Installation and Operation Guide
For The
Tiernan Family of
Audio Broadcast Receivers

01-0961-401
Revision A


TIERNAN
A Radyne Company

Warranty Policy

WP

Tiernan, A Radyne Company warrants that that its products will be free from defects in material and workmanship at the time of shipment and that they will conform to applicable specifications. In no event will Tiernan, A Radyne Company be liable for consequential misuse or damages.

The Tiernan product that you have purchased is warranted against any above-mentioned defects that appear within two (2) years of the shipping date.

Products subject to abuse, improper installation or application, alteration, accident, or negligence in use, storage, transportation, or handling are not covered under this warranty.

The Tiernan warranty, as stated herein, is in lieu of all other warranties, expressed, implied, or statutory.

How & Where to Ship

Packing the Unit

The original factory shipping carton and packing materials were specifically designed to protect Tiernan equipment from excessive shock and vibrations. Please use the original shipping carton and packing materials to ship your Tiernan equipment.

Shipping Addresses

For Domestic Shipments Within the United States:

Tiernan, A Radyne Company
Customer Service
7330 Trade Street
San Diego, CA 92121
RMA#

For International Shipments to the United States via Freight Forwarder:

Tiernan, A Radyne Company
c/o CJ& S Express
4901 W. Van Buren, Suite #2
Phoenix, AZ 85043 USA
Contact: Oliver Adam
Telephone: 01 country code +1.602.437.4732
Fax: 01 country code +1.602.437.4884
Email: Oliver.Adam@agsystems.com
RMA#

For International Shipments to the United States via Express Courier Service (UPS, FedEx, DHL, etc.):

Tiernan, A Radyne Company
Customer Service
7330 Trade Street
San Diego, CA 92121 USA
Telephone: 01 country code +1.858.805.7000
Fax: 01 country code +1.858.805.7007
RMA #

Shipping Procedure

All returned units will be completely evaluated, repaired, and tested for compliance to the appropriate specifications. All repaired units will be configured to the default settings.

Shipping Procedures

For All Shipments

- Before you ship your unit, record your configuration settings.
- Ship your unit in the original shipping carton and packaging or its equivalent. Do not include product accessories such as manuals, rack mount brackets, power cords, or cables.
- Write the RMA number in large, dark print on the outside of the shipping container.
- Reference the RMA number on all paperwork accompanying the unit.
- Fax a copy of the Airway Bill to Tiernan, A Radyne Company.
- Observe antistatic procedures and use antistatic bags for all circuit boards. Tiernan, A Radyne Company will provide you with antistatic bags upon request.

For International Shipments Only

- Mark the commercial invoice “Goods of US Origin - Return for Repair.”
- When declaring value of goods, use the original sale price.
- Ship the unit with freight prepaid using either:
  - Freight Forwarder, under 1990 Incoterm CPT–Carriage Paid To
  - Express Courier Service (UPS, FedEx, DHL, etc.) under 1990 Incoterm
  - DDU – Deliver Duty Unpaid

Rejection of Shipments

Tiernan, A Radyne Company does not accept responsibility for units that are improperly packaged or damaged in shipment and may reject such shipments. Tiernan, A Radyne

Company will reject shipments:

- Without an RMA number
- Shipped as Freight Collect
- If the original product identification markings or labels have been removed, defaced, or altered

Customer Service

24 Hours a Day, 7 Days a Week

We know problems don’t occur only during business hours. That’s why Tiernan, A Radyne Company provides a staff of trained Customer Service Engineers who are available 24 hours a day, 7 days a week.

During Business Hours: Our Customer Service Engineers are available to immediately answer your calls Monday through Friday, 8:00 a.m. to 5 p.m., Pacific Standard Time.

After Hour Emergencies: For after-hour emergencies, call us at 1.858.805.7000, and select option 1 on the voicemail system. Leave a message on our 24-hour paging system. A Customer Service Engineer will return your emergency call as soon as possible.

Leaving a Message

When you leave a message, please speak slowly and clearly and include the following information:

- Your name and the name of your company
- Your phone number including the area code and the country code, as appropriate
- The product name, firmware version, and serial number
- A short description of the problem

A Customer Service Engineer will return your call as soon as possible.

To Return a Unit

Contact Customer Service

Before you return a unit for repair, visit our website
www.radn.com/doc/inq-rma.html
and fill out all of the necessary information for our records.

Obtain a RMA Number

Once you have filled out the form online, you will receive your RMA number via e-mail, along with shipping instructions and a price quotation.

Expired Warranty

If the warranty on your product has expired, the Administrator will fax you a Product Repair Quote.

This quote must be approved and returned to the Customer Service Administrator, along with a valid purchase order (PO), before an RMA number can be issued.

Online Assistance

E-mail Us

To contact Customer Service via e-mail, send a message to:

customerservice@radn.com

Tiernan on the Web (http://www.radn.com)

Visit us on the World Wide Web for:

- Product and system information
- Sales information
- Investor information


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Preface

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This manual provides installation and operation information for the Tiernan, a Radyne Company family of Audio Broadcast Receivers. This is a technical document intended for use by engineers, technicians, and operators responsible for the operation and maintenance of the unit.

Conventions

Whenever the information within this manual instructs the operator to press a pushbutton switch or keypad key on the Front Panel, the pushbutton or key label will be shown enclosed in "less than" (<) and "greater than" (>) brackets. For example, the Reset Alarms Pushbutton will be shown as <RESET ALARMS>, while a command that calls for the entry of a '7' followed by 'ENTER' Key will be represented as <7,ENTER>.

Notes, Cautions, and Warnings

A note icon identifies information for the proper operation of your equipment, including helpful hints, shortcuts, or important reminders.

A caution icon indicates a hazardous situation that if not avoided, may result in minor or moderate injury. Caution may also be used to indicate other unsafe practices or risks of property damage.

A warning icon indicates a potentially hazardous situation that if not avoided, could result in death or serious injury.

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Record of Revisions

Revision	Date	Reason for Change
1.0	03-20-2006	Initial Release

Comments or Suggestions Concerning this Manual

Comments or suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Customer Service Department.

Updates to this Manual

The most up-to-date copy of this manual can be downloaded from our web site located at http://www.tiernan.com. As of the present date, Technical Manuals for Tiernan products are available in PDF format at http://www.tiernan.com/doc/techmanuals.html.

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Electric Shock Hazard

Do Not Open The Equipment!

Service Only by Tiernan, a Radyne Company.

Gefährliche Spannung!

Öffuen des Gerätes und Service nur dur Tiernan, a Radyne Company.

The unit contains no user-serviceable parts. Do not attempt to service this product yourself. Any attempt to do so will invalidate any and all warranties.


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Safety Precautions

SP

Carefully read and follow all safety, use, and operating instructions before operating the unit. Heed all warnings and cautions contained in this guide. Retain these instructions for future reference.

Follow Startup Procedure

Do not plug in the unit until you have connected the system and read the chapter on installation.

Provide a Safe Location

Place the unit in a rack or on a stable surface of sufficient size and strength, where it will not be jarred, hit, or pushed off its surface. Ensure that all cables and cords are out of the way and will not be tripped over, as this could cause personal injury or serious damage to the equipment.

Avoid Water and Moisture

If the equipment is exposed to any liquid, contact Tiernan, a Radyne Company , as serious damage could occur to the unit or its components.

Avoid Heat, Humidity, and Dust

To avoid internal damage, the unit should be placed away from all heat sources, including radiators, heater ducts, and so on, out of direct sunlight and away from high humidity, excessive dust, or mechanical vibrations that can cause damage to internal parts.

Provide Adequate Ventilation

Slots and openings on the unit are provided for ventilation that is needed to ensure reliable operation. To avoid overheating and ensure that the ventilation slots are not blocked, place the unit on a smooth, hard surface that has at least two inches of clearance around the unit and adequate air circulation. If the equipment is placed in a closed area, such as a rack, ensure that proper ventilation is provided and that the internal rack operating temperature does not exceed the maximum rated temperature at the position of the unit.

Never place the unit on a soft surface that would obstruct the required airflow into the ventilation slots.

Use Correct Power Source

For units equipped with a North American power cord, the cord has an IEC-compatible female plug on one end, and a male plug on the other end. This cord is UL and CSA approved up to 125 VAC at 10 A and is ready to use with no user wiring required.

For units equipped with an International power cord, the cord has an IEC-compatible female plug on one end, and three stripped and tinned bare wires on the other end. This cord is approved up to 250 VAC at 6 A and complies with the international color codes of green/yellow (ground), blue (neutral), and brown (line).

If these color codes do not correspond to the colored markings on the terminals in the plug, use the following standards:

- The green/yellow wire must be connected to the plug terminal marked by the letter E or by the earth symbol () or color-coded green and yellow.
- The blue wire must be connected to the plug terminal marked with the letter N or color-coded black.
- The brown wire must be connected to the plug terminal marked with the letter L or color-coded red.

An AC plug must be attached to the International power cord in accordance with government standards and codes in effect at the installation site. If an unterminated power cord is supplied with the unit, the appropriate

certified termination plug must be installed. The following is a list of the required certifying agencies for various countries.

Country	Agency	Country	Agency
Australia	SAA	Italy	IMQ
Austria	OVE	Japan	MITI
Belgium	CEBEC	Netherlands	KEMA
Canada	CSA	New Zealand	SECV, SECQ, SECWA, EANSW, ETSA, HECT, SANZ
Denmark	DEMKO	Norway	NEMKO
Finland	FEI	Rep. S. Africa	SABS
France	UTE	Spain	AEE
Germany	VDE	Sweden	SEMKO
India	ISI	Switzerland	SEV
Ireland	IIRS	United Kingdom (UK)	ASTA, BSI

Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk.

Route Power Cords Safely

Route power cords so they are not walked on or pinched. Pay particular attention to cords and connections at the plugs, receptacles (such as power strips), and the point where they exit from the unit and attach to other equipment. Do not place any items on or against power cords.

No Stacking

Do not place or stack any objects on top of the unit. Other equipment may be placed in a rack or on a shelf above or below the unit, but never stacked directly on top of it.

Protect Against Lightning and Power Surges

When the unit is installed, have the professional installer ground the system to protect against voltage surges and built-up static charges. For information on grounding standards for electrical and radio equipment, refer to the electrical code in the country of installation.

Protect the unit from lightning and power-line surges during a storm by unplugging it from the wall outlet and disconnecting the coaxial cable.

Provide Antistatic Protection

Wear a properly grounded antistatic wrist strap to prevent electrostatic damage to components when handling circuit boards or other electronic modules.

Turn the unit Off When Changing Circuit Boards

Turn the unit off before installing or removing any circuit boards from chassis slots. Possible damage may occur to modem, boards, or related equipment if power is left on during this procedure.

Lithium Battery

The lithium battery is not placed in an operator accessible area. The battery is part of an approved semiconductor package and is only replaceable by qualified service personnel.

Keep Objects Outside

Touching internal unit parts is dangerous to both you and the unit. Never put any object, including your fingers, through slots or openings, as this could result in touching dangerous voltage points, short-circuiting parts, electric shock, or fire.

There are no user-serviceable parts inside the unit. If an object falls into the equipment, unplug the unit and contact Customer Service, as serious damage could occur to the unit or its components.

Use Approved Attachments Only

Use only Tiernan, a Radyne Company-approved option cards and equipment with the unit.

Clean the Unit

Before cleaning the unit, unplug it from the wall outlet. Do not use any type of abrasive pads, scouring powders, aerosol cleaners, or solvents such as alcohol or benzene.

Use only a clean, soft cloth lightly moistened with a mild detergent solution. Wipe all equipment with a clean, soft cloth lightly moistened with water to remove the detergent solution.

Service the Unit

Do not attempt to service the unit yourself, as there are no user-serviceable parts. Opening or removing covers may expose you to dangerous voltages or other hazards as well as void your warranty. Contact Customer Service to obtain qualified service personnel.

The following conditions indicate that the equipment needs servicing:

- The power cord or plug has been damaged.
- An object has fallen into the unit.
- Liquid has been spilled into the unit, or it has been exposed to rain or water.
- The unit has been dropped or the cover has been damaged.
- The unit does not operate normally, or it shows a marked change in performance.

Perform Safety Checks

Upon completion of any service or repairs to the unit, ask the service technician to perform safety checks to verify that the system is in safe operating condition.


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Table of Contents

ToC

List of Figures

List of Tables

Chapter 1 Product Overview

1

1.1 Introduction

Satellites have proven to be a reliable method of communication for distribution of CD-quality digital audio. The Integrated Digital Audio Distribution Network, of which the ABR is a key component, is a recognized worldwide standard for digital audio distribution.

The ABR202A is the next generation receiver product, featuring functional backward compatibility to the ABR200 and ABR202.

The unique capabilities of the Tiernan digital audio system allow a network to start out small (offering a single monaural or stereo channel) and grow to a larger multichannel system without replacement of receiver hardware. Fast, easy selection of audio channels can be made either at the receiver or at the studio uplink.

The combination of Tiernan and Radyne transmission technology and the professional standard digital audio compression technology (ISO/MPEG Layer II/IIA) achieves reliable and efficient digital audio distribution. The Tiernan digital audio distribution system also provides asynchronous data distribution and relay contact closures for control of external station equipment.

This chapter provides an overview of a typical satellite digital audio distribution network, as well as an overview of the ABR202A audio broadcast receiver.

1.2 Satellite Digital Audio Distribution Network Overview

A satellite broadcast network consists of three major subsystems, as shown in Figure 1-1:

- A satellite transmission uplink station
- The satellite link
- One or more remote satellite receivers

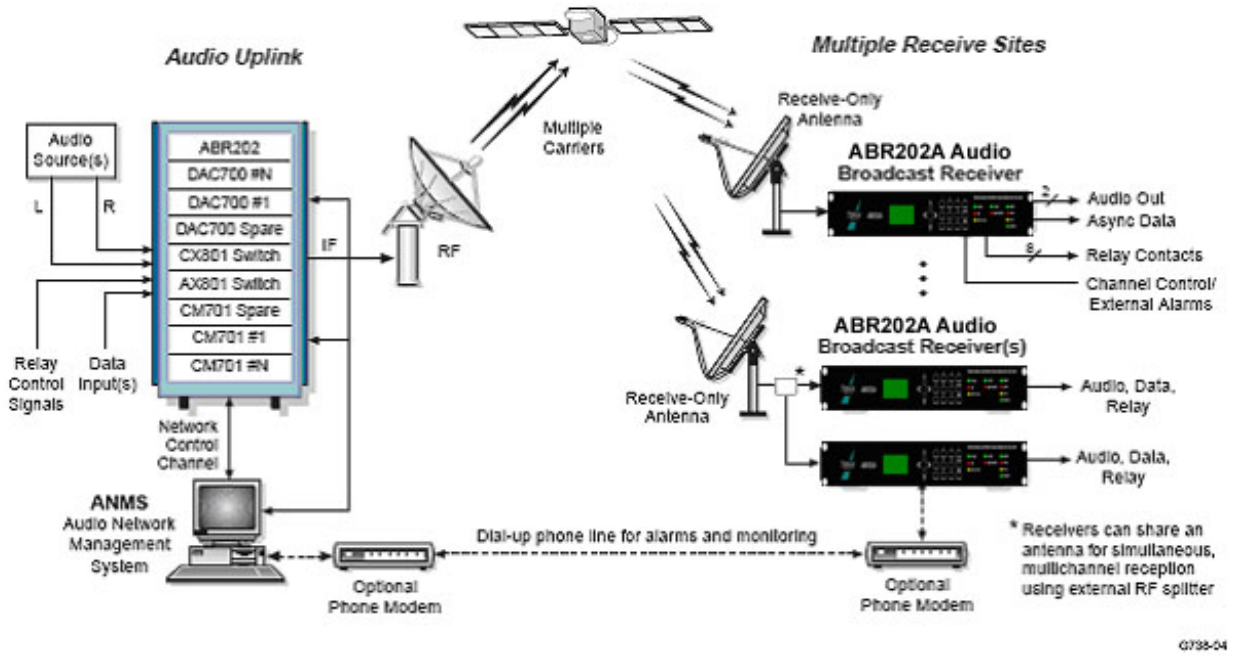

Figure 1.1 Satellite Digital Audio Distribution Network

The hub or satellite transmission uplink station is the facility where the audio to be transmitted is collected and uplinked to the satellite. This facility consists of an audio encoder/multiplexer, a digital modem, an earth station, an antenna, and a network control computer. As an option, a terrestrial link can provide dial-up diagnostics and performance monitoring of receiver sites. Alternately, a new feature available on the ABR202A allows monitor and control functionality through Telnet via a built-in Ethernet port.

- The satellite link consists of a commercial telecommunications satellite in geosynchronous orbit above the earth. Two radio frequency bands that are primarily used are C-band and Ku-band.
- The third major subsystem, the remote satellite receiver, includes three major components:
- A satellite antenna subsystem
- An interfacility link cable
- A satellite audio receiver such as the ABR

The satellite antenna and its associated Low Noise Block (LNB) downconverter collect and convert the signal from the satellite's native C- or Ku-band signal to L-band.

A phase lock loop (PLL) type LNB must be used for all satellite links using the QPSK modulation. Satellite links using BPSK modulation may use the lower cost dielectric resonance oscillator (DRO) type LNB.

The L-Band signal is then sent through the interfacility link (IFL) cable to the satellite receiver. The ABR audio receiver processes this signal and outputs the audio, data, and control to the user-supplied station equipment for distribution.

1.3 ABR Overview

The ABR is a multiple transmission rate digital audio receiver. Figure 1-2 details an ABR installed in a typical application, such as a radio station environment.

