value is set to 0 dB.
 20. Place the RF ON/OFF switch (on LPA front panel) in the **ON** position.
 21. Verify that the SHUTDOWN LED indicator (on LPA front panel) turns from red to off and the Digital Display message changes from FORCED SHUTDOWN to NORMAL OPERATION.
 22. Click on the **HOST RF** tab (see [Figure 4-2](#)). The **HOST RF** display will open within the main window.
 23. Enter the **Host Rev Att** (Reverse Attenuation), and **Host Div Rev Att** (Diversity Reverse Attenuation) values. This sets the reverse output RF signal levels at the HU. Refer to [Section 2.8](#) for details.
 24. If a delay adjustment is required per the system design plan, enter the **Host Fwd Delay**, **Host Rev Delay**, and **Host Div Rev Delay** values. By default, the delay values are set to 0. Refer to [Section 2.9](#) for details.
 25. If a separate laptop computer loaded with the EMS software was used to initially configure the system, disconnect the laptop computer from the SERVICE connector on the HU front panel.
- **Note:** Each HU and RU pair will generally remain permanently connected to a PC-type desktop computer loaded with the EMS software. When two or more systems are connected together through the CAN interface, only one EMS computer is required to manage the networked HU and RU systems. The EMS computer may be connected to the SERVICE port on any one of the HUs in the network.

26. Reconnect the external alarm system or notify the alarm system provider that the turn-up process has been completed.

2.2 Download HU and RU System Software

The HU's and RU's may require a system software download to make them operational. Use the following procedure to download the system software:

1. Click on the **HOST Prg Load** tab and on the **REMOTE Prg Load** tab. The **HOST Prg Load** display and the **Remote Prg Load** display will open within the EMS main window as shown in [Figure 4-3](#).

