



**Installation and Operation Manual for the
Tower Top Amplifier System
Models 434B-83H-01-T, 434B-83H-01-M-110/48**

**Manual Part Number
7-9547-1**



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Version Number	Version Date
1	12/09/14

Symbols Commonly Used



WARNING !!!



High Voltage



CAUTION or ATTENTION



Hot Surface



Important Information



ESD Electrostatic Discharge



Training Video Available



Electrical Shock Hazard



Heavy Lifting



Safety Glasses Required

Changes to this Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Angola, New York facility to the attention of the Technical Publications Department. This manual may be periodically updated. When inquiring about updates to this manual refer to the manual part number and revision number on the revision page following the front cover.

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GENERAL DESCRIPTION

Your Bird Technologies brand Tower Top Amplifier System provides the highest degree of reliability available in a Tower Top Amplifier (TTA). The system uses quadrature-coupled amplifiers to create a redundant amplifier configuration. Each quad-amplifier provides two simultaneously used, essentially parallel paths of amplification. Failure of one of these paths of amplification results in an overall gain reduction of only 6 dB.

The system is composed of two components including a tower top box (TTA) which incorporates filtering and a pair of low noise amplifiers. These amplifiers establish superior noise figure prior to feedline losses. The tower top box is mounted on the tower close to the antenna. The second component of the system is the base control unit which is located in the control room. Specifications for the system are listed in **Table 1**.

The system also supplies automatic backup-amplifier switching in the tower top box. Fault detection circuitry continuously monitors the DC power operation of the primary quad-amplifier and automati-

cally switches to the identical secondary quad-amplifier if conditions indicate a primary malfunction. Fault detection circuitry also provides at-a-glance status reporting, with front-panel LED's and an LCD display.

Parameter	Specification
Frequency Band	700 - 800 MHz
NET Gain	15.0 dB typical
Rejection	110 dB min @ 776 and 851 MHz
Noise Figure	2.9 dB typical
Total Power Dissipation	17 W

Table 1: System specifications.
15 dB TTA Net Gain and maximum 6 dB transmission line loss assumed.

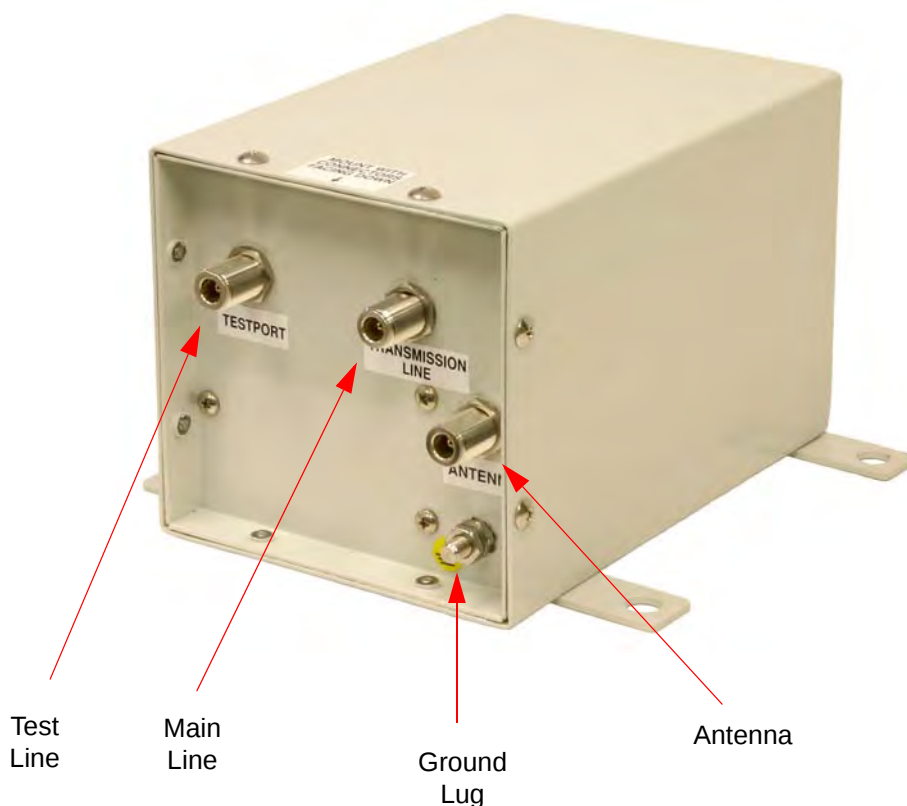


Figure 1: The tower top box.

Tower Top Box

The quad-amplifier in the tower top box amplifies the weak received signal before the signal enters a long and lossy transmission line, thus preventing the line loss from degrading the signal-to-noise ratio. The quadrature amplifiers have a separate power circuit for each half of the amplifier which provides component redundancy as well as unsurpassed IM performance. Microprocessor controlled fault detection circuitry in the tower top box provides continuous monitoring and switching of each quad amplifier while sending operational data to the base unit front panel for at-a-glance status

Parameter	Specification
EFP Area (no ice)	0.314 sq. ft.
EFP Area (w 1/2" ice)	0.418 sq. ft.
Wind Speed, Survival (no ice)	125 m.p.h.
Wind Speed, Survival (w 1/2" ice)	100 m.p.h.
Note: EFP stands for "effective flat plate" area. Table 3: Tower Top Unit wind loading specs.	

Parameter	Specification
Frequency Band	792 - 824 MHz
Preselector Included	Yes
Preselector Frequency Range	792 - 824 MHz
Type of Amplifier	Quadrature Coupled (Redundant)
Amplifier Switching	Automatic
Type of Amplifier Switching	Solid State RF Switch
TTA Gain (Input to Output of TTA)	23.0 dB (min)
LNA OIP3	> 42 dBm typical
Return Loss of all RF Ports	> 14 dB
Power Requirements	Power derived from RX Cable
Operating Temperature Range	-30 °C to +60 °C
Amplifier Redundancy	Automatic change-over
Lightning Protection	Impulse Suppressor on all external ports
Test Port Included	Yes
Coupling Test Port (Test In / Amp In)	30 dB
50 Ohm Termination Test	Controlled by base unit
Type of RF Test Switching	Solid State RF Switch
Bypass Test Mode	Controlled by base unit
Enclosure	Weather resistant housing Designed to NEMA standards
Dimensions	8.84" x 5.77" x 6.04"
Net Weight	8 lbs.
Table 2: Tower Top Box Specifications.	

reporting and form-C contact switching for alarm integration. Included in the tower top box is a pre-selector filter, amplifier “A” and amplifier “B,” switching circuitry, control board and lightning arresters (see **Figure 1**). The specifications for the tower box are listed in **Table 2**. The specifications for tower box wind loading are listed in **Table 3**.

Base Control Unit (MCU)

The ground-mounted Base Control Unit (also called an MCU) is intended for 19-inch rack mounting. It houses alarm indicators, a power supply or DC to DC converter, and a display panel to provide visual feedback on the system’s operating status. There is also a test port input for providing an RF signal path for loopback tests. The front panel display shows status information such as amplifier current draw and temperature. In addition the display is used to provide a user interface for adjustments such as setting TTA Net Gain attenuation. The current draw values of each amplifier in the system is displayed by the base control unit. The front panel of the base control unit is shown in **Figure 2**.

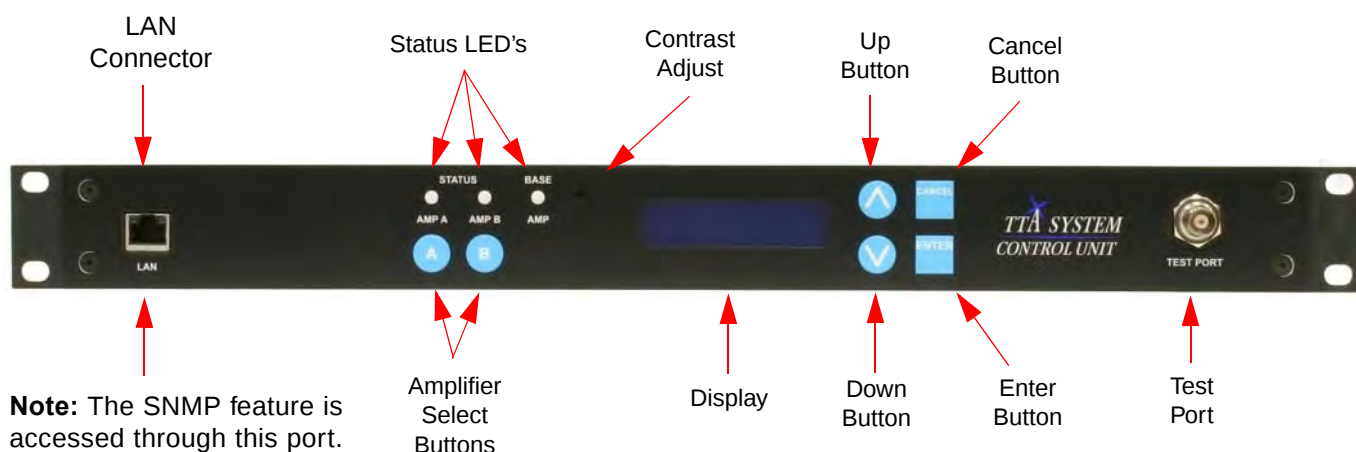
The base control unit design includes a receiver multicoupler function in addition to the system control and monitoring functions. The deck has the built-in capability to split the received RF signal from the tower top box to 16 individual receivers. In addition, there is an expansion port available which allows expansion of the system up to 32 ports. The

specifications for the base control unit are listed in **Table 4**. The top and rear views of the base control unit are shown in **Figures 3 and 4** respectively.

FUNCTIONAL BLOCK DIAGRAM

Figure 5 is a functional block diagram of the entire TTA system which includes the tower top box and the control deck. RF signals enter the tower top box through the antenna port and are applied to either the A or B tower top LNA. When the system is in the bypass mode signal flow is around the amplifiers. Signals are output from the tower top box at the main port and travel down the main transmission line to the main port of the base control unit. As noted on the block diagram, the main transmission cable also carries DC operating voltage up to the tower box and provides a conduit for serial communications between the processors in the tower box and the base deck.

RF signals enter the main port of the base control unit deck and are routed to the optional preselector port on the rear of the unit. This connection provides an easy way for the customer to add a narrowing filter to the signal path of the system. If an optional narrowing filter is not used then a loop back cable must be installed to insure RF continuity through the system. Upon re-entering the deck the RF signals are input to the base amplifier assembly. The amplifier assembly provides bandpass filtering, attenuation, amplification, and signal splitting. The signal splitter feeds a 16-way splitter



Note: The SNMP feature is accessed through this port. Refer to the section of this manual titled SNMP Notifications for details on the use of this feature.

Figure 2: Base Control (MCU) Unit front panel.

for distribution to station receivers and an expansion port connector. The expansion port allows an optional 16-way to be added to the system.

UNPACKING

Each major component of the TTA system is individually packaged and shipped via motor freight or UPS. It is important to report any visible damage to the carrier immediately. It is the customer's responsibility to file damage claims with the carrier within a short period of time after delivery (1 to 5 days).

PRE-INSTALLATION CHECKOUT

The following pre-installation tests should be performed after unpacking the system to verify nothing

has loosened during transit. Additionally, the system should be made operational on the bench with all components at ground level to verify proper electrical performance.



The tower top box should NOT be installed on the tower until all of the pre-installation inspections and tests have been successfully completed.

Mechanical Inspection

It is advisable to check the tightness of the hold-down screws for the base unit assemblies to insure nothing loosened during shipment. Likewise, check all of the cable connections on the base control unit

Parameter	Specification
Frequency Band	792 - 824 MHz
Net Gain or Loss (RMC In to RX out)	+1 dB typical
Amplifier Type	Quadrature Coupled
Amplifier Output IP3	> +45 dBm
Number of Output Ports	16 expandable to 48
RF Port Return Loss (min)	> 14 dB
TTA Connector	N - Female
Receive Connector	BNC - Female
Rx - Rx Port Isolation (min)	> 20 dB
Test Port Input (front of RMC)	BNC - Female
Test Port Output (rear of RMC)	N - Female
TTA Net Gain Electronic Attenuator	15.5 dB in 0.5 dB steps
Distribution Gain Electronic Attenuator	4 dB in 0.5 dB steps
Alarm Contacts	Form-C contacts
Ethernet Port	RJ45 (front panel access)
Power Requirements	90 - 240 VAC @ 50/60 Hz, or -48 VDC
Operating Temperature Range	0°C to +50°C
Enclosure	Standard EIA 19" Rack Mounting
Dimensions (HWD)	1 RU x 19" x 14" (45 x 483 x 356 mm)
Net Weight	11.5 lbs.
Table 4: Base Control Unit (MCU) Specifications.	

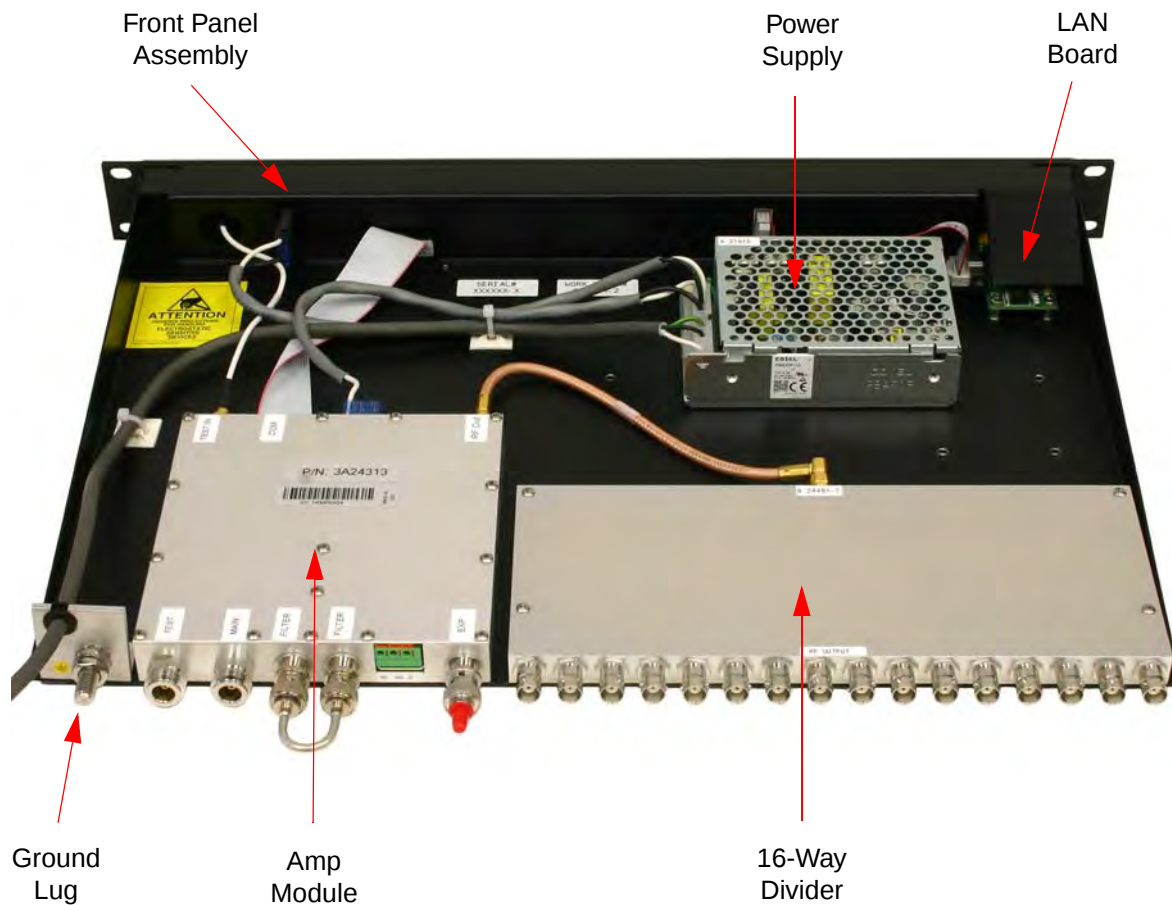


Figure 3: Top view of the Base Control Unit (MCU).