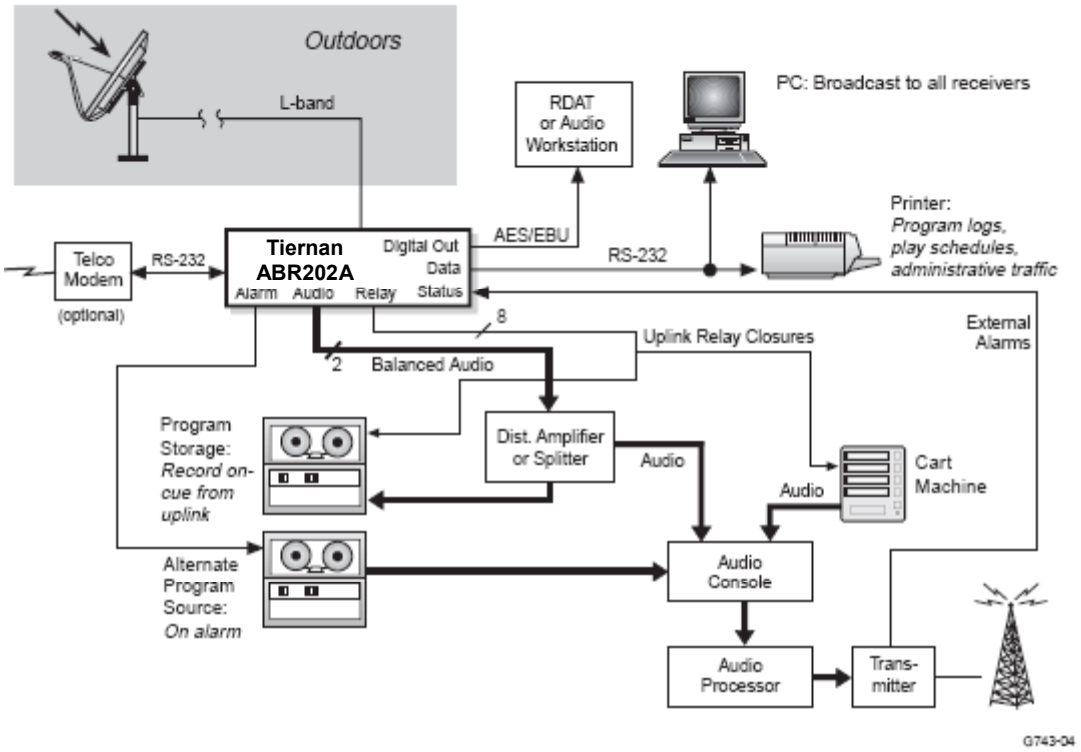

Figure 1.2 Typical ABR Installation

The analog output audio from the ABR is used to feed both the on-air studio console as well as taping equipment for off-hours distribution of programmed material. The relay contact closures are used to control station equipment such as cart machines and tape recorders. The data port can be connected to a low speed dot matrix printer or a personal computer for station traffic, air logs, etc. The alarm relay closure is used to activate an alternate program source should the satellite channel become inoperative. The Ethernet port is used for monitor and control in conjunction with a Telnet application.

1.4 ABR Features

The ABR:

- Provides full 20 kHz, CD-quality audio at 128, 192, 256, or 384 kbps
- Accommodates both Ku- or C-band in BPSK or QPSK mode
- Uses ISO/MPEG Layer II/IIA audio compression, which is the most tested and documented audio compression algorithm in the world
- Uses Quick Channel Access, which provides fast, nearly transparent, audio channel changes for receiving multiple channels
- Provides a relay (cue) control port with eight contact closures, each independently controllable from the uplink facility
- Provides seven transistor transistor logic (TTL) inputs for local channel changes and auxiliary equipment monitoring
- Is addressable to provide complete control of receiver configuration and operation from the uplink facility
- Allows audio channel changes either locally or from the uplink facility

- Is equipped with a low speed (300 to 9600 baud), asynchronous data port
- Provides remote control capability with access via an external wireline modem (optional equipment)
- Provides built-in audio, relay control, and data port diagnostics
- Has a built-in performance monitoring capability that measures the lowest received Eb/No and counts RF and audio sync losses
- Is equipped with software that can be upgraded over the satellite link via down-line loading
- Has a battery-backed SRAM memory and real-time clock (RTC) so that configuration and operating parameters are not lost in the event of a power outage and event logs specify time
- Provides a 10/100BASE-T Fast Ethernet port running a Telnet server for monitor and control from any computer or other device containing an Ethernet port and Telnet client software
- Provides a smart front panel interface that allows for quick monitor and control

The remaining portion of this manual describes in detail the steps necessary to install, configure, and operate the ABR digital audio receiver within a network environment.

Chapter 2 Functional Description and Theory of Operation

2

This chapter provides functional descriptions and operational theory for the basic components of the ABR receiver system. The ABR system consists of the following:

- An outdoor receive-only antenna and feed-optional antenna sizes range from .75 to 2.4 meters
- A low noise block (LNB) downconverter assembly that performs the initial signal downconversion (optional frequencies)
- A user-supplied interfacility link (IFL) cable connecting the LNB downconverter on the antenna to the ABR
- An ABR receiver providing an L-band demodulator

2.1 Functional Description

2.1.1 Outdoor Components

The outdoor components consist of an antenna assembly, a feed assembly, and an LNB downconverter.

2.1.1.1 Antenna Assembly

The antenna assembly consists of the satellite reflector, mast, feed horn, and LNB downconverter. The antenna assembly collects and concentrates RF transmissions that are produced by a communication satellite and converts them to an electronic signal. A typical antenna assembly is shown in Figure 2-1.

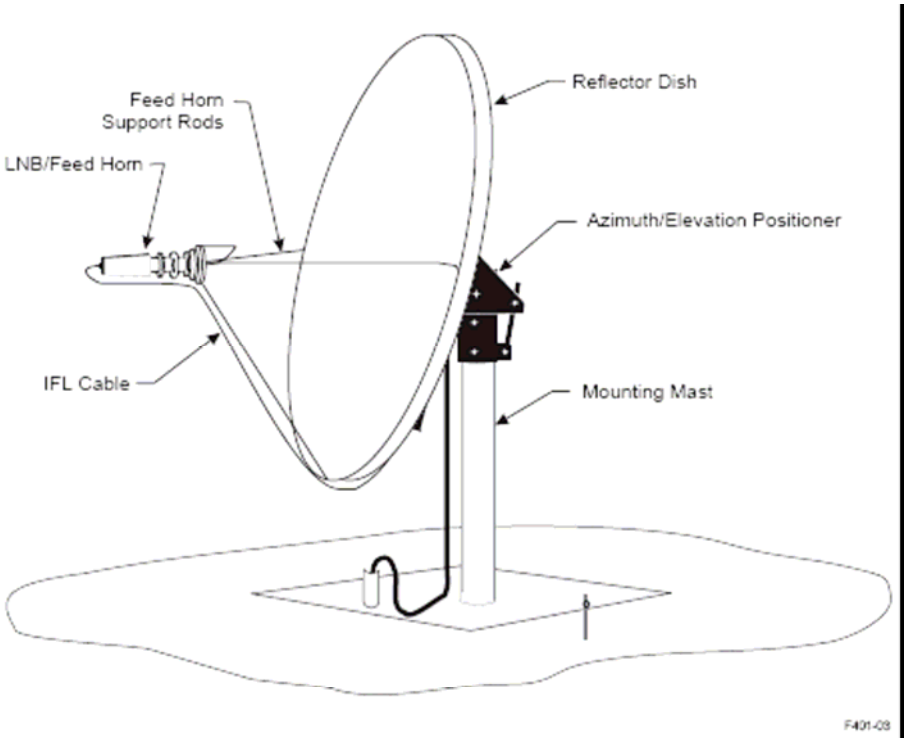

Figure 2.1 Receive-Only Antenna Assembly

The optional antenna supplied with the ABR system is an elliptical offset feed-type suited for receive-only applications. The appropriate antenna size is determined by the location and transmitted satellite power (EIRP) for each installation. Available antenna sizes are shown in Table 2-1.

Table 2.1 Available Prodelin Antenna Sizes

C-Band	Ku-Band
1.2 m linear or cicular	.60 m AZ/EL mount .60 m wall mount
1.8 m linear or cicular	• .76 m AZ/EL mount • .76 m wall mount
2.4 m linear or cicular	.90 m AZ/EL mount
3.0 m linear or cicular	1.0 m AZ/EL mount
3.4 m linear or cicular	1.2 m AZ/EL mount
3.7 m linear or cicular (also polar mount)	• 1.8 m AZ/EL mount[1] • 2.4 m AZ/EL mount[1] • 3.0 m AZ/EL mount[1] • 3.4 m AZ/EL mount[1] • 3.7 m AZ/EL mount[1]
[1] Available in both single and dual feed	

The antenna subsystem receives DC power from the ABR receiver via the IFL cable, so an additional power source is not required at the antenna site.

The reflector is mounted on a continuously adjustable azimuth/elevation positioner that supports precision aiming to the satellite of choice. For proper signal reception, the antenna must have an unobstructed view of the satellite

location in the sky. Prior to operation, the antenna must be aligned to maximize the receive signal reception from the satellite used.

2.1.2 Feed Assembly and LNB Downconverter

The radio frequency signals gathered by the satellite antenna are focused on the feed horn, which collects the signal. The output of the feed horn is then directed to the LNB downconverter, which provides the initial amplification of the Ku or C-Band downlink signal and converts the Ku or C-band signals to L-band. The output of the LNB downconverter is routed to the IFL cable through an F connector.

2.1.3 Interfacility Link (IFL) Cable

The IFL cable connects the antenna assembly to the ABR receiver. This cable carries L-band signals to the ABR and supplies DC power to the LNB downconverter.

The outdoor end of the cable is attached to the LNB downconverter mounted on the antenna. The indoor end connects to the ABR RF Input connector. The IFL cable uses F connectors on both ends.

The IFL cable is an important component of the receiver system. Proper cable selection and installation is imperative to obtain optimal system performance. Appendix C: IFL Cable Characteristics provides detailed information on the IFL cable, vendor sources, and connector installation.

2.1.4 ABR Satellite Receiver

The ABR is a multiple transmission rate digital audio receiver. Analog audio, data, and control commands are output from the ABR. The receiver feeds the audio, data, and commands to the on-air studio console, as well as the taping equipment for off-hours distribution of programmed material.

The ABR receiver chassis, shown in Figure 2-2, is a standard 19” rack-mount design with built-in handles. The ABR chassis is designed to meet worldwide electromagnetic compatibility (EMC), safety, and power requirements. Its lightweight aluminum construction is optimized to provide strength and EMC. The ABR contains a universal autosensing power supply, allowing the unit to accommodate virtually any standard AC power source.

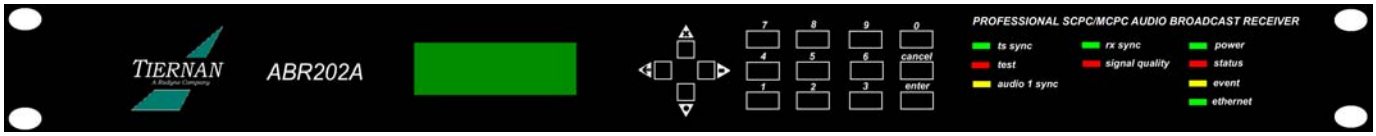

Figure 2.2 ABR Unit

2.1.5 Using the Front Panel

The front panel of the ABR, shown in Figure 2-3, displays the following:

- LED indicators
- Message display
- Directional arrows to scroll through a display
- Numeric keypad for data entry
- CLR (Clear) button
- ENT (Enter) button

2.1.5.1 Front Panel Commands

Some commands can be entered from the front panel. See the "Remote Monitor and Control Operation," Command Description sections, for specific commands available from the ABR front panel. Each front panel command is listed within the alphabetical command listing of remote commands. There is also a menu tree table describing front panel commands.

2.1.5.2 Front Panel Indicators

Table 2.2 Front Panel Indicators

Indicator	Color	Description
Power	Green	Indicates the unit is powered on and changes color based on the presence of any operating fault. • If the Power LED is green, the unit is powered on. • If the Power LED is off, then the power supply is not functioning properly. Refer to the Troubleshooting section to determine whether the AC power source or the internal power supply is faulty.
Status	Red	Indicates the state of the status relay. By default, all faults trigger the status relay. • If the Status LED is Red, the status relay is active • If the Status LED is off, then the status relay is inactive.
Event	Amber	Indicates the state of the event log. • If the Event LED is Amber, one or more events have occurred since the last acknowledgement. • If the Event LED is off, no events have occurred since the last acknowledgement.
Ethernet	Green	Indicates the state of the Ethernet port. • If the Ethernet LED is green, the Ethernet port is connected to another active Ethernet device. • If the Ethernet LED is off, then the Ethernet port is not connected to another active Ethernet device or the port has been shut down.
Rx Sync	Green	Indicates whether the demodulator has synchronized (or "locked") to the modulator's RF signal. • If the Rx Sync LED is green, the demodulator has "locked". • If the Rx Sync LED is off, then the demodulator is not "locked".
Signal Quality	Red	Indicates the current received RF signal to noise ratio (defined as Eb/No) relative to user-specified criteria. Refer to Table 2.3 for default values. • If the Signal Quality LED is solid Red, the Eb/No has dropped below the value set by <Q0>. • If the Signal Quality LED is blinking Red, the Eb/No has dropped below the value set by <Q1>, but is above the value set by <Q0>. • If the Signal Quality LED is off, the Eb/No is above below the value set by <Q1>.
TS Sync	Green	Indicates the state of the audio decoder. • If the TS Sync LED is green, the audio decoder has synchronized to an incoming audio transport stream. • If the TS Sync LED is off, the audio decoder has not synchronized to an incoming audio transport stream.

Indicator	Color	Description
Test	Red	Indicates the state of test tone output. • If the Test LED is Red, the audio decoder is outputting a test tone. • If the Test LED is off, the audio decoder is not outputting a test tone.
Audio 1 Sync	Amber	Indicates the state of the audio decoder. • If the Audio 1 Sync LED is amber, the audio decoder has synchronized to an incoming audio transport stream. • If the Audio 1 Sync LED is off, the audio decoder has not synchronized to an incoming audio transport stream.

Table 2.3 Signal Quality Defaults

Q0 = 4.0 dB; Q1 = 7.0 dB

Signal Level (Eb/No)	Indicator
>7.0 dB	Off
>4.0 dB, <7.0 dB	Blinking Red
<4.0 dB or no RF Sync	Red

2.1.5.3 Front Panel Navigation Buttons

The following front panel buttons are used to move through menus and view status and fault information.

ENT Use the Enter button to save the parameter or other information currently entered in the LCD.

CLR Use the Clear button to clear the display of any non-saved data.

→ Press the button beside the Right Arrow key to scroll forward through a menu.

← Press the button beside the Left Arrow key to scroll back through a menu.

↑ Press the button beside the Up Arrow key to display additional information or parameters for the current command.

↓ Press the button beside the Down Arrow key to display additional information or parameters for the current command.

2.1.5.4 Front Panel Audible Key Press Indicator

The front panel provides and audible indication of a key press. The indicator can be disabled or enabled through the front panel by navigating to ***Management > Front Panel > Buzzer.***

2.1.5.5 Front Panel Screen Saver

A screensaver will appear on the front panel after five minutes have transpired. The screensaver displays the current time, the Eb/No and the current format selected. The screensaver can be manually entered by pressing the up-arrow key until the front panel navigates to the screensaver above the top-level menu items.

2.1.5.6 Front Panel Modes

The front panel can be set to two modes of operation: Basic Mode and Advanced Mode. The front panel is set to Advanced Mode by default. Advanced Mode offers complete monitor and control capabilities of all available front panel options. Basic Mode lets users access status information and change formats, however, the in Basic Mode, users cannot configure any parameters. The default password is `7384`.

To change modes, navigate to ***Management > Front Panel > Mode***, if the front panel is in Advanced Mode. Otherwise, navigate to ***Management > Front Panel > Enter Password***, if the front panel is in Basic Mode. Once the correct password has been entered, the front panel will switch to Advanced Mode.

2.2 Theory of Operation

The ABR is a multiple transmission rate, QPSK/BPSK, digital audio receiver. The ABR site setup is comprised of two elements, an outdoor unit and an indoor unit. The outdoor unit consists of an LNB downconverter that is mounted directly onto the antenna. The L-band output signal is transmitted via coax cable to the indoor electronics. Up to 400 feet of separation is possible before line amplifiers or switching to RG-35 cable is required. Standardizing on an LNB configuration permits both Ku- and C-band satellite operation with a single indoor receiver by selecting the appropriate LNB downconverter frequency range. The LNB downconverter can receive DC power from the receiver via the single coax cable. Should the coax connection become interrupted for any reason, an ODU alarm condition occurs.

The indoor unit consists of a compact, fully integrated, digital receiver. Internally the unit is composed of four circuit cards:

- An L-band demodulator card including:
    - An F-type L-band input connector
    - A DC power control circuit to provide a selectable DC voltage
- An audio decoder card including:
    - A single DSP-based audio decoder providing two audio outputs, analog and AES/EBU
    - A 8-relay control port
    - An RS-232 serial user data output port
- A central processing card including:
    - A powerful embedded Linux network processor for control of the entire unit
    - A 10/100BASE-T Fast Ethernet port
    - An RS-232/RS-485 serial monitor and control port
    - An RS-422 baseband I/O port
    - A serial printer and data output port
- Front panel interface card including:
    - A 16x2 backlit character display
    - A rubber entry keypad
    - 9 status LED indicators
    - An audible key press indicator

With the built-in rack mount ears, the receiver requires only one rack unit (1.75 inches) of vertical space.

All input and output connections are made on the rear panel.

2.3 Transmission Channel Signal Format

The Tiernan digital audio satellite broadcast system uses a single RF carrier to distribute audio, data, and control information from the uplink to all downlinks. This multiservice data stream uses time division multiplexing (TDM) to transport the following information:

- CD-quality digital audio (mono, dual-mono, or joint stereo pair)
- User data
- Relay contact closure messages and receiver commands
- Network management commands

The TDM frame structure is provided by the ISO/MPEG Layer II/IIA audio standard, as shown in Figure 2-4. This transport stream is commonly referred to as an MPEG elementary stream.

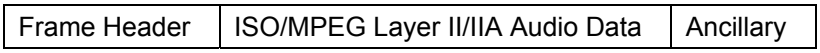

Figure 2.3 ABR Channel Format

The frame header provides all information regarding the audio rate, compression mode (mono, dual-mono, joint stereo), sampling rate (48 kHz), ancillary data size, and checksum. The audio data is the processed data generated by the ISO/MPEG Layer II/IIA encoder. The ancillary data stream is used to transport the following information: network control, user data, and relay (equipment) control messages. This data is stripped out by the ISO/MPEG Layer II/IIA decoder within the receiver and sent to the main control microprocessor for additional processing and checksum. The checksum provides error detection of key audio data-related parameters.