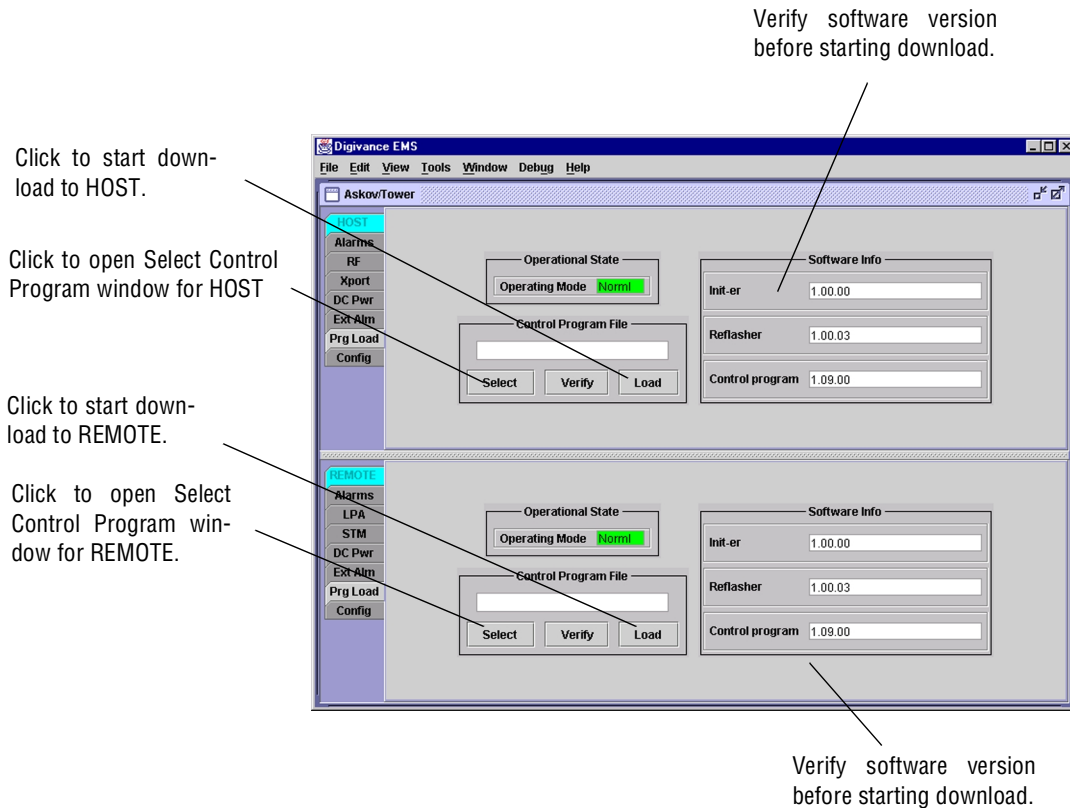


Figure 4-3. HOST and REMOTE Prg Load Displays

2. Click on the **HOST Select** button (see [Figure 4-3](#)). The **Select Control Program File** window will open as shown in [Figure 4-4](#). Browse until the folder where the Control Program files are located is selected and the software files are displayed in the window.

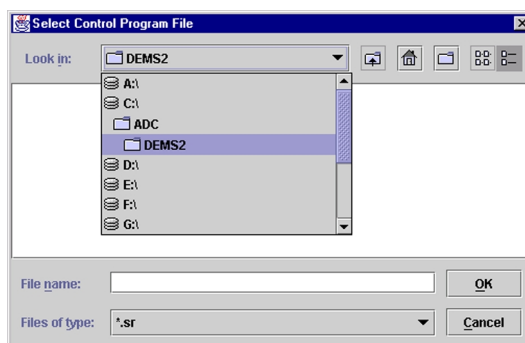


Figure 4-4. Select Control Program File Window

3. Check the software version numbers shown in the Software Info section of the **Prg Load** display against the version numbers of the software files displayed in the **Select Control Program File** window. If files in the **Select Control Program File** window are a later version than those shown in the **Prg Load** display, proceed with the software download. If the version numbers shown in the Software Info section are the same as the version numbers of the files in the **Select Control Program File** window, the software download is not required.
4. Select the required file to download and click on the **OK** button.
5. Click on the **HOST Load** button (see [Figure 4-3](#)) to start the download.
6. Repeat steps 2 through 4 for the REMOTE.

2.3 Determine Forward Path Input Signal Level

The level of the composite RF input signal at the FORWARD RF IN port at the HU will vary depending on the type of BTS, the cable loss, and the number of channels present. To interface with the HU, the signal level of the composite forward path RF signal must be adjusted to fall within a range of **–10 to –40 dBm**. If the signal level is not within this range, it must be adjusted to fall within this level through the use of an external attenuator. Use the following procedure to measure and adjust the input RF signal level at the HU:

1. Connect a spectrum analyzer or power meter to the forward path output port at the BTS. The required signal levels and test points are shown in [Figure 4-5](#).
2. Measure the RF level of a single carrier, such as the control channel, in dBm. Make sure the resolution bandwidth of the spectrum analyzer or power meter is narrow enough to measure the power of the single 30 kHz channel only.
3. Verify that all carriers are coming in at equal power at bandwidth and adjust to the same level if necessary.

4. Calculate the total composite signal power from the BTS using the following formula:

$$P_{\text{tot}} = P_c + 10\text{Log } N - (\text{see Note})$$

Where,

P_{tot} is the total composite power in dBm

P_c is the power per carrier in dBm as measured in step 2, and

N is the total number of channels.

► **Note:** Subtract 16.23 dBm if calculating the composite power for a CDMA system.

5. Determine the total cable loss that is imposed by the forward path coaxial cable that links the BTS to the HU and also any insertion loss imposed by splitters or combiners.
6. Subtract the total cable loss and any insertion losses from the total composite power calculated in step 4.
7. Subtract -25 (the midpoint of the required range) from the value determined in step 6. The difference (which should be positive) equals the value of the external attenuator that is required to reduce the forward path signal level to fall within the required range. The following formula outlines the required calculations for steps 6 and 7:

$$P_{\text{tot}} - (\text{Cable and insertion loss}) - (-25) = \text{Value of external attenuator required}$$