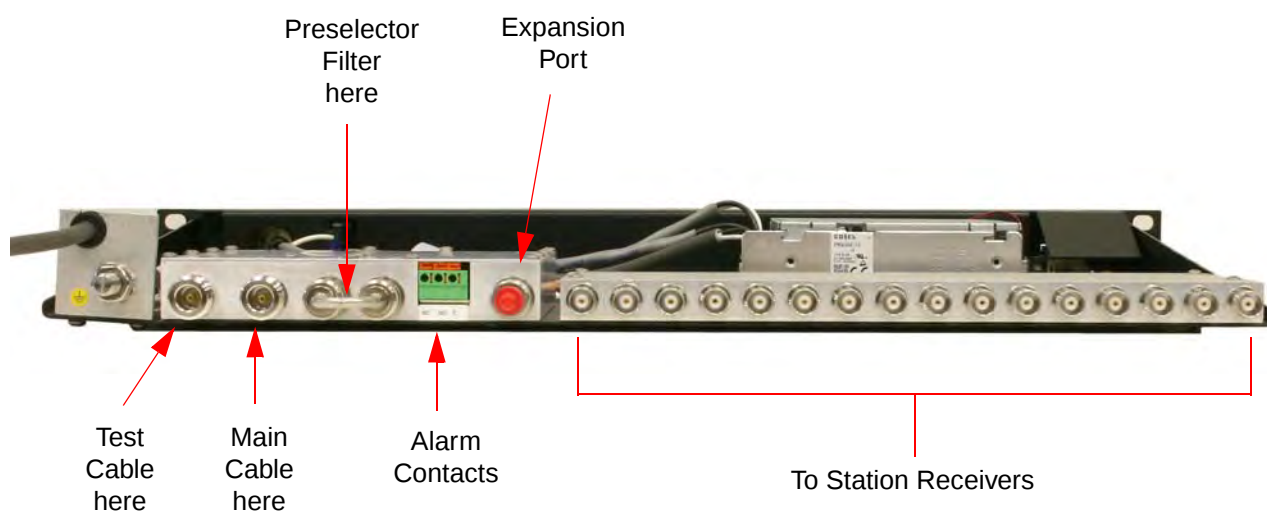


Figure 4: Back view of the Base Control Unit (MCU).

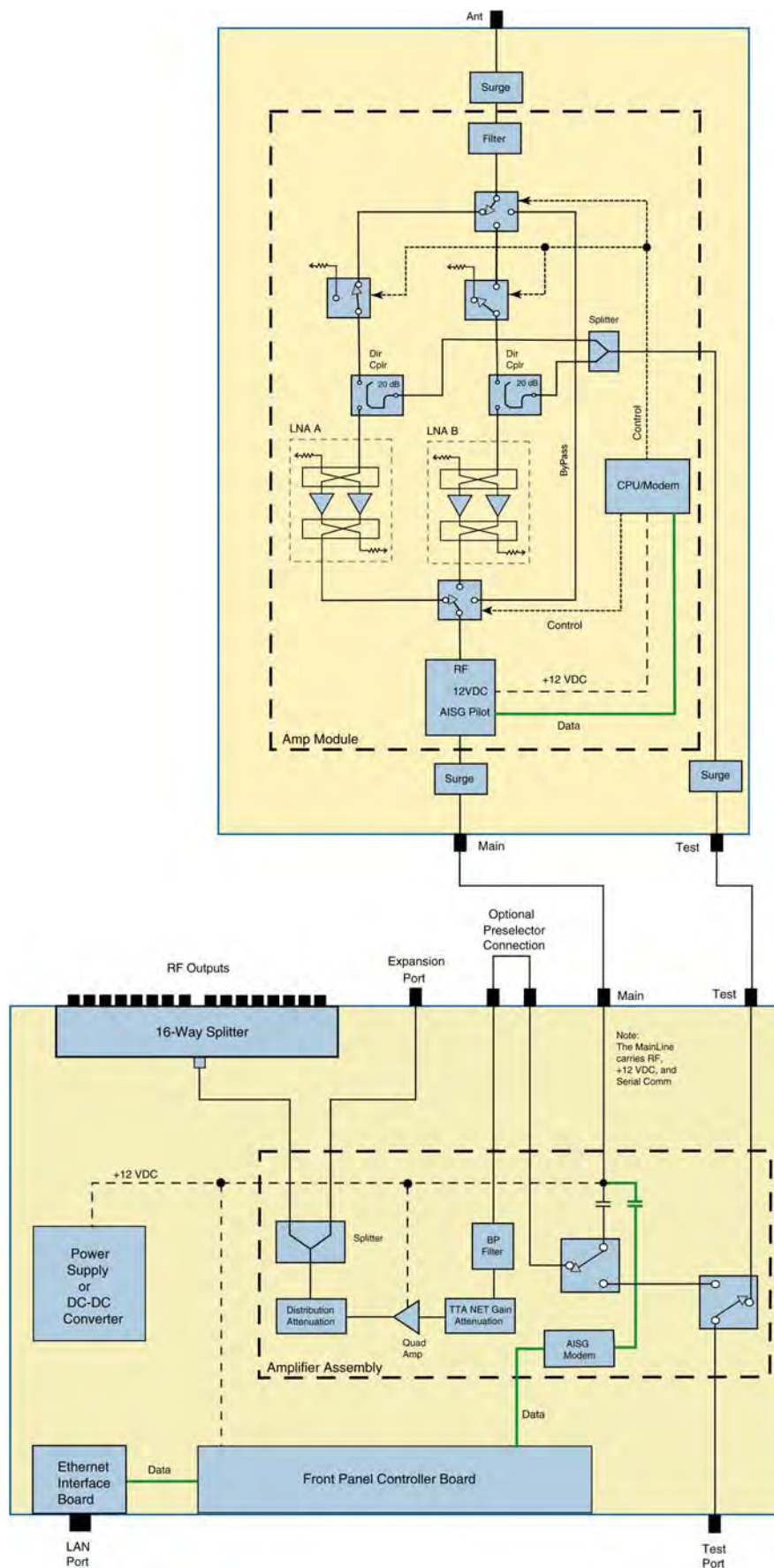


Figure 5: Functional block diagram of the system.

to insure that they are all properly mated to their associated plugs.



CAUTION: The wide band filter in the tower top box is factory tuned and must not be field adjusted. Field tuning of this filter is not required. Do not adjust the tuning slugs of the amplifier/filter assembly.

Initial Power-Up Test

To perform the initial power-up test the system should be temporarily interconnected at ground level using short temporary cables. To temporarily interconnect the equipment connect a cable between the main port on the tower box and the main port on the base unit. Also connect a cable from test port connector on the tower box to the test port connector on the base unit. **Figure 6** shows the temporary equipment hookup for initial power-up testing. Once the equipment is tempo-

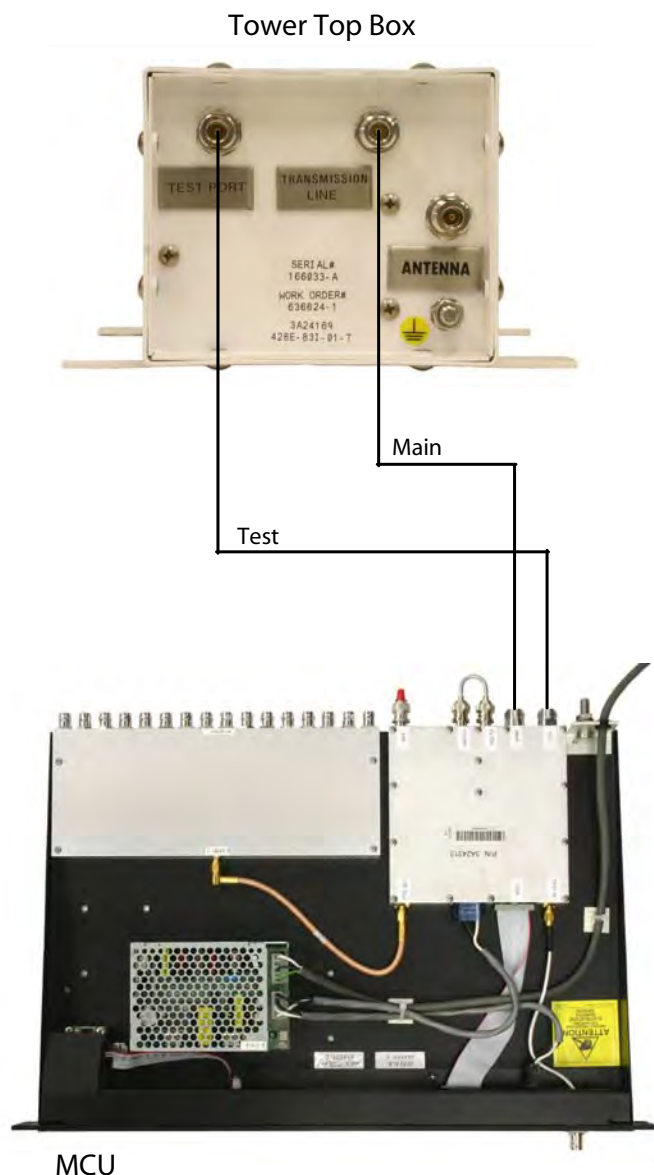
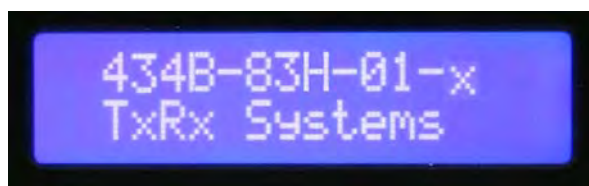


Figure 6: Initial power up test of the system.

rarily interconnected then power is applied to the system by plugging the control unit's AC cord into a suitable AC outlet or by connecting the DC power cable to a suitable -48 VDC supply. The following start-up sequence occurs.

- 1) At turn-on, the three front panel status LED's will all flash then dim. This will last for a few seconds while the systems micro-controllers boot-up.
- 2) During the next few seconds the base control unit will establish communications with the tower box. The display panel will present the message "Connecting to Tower Controller".
- 3) After the power-up sequencing is complete the screen should show the default display. See below. The status LED for each active amplifier will glow a steady green and the status LED for the inactive (stand-by) LNA will be dark.



Display Panel default display

The tower top amplifier system is software directed so control of the system is accomplished via user interface with the front panel using the display screen and the four menu selection buttons. A flow chart showing all of the possible user menu selections is shown in **Figure 7**.

Bench Testing

The purpose of the bench test is to verify that all of the system components are working correctly and to measure the systems sensitivity before climbing the tower to mount the tower top box. One station receiver is selected and the test is performed at this frequency. Short temporary cables are used to interconnect all components. A SINAD meter (or a bit error rate meter if required) is used for the test along with a signal generator.

- 1) The stand-alone receiver sensitivity is measured and recorded first.

- 2) To interconnect the equipment connect a cable between the main port on the tower box and the main port on the base unit. Also connect a cable from test port connector to the test port connector. **Figure 8** shows all of the equipment interconnections for bench testing. Inject the test signal into the tower box antenna port. Be sure that the signal generator is setup for a 3 KHz deviation with a 1000 Hz tone (analog) or proper pattern for BER testing. Connect the SINAD/Bit Error Rate meter to a receiver and connect the receiver to one of the RF output ports on the back of the base unit.
- 3) Measure and record the systems bench test static sensitivity. The sensitivity value will vary depending on the amount of internal programmable attenuation selected via software interface. The bench test measurement should be taken with the default attenuation values. As shipped from the factory the default TTA NET Gain attenuation for the system is 6.0 dB and the default Distribution attenuation is 4.0 dB.
- 4) Select the other tower top amplifier and check that the bench test static sensitivity value remains nearly the same. This will insure that both amplifiers in the tower top box are functioning properly. To select an alternate tower-top amplifier press the associated amplifier select button on the front panel, the status LED will begin to flash, then press the ENTER button to finalize the selection.

AMPLIFIER BYPASS

The system is designed with a bypass function which allows the antenna to be connected directly to the test port. In this mode of operation the front panel test port is electronically re-routed to the main transmission line and the amplifier circuit in the TTA is bypassed. This will allow for sweeping the antenna from the front panel test port. As part of bench testing the system this function needs to be tested. To temporarily interconnect the equipment connect a cable between the main port on the tower box and the main port on the base unit. Also connect a cable from test port connector to the test port connector. Using the front panel display interface place the unit in the bypass mode. When the system enters the bypass mode there should be an RF signal path between the front panel test port on the base unit and the antenna port on the tower top box. Note that after 1 minute of being in the bypass

434B-83H-01-X Menu System

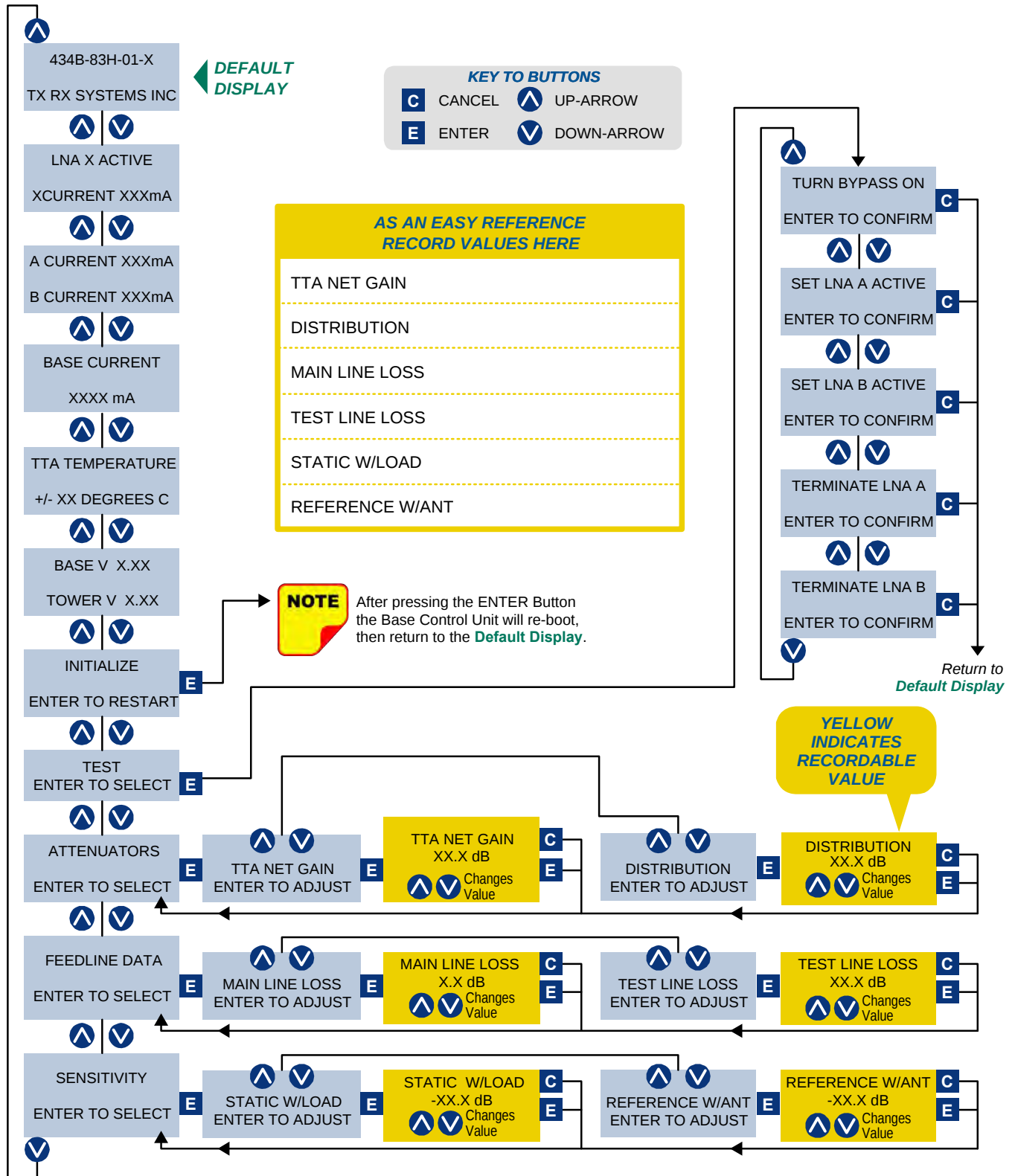


Figure 7: Front panel display menu selections.