Multiple (stereo) audio channels can be transmitted by uplinking an RF carrier for each stereo, dual-mono, or mono channel service. This is known as frequency division multiplexing (FDM). The ABR is designed for multicarrier FDM operation. By using digitally programmed local oscillators and optimized acquisition routines, changes from one RF carrier to another occur in less than 600 msec and the signal parameters between the two carriers can be different.

One carrier may be operating monaural audio at 64 kbps using QPSK modulation, while a second dual mono at 256 kbps using BPSK modulation. The RF frequencies may be a full 750 MHz apart. The key parameters for each RF carrier are programmed into the ABR unit in one of five ways:

- Locally via a computer terminal
- Locally via a front panel keypad
- Locally or remotely via Telnet through the Fast Ethernet port
- Remotely via a telephone modem
- Over the satellite link using the Audio Network Management System (ANMS), which is located at the uplink facility

Figure 2-5 provides an illustration of various digital audio carriers on a single transponder

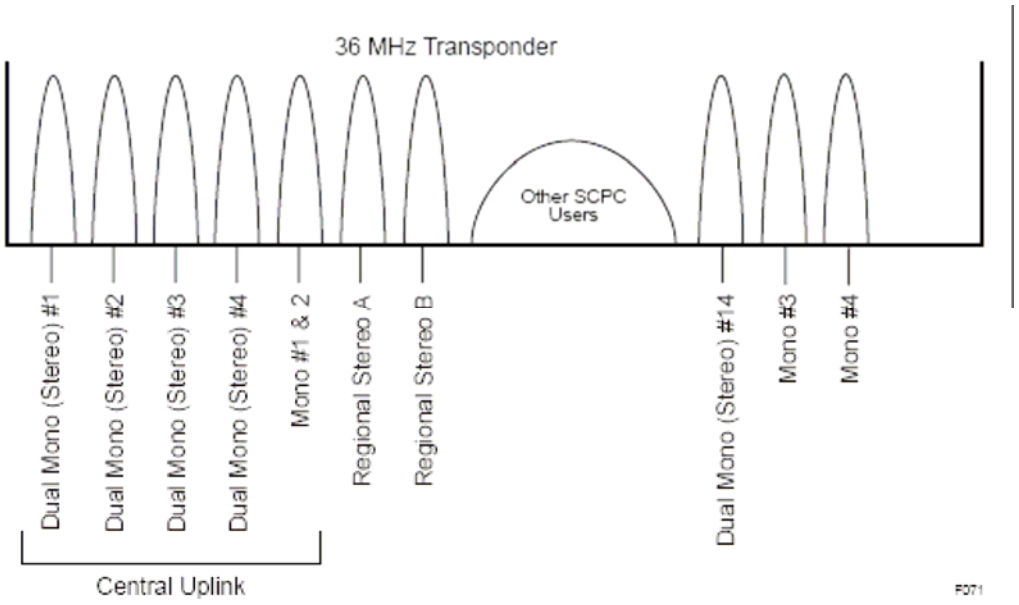

Figure 2.4 Multichannel Single Transponder System

RF channel changes can be initiated from several sources:

- Over the satellite control channel from the uplink
- Via the monitor and control port
- Via the Ethernet port
- Via the front panel
- Locally (if permitted) via three TTL control inputs

The output audio is muted just prior to initiating a channel change to prevent audio blasting. If the new RF carrier cannot be acquired within one bin-time, a channel change fault <FL 29> is declared and the original channel is reacquired. For information on channel acquisition and bin-time, refer to the "Installation Mode Acquisition" section of this chapter.

2.3.1 Proper Signal Discrimination of Narrow Band RF Signals

A single satellite transponder can provide access to hundreds of individual RF carriers because of their very wide bandwidths, typically 36, 54, or 72 MHz. The Tiernan Single Channel Per Carrier (SCPC) digital audio system uses very narrow bandwidth RF carriers where the bandwidth can range from 64 kHz (64 kbps, QPSK) to 512 kHz (256 kbps, BPSK). The ABR receiver has the capability to acquire RF signals over the full satellite frequency range of 500 MHz or 750 MHz.

Because local oscillators are used in translating the signal to various radio frequencies throughout the transport cycle (uplink, satellite, and downlink), frequency uncertainties may become significant in comparison to the bandwidth of the signal itself. This uncertainty can be as much as 2 MHz when operating with a DRO-type LNB downconverter or as little as +15 kHz with a PLL-type LNB. To ensure that only the RF carrier of interest is detected and processed, a further means of signal discrimination is required.

Additional discrimination is provided by embedding a unique identifier into the composite data stream of each carrier. This unique identifier is comprised of two components: a network identification (ID) number, and a channel ID number. The network and channel IDs are generated at the uplink by the codec/mux at regular intervals (typically every 100 msec). For a given uplink, each codec/mux is programmed with a unique channel number, with each carrier typically having the same network ID.

During the receiver signal acquisition process, the proper RF signal is acquired and then the channel and network identifiers are matched against the user's predetermined configuration within the receiver. When these match, the Sync and Enable indicators are illuminated. However, if either of the IDs do not match, an acquisition network ID fault <FL 31> is declared and the acquisition process continues until the correct signal is received.

If the network and channel ID information stops for a period of thirty seconds, a network ID timeout fault <FL 30> is generated.

It is important that the channel and network ID numbers generated at the codec/mux match the receiver configuration. For example, if a channel ID of 16 is used at the uplink, then all downlink ABR receivers must have channel configuration #16 defined for the proper RF receiver frequency, symbol rate, and demodulation type i.e., <CC 16,11700000,128000,1>.

If another channel configuration number is used, say “CC 1”, in any receiver, those receivers configured with “CC 1” instead of “CC 16” will not acquire the signal properly and will not operate. For multiple carriers from a single uplink the network ID should be the same for all codec/muxes, but the channel IDs must be unique (i.e., 1, 2, 3, etc.).

An example of several different possible combinations of channel identifiers and frequency allocations are provided in Table 2-3 (assuming QPSK operation and 128 kbps transmission rate)

Table 2.4 Channel Identifier & Frequency Allocation Combinations

Carrier No.	Uplink Site	RF Freq MHz	NI	CI	CC/FD Format (at ABRs)	
A	X	11,700.0	2	1	CC 1,...	FD 1,2,1,7
B	Y	11,700.2	1	1	CC 1,...	FC1,1,1,7
C	Z	11,701.0	1	2	CC 2,...	FC 2,1,2,7 FC 3,1,2,5
D	Z	11,701.2	1	3	CC 3,...	FD 4,1,3,7

If you add a fifth carrier, Carrier E (shown in Table 2-4), to the configuration of carrier frequencies and ID numbers in Table 2-3, it is possible that carriers B and E would be incorrectly received, since they are within 600 kHz of each other and do not have unique ID numbers. All other carriers would operate properly

Table 2.5 Carrier B and E Channel Identifier and Frequency Allocation

Carrier No.	Uplink Site	RF Freq MHz	NI	CI	CC/FD Format (at ABRs)	
B	Y	11,700.2	1	1	CC 1,...	FD 1,1,1,7
E	Z	11,700.8	1	1	CC 1,...	FC1,1,1,7

2.3.2 Low Noise Block (LNB) Downconverter

The LNB downconverter takes the satellite signals at C- or Ku-band and block downconverts them to L-band for processing by the satellite receiver. The performance of the LNB downconverter is critical, as it establishes the noise figure for the entire receiver system. A block diagram of the LNB subsystem is shown in Figure 2-6

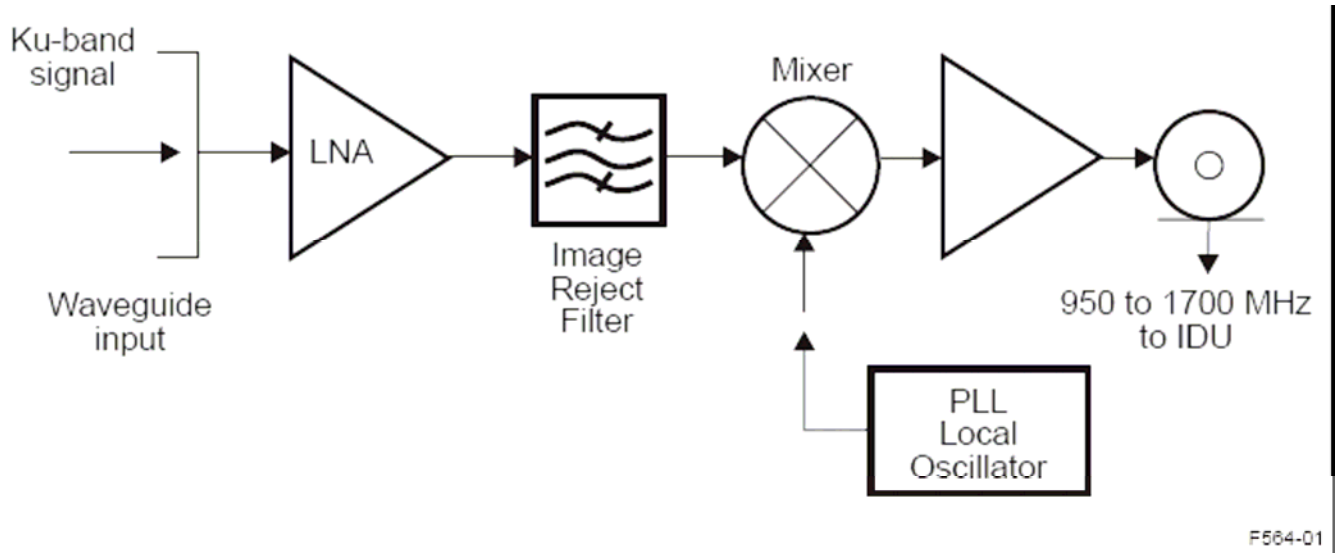

Figure 2.5 LNB Downconverter PLL Block Diagram

The LNB downconverter is installed at the focus of the parabolic antenna dish. The LNB downconverter consists of:

- A low noise amplifier (LNA)
- A dielectric resonance oscillator (DRO) or phase lock loop (PLL) oscillator
- A mixer
- An image reject filter
- An IF amplifier

The input of the LNB downconverter receives signals collected by the antenna and routes them to the LNA. The LNA sets the LNB downconverter noise figure and provides the first stage of amplification. The amplified signal is mixed with the local oscillator for downconversion to L-band frequencies and then passed through the image reject filter. The IF amplifier boosts the signal to provide dynamic range, allowing for substantial cable loss. DRO technology provides good stability and phase-noise performance and is acceptable for BPSK operation above 112 ksps. A PLL-based LNB downconverter is required for QPSK operation.

2.3.3 Receiver

The ABR broadcast receiver block diagram is shown in Figure 2-7. The major functional blocks consist of:

- An L-band digital demodulator
- The ISO/MPEG Layer II/IIA audio decoder DSP processor
- The receiver control processor

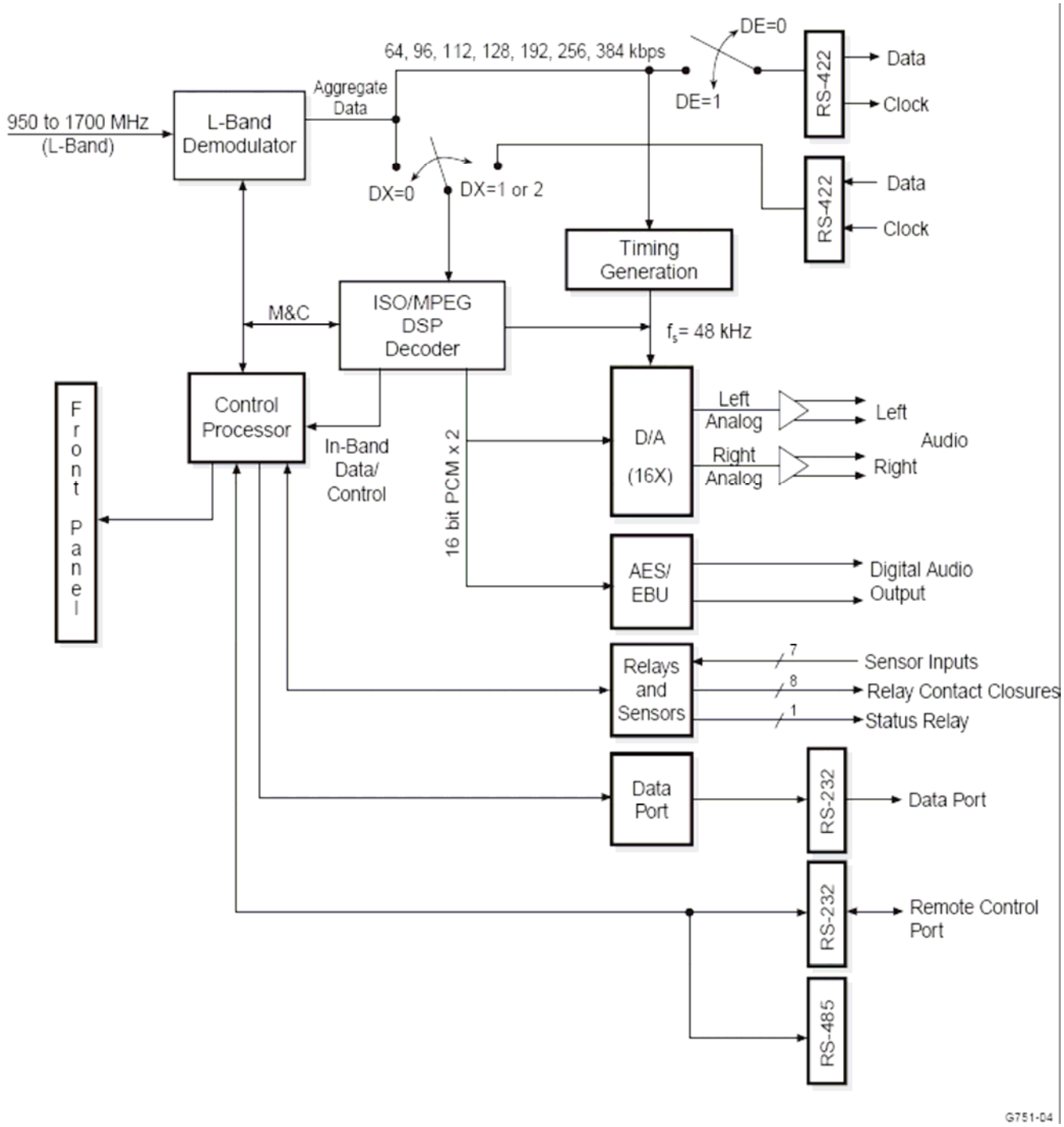

Figure 2.6 ABR Functional Block Diagram

The L-band demodulator receives the signal from the LNB downconverter. The signal is downconverted by a digitally controlled tuner IC. The signal is then sampled, and input to the demodulator IC. In the demodulator IC, soft decisions are made on the digitally compressed audio stream and it creates error signals for the carrier tracking, bit timing, and AGC loops. The soft-decision bits are directed to the Sequential decoder block, which supports differential decoding, V.35 descrambling, and sequential decoding.

The Digital Signal Processor (DSP) synchronizes to the digitally compressed audio stream and performs audio decoding and audio/control demultiplexing. Next, the compressed digital audio is converted back into left and right

channel 16-bit linear PCM audio. A dual channel 16-times-oversampled digital-to-analog (D/A) converter, operating at a 48 kHz sampling rate, is used to produce the final CD-quality analog audio signal. The CD-quality analog audio is available on a male, 9-pin DB connector. The outputs are direct coupled and actively balanced, with the capability to drive a 600 ohm impedance load. When operating in the mono mode, there are several options for the output audio signal mapping. For information about signal mapping, refer to the left and right toggle (L/R) and mute (MU) commands in the chapter on Remote Monitor and Control Operation.

During any type of signal or processing failure, the output audio is immediately muted to prevent audio blasting. Also, to provide blast-free audio channel changes, the audio is always muted prior to changing RF channels during audio channel changes. It is then unmuted once audio decoder sync is achieved.

An AES/EBU digital output interface is also available. This interface permits direct output of the 16-bit PCM samples. The interface operates using a 48 kHz sampling rate only. Newer studio equipment using the AES/EBU interface will provide a direct digital interface from the ABR for maximum performance.

For diagnostic testing and installation, a test tone at approximately 1 kHz can be generated within the receiver for output to both analog audio channels. This is accomplished through the audio test (AT) command, as described in the chapter on Remote Monitor and Control Operation. Audio tone generation permits verification of external equipment connection, proper channel phasing, level settings, distortion measurements, and the like.

2.3.3.1 Cue Signaling

Up to 16 cue control lines can be input into the DAC multiplexer unit located at the uplink. These 16 cue lines independently control eight relay closures located at the ABR receiver. The cue inputs are typically connected to studio control consoles or event sequencers.

Since only eight contact closures are available at the receiver, a mapping must be made as to which eight of the 16 possible control inputs activate the closures. This mapping is performed at the ABR receiver using the contact mapping (CM) command or at the uplink via the ANMS control computer. The receiver defaults to have the first eight inputs at the DAC mux control the eight closures at the ABR.

Any change in the state of an input line is sensed, and within two sample periods this change is muxed into the continuous transmission of the control channel. The input levels are continuously transmitted over the control channel at a rate specified by the DAC RM command every 100 msec (default setting). The relay contact closures at the ABR receiver directly track the logic levels (active, nonactive) at the uplink mux. Given the two default sampling rates, pulsed signals are reproduced within an accuracy of less than or equal to 50 msec.

Figure 2-8 provides a pictorial representation of the 16-to-8 mapping function that occurs for the cue signals within the ABR receiver.