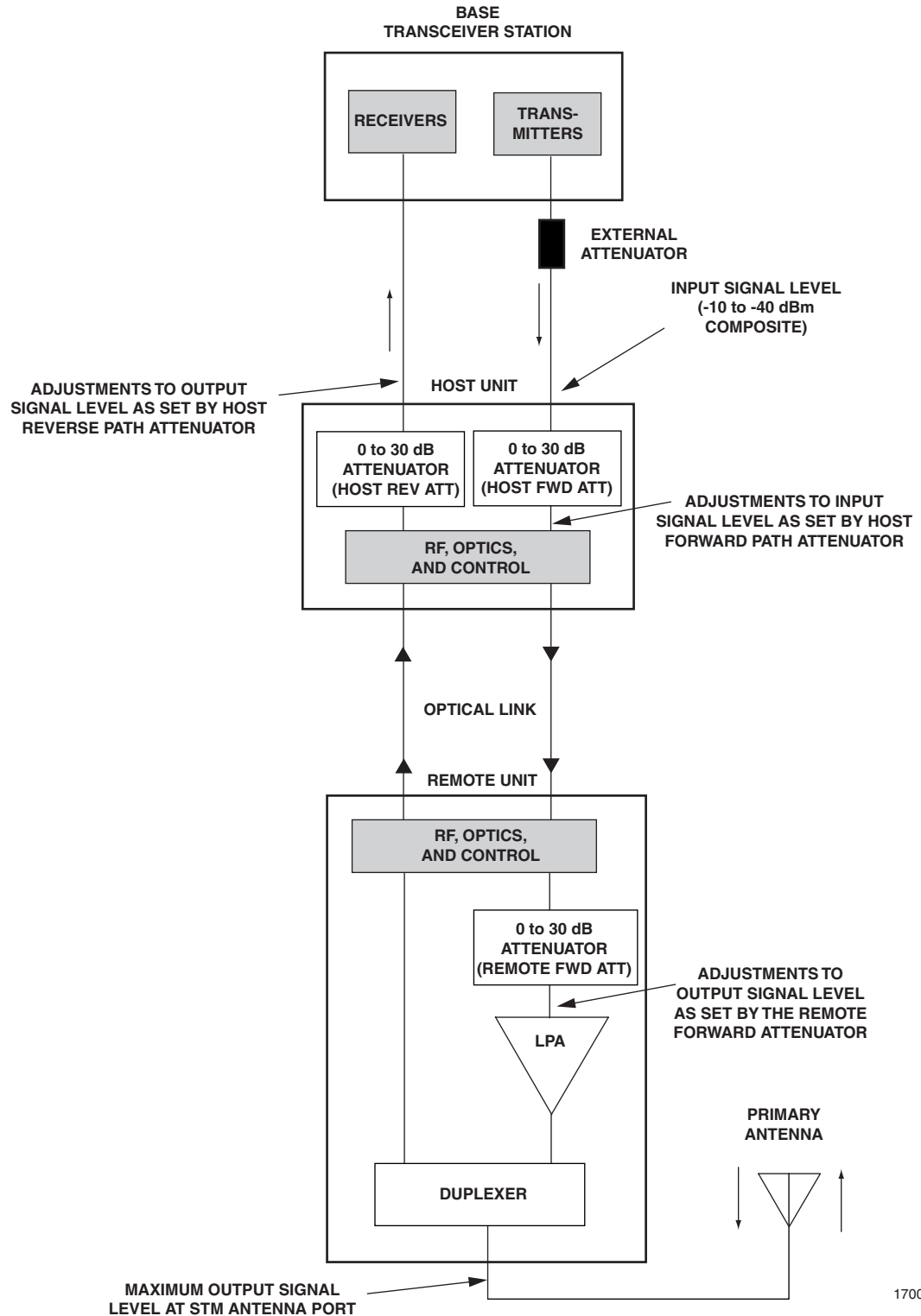
► **Note:** If the input signal level is already within the required range of -10 to -40 dBm, then no external attenuator is required.

8. Select an attenuator that is as close to the value calculated in step 7 as possible. Select a value that will adjust the signal level of the composite input signal to fall within the specified range.
9. Install the external attenuator in the coaxial cable that is connected to the FORWARD RF IN port at the HU.