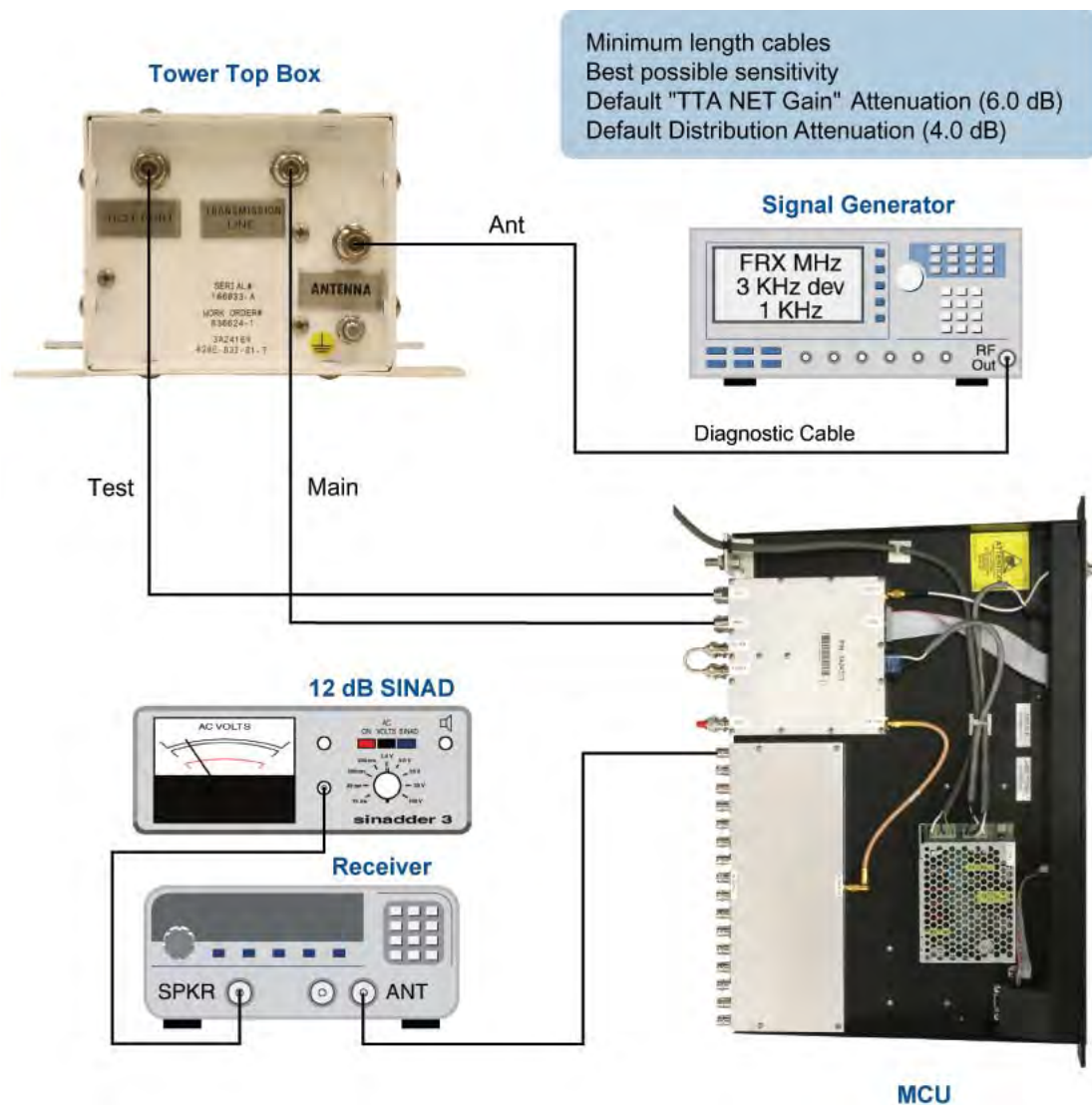


Figure 8: Test equipment interconnection for "bench testing" of system components.

mode the system will automatically switch back to normal operation.

AMPLIFIER TERMINATION

The input of the tower top amplifier can be switched to an internal 50 Ohm load for diagnostic purposes. As part of bench testing the system this function needs to be tested. To temporarily interconnect the equipment, connect a cable between the main port on the tower box and the main port on the base unit. Also connect a cable from test port connector to the test port connector. Using the front panel display interface place the unit in the

terminate mode. The system will switch the input of the tower top amplifier to the internal load. Note that after 1 minute of being in the terminate mode the system will automatically switch back to normal operation. Signals applied to the antenna port of the TTA will be greatly attenuated in this mode.

INSTALLATION

The following sub-sections of the manual discuss general considerations for installing the system. All work should be performed by qualified personal. Bird Technologies provides the base control unit and tower top amplifier box. All additional parts

required for installation must be supplied by the customer. Before mounting the tower top box we recommend that you record the model number and serial number of the tower top box and control unit for future reference in the event you need to call the factory for customer service support.



Proper installation of this system requires the installation of a test transmission line in addition to the main transmission line for system testing and diagnostics.

Installing the System

Installation of the TTA system should follow the installation standards listed in **Figure 9, and 10**. Installation and grounding of the system should follow the R56 standards. Lightning surge suppressors are incorporated throughout the system. In addition, surge suppression is also provided for all cable connections within the tower top box. Proper grounding techniques **MUST BE** observed for these devices to perform properly.

Installing the Tower Top Unit

The tower top box has mounting tabs on the back of the unit to allow for fastening to the tower, refer to **Figure 11**. *Because of the varied tower types, the customer must fabricate the interface brackets between the tower frame and the unit.* Bird Technologies offers an optional TTA mounting bracket kit (part # 91-00-123). The kit allows for easy installation of tower top units to poles about 3 inches in diameter. To install the tower top unit perform the following steps.

- 1) Mount a receiving antenna on the tower.
- 2) Run the main transmission cable and test cable up the tower.
- 3) Mount the tower top unit on the tower at a location near the antenna and connect the antenna feedline, main transmission line, and test line to the unit.
- 4) Connect the tower top box ground lug to a good solid ground on the tower.



To insure stability, it is important to fasten the box to the tower using all mounting tabs. The box must be mounted with the connectors and moisture openings facing **downward** to prevent water entry. After connecting the main transmission line, test line, and the antenna feedline, we recommend that the connections be tightly wrapped with rubber splicing tape (see **Figure 12**). This will help prevent water entry into the cables. Start the wraps on the cable several inches away from the connector and wrap **towards** the connector, this will prevent water from seeping in between the wraps of tape. Cover the connectors completely with tape.

In-building Lightning Arresters

Lightning arresters must be installed in the equipment room one each for the main and test transmission lines. The following steps are required for proper installation.

- 1) For the test line install a lightning arrester. PolyPhaser part# 1090501WA (male/female) or 1090501WD (female/female). The chassis of the arrester should be connected to the master ground buss with a pigtail.
- 2) For the main transmission line install a lightning arrester. PolyPhaser part# 1090501WA (male/female) or 1090501WD (female/female). The chassis of the arrester should be connected to the master ground buss with a pigtail.

Installing the Base Control Unit (MCU)

The base control unit is designed for indoor mounting in a common 19-inch relay rack or cabinet. The following steps are required for proper installation.

- 1) Install the base control unit into the rack or cabinet with four mounting screws included with the hardware kit (part # 3-16509) which is included with your shipment. Make sure you use a nylon washer under the head of the screws in order to protect the front panel. Torque the mounting screws to no more than 15 in/lbs. Overtightening the mounting screws may damage the front panel.

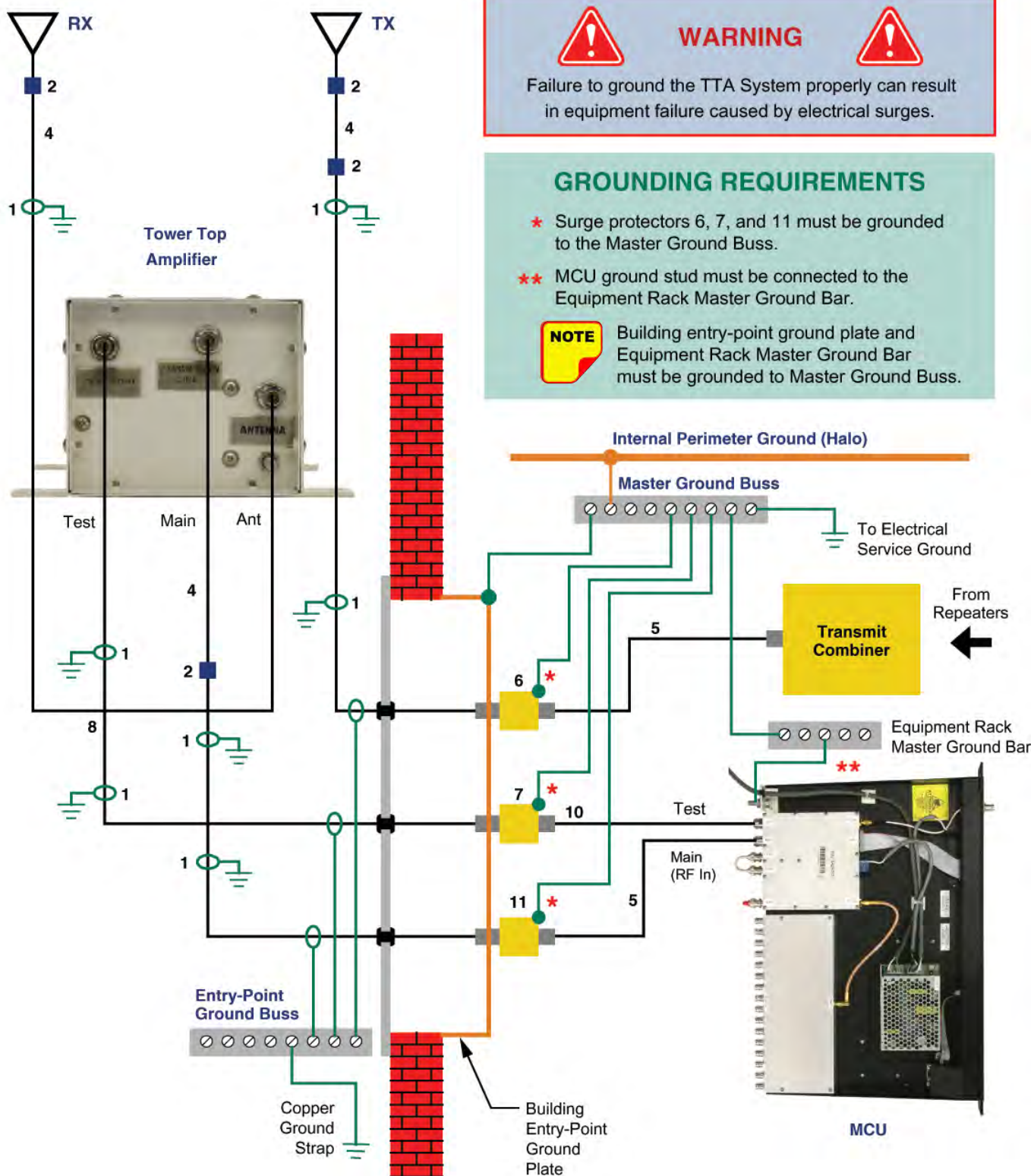


Figure 9: Base Control Unit (MCU) system installation guidelines.

INSTALLATION STANDARDS

1. Main transmission and test transmission lines grounded at top, base, shelter entrance and every 75 feet.
2. All external cable connections weatherproofed.
3. Hoisting grips used every 200 feet per mainline.
4. 1/2" LDF cable from each antenna to its mainline or tower top amplifier.
5. 1/2" Superflex for all internal RF runs.
6. Lightning Arrester on TX Line. (Customer Supplied)
PolyPhaser part number TSXDFFBF (Female/Male)
PolyPhaser part number TSXDFFBF (Female/Female)
7. Lightning Arrester on Test Port line. (customer supplied)
PolyPhaser part number 1090501WA (Male/Female)
PolyPhaser part number 1090501WD (Female/Female)
8. 1/2 " LDF test port transmission line.
9. Installation and grounding must conform to R56 Standards.
10. 1/4" Superflex, N male to N male.
11. Lightning Arrester with DC and 2.176 MHz Subcarrier pass through. (customer supplied)
PolyPhaser part number 1090501WA (Male/Female)
PolyPhaser part number 1090501WD (Female/Female)

GROUNDING REQUIREMENTS

- * Lightning Arresters 6, 7 and 11 must be grounded to the Master Ground Buss.
- ** Base Control Unit ground stud must be connected to the Equipment Rack Master Ground Bar.



Building entry-point ground plate and Equipment Rack Master Ground Bar must be grounded to Master Ground Buss.

SYSTEM ENGINEER RESPONSIBLE FOR

All mounting hardware
Wall feed-through hardware

Figure 10: System installation guideline notes.