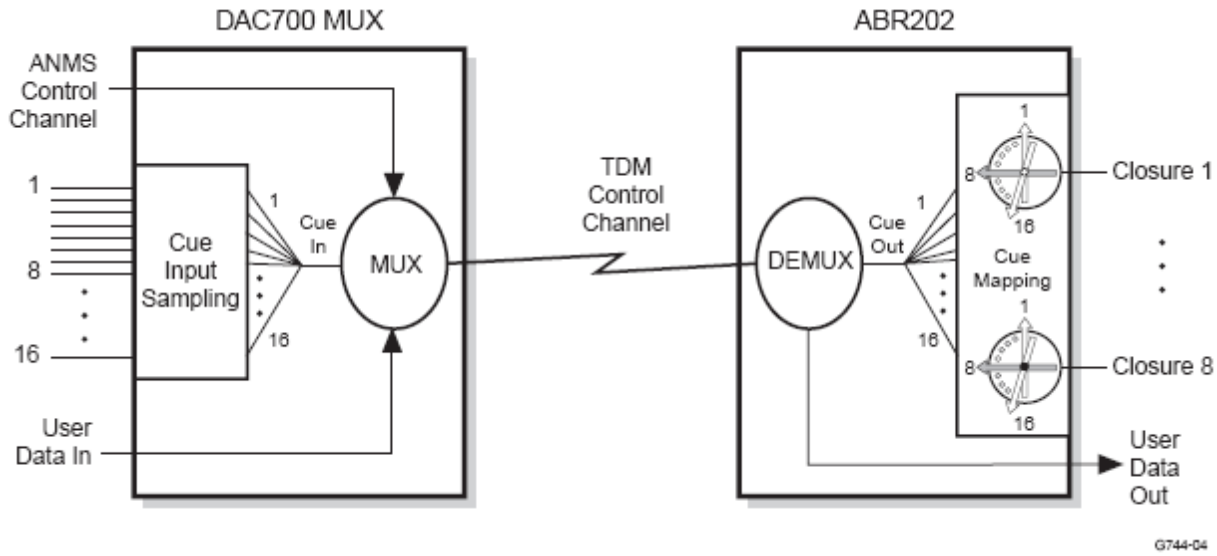

Figure 2.7 Cue Signaling System Diagram

Seven TTL sensor inputs are provided for external control of channel selection or for ancillary equipment monitoring. The first three inputs permit selection of up to eight different RF audio channels by connecting a rotary (or similar) switch to the inputs. Only a simple contact closure is required to perform audio channel changes. The actual RF channel frequencies and related operating parameters are programmed either locally or from the uplink and are stored in eight presets. For more information about the presets, refer to the preset definition (PD) command in the chapter on Remote Monitor and Control Operation.

The switch unit (TPN 03-0507-001), shown in Figure 2-9, allows the user to externally select one of eight preset channel configurations with a BCD complementary rotary switch. This unit is mounted into a one unit high chassis and has a front polycarb to allow the user to mark their presets. The unit attaches through a cable (TPN 05-0506-001) to the receiving ABR.

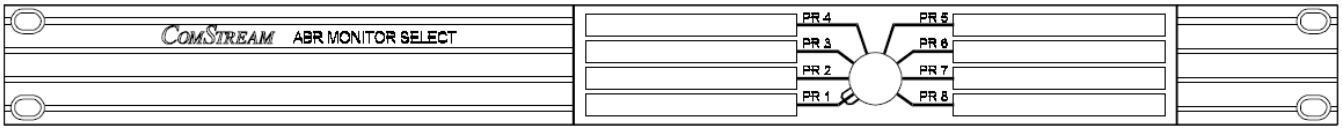

Figure 2.8 Switch Panel

The second group of three inputs can be used to trigger a fault condition within the receiver. These fault conditions are monitored and can be used to activate the status alarm relay. A brief summary of the possible trigger events are: low signal strength, loss of sync (audio or carrier), IDU and ODU Faults, and external inputs.

The seventh input is reserved for future use.

2.4 ABR Carrier Acquisition

Acquisition is the process the receiver uses to adjust its frequency, phase, gain, and synchronization to match the incoming carrier. Acquisition of the carrier signal for the ABR is a sophisticated process. Frequency errors arising from temperature changes in the outdoor environment and the aging of components over time can make signal acquisition difficult. The ABR has been designed to overcome these errors by the use of internal synthesizers that correct for nearly all components of error, without operator intervention.

- The automatic acquisition feature of the ABR operates in two distinct modes, installation and fade:
- Installation mode acquisition is performed when the system is locking onto a new carrier.

- Fade acquisition is performed when the receiver loses the carrier to which it was previously locked.

Added to this process is the identification of the correct carrier via unique channel identifiers transmitted within the control portion of the received audio stream. Each RF carrier is identified in two ways, a network identification (ID) number and a channel ID number. These ID numbers originate within the digital audio codec at the transmitter (uplink) site. All carriers on a single network are typically configured with the same network ID number. However, each RF channel is given a unique channel ID number. If the receiver tries to lock to an RF carrier with the incorrect network or channel identifier, the RF synchronization process is aborted and acquisition continues until the carrier with the proper network and channel number is acquired. This ensures that receivers are locked to their preassigned, authorized channel.

2.4.1 Installation Mode Acquisition

During installation, acquisition begins at the nominal carrier center frequency, which is user-defined by the channel configuration (CC) command and the acquisition offset (AO) command. An attempt to acquire the carrier begins by searching a range of frequencies, called a frequency bin, centered around the nominal carrier frequency. The size of this range is determined by the symbol rate. If the ABR is unable to find the carrier within this range, the receiver will move to the next contiguous range below the center carrier frequency and repeat the process. If the carrier is not found there, the receiver will move to the next contiguous frequency above the center carrier frequency and continue the search.

The receiver will continue this process, each time searching the next outside range (on either side of the starting point) until the carrier is found, or until the user-defined acquisition range limit (B3) is reached. If the receiver reaches this limit, it will log an acquisition range fault (FL9) and repeat the entire process, starting again at the center carrier frequency. Figure 2-10 illustrates the installation acquisition process.

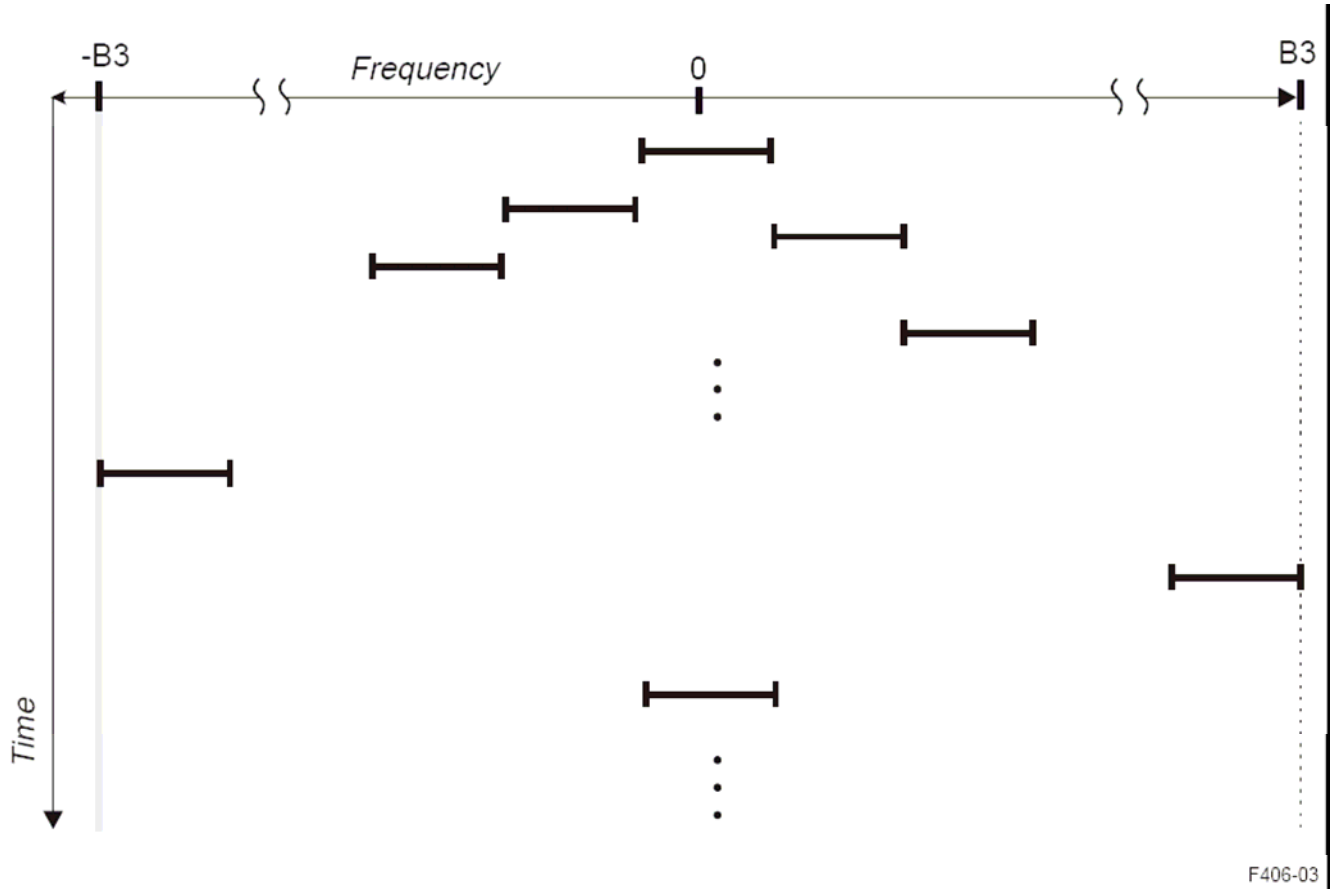

Figure 2.9 Installation Acquisition Mode

Immediately following RF carrier acquisition, the channel and network identifiers are matched against the configuration within the receiver. If these match, the Sync and Enable indicators both illuminate and the signal is further processed by the ABR. However, if either of the IDs do not match, an acquisition network ID fault (FL 31) is declared and the acquisition process continues until the correct signal is received and detected.

2.4.2 Fade Acquisition

Fade acquisition uses a different search pattern in order to concentrate the search in a narrower frequency range. This range is centered on the point the carrier was last seen, as illustrated in Figure 2-11, while still covering the entire user-defined search range (B3).

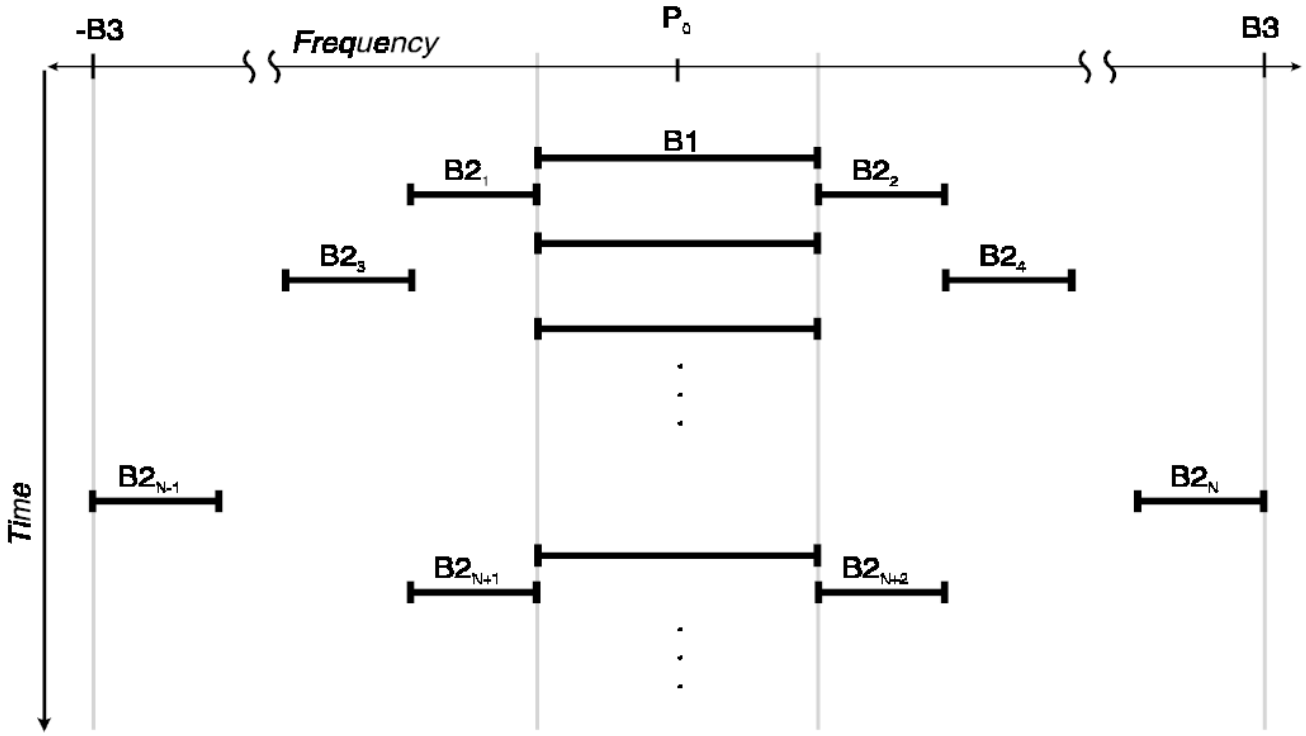

Figure 2.10 Fade Acquisition Mode

When the receiver loses the carrier, it starts a fade acquisition at the point it last saw the carrier. It searches the range centered on that point (P_0). The size of this range is defined by the B1 command. If no carrier is found, the search continues in the areas above and below sequentially.

The size of the range searched outside the B1 range is defined by the B2 command. These points are indicated in Figure 2-11 as $B2_1$ and $B2_2$.

Once the $B2_1$ and $B2_2$ ranges are searched, the receiver returns to P_0 and resumes the expanding search from the beginning. When the B1 limit is reached again, the system searches another B2 range beyond the last B2 attempts. If the carrier is still not found, the receiver starts again at P_0 and searches the B1 range.

In this manner the system expands the search until the carrier is found or the user-defined acquisition range limit (B3) is reached. If the range limit is reached without finding the carrier, an acquisition range fault (FL9) occurs and the entire fade acquisition process begins again at P_0.

Immediately following RF carrier acquisition the channel and network identifiers are matched against the configuration within the receiver. If these match, the Sync and Enable indicators both illuminate and the signal is

further processed by the ABR. However, if either of the IDs do not match, an acquisition network ID fault (FL 31) occurs and the acquisition process continues until the correct signal is received and detected.

Chapter 3 Quick Installation

3

3.1 Overview

This chapter provides quick installation and startup instructions for experienced users who are familiar with satellite communications equipment.

It assumes that the:

- Satellite antenna is installed and aligned to the desired satellite
- IFL cable is properly installed and connected to the receiver and the LNB downconverter at the antenna
- ABR is configured correctly for your network

Ensure AC power is off before connecting or disconnecting the IFL cable to the receiver.

3.2 Installing an ABR202A in an Existing ABR202 Network

If you are installing an ABR202A in an existing ABR202 network, there are no configuration changes which must be made to the audio network.

3.3 Quick Installation Procedure

Under the above-listed conditions, the ABR is a plug-and-play component and the system startup is straightforward. If the above conditions do not apply, or if you experience problems following the Quick Installation procedure, refer to the chapter on Full Installation and Startup.

To perform quick installation:h

1. Make sure the ABR is properly installed in an equipment rack or on a flat surface with the following connected:
    - AC cord
    - IFL cable
    - Audio, data, and relay port cables

CAUTION!!

Ensure that the unit has at least 3 inches of side clearance and 1 inch of top and bottom clearance for adequate ventilation.

2. If the receiver was not configured at the factory with customer-supplied satellite frequencies, then it must be configured by the end-user.

   To configure the receiver:

   - An RS-232 terminal (or software equivalent, i.e., HyperTerminal) must be connected to the receiver Monitor and Control (M&C) port. Pin definitions on the M&C port allow for ribbon cable connection from a DB-9 COM port.
   - The terminal must be configured to operate at the default communication values of 2400 baud, using 7 data bits, odd parity, and 1 stop bit.
   - The following commands and associated values must be entered at the terminal to program the minimal essential operating parameters. Items in italics are variable syntax depending on what information is being requested. (For more information about any of the following commands, refer to the chapter on Remote Monitor and Control Operation.)

     The ABR is factory preset for a PLL LNB, unless otherwise requested. Use of a DRO LNB requires that a master reset (MR) command be invoked first with the applicable argument shown below:

     ```
     MR 0   {to select a DRO LNB}
     MR 1   {to select a PLL LNB}
     ```

   - Enable the LNB DC voltage as necessary.

     ```
     LV 3 {Selects +18VDC}
     ```

   - Enter the channel configuration for each channel to be used. Command format is:

     ```
     CC channel_number,RF_frequency,
     symbol_rate,modulation_type, coding_rate, outer_block_code_rate
     ```

   - Enter the definition for the service (format) that is to be received. Command format is:

     ```
     FD format_number,network_id_number,
     channel_id_number,service_authorization
     ```

- Select the desired audio service channel using the FS (format select) command. Command format is:

  ```
  FS format_number
  ```

  - Initiate initial acquisition search mode by entering:

    ```
    AQ 2
    ```

3. Observe the following about the front panel indicators:

- The Status indicator is on and remains illuminated red signifying that there is at least one operating fault.
- When signal acquisition is complete, the Rx Sync indicator is illuminated green and the Status indicator changes to green, indicating no operating faults are present.
- The Signal Quality indicator may or may not be illuminated based on the signal-to-noise ratio.

- The TS Sync and Audio 1 Sync indicators will illuminate if the audio decoder has synchronized properly with the digital audio feed and is outputting audio.

4. Check if audio is available at the audio output port. If the receiver configuration is correct and the receiver is permissioned from the uplink, then audio will be heard.

You are finished installing the ABR satellite audio receiver system.

For further verification of proper operation of the ABR, or if there is a problem during quick installation, refer to the chapter on Full Installation and Startup.

Chapter 4 Full Installation and Startup

4

4.1 Overview

This chapter describes the steps necessary to install and start up a complete ABR Audio Broadcast Receiver. It presents separate instructions for outdoor equipment, the IFL cable, and indoor equipment.

The material in this chapter may be used as a guide to overall installation of a receiver site or a startup of selected components related to the ABR system.