Caution: *The Host Unit can be damaged if it is overdriven by the BTS. Always install an external protective attenuator at the Host Unit FORWARD RF IN port if the forward path composite input signal level is greater than -10 dBm.*

10. Subtract the value of the external attenuator used in step 9 from the total composite signal power (P_{tot}) and record the result. This value will be required when setting the attenuation of the HU's internal forward attenuator.



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Figure 4-5. Signal Levels, Test Points, and Adjustments

2.4 Enter Site Name and Site Number

All HU's and RU's are programmed with the same site name and site number. It is therefore necessary to assign a unique site name and site number to the HU and RU before they can be connected to the same CAN. Use the following procedure to assign a unique site name and number to each HU and RU system:

1. Click on the **HOST Config** tab and on the **REMOTE Config** tab. The **HOST Config** display and the **REMOTE Config** display will open within the EMS main window as shown in [Figure 4-6](#).

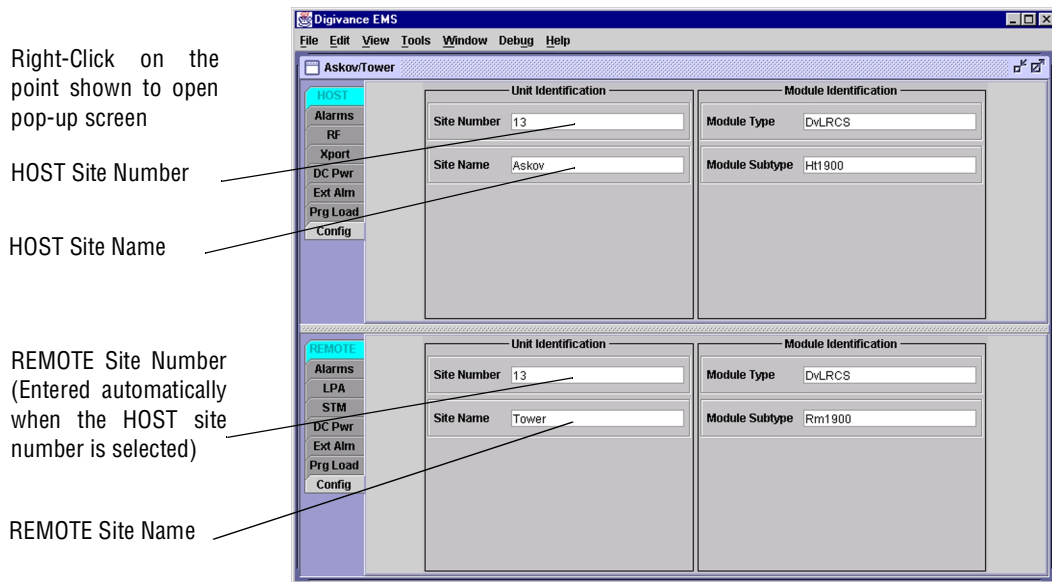


Figure 4-6. HOST and REMOTE Config Displays

2. Right-click on the **HOST Site Name** field (see [Figure 4-6](#)). The **Site Name** pop-up screen will open as shown in [Figure 4-7](#). 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.

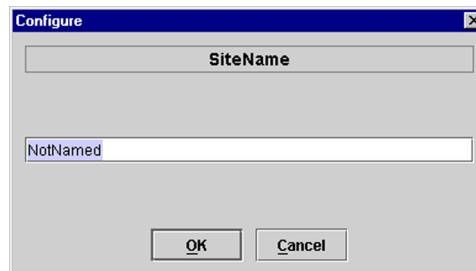


Figure 4-7. HOST Site Name Pop-Up Screen

3. Right-click on the **HOST Site Number** (see [Figure 4-6](#)). The **Site Number** pop-up screen will open. Enter any number 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 4-6](#)). 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. Right-click on the **REMOTE Site Name** field (see [Figure 4-6](#)). 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 input signal input at the HU's FORWARD RF IN port. The maximum output power that can be provided by the system is 43.5 dBm (22.4 watts). The total forward path gain that is provided by the system (with host and remote forward attenuators set to 0 dB) is 83.5 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 4-8](#).
2. Right-click on the **Host Fwd Att** section of the display (see [Figure 4-8](#)). The **Host Fwd Att** pop-up screen will open as shown in [Figure 4-9](#).
3. Obtain the value of the total composite input signal level as determined in step 10 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 83.5 (the total system gain) and then adding the composite input signal level. The result (see sample calculation) is the amount of attenuation required.