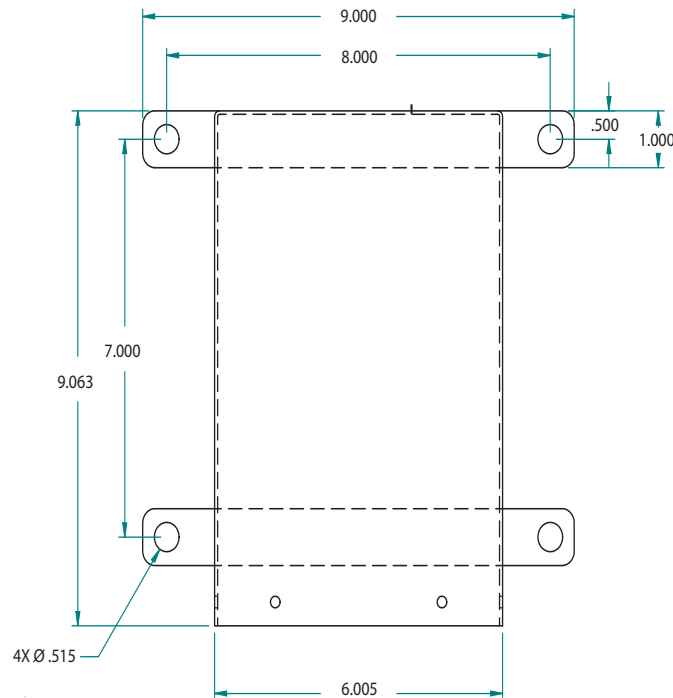


Figure 11: Tower top box mechanical details.

- 2) Connect the base control unit ground lug to the Equipment Rack Master Ground Bar with a pig-tail.
- 3) Connect the main and test transmission cables to the appropriate connectors at the back of the deck.
- 4) If you have a supervisory alarm system, connect its wiring harness to the alarm terminals at the back of the control unit. Refer to **Figure 13**.
- 5) Connect the station receivers and optional 16-port receiver multicoupler expansion deck to the output ports on the back of the base control unit with high-quality 50-ohm coaxial cable such as 1/4-inch super flexible transmission line. Some flexibility in the jumper cables will prevent strain and possible damage to the connections. We also recommend the use of quality BNC connectors. Unused receiver outputs need not be terminated. However an unused expansion port should be terminated with 50 ohms until connected to an expansion deck.

Interference and IM Considerations

Although Bird Technologies TTA systems are designed for maximum interference immunity, there are many factors that can lead to harmful interference when using a tower-mounted amplifier. It is highly recommended that the receiving and transmitting antennas be vertically separated to maximize antenna isolation.

Although most transmitters are connected to their antenna through a combiner, it is quite likely that the combiner does not have enough transmitter noise filtering to prevent desensitization of the receivers unless there is significant antenna space isolation. Large values of antenna isolation are most easily realized when the antennas are separated vertically. This antenna isolation also helps reduce the possibility of intermodulation interference in the receiving system.

One other important factor that can strongly contribute to interference problems is excessive gain, ahead of the receiver. Excessive gain can cause overdrive to the station receivers when strong sig-



Figure 12: Application of rubber splicing tape. NOTE: Additional waterproofing protection can be realized by covering the rubber tape with either "Scotch Kote" or Vinyl plastic Electrical tape ("Scotch" brand 33+).

nals are present, making them more prone to inter-modulation or carrier desensitization problems. Receiver preamplifiers should not be used.

FEEDLINE DATA

As part of the installation process you will need to determine the cable losses for your main and test transmission lines. These loss values can be determined by sweeping the cables or they can be looked up from the cable manufactures specifications. For your system these values will be fixed once the cable type is chosen and cut to length.

Once you have determined the main and test line cable loss for your system this information can be recorded in system memory for future reference using the Feedline Data menu selection. To save the cable loss values in memory perform the following steps.

- 1) From the default display press the DOWN ARROW button on the front panel to scroll through the menu choices until you reach the FEEDLINE DATA menu.
- 2) With the FEEDLINE DATA menu displayed press the ENTER button to step down to the MAIN LINE LOSS sub-menu.
- 3) Use the UP and DOWN ARROW buttons to set the main line loss to the desired value. This

storage register works in a forward loop fashion, starting at 0.0 and increasing to 9.5. A button press after 9.9 returns the setting back to 0.

- 4) After setting the main line loss value press the ENTER button to return back to the FEEDLINE DATA menu. This will save your setting choice.
- 5) With the FEEDLINE DATA menu displayed press the ENTER button to step down to the MAIN LINE LOSS sub-menu. Press the UP ARROW button to move to the TEST LINE LOSS sub-menu.
- 6) Use the UP and DOWN ARROW buttons to set the test line loss to the desired value. This storage register works in a forward loop fashion, starting at 0.0 and increasing to 20.0. A button press after 20.0 returns the setting back to 0.
- 7) After setting the test line loss value press the ENTER button to return back to the FEEDLINE DATA menu. This will save your setting choice. Then pressing the CANCEL button while at the FEEDLINE DATA menu will return you to the default display.

OPTIMIZING THE SYSTEM

In the TTA system the first stage of amplification is in the tower top box which is used to overcome the main line loss, develop the noise figure, and the



Figure 13: Alarm terminals. Normally open and normally closed terminals are available.

TTA NET. The second amplifier, located on the base control unit is used to overcome the losses associated with distribution.

When the tower top amplifier system is installed there are detailed adjustments and test procedures which must be followed in order to insure optimum performance of the system. The process includes:

- Attenuation Settings
- Spectrum Analysis
- Operational Tests
 - Sensitivity with Load Connected
 - Sensitivity with Antenna Connected

Operational testing must be performed in a methodical manner to provide the correct performance evaluation and ensure that the information obtained is correct. For each procedure it is important that the data be recorded accurately and is available anytime assistance is required or when performance is in question. Before a receive system problem is suspected, the appropriate operational tests must be performed. Before operational tests for sensitivity can be verified, the programmable attenuation settings and spectrum analysis must be performed. If these are not correct, the sensitivity and degradation may appear out of tolerance.

ATTENUATION SETTINGS

The system contains programmable attenuators for optimizing the TTA NET and adjusting the receiver multicoupler distribution. Both of these attenuators must be adjusted as part of the system installation. The attenuation adjustments allow the system to

maintain maximum protection of the receivers, while obtaining the best sensitivity possible.

TTA NET Gain

TTA NET is defined as the net gain between the input of the tower top LNA and the input of the station receiver. The amount of programmable attenuation that your system requires in order to reach an ideal amount of TTA NET Gain will vary depending on the length of your main transmission line and the loss of the short (pig-tail) cable between the base control unit and the radio.

Setting the Attenuators

The system has two programmable attenuators including the TTA NET Gain Attenuator and the Distribution Attenuator. These attenuators need to be adjusted such that the gain from the input of the tower top LNA to the input of the station receiver equates to **15 dB**.

The TTA NET Gain Attenuator is preset at the factory for 6.0 dB and the Distribution Attenuator is factory preset to 4.0 dB. These settings are appropriate for 0 dB of Main Line Loss and 1 dB of Pig-tail Loss. **Table 5** indicates how to set the attenuators for any other case.

Attenuator changes are done through software interface via the menu select keys. Your setting will be stored in system memory until you change it again even if the equipment is powered down. To adjust the value perform the following steps.

- 1) Press the DOWN ARROW button on the front panel to scroll through the menu choices until you reach the ATTENUATORS menu.

- 2) With the ATTENUATORS menu displayed press the ENTER button to step down to the TTA NET Gain or DISTRIBUTION sub-menu.
- 3) Press the ENTER button again to advance to the TTA NET Gain or DISTRIBUTION adjustment screen. The current value will now be displayed. Use the UP and DOWN ARROW buttons to set it to the desired value. The attenuation setting works in a forward loop fashion.
- 4) After setting the correct value press the ENTER button to return back to the ATTENUATORS menu. This will save your setting choice. Then pressing the CANCEL button while at the ATTENUATORS menu will return you to the default display.

Main Line Loss	Reserve Gain Attenuator Setting
0	6.0
0.5	5.5
1.0	5.0
1.5	4.5
2.0	4.0
2.5	3.5
3.0	3.0
3.5	2.5
4.0	2.0
4.5	1.5
5.0	1.0
5.5	0.5
6.0	0
Pig-tail Loss	Distribution Attenuator Setting
1.0	4.0
2.0	3.0
3.0	2.0
Note: Values marked in red are the factory preset values. Note: A TTA system is not required for main line losses of less than 1.5 dB	
Table 5: Base Control Unit (MCU) Attenuator Settings.	



Additional attenuation may be required in cases where carriers are encountered above -35 dBm as measured at the receiver. In such cases 1 dB of additional attenuation is recommended for each 2 dB of signal over -35 dBm. Good sensitivity will never be obtained if the signals entering the system are above -25 dBm.

SPECTRUM ANALYSIS

Obtaining good sensitivity requires an understanding of the levels applied to the receiver. A receiver, like any electronic device, has a dynamic range of operation. As long as this dynamic range is maintained, the specifications of the receiver are maintained. When the levels applied to the receiver exceed this range, the sensitivity, intermodulation rejection, as well as the adjacent channel selectivity will deteriorate. To properly perform a Spectrum Analysis, a spectrum analyzer must be connected to the output of the multicoupler as if it were a receiver, essentially monitoring what the receiver sees.

Figure 14 shows the equipment interconnections for this measurement while **Figure 15** is a graph which indicates the maximum desired measured-signal levels both inside and outside of the transmit and receive bands. TTA filter selectivity and antenna space isolation are the dominant factors that determine the signal levels observed. Excessively strong receive signals indicate the need for additional attenuation in the control unit. There are three areas of the spectrum that must be evaluated:

- 1) **Receive Band** - The spectrum where the receive frequencies reside must not have carriers above -35 dBm. These are the carriers that are intended to enter the receiver. If subscribers or control stations are near the infrastructure the levels can be very high. If the levels are above -35 dBm, the gain of the system must be reduced or the source of the high level carrier must be reduced.
- 2) **Transmit Band** - The highest carrier that the receive system will consistently see is its own transmitter. The preselector of the receive system must adequately remove these carriers to prevent over-drive. The goal of the preselector is to reduce all transmit carriers below -55 dBm.

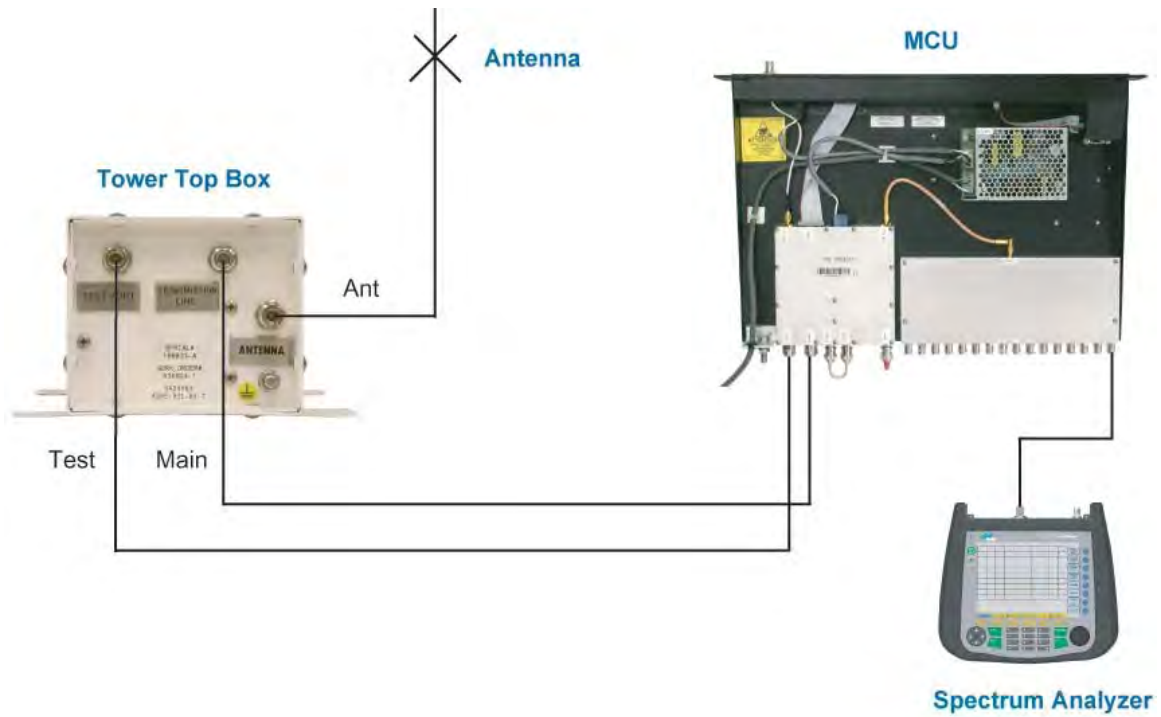


Figure 14: Testing the output spectrum of the system.

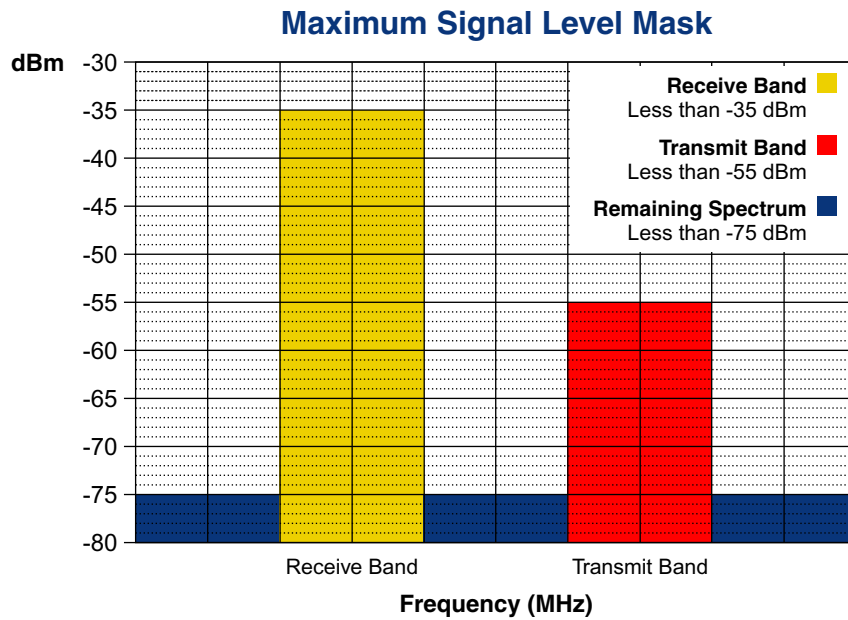


Figure 15: Maximum permissible signal levels of receiver outputs of the base unit.

If the level of a transmitter is above -55 dBm the preselector is not adequately performing its job and must be changed.

- 3) **All Other Frequencies** - The receiver is designed to monitor very low signals and there must be a minimum amount of undesired energy exposure. The preselector has very sharp selectivity and must reduce all carriers outside the bandwidth below -75 dBm except as indicated above.

Procedure for Spectral Analysis

Spectral analysis will verify the signals arriving at the receiver as well as validate the TTA NET Gain adjustment. To perform a spectral analysis of the site follow the steps listed below.

- 1) Make sure programmable attenuators are properly adjusted.
- 2) Connect the spectrum analyzer to one of the output ports of the multicoupler.
- 3) Setup the spectrum analyzer as follows;

Span = 700 - 800 MHz
Resolution = 50 KHz
RF Attenuation = 0 dBm
Reference Level = - 20 dBm
Peak (Max) Hold = ON

- 4) Monitor the spectrum for 5 minutes (during peak hours).