4.2 Installation Overview

The overall steps for installing and starting up the ABR are as follows:

1. Plan the site.
2. Install and align the antenna.
3. Install the IFL cable.
4. Install the ABR.
5. Connect the ABR.
6. Start up the system.
7. Validate or verify the installation.

4.3 Planning the Site

The purpose of site planning is to specify where the various components of the receiver system are to be located and to identify any special installation or operational requirements. Time spent in planning prevents unnecessary complications during installation and allows potential problems to be resolved before work begins.

There are three main issues to be addressed:

- Location and mounting of the antenna assembly
- Routing of the IFL cable
- Location of the ABR

4.4 Installing and Aligning the Antenna

The location of the receiving antenna is the first element to be considered. The antenna must be placed with an unobstructed line-of-sight path to the transmitting satellite. The antenna will not function properly if the path to the satellite is blocked or obstructed by buildings, trees, or other objects. If possible, placement should avoid situations that limit the field of view, such as buildings or large metal structures.

Aside from physical considerations, the location of the antenna requires compliance with local ordinances and building codes, particularly those pertaining to electrical conduits. This is particularly true if the outdoor portion of the cable is to be buried. The responsibility for complying with local ordinances rests solely upon the purchaser of

the antenna. It is best to be aware of the local building and construction codes as early in the planning process as possible.

After the antenna assembly is complete, install the LNB and align the antenna. The LNB installation kit includes mounting hardware for most standard feed horns. Some feed horns may require different hardware (bolts, nuts).

4.5 Installing the IFL Cable

To ensure that the receiver operates properly, the IFL cable must meet the specifications described in Appendix C: Interfacility Link (IFL) Cable Characteristics and Preparation.

In most cases, the routing of the IFL cable from the antenna assembly to the ABR consists of an outdoor run, for one part of its length, and an indoor run for the remaining length. It is always advantageous to carefully plan the path for the run of the IFL cable since an improper installation can significantly degrade system performance.

In general, always try to minimize the length of the cable run. In addition, the specifications for the cable should be carefully reviewed with the proposed layout and intended system data rate in mind. For example, using the recommended RG-11 cable, a run of 400 feet is possible, assuming a 192 kbps data rate. Runs longer than 400 feet are possible using RG-35 cable or an L-band line amplifier (use L-band line amplifier LA-20 by Norsat (604) 597-6278) with a gain of 20 to 30 dB. Ensure that the line amplifier also passes the 18 VDC line voltage on to the LNB downconverter.

Table 4-1 provides information on maximum cable losses that are acceptable before signal degradation can be expected (assuming 5 dB Eb/No LNB output, 55 dB LNB gain, 150°K system noise temperature).

Table 4.1 IFL Cable Loss vs. Data Rate

Data Rate	Cable Loss Maximum (dB)
384 kbps	14
256 kbps	12.2
128 kbps	9.2
64 kbps	6.2

4.6 Installing the ABR

Once the antenna has been properly located and installed, attention should be directed to the location of the receiver. The ABR functions over a wide range of power and environmental conditions. An autoranging power supply allows the receiver to use most common utility power feeds.

For maximum availability and reliability, connect the receiver to an uninterrupted power supply (UPS) to allow continued operation during power outages.

The low wattage requirements and small size of the unit make it adaptable to most installations. For detailed environmental specifications, refer to the chapter on Technical Specifications and Port Information.

The physical location of the ABR is flexible and largely depends on the location of the audio processing equipment rack. The ABR should be located close to the equipment it will serve.

4.6.1 Rack-Mount

Normally, the ABR mounts in a standard 19-inch equipment rack, using the built-in rack mount brackets, and occupies one rack unit of height (1.75 inches).

To allow for adequate ventilation of the ABR in a rack, the ABR requires a free air space beside it. Other hardware may be installed directly above or below the ABR in the rack, but the unit must not cover the ventilation holes on the sides. Any hardware directly touching the ABR should not conduct heat onto the ABR chassis.

The maximum ambient temperature specification for the ABR is 50º C. This temperature is measured one inch from either side of the receiver within the rack enclosure. This temperature must not exceed 50º C to maintain the product's warranty. Proper rack ventilation and forced air flow techniques should be used to ensure the internal ambient temperature within the rack does not exceed the ABR specifications.

It is strongly recommended that surge suppression be used on the AC input to the ABR, or any rack that contains an ABR. There are many surge suppression vendors that can recommend and supply products to meet your voltage and power requirements. In addition, placement of the ABR should allow access to its rear panel.

NOTE

The IDU should be rack-mounted only in enclosures that will not exceed an ambient temperature of 50° C.

4.7 External Connections

This section describes the physical and electrical connections to the ABR receiver.

CAUTION!!

Ensure that the power to the ABR is off when connecting or disconnecting either end of the cable that connects to RF In. Failure to do so may cause equipment damage.

All external connections to the ABR are made through the rear panel connectors. The ABR has fouteen possible connections on the rear panel, four of which are unused. The location of these connectors is shown in Figure 4-1.

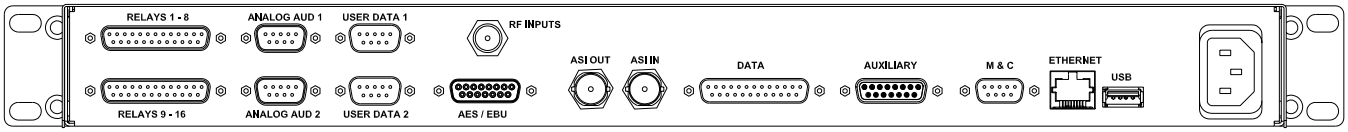

Figure 4.1 Rear Panel Connectors

The pinouts for these interfaces are detailed in Appendix A: Interface Pinouts.

NOTE

To ensure compliance with EMC standards, all signal cables connected to the receiver should be shielded. The shield must be properly terminated to the mating connector.

4.7.1 Analog Audio 1

Connector Type: DB-9, Male (Top Row)

The Audio Out port provides the analog audio output for left and right audio channels. The outputs are direct coupled and actively balanced, with the capability to a drive 600 ohm impedance. To ensure against circuit damage resulting from short circuits, a series current-limiting resistor (510 ohm) exists between the op-amp output and the connector.

Audio gain through the system is nominally 0 dB with a 100k load impedance and a nominal (mid-range) audio volume setting. Using 600 ohm output load will reduce the audio output power by 5.3 dB. The audio volume command may be used to recover this lost power, if required. For additional information, refer to the chapter on commands and codes.

When operating in the mono mode, there are several options for the output audio signal mapping. For information about signal mapping, refer to the left and right toggle (L/R) and mute (MU) commands in found in the chapter on Remote Monitor and Control Operation.

A mating female DB-9 connector, with a metal shell cover, is supplied with the audio receiver for connecting to studio equipment. The user is required to supply the interconnecting cable, which should be a shielded, twisted pair audio cable.

4.7.2 Analog Audio 2

Connector Type: DB-9, Male (Bottom Row)

This connector is unused on the ABR202A.

4.7.3 AUX (Auxiliary)

Connector Type: DB-15, Female (Bottom Row)

The auxiliary port provides a connection to a variety of signals for optional use, including:

- Status relay contacts
- AGC monitor voltage
- Composite non-MPEG data only, synchronous RS-422 receive clock/data output
- Composite MPEG data, synchronous RS-422 clock/data input

4.7.3.1 Status Relay

The Status Relay contacts are made at this connector. The Status Relay output provides the capability for an external indication of errors in the satellite receiver system operation. The Status Relay tracks the front panel Fault indicator and consists of contact closures (both normally open and normally closed presentations) that remains inactive during normal operation (Figure 4-2).

A powerful feature of the Status Relay is its ability to be programmed to trigger when specific user-selected fault conditions are detected while ignoring others. This allows the status relay actions to be customized for the conditions at a specific receiver installation. The status relay mask (SR) command provides this customizing ability. (For specific details, refer to the chapter on Remote Monitor and Control Operation.)

Both normally open and normally closed presentations of the status relay are available on the Status Relay connector. The normally open relay pins will present an open circuit when the unit power is off or when an unmasked fault is present. Conversely, the normally closed relay output will present a short circuit when power is off or an unmasked fault is present. The logic of the relay, i.e., open or closed, may be reversed using the SS command as described in the chapter on commands and codes.

NOTE

The Status Relay output should not be used to switch currents greater than 1 amp, voltages higher than 100 volts, or total power higher than 25 VA.

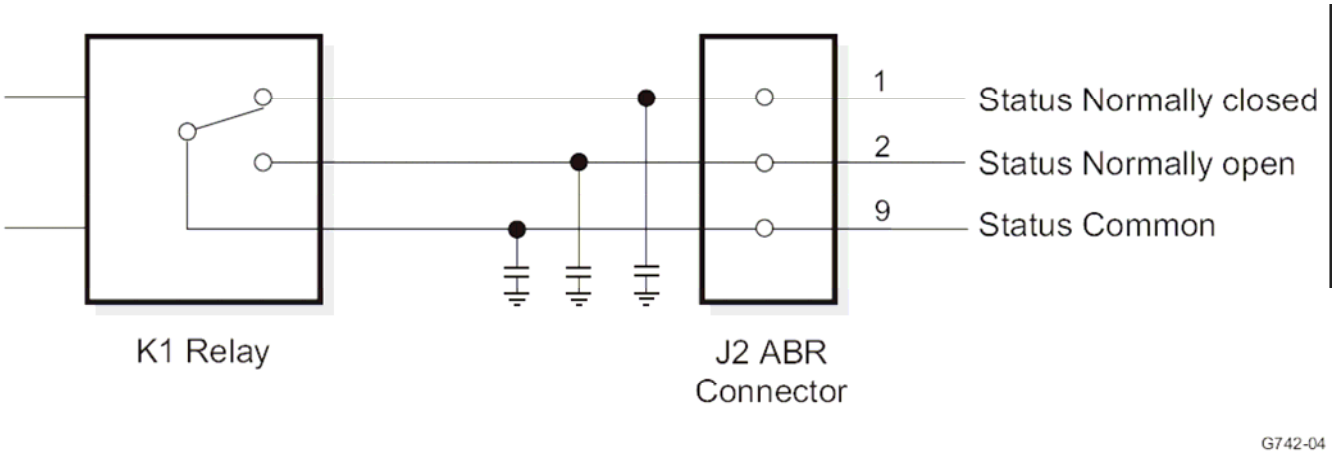

Figure 4.2 Relay K1 and J2 ABR Connector

4.7.3.2 RS-422 Composite Data Output

The undecoded audio data stream is on this connector as RS-422 data and clock signal pairs. This interface operates synchronously with the output data being valid on the falling edge of the receive timing clock that is also provided.

4.7.3.3 RS-422 Digital Audio Input

External RS-422 data and clock signals may be provided to the auxiliary port and passed to the internal audio decoder from an external MPEG audio encoder or storage device.

4.7.4 AES/EBU Digital Audio Output

Connector Type: DB-15, Female (Bottom Row)

A digital pulse coded modulation (PCM) audio output is available. This interface operates per the AES/EBU interface specification. This interface permits direct connection to studio equipment or digital audio tape recorders that support the AES/EBU interface. Higher quality audio is thereby possible since all of the digital-analog and analog-digital conversion noise is alleviated with digital PCM.

4.7.5 Relay/Control 1-8

Connector Type: DB-25, Male (Top Row)

The Relay/Control port provides eight separate form C (SPST) relay contacts that are controlled from the uplink. Each contact can be programmed independently or in combination with other contacts. The polarity (normally open or closed) is also configurable (either locally or from the uplink). The relay contacts are intended to be used to control external equipment, either audio or other station equipment.

Seven TTL sensor inputs are provided for external control of channel selection or for ancillary equipment monitoring. Each input is internally pulled up to +5 VDC through a 4.7 K ohm resistor. These inputs can be directly monitored via the TTL sensor input query (SI) command. The first three inputs permit selection of up to eight different RF audio channels by connecting a rotary (or similar) switch to the inputs. A contact closure from the input to the ground pin provided on this connector activates the input. The actual RF channel frequencies are programmed either locally or from the uplink and are stored into eight presets.

The second group of three inputs can be used to trigger an automatic dial-out trouble reporting call into the uplink facility when activated. (For more information, refer to the FL command section in the chapter on Remote Monitor and Control Operation.) The seventh input is reserved for future use. Also available on this port is +15 VDC. An internal resistor limits the output current to 50 mA. One possible use for this voltage is to support interfacing to coupled inputs of user equipment.

4.7.6 Relay/Control 9-16

Connector Type: DB-25, Male (Bottom Row)

This connector is unused on the ABR202A.

4.7.7 User Data 1

Connector Type: DB-9, Female (Top Row)

The User Data port provides an asynchronous RS-232 data output. The data is part of the audio data stream transmitted from the uplink. Data rates up to 9600 baud are supported. The port can be configured by the user via the user data port configuration (P1) command described in the chapter on Remote Monitor and Control Operation. Flow control is not implemented for this interface.

4.7.8 User Data 2

Connector Type: DB-9, Female (Bottom Row)

This connector is unused on the ABR202A.

4.7.9 Printer Data

Connector Type: DB-25, Female (Bottom Row)

The Printer Data port provides either an asynchronous RS-232 data output or a synchronous RS-422 data output. The data is part of the audio data stream transmitted from the uplink. Data rates up to 9600 baud are supported. The port can be configured by the user via the printer port configuration (P3) command and the interface selection (S1) command described in the chapter on Remote Monitor and Control Operation. Flow control is not implemented for this interface.

4.7.10 Ethernet

Connector Type: RJ-45, Female (Bottom Row)

The Ethernet port is used for monitor and control by Telnet. The speed and duplex is auto-negotiated by default. It can operate on 10 mbps or 100 mbps as well as full-duplex or half-duplex. The IP address and subnet mask of the port can be configured through the terminal or the front panel.

4.7.11 USB

Connector Type: Type-A, Female (Bottom Row)

This connector is unused on the ABR202A.

4.7.12 M&C

Connector Type: DB-9, Female (Bottom Row)

The M&C port is used to connect an RS-232 control terminal, RS-485 multidrop bus, or telephone modem to the ABR. During normal system operation, commands are received from the uplink via the control channel. However, control and diagnostic commands can also be issued to the receiver through this port. During normal operation, the front panel LED indicator displays summary failure information. The diagnostic port is used to provide detailed information on the ABR status.

The M&C port is configurable via the M&C port configuration (P2) command described in the chapter on Remote Monitor and Control Operation.

With the Tiernan-approved, Hayes-compatible telephone modem (TPN 30-0120-194) connected to the M&C port, a terrestrial backlink to a network uplink can be established for remote performance monitoring. (For more information about telephone modem operation, refer to Appendix B: Telephone Modem Operation.)

The data terminal ready (DTR) lines must be active for proper operation. The default port configuration is 2400 baud, 7 data bits, 1 stop bit, and odd parity with packet address 31.

Since the M&C port can be reprogrammed, it may be necessary to reset the port to the default configuration. To reset:

1. Using the front panel arrow keys, navigate to “Management > Console Port”.
2. Change the parameters as necessary.

The M&C port will also accept commands via an RS-485 party line bus. While the receiver does not distinguish between RS-232 and RS-485 electrical levels, it is essential to invoke “packet-only” mode for multiple Tiernan products communicating over the same RS-485 bus in Tiernan/ComStream Packet Protocol. The ABR is a “slave” on the RS-485 bus, i.e., it only responds to commands and never initiates communication with the “master.”

4.7.13 RF In

Connector Type: F, 75 ohm, Female (Top Row)

The RF In port is the primary input to the receiver. The RF signal is brought into the receiver through this connector.

The power of the input carrier should be in the range of -75 dBm to -20 dBm with the RF frequency in the range of 950 MHz to 1700 MHz. The total power in the 950 MHz to 1700 MHz band should be less than -10 dBm. The input impedance is 75 ohm, with a return loss of greater than 8 dB.

The RF In connector on the back panel also supplies +18 VDC (500 mA maximum) to the LNB downconverter. By default, the voltage is disabled. The voltage can be enabled by entering `LV 3` through the M&C port. This is supplied through the center conductor of the connector via the IFL cable. Caution should be exercised when:

- Fabricating an IFL cable. Using connectors or cables other than those specified in Appendix C: Interfacility Link (IFL) Cable Characteristics and Preparation may result in shorting the +18 V to connector

ground, which will prevent the ABR from operating. Ensure the cable's center conductor slides into the receptor cup of the connector's center pin prior to crimping the connector.

- Connecting any extraneous test equipment (e.g., simulator) to the RF In port. A suitable DC blocking capacitor must be connected between the port and external equipment to prevent a possible short from tripping the internal short circuit protection circuit.

CAUTION!!

Ensure that the power to the ABR is off when connecting or disconnecting either end of the cable that connects to RF In. Failure to do so may cause equipment damage.

4.7.14 Power Connector

Connector Type: IEC 320, Male socket

The ABR power supply is autoranging from 85 to 264 VAC and 47 to 63 Hz. Maximum power supply output for the ABR is 60 watts. The typical power consumption for the ABR is less than 40 watts. There is no power on/off switch on the receiver. Remove the AC power cable from the unit to turn the power off.

NOTE

Always power down the ABR before connecting or disconnecting signal cables to the unit.

If an unterminated power cord is supplied with the unit, the appropriate certified termination plug must be installed. The power cord wires are color-coded as follows:

- Green and Yellow: earth/ground
- Blue: neutral
- Brown: live

If the color code described does not correspond to the colored markings identifying the terminals in your plug, proceed as follows:

- The green and yellow wire must be connected to the terminal in the plug marked by the letter E or by the earth symbol , or colored green and yellow.
- The blue wire must be connected to the terminal marked with the letter N, or colored black.
- The brown wire must be connected to the terminal marked with the letter P, or colored red.

Table 4-2 lists the required certifying agencies for some countries.

Table 4.2 Certifying Agencies by Country

Country	Agency
Australia	SSA
Austria	OVE
Belgium	CEBEC
Canada	CSA

Country	Agency
Denmark	DEMKI
Finland	FEI
France	UTE
Germany	VDE
India	ISI
Ireland	IIRS
Italy	IMQ
Japan	MITI
Netherlands	KEMA
New Zealand	• SECV • SECQ • SECWA • EANSW • ETSA • HECT • SANZ
Norway	NEMKO
Republic of So. Africa	SABS
Spain	AEE
Sweden	SEMKO
Switzerland	SEV
United Kingdom	• ASTA • BSI

4.8 Starting Up the System

This section describes the activities necessary to bring an assembled ABR system online. The following steps assume that the antenna, IFL cable, and ABR have been properly installed and connected. Do not proceed until this setup is complete.