$$\text{Atten Required} = 83.5 - (\text{Required System Output Power}) + (\text{Composite Input Power})$$

5. Enter the attenuation value and click OK to close the pop-up screen and to make the changes take effect.

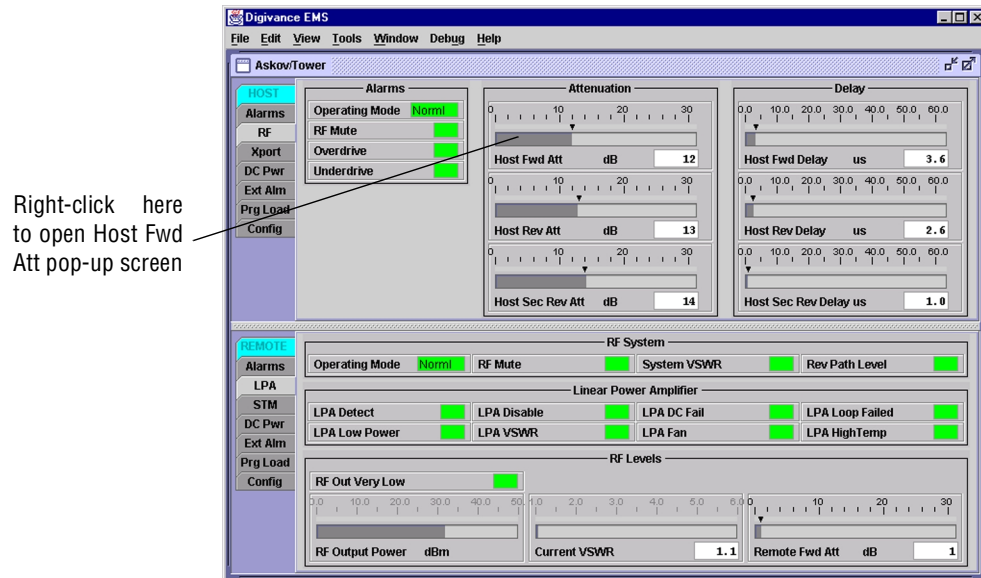


Figure 4-8. HOST RF Display

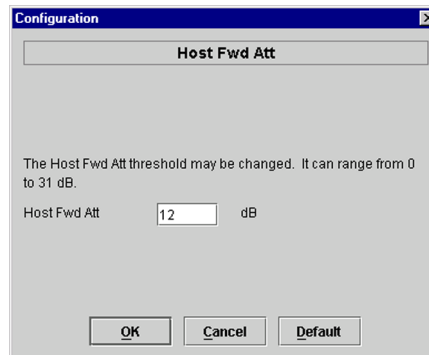


Figure 4-9. Host Fwd Att Pop-Up Screen

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 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 and insert a PAD if necessary.)

4. Place the RF ON/OFF switch on the LPA in the **ON** position.
5. Measure the RF level of a single carrier, such as the control channel, in dBm. Make sure the resolution bandwidth of the spectrum analyzer or power meter is narrow enough to measure the power of the single 30 kHz channel only.

6. Calculate the total composite signal power using the following formula:

$$P_{\text{tot}} = P_c + 10\log N - (\text{see Note})$$

Where,

P_{tot} is the total composite power in dBm

P_c is the power per carrier in dBm as measured in step 2, and

N is the total number of channels.

- **Note:** Subtract 16.23 if calculating the composite power for a CDMA system.

7. Record the result calculated in step 6.
8. Place the RF ON/OFF switch on the LPA in the **OFF** position.
9. Disconnect the spectrum analyzer or RF power meter from the STM ANTENNA port.
10. 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 increase or reduce the power level of the composite output signal level 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 2.4). 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 0 dB. Use the following procedure to change the STM forward attenuation:

1. Click on the **REMOTE LPA** tab. The **REMOTE LPA** display will open within the EMS main window as shown in [Figure 4-10](#).