OPERATIONAL TESTS (SENSITIVITY AND DEGRADATION)

Before sensitivity and degradation can be verified, attenuation adjustments and spectrum analysis must be performed. If these are not correct, the sensitivity and degradation may appear out of tolerance.

The sensitivity tests will measure the full range of performance from the maximum achievable to real-world performance in the presence of RF noise. These tests are absolutely necessary, not only to insure proper performance, but also to serve as a bench mark for future evaluations and troubleshooting.

Two types of sensitivity measurements will need to be made, static and effective. Static sensitivity is measured without the presence of site noise while

the Effective sensitivity measurement includes site noise. The difference between the two is the system degradation.

Front Panel Test Port

The front panel BNC test port is connected to the tower box through the test line allowing signals generated at ground level to be injected into an isolated 30 dB port at the input of each tower top amplifier circuit. The test port feature provides a convenient means of performing static sensitivity tests of the system.

Tower Top Amplifier Inputs

Under normal operating conditions RF signals pass from the antenna to the inputs of the tower top amplifier. In addition, the input of each tower top amplifier can also be switched to an internal 50 Ohm load for testing purposes. The front panel test port remains connected (through its isolated 30 dB input plus test cable loss) to the tower top amplifiers regardless of whether the amplifiers input is connected to the antenna or the internal load. This allows system sensitivity testing to be done with and without site noise being coupled into the system through the antenna.

Static System Sensitivity

Static sensitivity is the maximum sensitivity achievable because any possible interfering signals are blocked from entering the LNA while static sensitivity is measured. To determine the Static system sensitivity the signal level into the first amplifier must be known. The easiest way to achieve this is to inject a test signal into the Test Port (located on the front panel of the base unit) and measure the BER or SINAD of the test receiver. The static system sensitivity can only be measured while the active tower-top LNA is connected to the internal load. Once you have made the measurement the actual static system sensitivity can be calculated.

Measuring Static Sensitivity (Load Connected)

To test the static system sensitivity through the test port with the internal load connected to the amplifier perform the following steps;



Caution: During this test on-air signals will NOT pass through to the station receivers.

- 1) The signal generator should be connected to the front panel test port.
- 2) Be sure the signal generator is setup for a 3 KHz deviation with a 1000 Hz tone (analog) or proper pattern for BER testing.
- 3) The test receiver and SINAD meter (or bit error rate meter if appropriate) should be connected to one of the RF outputs at the rear of the base unit. Refer to **Figure 16**.
- 4) From the default display, use the ARROW buttons to scroll to the TEST menu choice then select and active the terminate function. The RF signal path through the tower top box will be interrupted and on-air signals will not be passed to the station receivers.
- 5) Adjust the signal strength from the signal generator until the 12 dB SINAD or 5% BER point is acquired. This determines the systems static sensitivity without the presence of site noise. This value should be recorded in the base control unit's memory for future use.

NOTE

It is very important that sensitivity always be measured to a recognized benchmark such as bit rate error (BER) or SINAD. Do not use your ear or other subjective techniques.

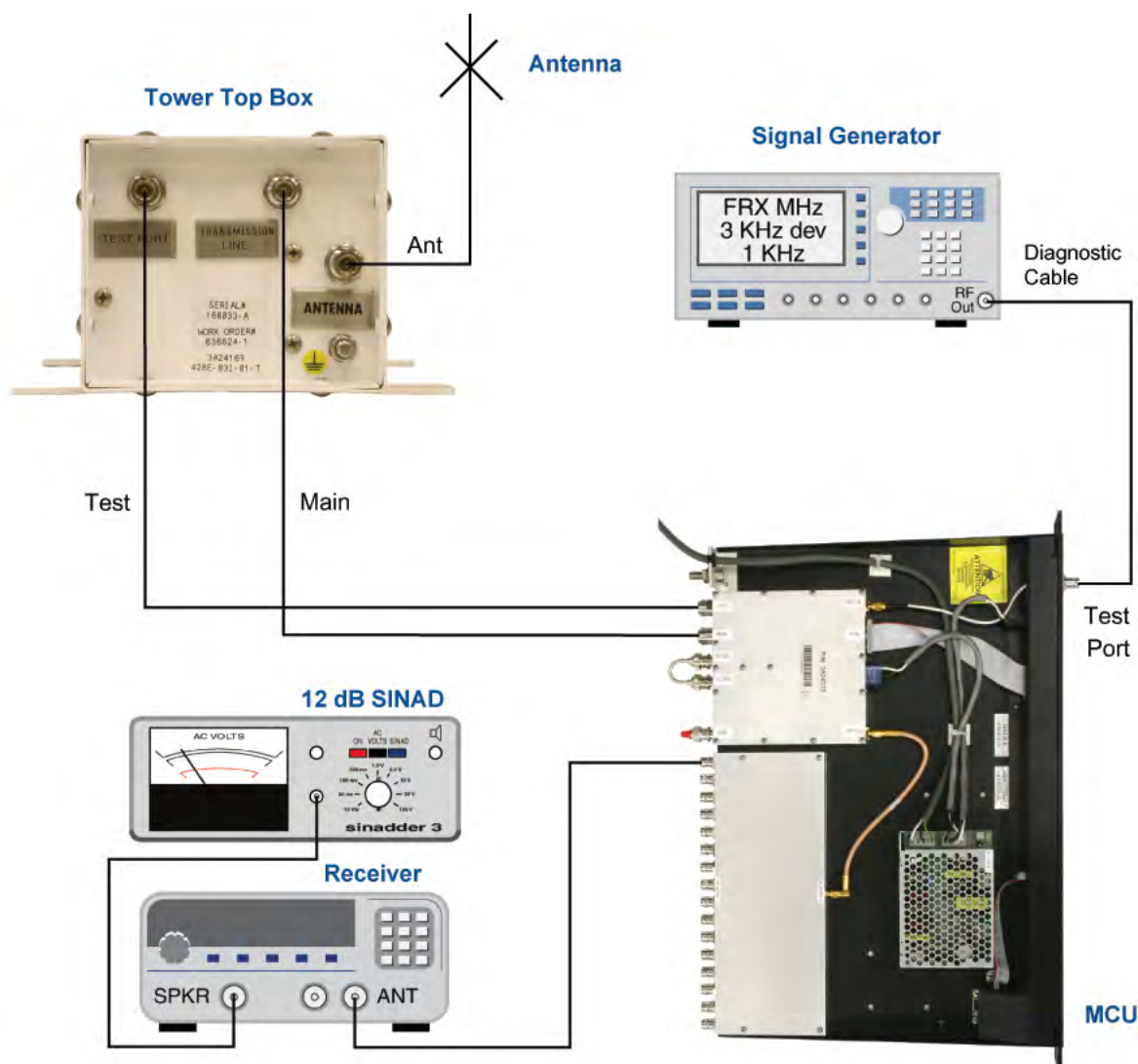


Figure 16: Using the test port to measure sensitivity.



If left unattended, after about 1 minute the input of the active amplifier will automatically switch back to the antenna and on-air signals will again pass through to the station receivers.

- 6) From the default display, use the ARROW buttons to scroll to the SENSITIVITY menu choice then press the ENTER button.
- 7) Use the ARROW buttons to scroll over to the STATIC W/LOAD menu choice and press the ENTER button.
- 8) Use the ARROW buttons to dial in the static sensitivity value (from the signal generator) and press the ENTER button to save the information into memory. By storing the sensitivity value at the time of installation it can be compared with future tests and used as an indication of system degradation or failure. In general, the sensitivity measured with the antenna will be less than that measured with the load unless site noise is at a minimum.



The sensitivity value measured in step 5 is less (30 dB plus Test Line loss) than the actual sensitivity value.

Effective System Sensitivity

The Effective System Sensitivity is the sensitivity as seen by the subscriber. This represents the talk-in coverage component of the infrastructure. To determine the Effective System Sensitivity the signal level into the first amplifier must be known. The easiest way to achieve this is to inject a test signal into the Test Port (located on the front panel of the base unit) and measure the BER or SINAD of the test receiver. The effective system sensitivity can only be measured while the active tower-top LNA is connected to the antenna. Once you have made the measurement the actual effective system sensitivity can be calculated.

Measuring Effective Sensitivity (Antenna Connected)

The Effective system sensitivity should be taken under normal conditions as well as with all transmitters producing full power. All transmitters keyed will show the worse case situation. To test the systems effective sensitivity through the test port with

the antenna connected to the amplifiers perform the following steps;

- 1) The signal generator should be connected to the front panel test port.
- 2) The test receiver and SINAD meter (or bit error rate meter if appropriate) should be connected to one of the RF outputs at the rear of the base unit.
- 3) Under normal conditions the antenna is connected to the amplifiers so no software interactions are required. Be sure the signal generator is setup for a 3 KHz deviation with a 1000 Hz tone (analog) or proper pattern for BER testing.
- 4) Adjust the signal strength from the signal generator until the 12 dB SINAD or 5% BER point is acquired. This determines the systems sensitivity in the presence of site noise. Record this value in the base control unit's memory for future use.
- 5) From the default display, use the ARROW buttons to scroll to the SENSITIVITY menu choice then press the ENTER button.
- 6) Use the ARROW buttons to scroll over to the REFERENCE W/ANT menu choice and press the ENTER button.
- 7) Use the ARROW buttons to dial in the effective sensitivity value and press the ENTER button to save the information into memory. By storing the sensitivity value at the time of installation it can be compared with future tests and used as an indication of system degradation or failure.



The sensitivity value measured in step 4 is less (30 dB plus the Test Line loss) than the actual sensitivity value.

Degradation

The difference between the static sensitivity (load-connected) and the effective sensitivity (antenna-connected) is the system degradation which can be caused by noise or interference (such as a user on an active channel). At 800 MHz it is unusual to have degradation greater than 2 dB (and even this is rare). The degradation value should be recorded

for future reference. Degradation levels in excess of 1 to 2 dB should be investigated, as this will decrease the range and performance of the system.

ROUTINE OPERATION

During normal operation only one of the two tower top amplifiers ("A" or "B"), and the base control unit amplifier ("BASE"), are used to amplify the received RF signals. The LED's for the active amplifiers will illuminate green. The remaining tower-top amplifier will be in stand-by mode, which is indicated by its LED being off. The system software also provides an indication of which tower top amplifier is active. From the default display use the ARROW button to scroll down to the LNA X ACTIVE menu which will display the currently active tower top amplifier.

Upon power-up, the system defaults to operation on the "A" tower top amplifier (the "BASE" amplifier in the base control unit is always on). Operation can be manually switched to the "B" tower top amplifier by pressing the "B-SELECT" switch, which is located below the "B-Status LED" on the control unit front panel. The "B-Status LED" will begin to flash, then press the ENTER button to finalize the selection.



If necessary the system can be re-initialized via software interaction. From the default display use the ARROW button to scroll to the INITIALIZE menu then press the ENTER button.

Amplifier Monitoring

The system continuously monitors the current being drawn by the amplifiers and reveals the status of the amplifiers in three ways: LCD Display, front panel LED's and Form-C contacts ("screw terminals").

LCD Display

The LCD display provides extensive status information through the menu system including the current draw of all amplifiers, connection of the test transmission line, the tower top box temperature, and installed software version level.

CURRENT DRAW

Typical displayed values for each of the system amplifiers are listed in **Table 6**. The current value for any amplifier can be read from the display by

using the ARROW buttons to scroll down from the default display. The A and B tower top amplifiers current draw are shown on one menu display and the BASE amplifier current draw on another.

Amplifier	Displayed Value
TTA Amp A	~440 mA
TTA Amp B	~440 mA
Base Amp (MCU system only)	~980 mA

Table 6: Typical current readings.
Note: An inactive amp will show about 0 mA.

TTA TEMPERATURE

The temperature of the tower top box can be read from the display by using the ARROW buttons to scroll down from the default display to the TEMPERATURE sub-menu. The recommended normal operating temperature range for the tower top box is -30 to +60 degrees Celsius. The tower top amplifier will function up to +70°C without shutting down. However, the specifications are not guaranteed.

SOFTWARE VERSION

There are micro-controllers located in both the tower top box as well as the base unit so there are two software versions in the system. Both the BASE and TOWER software version can be read from the display by using the ARROW buttons to scroll down from the default display to the SOFTWARE VERSION sub-menu.

Front Panel LEDs

Status indicator LED's for all the amplifiers illuminate in one of two colors; green for normal operation and red for alarm condition. During normal operation, the LED's for amplifier A and the BASE amplifier will glow green, indicating normal current draw. The LED for amplifier B will be off indicating this amplifier is in stand-by.

Form-C Contacts

The ALARM Form-C relay contacts are located at the back of the control unit. These terminals are intended for connection to the customer's supervisory and data acquisition system. Both normally open and normally closed contacts are available.

When power is applied to the base control unit the CPU will energize the relay and the common terminal will then be connected to the normally closed terminal. This is the normal mode of operation. When an alarm condition occurs the CPU will de-energize the relay and the contacts will change state indicating the alarm condition. **Figure 17** is a schematic representation of the Form-C contacts functionality. The contacts are shown in the drawing in the de-energized state.

Specifications for the Form-C contacts are: Nominal switching capacity (resistive load) of 2 Amps @ 30 VDC or 0.5 Amps @ 125 VAC, and Maximum switching power (resistive load) of 60 Watts.

ALARMS

The system will alarm when an abnormal current flows in any of the systems three amplifier assemblies. The specific devices front panel LED will glow a solid red. The alarm Form-C contacts located at the back of the unit will also change state. In addition, a loss of serial communications between the base unit and the tower top box will cause both the A & B LED indicators to flash red.

Fault detection circuitry continuously monitors the DC power operation of the primary tower top quad-amplifier and automatically switches to the identical secondary quad-amplifier if conditions indicate a primary malfunction. When the current to any of the amplifiers deviates from normal, amplifier switching will take place in the tower top box if the

fault lies with one of the tower top amplifiers. There is no switching provision for the amplifier in the base control unit.

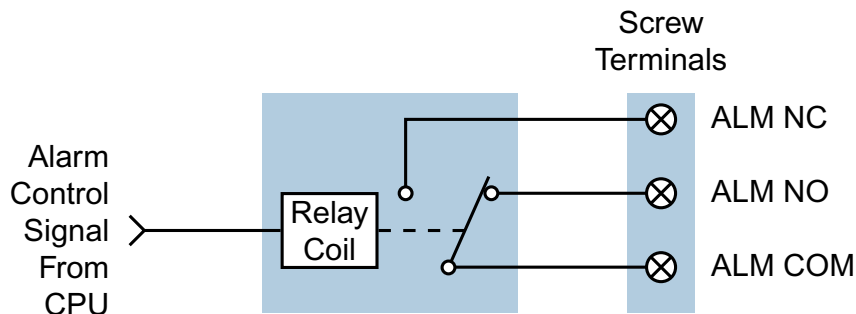
SYSTEM TROUBLESHOOTING

System problems fall under these main categories:

- 1) Performance problems characterized by poor receiver sensitivity and possibly accompanied by activation of the alarm system. RF interference or component problems can be the cause.
- 2) Hardware problems.
- 3) Power Supply.