Ensure that the power to the ABR is off when connecting or disconnecting either end of the cable that connects to RF In. Failure to do so may cause equipment damage.

If problems are encountered in the startup sequence, refer to the "Startup Problems" section of this chapter and the chapter on Maintenance and Troubleshooting.

To start up the ABR:

1. Make sure the ABR is properly installed in the equipment rack or on the table top with the IFL cable and the audio/data cables connected.
2. Turn on the unit by connecting the AC power cable to the unit and observe the front. The front panel lights flash through a consistent sequence when the unit is first powered on. The pattern the lights follow is

dependent on the signal conditions and strength at your site. When acquisition is complete, the Rx Sync LED is illuminated. The TS Sync/Audio 1 LEDs may or may not be illuminated based on the signal strength and the Q0 (Low Signal Quality Threshold Level) and Q1 (High Signal Quality Threshold Level) command settings.

3. Check to see if audio is available at the Audio Out port. If the network is properly configured and the receiver properly authorized, audio will be present.

At this point the ABR is ready for verifying proper equipment setup and operation.

Validating Installation

Once the ABR has been powered up, verify that the unit is connected properly for the audio, data, and relay ports. This is accomplished by communicating with the receiver using an ASCII terminal and performing several diagnostic commands. The electrical interface is RS-232 on a PC-AT style DB-9 connector, DTE presentation. The terminal should be configured for 2400 baud, 7 data bits, 1 stop bit, and odd parity.

To establish communication with the receiver:

1. At the ASCII terminal connected to the ABR, press the ENTER key on the terminal. The receiver should respond with an ASCII login request string.

2. Type the default password HOMEYD (must use all caps). When successful communication has been accomplished, the terminal displays a > prompt, indicating it is ready to accept commands.

3. Once the communications link with the ABR is established, the following steps can be used to verify proper receiver operation.

For an alphabetical listing of commands and proper command syntax, refer to the chapter on Remote Monitor and Control Operation.

1. Validate the:

- Audio interface. Enter AT 1 and verify that a 1000 Hz audio tone is present on both left and right audio outputs. This can be accomplished at the receiver or at an appropriate patch panel location. When the test is complete enter AT 0.
- Relay port interface. Each individual relay closure contact can be activated (closed/opened) or deactivated (opened/closed) via the terminal using the CO (contact closure) and CS (contact sense) commands. Each line should be verified to exercise the external equipment connection to ensure proper operation. Ensure that CO is returned to all Xs.
- User Data port interface. Connect the data port to the data terminal equipment (DTE) device. Ensure the data port configuration (P1 command) and the DTE configuration agree. At the M&C terminal enter X1 1 to initiate the data port test. The string, THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789, should be printed out continuously at the DTE. If not, recheck all connections and configurations. When finished, enter X1 0 to stop the test.
- Printer Data port interface. Connect the data port to the data terminal equipment (DTE) device. Ensure the data port configuration (P3 command) and the DTE configuration agree. At the M&C terminal enter X3 1 to initiate the data port test. The string, THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789, should be printed out continuously at the DTE. If not, recheck all connections and configurations. When finished, enter X3 0 to stop the test.
- Receiver operation. Enter ST ? to verify the status of the ABR. The ST 0 response indicates status zero or no faults.

- Enter CF 0 to clear the fault register.
- Enter EB ? to verify the Eb/No of the link.

2. Verify the operation of the ABR compared to the link budget for a particular installation. Enter FL 0. The response should be FL 0 indicating no faults have been detected since the CF 0 command. Keep in mind that other factors, such as weather, may affect this measurement. If faults are observed, refer to the chapter on Remote Monitor and Control Operation for more information on the FL command.

At this point, the ABR installation is verified and ready for normal operation.

4.9 Startup Problems

This section describes common problems encountered during startup. In general, the ABR has been designed for unattended operation and few problems should be encountered.

The ABR is factory preset for a PLL LNB, unless ordered otherwise. Use of a DRO LNB requires that a master reset (MR) command be invoked with the applicable argument shown below:

```
MR 0 {to select a DRO LNB}

MR 1 {to select a PLL LNB}
```

The MR command with the applicable agreement must be entered twice to take effect. For more information, refer to the chapter on Remote Monitor and Control Operation.

4.9.1 The Receiver Will Not Lock Onto The Satellite Signal

The most common cause of this problem is a lack of signal at the RF input. If there is a problem with the signal, most likely it is improper pointing of the antenna or the IFL cable. An indication of a lack of signal is the AGC value. If the AGC gain factor (AG) command indicates a value of 255, there is no signal present.

To troubleshoot this problem:

1. Ensure the antenna is properly assembled, and recheck the antenna alignment to ensure it is pointed to the proper satellite.
2. Check the connectors on the IFL cable for proper installation. With the cable disconnected, ensure the cable passes a continuity and no-short test.
3. Measure the DC output of the ABR at RF Out. The DC level should be approximately 18 V. If DC is present here, the ABR power supply is OK.
4. Attach the IFL cable to the ABR and measure the DC voltage at the antenna end of the cable. If there is no DC voltage present on the center conductor of the IFL, the cable is defective.
    - If the DC value is below 15 V, there is an excessive DC voltage drop in the cable due to improper installation or use of the incorrect cable for the distance.
    - If the DC value is 15 V minimum, connect the cable to the LNB downconverter. If the AG value is still 255, then the LNB downconverter is probably defective or the antenna is not pointed correctly.
5. Ensure the correct polarization of the LNB for the network is set. If it is incorrect, you could have a strong AG value but not be able to lock on to the carrier.

If the antenna is pointed correctly and the signal is present (AG other than 255), but the unit will not acquire, then there could be many possible causes. Enter DP on the diagnostic terminal. Check the values of B1, B2, and B3.

If operating in QPSK mode, then spectral inversions, caused by a high-side local oscillator in the transmission chain, may also prevent lock. Set the DI parameter to compensate for spectral inversion, if necessary.

Check the values of the FS, FD, and CC commands. These are dependent on the network configuration. If these commands do not match the values for the network hub, the receiver will not acquire the signal. Contact the Network Administrator for assistance.

If any of the other values vary from their expected values, change it to its proper value and enter AQ 2 to restart signal acquisition.

4.9.2 No Audio Is Received from the Audio Out Port

If the front panel TS Sync/Audio 1 Sync LEDs are on (signal is locked) but no audio is available, the most likely cause is that the receiver is not authorized to receive audio or there is a cabling problem.

To troubleshoot this problem:

1. Double check the pinouts on the cable and run the audio test described in the previous section.
2. Execute the audio sync status (AS) command, which will indicate if the audio output is muted and why. For more information, refer to the chapter on Remote Monitor and Control Operation.
3. Check with the Network Administrator to ensure audio is available on the output port you are checking.

For other problems or ideas, refer to the chapter on Maintenance and Troubleshooting.

Chapter 5 Remote Monitor and Control Operation

5

5.1 Overview

In audio distribution networks, the ABR is normally configured and controlled from the uplink via the Audio Network Management System (ANMS). In this configuration, the user typically does not need to communicate directly with the receiver. However, during receiver installation, troubleshooting, or performance monitoring, direct communication may be required.

This chapter details the remote control operation of the receiver. Complete monitoring and control of the receiver is available using an ASCII computer terminal connected to the RS-232 M&C port located on the rear of the unit. Alternatively, a telephone modem may be connected to the M&C port permitting access from a remote terminal. (For more information, refer to the appendix on Telephone Modem Operation.) In addition, the monitor and control console is available by Telnet through the Ethernet connector.

Commands are input by the user to set or display ABR parameters. ABR codes are output by the receiver to indicate errors, faults, or current status. This chapter:

- Describes the ABR command syntax
- Explains each functional group of commands
- Presents errors, faults, and status codes
- Provides an alphabetical listing of all ABR commands and codes

In addition, this chapter describes the commands available from the front panel of the unit. These commands are included within the description of the individual remote commands, where applicable.

5.2 Command Syntax

Commands are input to the ABR by sending a sequence of ASCII characters to the receiver M&C port. Each message consists of a two-letter mnemonic string, a single-space character, and an optional parameter followed by a carriage return. Commands may be entered in either upper or lowercase.

Most commands are used to establish internal parameter values and interrogate their current value. The parameter may be either a single-digit number referenced as *n*, a multiple-digit number referenced as *nnnnn*, or a single ASCII character or string designated *s* or string. Syntax that appears in italics represents variable characters; this syntax varies depending on what information is being requested.

Parameter values are interrogated by replacing the numeric parameter in the command string with a question mark (?) character, or by simply entering a carriage return immediately following the two-character command.

Some commands do not have parameters associated with them and are terminated with a carriage return.

Example 1: *command* SP ?

Example 2: *command*

The first example requests the receiver display the current parameter value(s). The second example demonstrates the syntax for a command that does not require a parameter (i.e., RE, DC, DP, etc.).

Command actions are performed if the:

- Command is valid

- Parameter value is within the valid range
- Parameter value or command is compatible with the present receiver configuration
- Command or query can be executed immediately
- Commands that do not follow these guidelines produce an error code.

5.3 Password Protection

In providing a measure of security from unauthorized access to the receiver, a login password is provided. The factory default for the password is HOMEYD. The command and associated parameter syntax is such that the character case is not distinguished. The user is requested to change the password, using the password change (PC) command, if protection is desired.

5.4 Command Error Codes

Command errors occur when a command has been mistyped, is inappropriate, or cannot be immediately executed. The normal response of the receiver is to display one of the error codes/descriptions shown in Table 5-1.

Table 5.1 Error Codes/Descriptions

Error	Description
ER 1	Command format error
ER 2	Parameter out of range
ER 3	Command not supported by configuration
ER 4	Command temporarily not supported

5.5 Command Groups

Most commands establish the operating characteristics of the receiver. These commands install permanent values into memory that remain in place unless changed by the operator. Operators should avoid changing configuration values unless they are certain of the result. Most of the operating parameters are established at the uplink at the time of installation and do not change except under specific conditions.

ABR commands are grouped into nine functional areas:

- L-band Demodulator
- Channel Control
- Audio Port
- Data Ports
- Relay Port
- M&C Port
- Alarm/Status
- Front Panel
- Miscellaneous

Table 5-2 through Table 5-13 list the commands and their description.

NOTE

The characteristics and use of each command group, along with a summary of commands in the group, are discussed in following sections. The detailed usage and syntax of individual commands is presented in the alphabetical listing at the end of this chapter

Table 5.2 L-band Demodulator Commands

Command	Description
AG	AGC Gain Factor
AO	Acquisition Offset Frequency
AQ	Acquisition Mode
B1	Primary Search (Binning) Range
B2	Secondary Search (Binning) Range
B3	Overall Search (Binning) Range
CE	Channel Error Rate
DC	Display Configuration
DI	Spectral Inversion
DQ	Data Rate Query
EB	Eb/No Signal Level Query
EM	Eb/No Minimum Receive Level
EX	Maximum Eb/No
LO	Local Oscillator Offset
LT	LNB Type
LV	LNB Voltage
RB	Read Calculated Bit Error Rate
RF	Read RF Value

Table 5.3 Channel Control Commands

Command	Description
CC	Channel Configuration
FD	Format Definition
FS	Format Select
LA	Logical Address Definition
LC	Local Format Change Permission
NS	Network Status
PD	Preset Definition

Table 5.4 Audio Port Commands

Command	Description
AP	CS4922 Inputs (AES/EBU interface)

Command	Description
AS	Audio Status
AT	Audio Test
LR	Left/Right Channel Toggle
M0	Eb/No Mute On
M1	Eb/No Mute Off
MU	Audio Mute
VC	Volume Control

Table 5.5 Data Port Commands

Command	Description
P1	User Data Port Configuration
X1	Exercise User Data Port

Table 5.6 Relay Port Commands

Command	Description
CM	Relay Contact Mapping
CO	Relay Contact Control
CQ	Relay Contact Query
CS	Relay Contact Sense

Table 5.7 M&C Port Commands

Command	Description
BY	Bye-Logout
EE	Echo Terminal Input
P2	M&C Port Configuration
PA	Packet Address
PC	Password Change
PO	Packet-Only
X2	Exercise M&C Port

Table 5.8 Alarm Status Commands

Command	Description
AL	Alarm Reporting
CF	Clear Fault Register
ET	Eb/No Alarm Threshold Level
FL	Fault Query
HM	Hex Mode
NF	Number of RF Signal Fades
SI	TTL Sensor Input Query
SL	Audio Sync Loss Counter

Command	Description
SR	Status Relay Mask
SS	Status Relay Sense
ST	Status Query

Table 5.9 Front Panel Commands

Command	Description
FP CODE	Front Panel Password
OM	ODU Fault Mask
Q0	Low Signal Quality Threshold Level
Q1	High Signal Quality Threshold Level

Table 5.10 Printer Port Commands

Command	Description
P3	Printer Port Configuration
S1	Interface Select for Auxiliary Data
X3	Exercise Printer Data Port

Table 5.11 Miscellaneous Commands

Command	Description
DATE	RTC Date
DE	Composite Data Port Enable
DM	Display Message
DP	Display Parameters of Receiver
DX	Decoder Data Source
EN	Enable Network Data
ID	Receiver ID Query
IG	Verbose Mode
IP	IP Address
MR	Master Reset
RE	System Reset
TIME	RTC Time

*Data is only available on the output if it is non-Musiciam-encoded composite data.

Table 5.12 Terrestrial Backlink Commands

Command	Description
AI	Alarm Interval
F1	Fault Mask 1
F2	Fault Mask 2
T1	Backlink Telephone Number 1
T2	Backlink Telephone Backlink 2

Command	Description
TB	Terrestrial Backlink
TI	Telco Initialization

Table 5.13 Alphabetical Command Listing

Command	Description
AG	AGC Gain Factor
AI	Alarm Interval
AL	Alarm Reporting
AO	Acquisition Offset Frequency
AP	CS4922 Inputs (AES/EBU interface)
AQ	Acquisition Mode
AS	Audio Status
AT	Audio Test
B1	Primary Search (Binning) Range
B2	Secondary Search (Binning) Range
B3	Overall Search (Binning) Range
BY	Bye-Logout
CC	Channel Configuration
CCD	Channel Configuration with Data Rate
CE	Channel Error Rate
CF	Clear Fault Register
CM	Relay Contact Mapping
CO	Relay Contact Control
CQ	Relay Contact Query
CS	Relay Contact Sense
DATE	RTC Date
DC	Display Configuration
DE	Composite Data Port Enable
DI	Spectral Inversion
DM	Display Message
DP	Display Parameters of Receiver
DQ	Data Rate Query
DX	Decoder Data Source
EB	Eb/No Signal Level Query
EE	Echo Terminal Input
EM	Eb/No Minimum Receive Level
EN	Enable Network Data
ET	Eb/No Alarm Threshold Level
EX	Maximum Eb/No

Command	Description
F1	Fault Mask 1
F2	Fault Mask 2
FD	Format Definition
FL	Fault Query
FP CODE	Front Panel Password
FS	Format Select
HM	Hex Mode
ID	Receiver ID Query
IG	Verbose Mode
IP	IP Address
LA	Logical Address Definition
LC	Local Format Change Permission
LO	Local Oscillator Offset
LR	Left/Right Channel Toggle
LT	LNB Type
LV	LNB Voltage
M0	Eb/No Mute On
M1	Eb/No Mute Off
MR	Master Reset
MU	Audio Mute
NF	Number of RF Signal Fades
NS	Network Status
OM	ODU Fault Mask
P1	User Data Port Configuration
P2	M&C Port Configuration
P3	Printer Port Configuration
PA	Packet Address
PC	Password Change
PD	Preset Definition
PO	Packet-Only
Q0	Low Signal Quality Threshold Level
Q1	High Signal Quality Threshold Level
RB	Read Calculated Bit Error Rate
RE	System Reset
RF	Read RF Value
S1	Interface Select for Auxiliary Data
SI	TTL Sensor Input Query
SL	Audio Sync Loss Counter
SR	Status Relay Mask

Command	Description
SS	Status Relay Sense
ST	Status Query
T1	Backlink Telephone Number 1
T2	Backlink Telephone Backlink 2
TB	Terrestrial Backlink
TI	Telco Initialization
TIME	RTC Time
X1	Exercise User Data Port
X2	Exercise M&C Port
X3	Exercise Printer Data Port
VC	Volume Control

Table 5.14 Front Panel Menu Tree

Menu	Sub-Menu	Commands
Format		• Select: <enter 0 – 63> • Presets: Enable, Disable • Source: Demod, Demod/AUX, AUX
Channel Setup		
	ChannelConfig	• CC Number: <enter 0 – 31> • RF: <enter frequency> • Data Rate: 64K, 96K, 112K, 128K, 192K, 256K, 384K, 512K • Modulation: BPSK, QPSK • Code Rate: Uncoded, ½ Sequential, … 3/4 Viterbi • Reed Sol: None, 187/204, 188/204
	Format Defs	• FD Number: <enter 0 – 63> • Network ID: <enter 0 – 255> • Channel: <enter 0 – 31> • Audio: Enable, Disable • User Data: Enable, Disable • Relays: Enable, Disable • Left/Right: Normal, Reversed, Left on Both, Right on Both • Output: Stereo, Left Only, Right Only, Muted
	Presets	• PD Number: <enter 0 – 7> • Selects: <enter 0 – 63>
	Relay Mapping	• CM Number: <enter 0 – 15>

Menu	Sub-Menu	Commands
		• Relay1 Map: <enter 1 – 8> • Relay2 Map: <enter 1 – 8> • Relay3 Map: <enter 1 – 8> • Relay4 Map: <enter 1 – 8> • Relay5 Map: <enter 1 – 8> • Relay6 Map: <enter 1 – 8> • Relay7 Map: <enter 1 – 8> • Relay8 Map: <enter 1 – 8>
Interfaces	Demod Control	• Spectral: Inversion, No Inversion • LNB Voltage: 13v, 14v, 18v, 19v, Off • LNB Type: PLL, DRO, Auto • Acq Mode: Acquire, Disable • Acq Offset: <enter value>
	Demod Status	• Eb/No: [Eb/No] • Signal Level: [0 – 255] • Acq State: [Acquired/Disabled, Fade, Initial] • Min Eb/No: [Eb/No Minimum Level], Reset • Max Eb/No: [Eb/No Maximum Level], Reset • Rx Offset: [Rx Offset Frequency] • Network ID: [NetID] • Channel ID: [ChID]
	Audio	• Output: Stereo, Left Only, Right Only, Muted • Mute Eb/No: <enter Eb/No> • Unmute Eb/No: <enter Eb/No> • Left/Right: Normal, Reversed, Left on Both, Right on Both • Test Tone: Enable, Disable • Volume: <enter 0 – 18> • Sync Status: [Audio sync loss count]
	User Data	• Baud: 1200, 2400, … 9600 • Data Bits: 7, 8 • Parity: Even, Odd, None • Stop Bits: 1, 2 • Test Pattern: Enable, Disable
	Printer Port	• Baud: 1200, 2400, … 9600 • Data Bits: 7, 8 • Parity: Even, Odd, None • Stop Bits: 1, 2

Menu	Sub-Menu	Commands
		• Interface: RS232, RS422 • Test Pattern: enable, Disable
	Relays	• Relay Number: <enter 1 – 8> • Sense: Normally Open, Normally Closed • Relay Mode: Auto, Activate, Deactivate • Relay State: [Active, Inactive]
Events	Current Events	
	Event History	
	Clear History: Execute	
	Alarm Settings	• Low Eb/No: <enter Eb/No> • Low Signal: <enter Eb/No> • High Signal: <enter Eb/No>
Management	General	• Date • Time • Unit ID: [Unit ID] • System Reset: Reset System
	Front Panel Access:	• Mode: Basic, Advanced • Password: <enter password>
	Console Port	• Baud: 1200, 2400, … 115200 • Data Bits: 7, 8 • Parity: Even, Odd, None • Stop Bits: 1, 2 • Echo: Enabled, Disabled • Packet Mode: Auto Detect, RS485 only • Packet Addr: <enter 1 – 31> • Test Pattern: Enable, Disable
	Ethernet Port	• IP Address: <enter IP address> • Subnet Mask: <enter subnet mask> • Gateway: <enter gateway IP> • Mode: Auto, 100/Full, 100/Half, 10/Full, 10/Half • MAC Address

5.6 Command Descriptions

The following is an alphabetical list of commands with a detailed description of each command. Items in italics are variable syntax depending on what information is being requested.