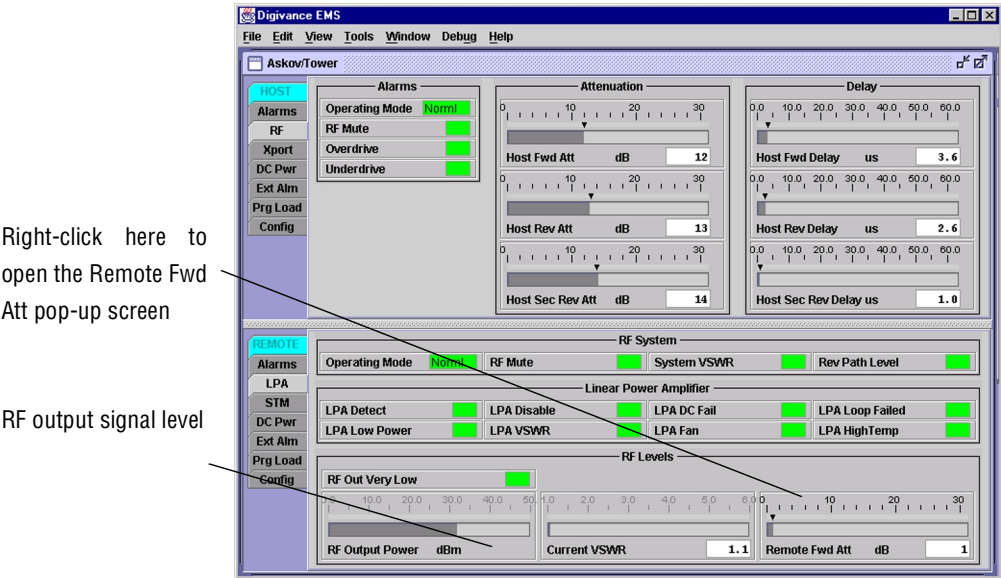


Figure 4-10. REMOTE LPA Display

2. Check the level of the RF output signal (as determined in [Section 2.6](#)) against the system design plan specifications. [Table 4-1](#) 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 43.5 dBm (22.4 watts).
3. Determine if more or less attenuation is required to produce the required output signal level.
4. Right-click on the **Remote Fwd Att** section of the display (see [Figure 4-10](#)). The **Remote Fwd Att** pop-up screen will open as shown in [Figure 4-11](#).
5. Enter the required attenuation value and click OK to close the pop-up screen and to make the changes take effect.

Table 4-1. 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
When there are five or more channels, each channel will always be less than 5 watts since the system has a maximum power output of 22.4 watts (43.5 dBm).	

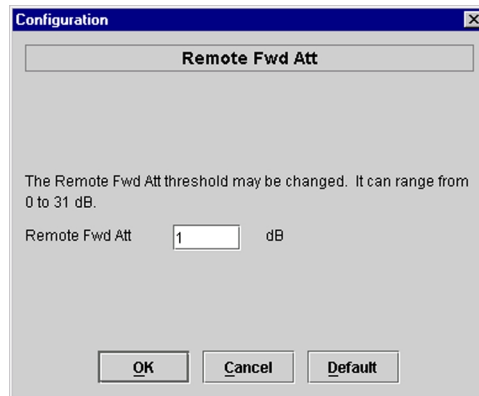


Figure 4-11. Remote Fwd Att Pop-Up Screen

6. Verify that the appropriate RF output signal level appears in the **RF Pwr-VSWR Low** section (see [Figure 4-10](#)). 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 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 BTS will vary depending on the type of BTS, the receive distribution, and the number of channels present. To interface with the BTS, the reverse path signal level must be adjusted to provide the signal level required by the BTS. The HU provides from 0 dB to +30 dB of gain in the reverse path. Use the following procedure to set the reverse path gain:

1. Check the BTS manufacturer's specifications to determine the composite signal level required at the BTS reverse path input port.
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 BTS.
3. Determine the amount of gain required to raise the reverse path signal to the level required at the BTS.
4. Click on the **HOST RF** tab. The **HOST RF** display will open within the EMS main window as shown in [Figure 4-12](#).