Performance Degradation

Most performance difficulties manifest as an intermittent or continuous loss of effective receive channel sensitivity sometimes accompanied by audible interference in FM systems or dropouts in digital radios. Sensitivity loss on a continuous basis is more likely to indicate a hardware problem which may produce an alarm condition. **Table 7** is a troubleshooting guide that is read from top to bottom to narrow down the possible causes. The guide contains both symptoms and suggested tests as outlined earlier in this manual. Both the measurement of sensitivity and observation of the output spectrum are key tests along with the presence of any alarm condition.



Relays shown when Control Unit is in De-Energized State

Figure 17: Schematic representation of the Form-C contact functions.

Loss of Sensitivity (Intermittent / Continuous)			
Individual Receive Channel(s) affected		All Receive Channels affected	
Intermittent	Continuous	Intermittent	Continuous
Measure Sensitivity	Measure Sensitivity	Measure Sensitivity	Measure Sensitivity
Small to moderate loss of sensitivity	Small to severe loss of sensitivity	Small to moderate loss of sensitivity	Small to severe loss of sensitivity
Do spectrum analysis	Do spectrum analysis	Do spectrum analysis	Do spectrum analysis
Two or more carriers > 35 dBm when desense occurs	On-channel TX stuck on and visible in spectrum.	One carrier > 35 dBm when desense occurs then Carrier Desense Interference likely.	Possible Alarm condition
Other-channel modulation heard in FM system or dropouts in digital system	Defective cable / connector / Receiver	Carrier(s) < 35 dBm when desense occurs then Transmitter Noise Interference likely.	Check operation with amplifier A and B. Failed amplifier gives low sensitivity on 1 amplifier only.
Intermodulation Interference likely			If operation is the same on amplifier A or B, Defective common component is likely

Table 7: Troubleshooting Guide for TTA systems with degraded performance. Shaded blocks indicate common possible cause.

Hardware Problems

Two of the most common reasons for TTA alarms are direct lightning strikes and vandalism. Even though the system is designed with redundancy so that likely-to-fail components have backups, it is possible to shut the system down, especially if a common component such as a transmission line or antenna is damaged.

LIGHTNING & LIGHTNING ARRESTERS

The tower box uses three lightning arresters: one on the antenna port, one for the main transmission line and one for the test line. Although no practical amount of protection can prevent catastrophic failure as the result of a direct hit, the lightning arresters are very effective in preventing damage from nearby strikes and smaller direct hits. Lightning arresters do not last forever and can eventually fail, especially after a strong hit. A damaged arrester can cause low gain with known-good A & B amplifiers. An arrester with lightning damage will exhibit increased insertion loss, poor return loss and may appear as a DC short on the main or test lines.

VANDALISM

Damage to the TTA caused by hunters or target-shooters in remote locations is not uncommon. Penetrating bullets may open or short transmission lines. Operating voltages are applied to the tower top box by the main transmission line. In addition, the main transmission line carries RF, tower box operating voltage, and serial communications, so serious damage to this cable can prevent system operation. The system will operate normally if the test transmission line becomes damaged but there will be a loss of system testing and an alarm will be continuously set.

AC Line Fuse (110 VAC model)

A failure of the power supply will obviously shut the tower amplifier down because of high signal loss through the tower box and control unit. The power supply is located on the control unit chassis and has a replaceable 250 volt, 2 amp fuse for the AC line. The supply has a green status LED located on the power supply assembly next to the connectors which illuminates when the supply is turned on. The 48 VDC model uses a DC-DC converter instead of a power supply assembly.

PERIODIC MAINTENANCE

The following procedures can be followed as part of a periodic maintenance program.

- 1) Bird Technologies recommends that tests for establishing the performance level of the system, as outlined in this manual, be performed every six months.
- 2) Because it is possible that the current alarms *may not* detect a fault affecting RF gain, we recommend measuring system sensitivity every six months and comparing this value against the recorded value.
- 3) A yearly inspection of the tower box is also recommended. Inspect and tighten any loose connectors or other hardware.
- 4) All feedline connections should be inspected for tightness and waterproofing integrity. Water seeping into the transmission lines will cause system degradation.

RECOMMENDED SPARE PARTS

There are no recommended spare parts for the TTA system.

OPTIONAL EQUIPMENT

Optional equipment can be purchased from Bird Technologies in order to increase the performance of your TTA system. These include a narrowband filter as well as a multicoupler expansion deck. The narrowband filter is designed to help limit the bandwidth of the multicoupler unit. The multicoupler expansion deck will increase the total multicoupler outputs to 32.

Multicoupler Expansion Deck

The multi-coupler expansion deck (part number 75-83K-01) includes a 16-way divider mounted on a 19 inch deck as shown in **Figure 18**. The divider is designed to be connected to the expansion port output on the back of the base unit. With this option installed, a total of 32 system receivers can be connected, with the system gain remaining constant for all receivers. A cable is provided for connecting the expansion deck to the base unit. It is recommended that the multicoupler expansion deck be

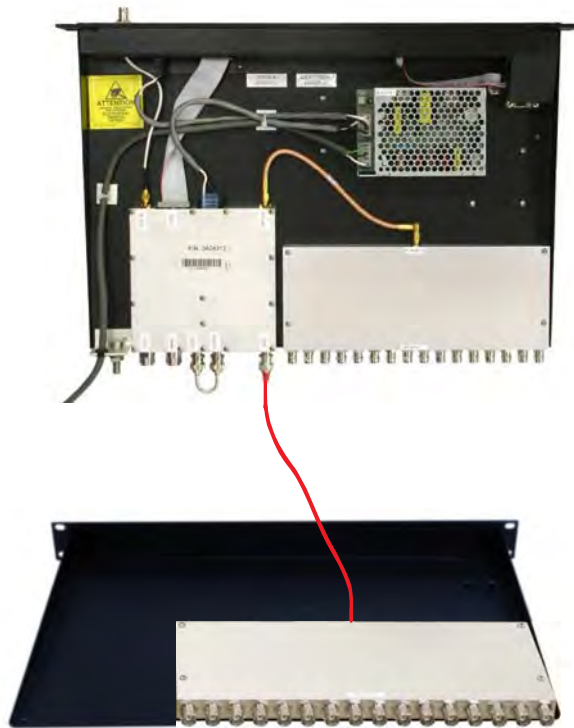


Figure 18: Multicoupler Expansion Deck model number 75-83K-01.

mounted in the same rack just beneath the base unit. The optional multicoupler expansion deck will require 1 “rack unit” of space.

Narrowband Filter

There are a total of nine different narrowband filters available for use with your TTA system. There are four filters that operate in the 792 to 806 MHz range and five filters in the 806 to 824 MHz range.

Table 8 lists all of the optional narrowband filters available. The additional filter will provide a narrower pass window for the system. The optional filter is connected to the back of either the base control unit at the two ports labeled Pin and Pout as shown in **Figure 19**. It is recommended that the filter be mounted in the same rack just above the control unit. The optional filter will require 2 “rack units” of space.

Model #	Operating Range (MHz)	Band-width (MHz)
89-83F-03-03	792 to 806	3
89-83F-03-06	792 to 806	6
89-83F-03-09	792 to 806	9
89-83F-03-14	792 to 806	14
89-86A-03-03	806 to 824	3
89-86A-03-05	806 to 824	5
89-86A-03-10	806 to 824	10
89-86A-03-15	806 to 824	15
89-86A-03-18	806 to 824	18

Table 8: Optional Narrowband Filters.



If the system is installed without the optional filter then a supplied jumper cable **MUST** be installed from the Pin to the Pout connectors in order to maintain the RF signal path through the system.

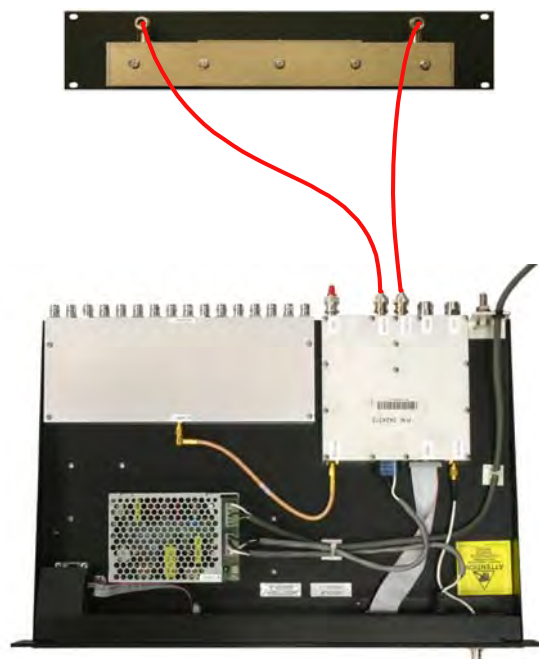


Figure 19: Connecting an Optional Filter to the Base Control Unit.

INSTALLATION KIT CONTENTS

Included in the installation kit are:

- 1) Panel-mounted narrowband preselector.
- 2) Pair of 24-inch BNC / N cables.
- 3) Required installation screws.

INSTALLATION PROCEDURE

To install the optional narrowband filter in your TTA system perform the following steps;



Electrical power to the Base Control Unit should be turned off during installation of the optional filter.

- 1) Disconnect the small BNC-BNC jumper cable at the back of the Base Control Unit. This cable is connected to the BNC connectors labeled FILTER. The jumper cable must be installed on systems that do not have an optional filter in order to ensure RF continuity through the deck. On systems with an optional filter installed RF continuity is provided by the filter.

- 2) Install the optional filter into the rack or cabinet with the four mounting screws contained in the hardware packet (part# 3-16509) which is included with your shipment. Make sure you use a nylon washer under the head of the screws in order to protect the front panel. Torque the mounting screws to no more than 15 in/lbs. Overtightening the mounting screws may damage the front panel.
- 3) Locate a 24" BNC/N cable from the kit. Connect the "N" end of the cable to the input port of the optional filter. Connect the "BNC" end of the cable to the FILTER port on the rear of the Base Control Unit. Connect at the FILTER port closest to the Main Transmission port as shown in figure 19.
- 4) Locate a 24" BNC/N cable from the kit. Connect the "N" end of the cable to the output port of the optional filter. Connect the "BNC" end of the cable to the FILTER port on the rear of the Base Control Unit. Connect at the FILTER port that is furthest from the Main Transmission port as shown in figure 19.

SNMP NOTIFICATIONS

The SNMP feature is designed to provide reliable internet notification of an alarm occurrence or a change in operational status of the TTA system. The SNMP (Simple Network Management Protocol) interface is available via the front panel LAN connector (refer to figure 2). The LAN port will

need to be connected to the internet by the customer using a standard CAT-5 cable. The SNMP feature will be energized and active whenever the booster has operational voltage applied to it. The IP address of the SNMP module will need to be changed from the factory default setting to an address suitable for the customers network. The factory default IP address is "**192.168.1.1**" and the factory default subnet mask is "**255.255.255.0**". The customer should consult with their IT department for recommendations on setting a new IP address. The initial customer interface to the SNMP feature should be done with a laptop computer at the time of installation.

Specific instructions for initially direct connecting a laptop to the SNMP feature are given in **Appendix A** at the back of this manual. The remaining SNMP discussions in this manual assume the initial connection to the SNMP feature is completed and the front panel LAN port has been set to a suitable IP address.

When the SNMP feature is properly connected to the internet it can be accessed by typing its IP address into the address bar of your web browser software. When a connection is made to the SNMP via the internet the SNMP home page will be displayed on your web browser as shown in **Figure 20**. The current IP address and MAC address of the control unit deck are displayed. Additional sub-menu's are available by selecting from the menu listings on the upper left-side of the screen. The

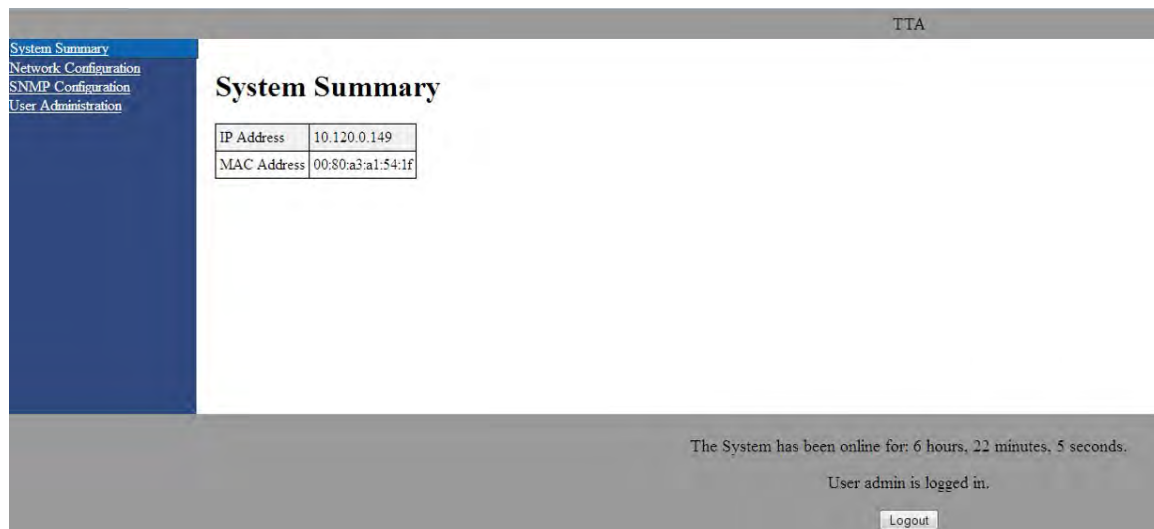


Figure 20: SNMP home page.

TTA

System Summary
Network Configuration
SNMP Configuration
User Administration

User Administration

Username:

Password:

The System has been online for: 1 day, 8 hours, 45 minutes, 9 seconds.

Figure 21: The User Administration menu page.

additional menu items include network configuration, SNMP configuration, and User Administration. When viewing these additional menu listings you will be able to view the screen but you will not be able to make changes without entering a password. After entering a valid password the menu screens will switch from read-only to fully interactive.

User Administration

To enter a password select the User Administration menu listing. The User Administration menu will appear as shown in **Figure 21** and the user will be queried for a user name and password. The default user name is “**admin**” and the default password is

“**admin**”. Once the correct user name and password are entered then a menu box for creating a new user will be presented as shown in **Figure 22**. To create a new user enter the new user name and associated password. Confirm the new password by entering it again then press the Submit button.

Network Configuration

The Network Configuration menu without password access displays the status of DHCP, the current IP address, the netmask, and the gateway as shown in **Figure 23**. With password access the decks MAC address is also displayed as shown in **Figure 24**. In addition, password access allows the DHCP status, IP address, netmask, and gateway to be

TTA

System Summary
Network Configuration
SNMP Configuration
User Administration

User Administration

User Table:

admin
admin
admin
admin
admin
admin

Create a new user

Username:

Password:

Password Confirm:

The System has been online for: 6 hours, 24 minutes, 5 seconds.

User admin is logged in.

Figure 22: Create a new user menu display.

DHCP:	Inactive
IP Address:	10.120.0.149
Netmask:	255.255.252.0
Gateway:	10.120.0.3

The System has been online for: 1 day, 8 hours, 44 minutes, 12 seconds.