AG AGC Gain Factor

Syntax: ***AG ?***

Front Panel:

Interfaces > Demod Status > 0 - 255

The AG command displays the gain factor applied to the received RF signal. During normal operation, the gain factor is constantly adjusted to bring the baseband signal to the same level regardless of input signal power. A value of 255 indicates no signal is present. A value of 0 indicates receive signal is too strong.

AI Alarm Interval

Syntax: ***AI n***
AI ?

The alarm interval command allows the user to specify the length of time the receiver waits between backlink attempts, and also allows the user to disable the monitoring for faults that may cause an attempt to establish a backlink. *n* specifies the length of time the receiver waits between backlink attempts when a fault is detected. The range for *n* is 0 to 65535 minutes. A value of 0 for *n* disables the monitoring of faults, which prohibits the receiver from attempting any backlinks.

AL Alarm Reporting

Syntax: ***AL n***
AL ?

This command enables/disables the automatic reporting of alarms to the M&C port. Acceptable parameter values are 1 to enable fault reporting and 0 to disable fault reporting. This command has no effect on the operation of other commands, such as ST (status query) and FL (fault query). The status of the faults can still be monitored by the FL query (?) command. The default value is 1 (enabled).

AO Acquisition Offset Frequency

Syntax: ***AO ?***

Front Panel:

Interfaces > Demod Control > Acq Offset

The AO command is a query-only command that displays the value of the acquisition offset. The acquisition offset is used to optimize the power-on acquisition process. The acquisition offset value is used by the ABR in its calculations for the frequency at which it will begin its search for the RF carrier on a power-on acquisition. The value of AO is automatically updated to the local offset (LO) value if the LO value is ever greater than 50 kHz. On subsequent power cycles, the ABR uses this offset value in AO to shorten the time needed to find the RF carrier.

Upon a master reset initialization, AO will reset to a factory default based on the unit's particular measured frequency offset.

AP CS4922 Inputs

Syntax: ***AP n***
AP ?

This command allows the user to configure the AES/EBU interface. The AES/EBU provides a digital PCM audio output to the ABR Aux port. The interface operates according to the AES3-199X (ANSI S4.40-199X) interface specification, which allows transmission of control information along with the digital audio data stream.

The ABR uses the CS4922 digital transmitter manufactured by Crystal semiconductor. Of the two operating modes available to the CS4922, professional (PRO) mode operation is recommended over consumer (CON) mode. The AP command allows users to program specific values at the input pins of the CS4922 which will specify the control information to be transmitted.

The AP command is AP *n*, where *n* is the decimal equivalent of the bit map of the CS4922 control interface, shown in Table 5-14. The default value for AP is 15.

Table 5.15 CS4922 Programming Inputs (PRO mode)

Bit Position	CS4922 Pin Name	Function	*n*
0	C4\	Inverse of channel status bit 4	1
1	C5\	Inverse of channel status bit 5	2
2	C1\	Inverse of channel status bit 1	4
3	C6\	Inverse of channel status bit 6	8
4	C7\	Inverse of channel status bit 7	16
5	MODE1\	Inverse of channel status bit 9	32
6	CRE	Sample address counter control	64
7	PROCON	Professional or consumer mode selector	128
8	MODE2	Channel status bit 10	256
9	MODE3	Channel status bit 11	512
10	USER 0	Channel status bit 13	1024
11	USER 1	Channel status bit 14	2048
12	LOCK	Channel status bit 15	4096
13	N/A	N/A	N/A
14	N/A	N/A	N/A
15	N/A	N/A	N/A

The inputs to the CS4922 are encoded as shown in Table 5-15.

Table 5.16 CS4922 Programming States

Pin Name	Input State	Option Selected
C4\, C5\	1,1	Receiver defaults to no emphasis, manual override enabled
	0,0	CCITT J.17 emphasis, no override
	1,0	50/15 usec emphasis, override disable
	0,1	No emphasis, manual override disable
C1\	0	Nonaudio mode
	1*	Normal audio mode
C6\, C7\	Sampling frequency bits hard coded	Sampling frequency not indicated, receiver defaults to 48 kHz with manual override or autosetting enabled
MODE1\	0*	Stereophonic mode, channel 1 is left, manual override is disabled
	1	Used in conjunction with MODE2\ and MODE3\ pins
CRE	N/A	N/A
PROCON	0*	Professional mode
	1	Consumer mode
MODE2 and MODE3 when MODE1\=1	0,0*	Not indicated; receiver defaults to Two Channel mode, manual override disabled
	0,1	Two Channel

Pin Name	Input State	Option Selected
	1,0	Single Channel
	1,1	Primary/Secondary
USER0, USER1	0,0*	None
	1,0	192-bit block
	0,1	None
	1,1	User defined
LOCK	0*	Lock
	1	Unlock

* Default value

AQ Acquisition Mode

Syntax: ***AQ n***
AQ ?

Front Panel:

Demod Control > Acq Mode: <Acquire, Disable>

This command is used to establish the acquisition type and to query the receiver for the currently active acquisition type. The value of *n* specifies what type of acquisition the receiver is to perform. The query reports the receiver acquisition status. Table 5-16 is a listing of the acquisition types and the corresponding action or status that the types represent.

Table 5.17 Acquisition Type, Action, Status

Type	Action	Status
0	Disable acquisition	Acquisition disabled/complete
1	Initiate fade acquisition	Fade acquisition in progress
2	Initiate power-on acquisition	Power-on acquisition in progress
5	None	Channel change acquisition in progress

An acquisition mode of 0 indicates acquisition has been disabled or the previous acquisition is complete. When the ABR achieves RF sync and audio sync, it sets the acquisition mode to 0 to indicate that the previous acquisition was successfully completed. An AQ 0 entered by the user instructs the ABR to disable all acquisition processes.

Entering a value of 0 for *n* will disable any acquisition in progress. The ABR will NOT begin a new acquisition until an AQ 1, AQ 2, or FS *n* is entered. Normally, disabling acquisition is not desirable.

A fade acquisition is automatically initiated whenever RF sync is lost while the receiver is locked onto a carrier. During a fade acquisition the ABR concentrates its search for the RF carrier at the frequency where it last achieved RF sync, based on the B1 and B2 values.

A power-on acquisition occurs any time the ABR is power cycled. A power-on acquisition begins its search for the RF carrier at the start acquisition frequency. The start acquisition frequency is calculated by the ABR using the

value of the RF parameter defined in the channel configuration (CC) command. The offset value specified in the acquisition offset (AO) command is also added to the calculated start acquisition frequency.

A channel change acquisition is performed when the ABR is locked to one RF carrier or RF channel and is then instructed to switch to another RF carrier. The ABR is instructed to switch to a new channel via the format select (FS) command, not the AQ command. The FS command must be used since it programs the receiver with all of the channel parameters for the new RF carrier needed by the ABR to achieve RF and audio sync on the new RF carrier.

Since the ABR is already locked onto an RF carrier, it has knowledge of the offsets present in the system. It uses this offset value, which is stored in the LO command, in its calculations for the frequency at which it searches for the new RF carrier. The ABR will only search one frequency bin for the new RF carrier. If the RF carrier is not found within this first bin, then the ABR performs a fade acquisition using the frequency where it last achieved RF and audio sync.

A detailed description of the ABR binning and acquisition processes can be found in the chapter on Functional Description and Theory of Operation.

AS Audio Status

Syntax: ***AS ?***

This command queries the receiver for the current audio status. If the audio is enabled, a value of 0 is returned. If the audio is disabled (muted), a nonzero value is returned. The value returned when audio is disabled is a weighted sum of the conditions causing the audio to be disabled. The conditions causing the audio to mute are mapped as shown in Table 5-17.

Table 5.18 Muted Conditions for Audio

Mute Condition	Weight (hex)	Weight (dec)
No RF sync	0x01	1
Low Rb/No	0x02	2
Internal Mute (MU=1)	0x04	4
No audio sync	0x08	8
Not authorized to receive audio	0x10	16
System mute	0x20	32

AT Audio Test

Syntax: ***AT n***
AT ?

Front Panel:

Interfaces > Audio > Test Tone: <Enable, Disable>

The *n* in the syntax above is the number of the audio test to be performed.

The audio test command selects the available audio test that the digital audio signal processor can perform. Valid number values are 0 and 1, as shown in Table 5-18.

Table 5.19 Audio Built-In Self-Tests

Number	Test
0	None, normal operating status
1	1 kHz tone, both channels

When operating these commands from the M&C port, the selected test will run for 2 minutes or until an AT 0 command is entered.

Table 5-19 provides detailed performance specifications for the audio tests.

Table 5.20 Audio Test Performance Specifications

Test	Frequency	Output Level	Termination
AT1	1.00 kHz	+4.00 dBm	100 K ohm
AT1	1.00 kHz	-1.3 dBm	600 ohm
AT1	1.00 kHz	-8.9 dBm	150 ohm

B1 Primary Search (Binning) Range

Syntax: ***B1 ?***

The B1 command is a query-only command that returns the value of the frequency range that will be searched for the primary (B1) bin. The value of this parameter is determined by the symbol rate and is given in units of kHz.

B1 and B2 are used together. When performing fade acquisition, the B1 range is searched first for the carrier signal. If the carrier is not found in the B1 range, the range indicated by the B2 parameter is searched above and below the B1 range. After the search of a B2 range, the B1 range is searched again.

When all B2 ranges have been searched within the user-specified acquisition range limit (B3) without finding the carrier, the search pattern is repeated from the beginning. A detailed description of the ABR acquisition process can be found in the chapter on Functional Description and Theory of Operation.

B2 Secondary Search (Binning) Range

Syntax: ***B2 ?***

The B2 command is a query-only command that returns the value of the frequency range that will be searched upon a fade acquisition for the secondary (B2) bin.

The value of B2 is determined by the symbol rate and is given in units of kHz. It denotes the frequency range to search for the carrier outside the B1 range. If the carrier has not been located when all the B2 ranges are exhausted, the search begins again. A detailed description of the ABR acquisition process can be found in the chapter on Functional Description and Theory of Operation.

B3 Overall Search (Binning) Range

Syntax: ***B3 nnnn***
B3 ?

The B3 command is used to specify the maximum frequency range that will be searched when the ABR is attempting to acquire the carrier in either installation or fade acquisition mode. Valid values are between 0 and 4000 in units of kHz offset from the RF frequency plus the acquisition offset defined by AO. The ? parameter causes the current B3 value to be displayed.

The default values are 3,000 when operating with a DRO LNB and 100 when operating with a PLL LNB.

The *nnnn* parameter denotes the overall frequency range to search for the carrier. When this value is reached, the acquisition search is repeated from the beginning. A detailed description of the ABR acquisition process can be found in the chapter on Functional Description and Theory of Operation.

BY Bye-Logout

Syntax: ***BY***

This command performs a manual logout. The receiver automatically logs out after five minutes of inactivity at the M&C port.

CC Channel Configuration

Syntax: ***CC***
Channel_n,RF_nnnn,RR_nnnn,RM_n,RC_n,RSC_n
CC Channel_n,ZAP
CC Channel_n ?
CC ?

Front Panel ***(See CCD below)***

This command sets or displays the configuration for the specified channel. The channel number is used in defining the required parameters for a particular channel. Access to a given channel is provided via the format definition (FD) command and the format select (FS) commands. A channel configuration and format definition must be successfully defined before the ABR can receive audio. Table 5-20 lists the parameters and a description of each.

Table 5.21 Parameter Descriptions

Parameter	Description
Channel_n	Channel number to be configured. Valid channel numbers are 0 through 31. This value must correspond to the channel identifier (CI) programmed into the encoder/mux at the uplink.
RF_nnnn	• Specifies the RF input frequency to be received by the ODU LNB. The range of valid receive frequencies are: • C-band 3.7 to 4.2 GHz • Ku-band 10.95 to 11.699 GHz, 11.7 to 12.2 GHz, and 12.25 to 12.75 GHz • All values are entered in increments of 1000 Hz (1 kHz). For: • Ku-band: 8 digits for nnnn • C-band: 7 digits for nnnn
RR_nnnn	Specifies the receive symbol rate (symbol/sec). Valid symbol rates are: 64000, 96000, 112000, 128000, 192000, 256000, 384000, 512000.
RM_n	Specifies the receive modulation type: 0 = BPSK, 1 = QPSK
RC_n	Optional field; specifies the inner convolutional coding rate and method. 0 = uncoded; 1 = rate ½ Sequential; 2 = rate ¾ Sequential; 3 = rate 1/2 Viterbi; 4 = rate 2/3 Viterbi; 5 = rate ¾ Viterbi
RSC_n*	Optional field; specifies the outer block code rate; 0 = no block coding; 1 = DVB compliant rate 188/204; 2 = non-DVB mode rate 187/204

* If no RC value is entered, the default value is 1 for rate ½ Sequential. If no RSC_*n* value is entered, then the default value of 0 (uncoded) is used

For example, the following command configures channel 1 for a Ku-band frequency of 11,700,000 kHz, 256000 symbol rate, QPSK operation, sequential rate 1/2 coding, and no Reed-Solomon coding.

CC 1,11700000,256000,1

The ZAP parameter clears the RF, RR, RM, RC, and RSC parameters for the specified channel. If this parameter is used, the channel is no longer defined.

To display the parameters associated with a given channel number, use the syntax CC channel_number ?.

To display the channel configuration of all defined channels, use the syntax CC ?, or just CC. After a master reset of the ABR, there are no values assigned to any of the CC parameters.

CCD Channel Configuration with Data Rate

Syntax: ***CCD***
Channel_n,RF_nnnn,RR_nnnn,RM_n,RC_n,RSC_n
CCD Channel_n,ZAP

CCD Channel_n ?
CCD ?

Front Panel

Format Setup > Channel Config >

CC Number: <enter 0 – 31>
RF: <enter frequency>
Data Rate: 64K, 96K, 112K, 128K, 192K, 256K, 384K, 512K
Modulation: BPSK, QPSK
Code Rate: Uncoded, ½ Sequential, … 3/4 Viterbi
Reed Sol: None, 187/204, 188/204

The CCD command is identical to the CC command with the exception of the RR_*nnnn* parameter. For CCD, the RR_*nnnn* parameter represents the data rate (bits/sec) rather than the symbol rate. This command was added to simplify the use of the new coding rates and methods (i.e., sequential 3/4, Viterbi, and Viterbi Reed-Solomon), which have symbol rates that are difficult to calculate.

CE Channel Error Rate

Syntax: ***CE ?***
CE

This query-only command provides the current calculated channel error rate, coded so that 65 = 6x10-5. The lowest channel error rate displayed is 09 (0x10-9).

CF Clear Fault Register

Syntax: ***CF nn***

This command clears the Fault Register and permits re-reporting of active faults. Once a fault is set and reported, no further occurrences of the fault will be reported until the fault is reset.

Parameter values for *nn* are integers in the range of 0 to 32, inclusive. CF 0 clears all active faults. Other values for *nn* correspond to the bit number of a fault as defined in the fault register. The FL and ST command descriptions contain a complete list of all fault code bit numbers.

CM Relay Contact Mapping

Syntax: ***CM channel_n,r1,r2,r3,r4,r5,r6,r7,r8***
CM channel_n ?

Front Panel:

Format Setup > Relay Mapping >

CM Number: <enter 0 – 15>
Relay1 Map: <enter 1 – 8>
Relay2 Map: <enter 1 – 8>
Relay3 Map: <enter 1 – 8>
Relay4 Map: <enter 1 – 8>
Relay5 Map: <enter 1 – 8>
Relay6 Map: <enter 1 – 8>
Relay7 Map: <enter 1 – 8>
Relay8 Map: <enter 1 – 8>

This command allows the receiver to be configured to provide a mapping of relay contacts at the uplink to relay contacts at the receiver. A contact map is maintained for each channel number and is recalled whenever channel changes are made via the FS command. Values for the channel number range from 0 to 15, inclusive.