Figure 23: Network Configuration menu without password access.

modified by clicking in the associated box and entering the new value.

The DHCP (Dynamic Host Configuration Protocol) is either active or inactive. When DHCP is active the values for IP address, netmask, and gateway are set to zero. When DHCP is inactive (default setting from the factory) the IP address, netmask, and gateway values can be modified by the user by typing the desired values into the associated box and pressing the submit button.

SNMP Configuration

The SNMP Configuration menu without password access displays the three IP addresses that trap messages will be sent to as well as the SNMP version (refer to **Figure 25**). With password access the screen will now display the three destination IP addresses, authentication type, user name (this

field must have a value or traps will not be sent), a password for the user name, encryption type, and an encryption passphrase. The SNMP Configuration screen with password access is shown in **Figure 26**.

The destination IP addresses should be the IP addresses of the computers you want the traps to be sent to. The destination computer must have trap receiver software installed and running. The trap receiver software is available for download. Authentication type can be either none or MD5. The User Name field must have a value entered with the associated user name password optional. Encryption type can be either none or MD5 with the associated encryption passphrase as optional. Whenever values in the SNMP Configuration screen are changed you must click on the submit button to save the changes.

DHCP Enabled	☐
IP Address	10.120.0.149
Netmask	255.255.252.0
Gateway	10.120.0.3
MAC Address	00:80:a3:a1:54:1f

Submit

The System has been online for: 6 hours, 22 minutes, 24 seconds.

User admin is logged in.

Logout

Figure 24: Network Configuration menu with password access.

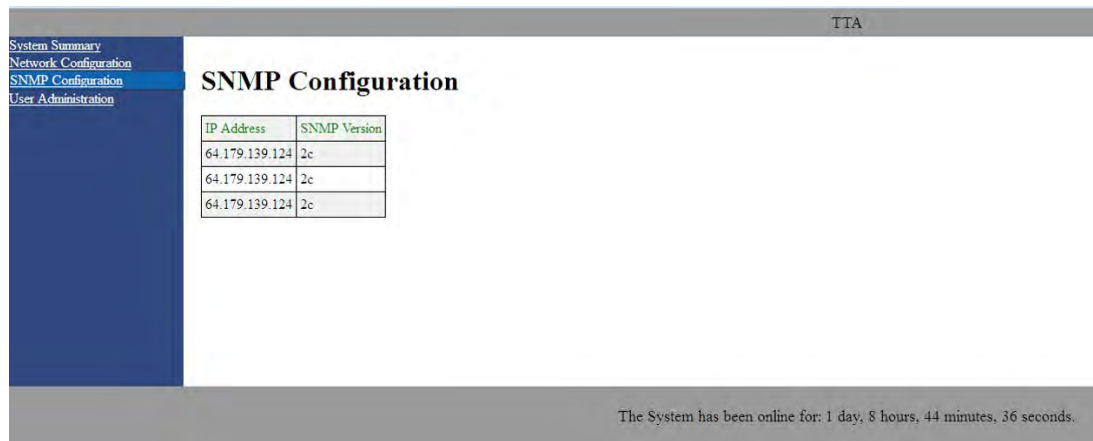


Figure 25: SNMP Configuration menu without password access.

Initial Setup

When the TTA system is installed the SNMP feature should be setup for proper communications. There are several steps required for proper setup of the SNMP feature as listed below.

- 1) Connect a laptop directly to the TTA deck. Refer to Appendix A for detailed instructions on how to make a direct connection. The TTA deck is shipped from the factory setup for static IP addressing with a default IP address of "192.168.1.1" and the factory default subnet mask is "255.255.255.0". Change the factory default IP address of the TTA deck to one provided by your IT department.
- 2) Use the Network Configuration to setup the DHCP as either active or inactive. When DHCP
- 3) Use the SNMP Configuration to enter up to three device addresses. These are addresses where the SNMP feature will send traps whenever a qualifying event takes place. Qualifying events are listed in the section of this manual under the title Trap Receiver GUI.
- 4) Load trap receiver software into the destination SNMP computer/manager(s), so it will be able to decipher the SNMP traps. The trap receiver software (called a MIB file) will be supplied by Bird Technologies as a downloadable file.

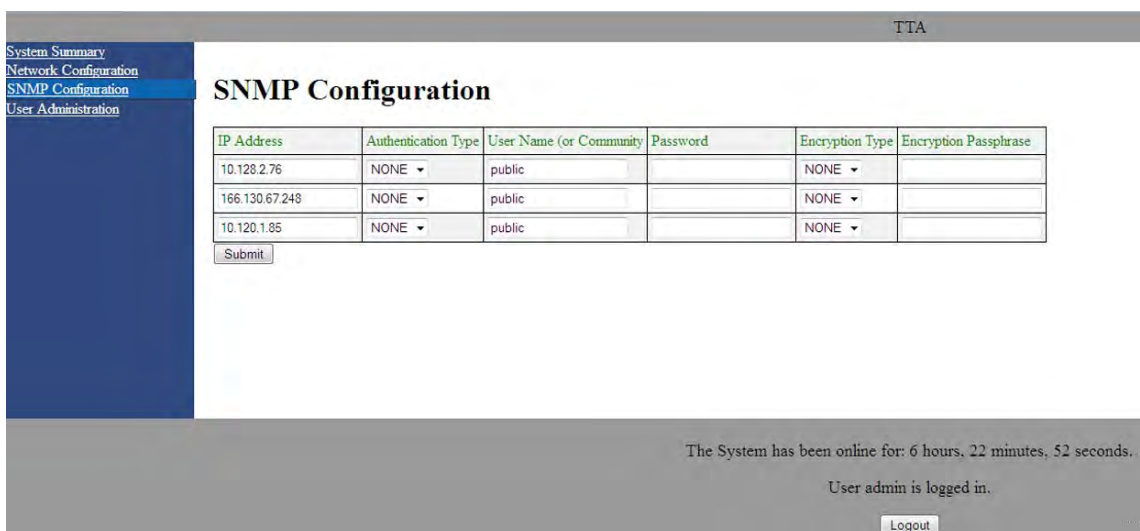


Figure 26: SNMP Configuration menu with password access.

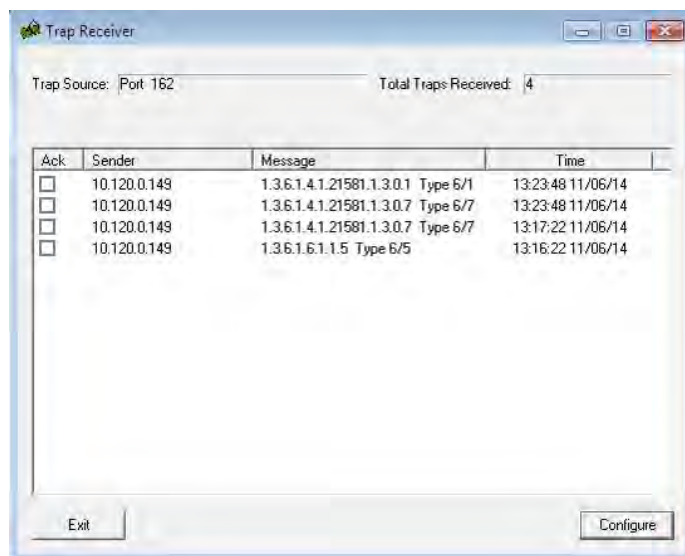


Figure 27: Trap Receiver GUI interface.

Trap Receiver GUI

The trap receiver software (MIB file) provides a GUI interface for the user so that traps sent from the TTA deck can be received and displayed for viewing. The trap receiver software must be downloaded from Bird Technologies and installed on your computer (destination computer). The software must be running on your machine in order to receive and display traps from the TTA deck. The GUI interface is shown in **Figure 27**.

When a qualifying event occurs in the TTA system a trap message is formulated and sent to the destination computer, Typical trap messages are shown in figure 37. To interpret the meaning of the trap

message it must be examined in detail for an integer value which is imbedded in the message. Double clicking on the message will allow you to see the imbedded details. When a trap message is double clicked a details window will be presented as shown in **Figure 28**. The details window will display the integer in the value column of the Variable Bindings table.

The definition of what the integer means is listed in **Table 9**. Closing the Trap Details window will return the user to the Trap Receiver GUI.

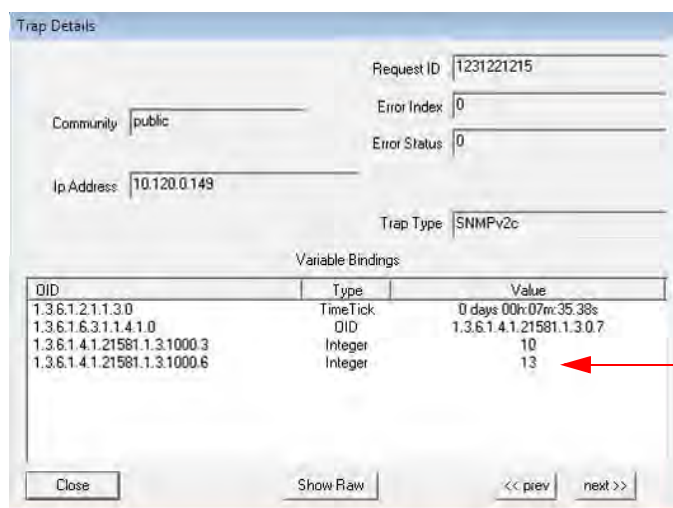


Figure 28: Trap details.

Integer	Description
0	Normal
1	LNA-A active, LNA-B ok, Base Amp ok
2	LNA-A active, LNA-B ok, Base Amp fault
3	LNA-A ok, LNA-B active, Base Amp ok
4	LNA-A ok, LNA-B active, Base Amp fault
5	LNA-A active, LNA-B fault, Base Amp ok
6	LNA-A active, LNA-B fault, Base Amp fault
7	LNA-A fault, LNA-B active, Base Amp ok
8	LNA-A fault, LNA-B active, Base Amp fault
9	Tower fault, Base Amp ok
10	Tower fault, Base Amp fault
11	Bypass Mode
12	Termination Mode
13	Communications fault
Table 9: Trap Integer definitions.	

APPENDIX A

Ethernet Connectivity

The LAN connector on the front panel of the deck provides for 10/100 BASE-T Ethernet connection using the TCP/IP or DNS protocol. The control unit deck is shipped from the factory with a default TCP/IP address of “192.168.1.1”. A direct connection (at the installation site) should be established the first time you interface to the SNMP feature using the fixed IP mentioned above. Once the initial communications are established the IP address in the deck can be changed to permit a connection to the internet. The initial direct connection should be made with an Ethernet crossover cable. **Figure A1** shows the pinout for a CAT-5 crossover cable.

LINK LED (left side)		ACTIVITY LED (right side)	
Color	Meaning	Color	Meaning
Off	No Link	Off	No Activity
Amber	10 Mbps	Amber	Half-Duplex
Green	100 Mbps	Green	Full-Duplex

Table A1: LAN port status LED's

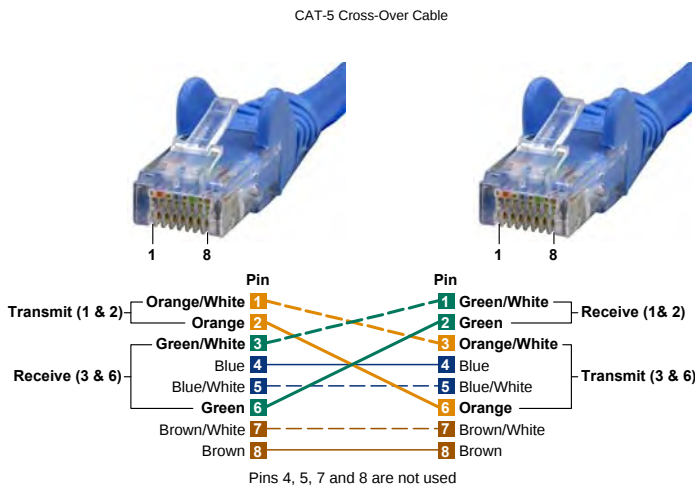


Figure A1: CAT-5 Crossover cable pinout.

Procedure

To direct connect your laptop computer to the LAN port on the deck perform the following steps;

- 1) Connect your laptop network port to the LAN connector on the deck using a standard CAT-5 Crossover cable.



The front panel LAN connector has two built-in bi-color status LED's which will aid you in establishing communications. The meaning of each LED is shown in **Table A1**.

- 2) The left-most (LINK) status LED built-in to the LAN port connector should illuminate amber or green indicating that a good physical connection is established between your computer and the TTA. After a few moments of initialization the right-most LED should flash occasionally.
- 4) Insure that your laptop's IP address is compatible with the default address of the deck. This may require changes be made to the Ethernet adaptor address on your laptop (refer to **Appendix B**). Your laptop's IP address will need to be set to “192.168.1.2” along with a subnet mask of “255.255.255.0”. The right-most (ACTIVITY) status LED built-in to the LAN port connector will turn amber or green and flash occasionally indicating good TCP-IP communications are established between the laptop and the control unit.
- 5) Launch your web browser software on the laptop.
- 6) In your web browsers address box type-in the IP address of the deck “http://192.168.1.1” and press the ENTER button. The home screen (System Summary) of the SNMP feature should appear in your laptop's browser window.

APPENDIX B

Changing Your Service Computers IP Address

When you initially direct connect your service computer to the SNMP Module it will be necessary to change the computers IP address. The procedure for doing this varies depending upon your operating system. As an example, this appendix illustrates how to make the change using the Microsoft XP operating system. The procedure for other operating systems will vary slightly from this example. Consult with your IT support personnel if needed. To change the IP address (assuming the Microsoft XP operating system is being used) perform the following in a step-by-step fashion;

- 1) Select "Start" from the status menu.
- 2) Single click the "Control Panel" choice from the "Start" pop-up menu as shown in **Figure B1**.
- 3) From the "Control Panel" icon selections double click on the "Network Connections" icon. Refer to **Figure B2**.
- 4) When the "Network Connections" folder opens double click on the "Local Area Connection" icon. See **Figure B3**.
- 5) The "Local Area Connection Status" box will open. Single click the "Properties" tab as shown in **Figure B4**. **Note:** If you do not have the cable connected between the service computer and the TTA front panel the "Local Area Connection Status" box will not open. Instead proceed to step 6.
- 6) The "Local Area Connection Properties" box will open. Use the arrow buttons to scroll down the list until the "Internet Protocol (TCP/IP)" choice is highlighted as shown in **Figure B5**. Click the "Properties" tab at the right-center of the box.
- 7) Select the "Use the following IP address" bubble. Make sure the circle is filled-in. Refer to **Figure B6**.
- 8) Enter the new IP address and subnet mask values as shown in **Figure B7**. To interface your computer to the SNMP Module use an IP address of "192.168.1.2" and a subnet mask of "255.255.255.0".
- 9) Click on the "OK" tab to initiate the changes. This completes the procedure. Close any open boxes.

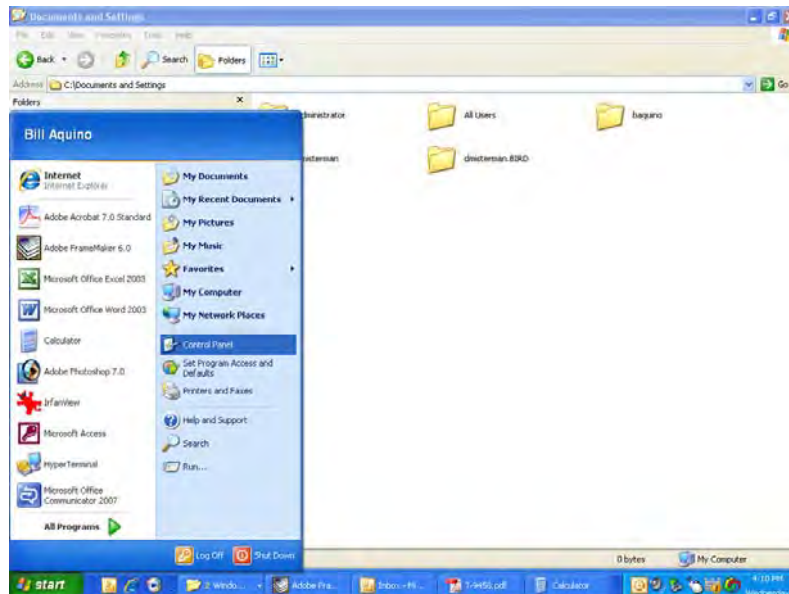


Figure B1: Choose the "Control Panel" icon.

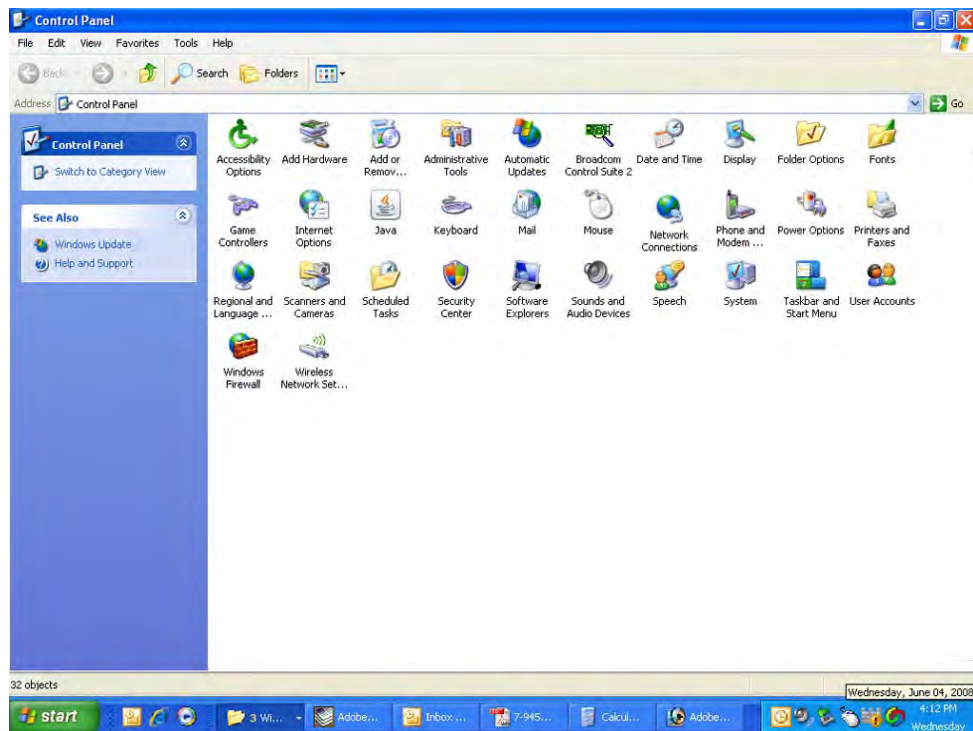


Figure B2: Select the “Network Connections” icon.

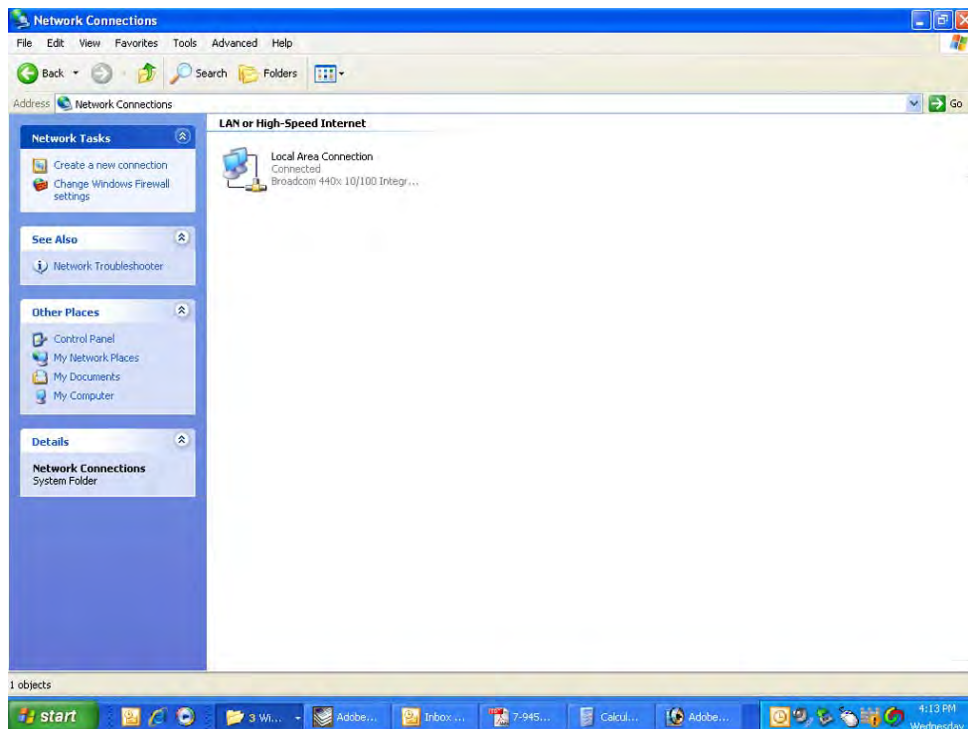


Figure B3: Select the “Local Area Connection” icon.

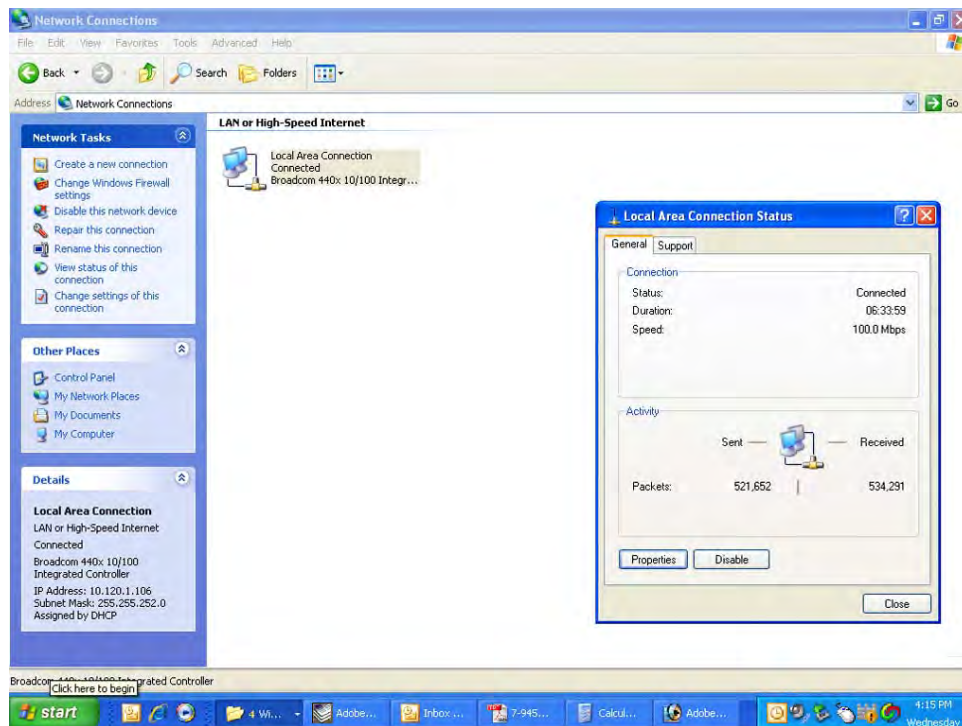


Figure B4: Select the “Properties” tab.

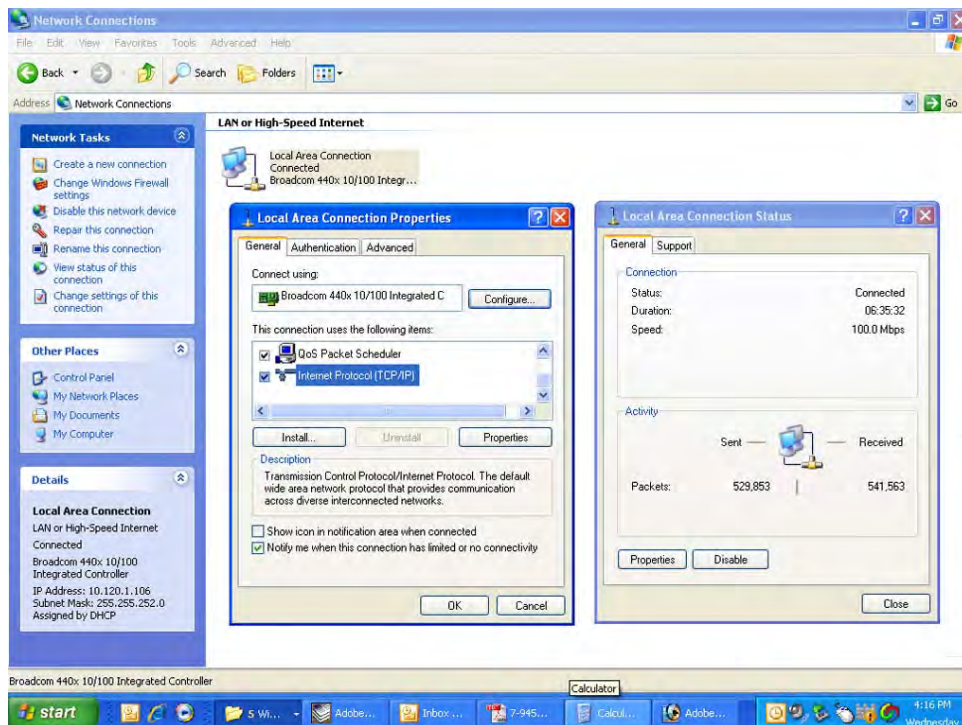


Figure B5: Make sure the “Internet Protocol (TCP/IP)” choice is highlighted. Then select “OK”.

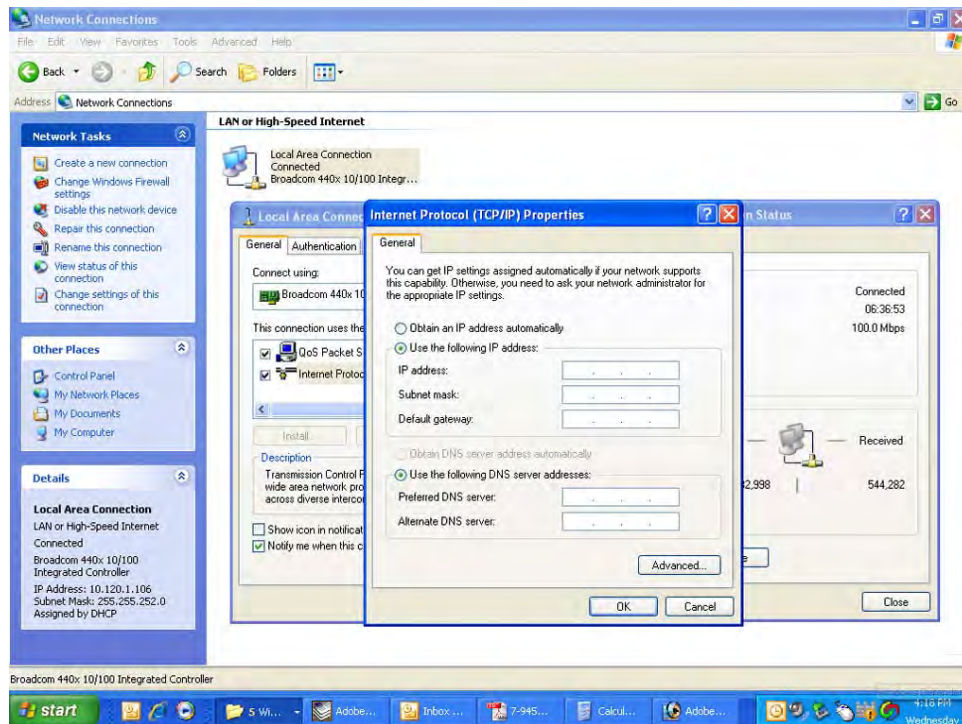


Figure B6: Select “Use the Following IP Address”.

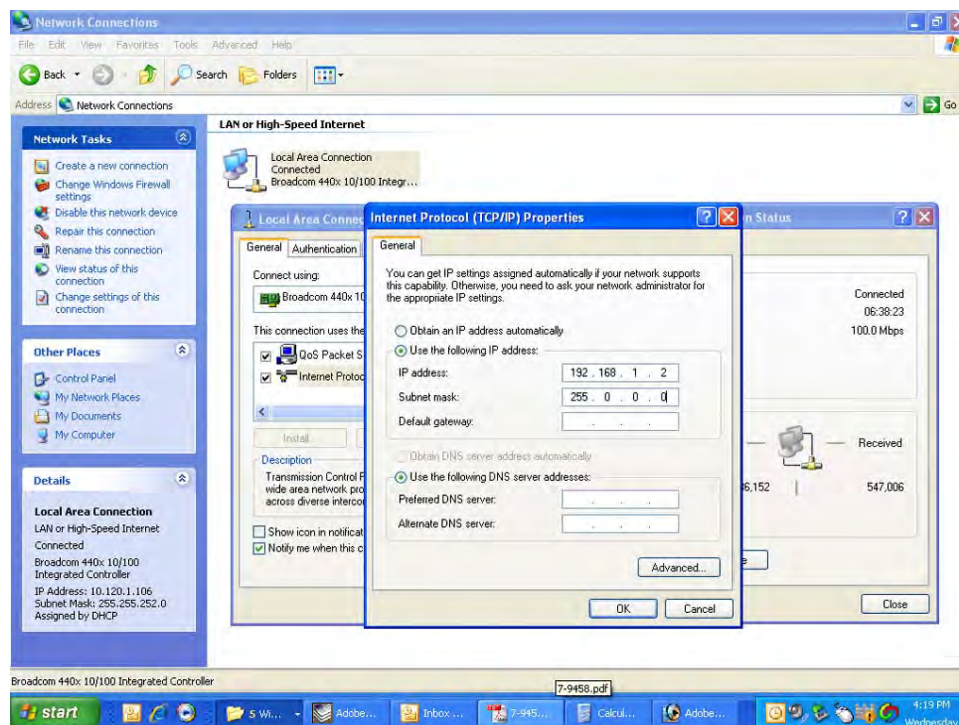


Figure B7: Enter the new IP address and Subnet mask values.