Parameters *r1* through *r8* correspond to the eight receiver relays. *r1* corresponds to receiver relay 1 mapping, *r8* corresponds to receiver relay 8 mapping. The value of *r1* through *r8* represents the relay input at the uplink that is

physically assigned to operate the designated receiver relay. Acceptable values for *r1* through *r8* are 1 to 16, where 1 is the first uplink relay input and 16 the most significant relay input. The default mapping for CM is 1,2,3,4,5,6,7,8 for all formats.

Example:

CM 3,3,2,1,4,5,6,10,7 will perform the relay mapping shown in Table 5-21 when channel 3 is selected via the FS command.

Table 5.22 Example Relay Mapping

Uplink Relay Input	Receiver Relay
3	1
2	2
1	3
4	4
5	5
6	6
10	7
7	8

CO Relay Contact Control

Syntax: ***CO string***
CO ?

This command allows the receiver relays to be temporarily activated/ deactivated for test purposes. The string in the command line is an 8-byte character string that controls the state of each relay. The first character controls relay number 1, the second controls relay number 2, and so on. Valid characters in the string are shown in Table 5-22.

Table 5.23 Valid String Characters and Descriptions

Character	Description
0	Deactivates a relay
1	Activates a relay
X	Relay action based on uplink relay input

The default setting is CO XXXXXXXX.

For example, the following command activates relay contacts 1, 4, and 5 while not changing the other contacts.

CO 1XX11XXX

Ensure that settings are returned to X so relay closures are controlled from the uplink. If this does not occur, the relay closures will remain in the state specified by the CO command.

CQ Relay Contact Query

Syntax: ***CQ ?***

This command queries the receiver for the physical state of the relay contact closures. The value returned is an eight-character value, each character representing the status of an individual relay. A 0 for a relay indicates the relay is open, a 1 indicates the relay is closed. The first character corresponds to receiver relay contact 1, the last character corresponds to relay 8.

CS Relay Contact Sense

Syntax: ***CS string***
CS ?

Front Panel:

Interfaces > Relays >

Relay Number: <enter 1 – 8>
Sense: <Normally Open, Normally Closed>

This command controls the normal (deactivated) position for the control relays. The string is a character string, with each character position controlling the normal state of a single relay. The first character position controls relay 1, the last character controls relay 8. An individual 1 character indicates the relay is normally closed and that the relay is activated by opening it. An individual 0 indicates the relay is normally open and that the relay is activated by closing it.

The default value for CS is 00000000 (all normally open).

DATE Date

Syntax: ***DATE month_nn,date_nn,year_nnnn***
DATE ?

Front Panel:

Management > General >

Date: <enter month_nn.date_nn.year_nnn>

This command allows the user to enter the current date of the real time clock. The valid range for month_nn is 1 to 12. The valid range of *date_nn* is 1 to 31. The valid range of year_nnnn is 2000 to 2199.

DC Display Configuration of Receiver

Syntax: ***DC ?***
DC

This command displays a summary output of the present control software and symbol rate configuration of the receiver as follows:

Tiernan Digital Audio Broadcast Receiver ABR

Software Version: X.XXX
Variable Rate: 64, 96, 112, 128, 192, 256, 384 kbps

The DC command is valid in ASCII-mode only.

DM Display Message

Syntax: ***DM Pn,string***

This command provides a means of sending an ASCII character string to the designated output port. Valid range for port number *n* is P1 (user data port), P2 (M&C port), or P3 (printer data port). The string terminates with a carriage return, which executes the command and is not part of the string. A vertical bar character (|) can be used to force the output of a carriage return to the port.

DP Display Parameters of Receiver

Syntax: ***DP ?***
DP

This command requests a summary output of all command parameters that are single valued. Commands that have multiple parameter sets, such as FD (format definition) and CM (relay contact mapping), are not displayed. DP requires no parameter and is equivalent to issuing a query for every available command.

The DP command is valid in ASCII-mode only.

DQ Data Rate Query

Syntax: ***DQ ?***

This command queries the receiver for the current channel data rate. The value returned is the data rate in bits per second.

DX Decoder Data Source

Syntax: ***DX n***
DX ?

Front Panel:

Interfaces > Audio >

Input: <AUX, Demod/AUX,Demod>

This command selects the input source for the audio decoder on the ABR. A value of 0 for *n* instructs the receiver to use the output of the L-band demodulator as the input to the audio decoder. 1 or 2 instructs the receiver to use the external data input on the auxiliary port (pins 3, 7, 10, 14) as the input to the audio decoder.

The interface operates at RS-422 electrical levels and requires the data to be valid on the falling edge of the clock. When DX is set to 1, it will be overridden during carrier acquisition to ensure that the input to the audio decoder is from the L-band demodulator. This allows the receiver to monitor the incoming composite data stream for the proper network/channel ID needed to achieve RF and audio sync.

Once RF and audio sync have been achieved, the DX command returns to the state it was in prior to the start of carrier acquisition. If DX is set to 2, the receiver disables all carrier acquisition processes and will not switch the input to the audio decoder from the auxiliary port under any circumstance.

Refer to Figure 2-7 for a graphic illustration of this command.

EB Eb/No Signal Level Query

Syntax: ***EB ?***
EB

Front Panel:

Interfaces > Demod Status >

Eb/No: 0.0 – 21.0

This command queries the receiver for the present energy per bit with respect to noise (Eb/No) in a 1 Hz bandwidth on the channel.

An estimate of the Eb/No is returned in the range of 3 dB to 20 dB. The Eb/No value is in 0.1 dB steps with an accuracy of ±0.5 dB in the range between 4.0 and 10 dB. This value is valid approximately 20 seconds after ABR acquisition and is updated every five seconds.

The maximum Eb/No value for all Viterbi rates is 11.5 dB.

The Eb/No value can be used to initiate several receiver functions, such as muting audio (see M0 and M1 commands), activating the Eb/No threshold (ET) alarm, and setting the condition of the front panel signal indicator (Q0 and Q1).

EE Echo Terminal Input

Syntax: ***EE n***
EE ?

Front Panel:

Management > Console Port >

Echo: <On,Off>

This command specifies whether characters input to the M&C port on the ABR are echoed at the M&C port output. Echoing sends back each character received so that it appears on the display of the M&C port CRT terminal. A value of 0 disables the echo. A value of 1, which is the default, enables the echo.

EM Eb/No Minimum Receive Level

Syntax: ***EM 0***
EM ?

Front Panel:

Interfaces > Demod Status >

Min Eb/No: 0.0 – 21.0

This command queries the receiver for the minimum Eb/No value that was measured since the last time the minimum value was reset.

EM 0 resets the minimum value of Eb/No to the highest possible Eb/No value. The minimum value is not affected if the receiver loses lock. The default is 20.

EN Enable Network Data

Syntax: ***EN n***
EN ?

The EN command is used to select the type of data to be output on the auxiliary data pins of the printer data port (pins 2 and 3).

A value of 0 disables the output of network ID data. The default value for EN is 0. A value of 1 for *n* enables the output of the network ID information.

The network ID information is generated at the uplink multiplexer and contains network ID, channel ID, and relay control information. This network ID information is used to support an external relay control unit (RCU). The RCU-16 provides up to 16 relay contact closures. The output of the network data is also conditioned on the unit authorization (UA command) of the receiver as specified in the FD command. If the receiver is not authorized to receive relay information, the network ID data output is disabled regardless of the state of the EN command.

A value of 2 for *n* instructs the receiver to output the user data on the printer port pins instead of the user data port pins, which provides the user the option of using the printer data port for the user data output.

A value of 3 for *n* enables the output of the user-defined data block. This user-defined data block is a generic block type that is made available to the user for user-specific needs. This data block is generated by the user and is input at the uplink multiplexer by a user-supplied DTE. This data block must follow the Tiernan ComStream Block Transfer Protocol. The receiver outputs the entire data block to a user-supplied DTE at the remote site.

ET Eb/No Alarm Threshold Level

Syntax: ***ET n.m***
ET ?

Front Panel:

Events > Alarm Settings >

Low Eb/No: <enter 0.0 – 20.9>

This command configures the receiver for a minimum Eb/No threshold. An Eb/No threshold error is generated whenever the value of Eb/No is strictly less than the ET value. The format for the number is *n.m*, where $0 < n \leq 20$ and $0 \leq m \leq 9$. The default value is 3.5.

EX Maximum Eb/No

Syntax: ***EX 0***
EX ?

Front Panel:

Interfaces > Demod Status >

Max Eb/No: 0.0 – 21.0

This command queries the receiver for the maximum Eb/No value recorded since the last maximum value was reset. The format of the command is EX 0, which resets the maximum value of Eb/No to the lowest possible Eb/No value.

F1 Fault Mask 1

Syntax: ***F1 nnn***
F1 ?

The F1 command specifies the faults that will trigger a backlink attempt to the user-defined number specified in T1.

The value of *nnn* is a decimal number that represents the bit map of the faults to be monitored by the terrestrial backlink (TB).

For example:

To select faults 6, 7, and 8, the user enters 224 (32 + 64 + 128 = 224) as the value for *n.*

(For a listing of the fault monitors and their decimal weightings, refer to the fault query [FL] command in this chapter.)

The ABR compares the faults specified in this command with the value of the receiver's current fault history (FL command). If any of the faults specified in F1 are also a member of the receiver's fault history, a backlink is attempted using the number specified in T1. The default value for this command is 0.

F2 Fault Mask 2

Syntax: ***F2 nnn***
F2 ?

The fault mask 2 command specifies the faults that will trigger a backlink attempt to the user-defined number specified in T2.

The value of *nnn* is a decimal number that represents the bit map of the faults to be monitored by the terrestrial backlink.

For example:

To select faults 6, 7, and 8, the user enters 224 (32 + 64 + 128 = 224) as the value for *n.*

(For a listing of the fault monitors and their decimal weightings, refer to the fault query [FL] command in this chapter.)

The ABR compares the faults specified in this command with the value of the receiver's current fault history (FL command). If any of the faults specified in F2 are also a member of the receiver's fault history, a backlink is attempted using the number specified in T2. The default value for this command is 0.

FD Format Definition

Syntax: ***FD format_nn,network_ID_nnn,channel_nn,unit_ authorization_n,LR_value,MU_value***
FD format_nn,ZAP
FD format_nn ?
FD format_nn
FD ?
FD

Front Panel:
FD Number: <enter 0 – 63>
Network ID: <enter 0 – 255>
Channel: <enter 0 – 31>
Audio: Enable, Disable
User Data: Enable, Disable
Relays: Enable, Disable
Left/Right: Normal, Reversed, Left on Both, Right on Both
Output: Stereo, Left Only, Right Only, Muted

This command configures the specified format number for a particular network, RF channel, and unit authorization value. Valid values for format numbers are 0 to 63. Valid network values are 0 to 255.

Note that the network ID and channel ID within the format definition must match the configuration of the uplink audio encoder. Channel_*nn* corresponds to the channel number as defined by the CC command. The valid range is 0 to 31.

The unit authorization (UA) selects what services are output from the receiver: audio, data, and relay contact closures. The authorization bit map is shown in Table 5-23, and the UA value and active ports are shown in Table 5-24.

Table 5.24 Authorization Bit Map

Bit Position	Authorization
Bit 0	0-audio disable, 1-audio enable
Bit 1	0-user data disable, 1-user data enable
Bit 2	0-relay port disable, 1-relay port enable

Table 5.25 UA Value and Active Ports

UA	Active Ports
0	None
1	Audio only
2	User data only
3	Audio and user data
4	Relay port only
5	Audio and relay port
6	Data and relay port
7	Audio, data, and relay port

Example:

To define format 6 to be assigned to network 1, RF channel 3, with authorization to receive audio and relay closures (UA Value 5 of Table 5-22) the following parameters are used:

```
FD 6,1,3,5
```

The left/right channel toggle (LR) and audio mute (MU) values are optional values. If no values are entered for these parameters when entering the FD command, then the LR (left/right toggle command) and MU (mute command) values are not modified when this format is selected via the FS command. If these values are entered, then the LR and MU values are modified when this format is selected using the FS command. Refer to the LR and MU command sections in this chapter for acceptable values or more information.

To display all active format definitions, use the FD command followed by a carriage return. To delete a format definition, the parameter value ZAP is used. Once a format is defined, the configuration is made operational via the format select (FS) command. The RF channel that is used, along with the associated receiver parameters, are specified by the channel number within the format definition. The default value is not defined.

FL Fault Query

Syntax: ***FL ?***
FL
FL 0

This command queries the receiver for the fault history of the receiver. Fault codes (numbers) and response values are retained in a fault register until the faults are cleared using the CF command. Each bit and associated fault weight are assigned to a particular fault indication. The fault/status map is shown in Table 5-23. The bits in the fault register are identical to those in the status register. (For more information, refer to the ST command section in this chapter.) If the hex mode (HM) is enabled (1), then the output is displayed in the hexadecimal format given in Table 5-23, with all bits displayed that are set.

If the hex mode is disabled (default), then the output value is the decimal summation of all set fault bits.

For example, if faults 17 and 18 are active, the returned value for the FL ? command is 196608 (decimal) or 0x00030000 (hex).

If the command format FL 0 is used, then each fault number is displayed, one per display line. Thus, for the above example, an FL 0 results in:

```
FL 17
FL 18
```

A detailed description of what each fault means is provided in the chapter on Maintenance and Troubleshooting.

Table 5.26 Fault Summary

Fault Number	Fault Description	Hex Weight	Decimal Weight
1	Not used	0x00000001	1
2	Not used	0x00000002	2
3	Not used	0x00000004	4
4	Not used	0x00000008	8
5	AGC Range Fault	0x00000010	16
6	Bit Time Lock Fault	0x00000020	32
7	Carrier Tracking Lock Fault	0x00000040	64
8	FEC Decoder Sync Fault	0x00000080	128
9	Acquisition Range Fault	0x00000100	256
10	Carrier Tracking Range Fault	0x00000200	512
11	Not used	0x00000400	1024
12	Bit Time Range Fault	0x00000800	2048
13	Nonvolatile Memory Fault	0x00001000	4096
14	Not used	0x00002000	8192
15	Not used	0x00004000	16384
16	Watchdog Timer Fault	0x00008000	32768
17	Audio PLL Lock Fault	0x00010000	65536
18	Audio Decoder Sync Fault	0x00020000	131072
19	DSP Watchdog Fault	0x00040000	262144
20	DSP Bit Failure	0x00080000	524288
21	Sensor Input 4-External Alarm Monitoring	0x00100000	1048576
22	Sensor Input 5-External Alarm Monitoring	0x00200000	2097152
23	Sensor Input 6-External Alarm Monitoring	0x00400000	4194304
24	Outdoor Unit Fault	0x00800000	8388608
25	Eb/No Threshold Fault	0x01000000	16777216
26	Not used	0x02000000	33554432
27	EPROM Checksum Fault	0x04000000	67108864
28	S/W Download Failure	0x08000000	134217728
29	Channel Change Fault	0x10000000	268435456
30	Network ID Timeout Fault	0x20000000	536870912

Fault Number	Fault Description	Hex Weight	Decimal Weight
31	Acquisition Network ID Fault	0x40000000	1073741824

FP CODE Front Panel Password

Syntax: ***FP CODE password_nnnn***
FP CODE

This command configures the password to allow the front panel to enter Advanced Mode while it is in Basic Mode. The valid values for *password_nnnn* are 1000 to 9999. The default value for *password_nnnn is 7384.*

FS Format Select

Syntax: ***FS format_nn***
FS ?

Front Panel:

Format Select

Select: <enter 0 - 63>

This command configures the receiver to the parameters specified in the format definition that corresponds to the format number. Valid values for format numbers are 0 to 63. An FS ? returns the format in operation.

For example, assume the current format is 1. An FS command would return FS 1. To change to format 2, enter FS 2. The default value is not defined. Different authorizations can be created using the same channel number and switch between the authorizations without the momentary interruption of audio.

FM Event Manager

Syntax: ***FM CURRENT***
FM HISTORY
FM CLEAR

Front Panel:

Events >

Current Events

Event History

Clear History

This command monitors and controls recorded events by the receiver. The *CURRENT* parameter displays events that are currently active. The *HISTORY* parameter displays events that have occurred in the past and have been logged. The *CLEAR* parameter will erase the events from the logged events.

HM Hex Mode

Syntax: ***HM n***
HM ?
HM

This command assigns the display format for the ST and FL commands to be decimal or hexadecimal. Valid values for *n* are 0, hex mode disabled (display decimal format), or 1, hex mode enabled. A query displays the current format.

ID Receiver ID Query

Syntax: ***ID ?***

Front Panel:

Management > General >

Unit ID: ID#

This command displays the ABR ID serial number, which is used for individual unit addressing. The number should be identical to the unit serial number as displayed on the label at the rear of the chassis.

IP IP Address

Syntax: ***IP address_nnn.nnn.nnn.nnn,mask_nnn.nnn.nnn.nnn,gateway_nnn.nnn.nnn.nnn***
IP ?
IP

Front Panel:

Management > Ethernet Port >

IP Address: <enter 1.0.0.0 – 223.255.255.255>

Subnet Mask: <enter 0.0.0.0 – 255.255.255.255>

Gateway Address: <enter 1.0.0.0 – 223.255.255.255>

This command defines the IP address, subnet mask and default gateway of the receiver. The parameters are required for any IP-based applications such as Telnet. The valid range for *address_nnn.nnn.nnn.nnn* and *gateway_nnn.nnn.nnn.nnn* is 0.0.0.0 to 223.255.255.255 with the exception of 127.0.0.0 to 127.255.255.255. The valid range of *mask_nnn.nnn.nnn.nnn* is 0.0.0.0 to 255.255.255.255.

Note that an IP Address of 0.0.0.0 disables the Ethernet port.

LA Logical Address Definition

Syntax: ***LA nn,address_nnnnn***
LA ?
LA

This command allows the receiver to respond to logical addresses received over the network control channel. Up to 32 logical addresses can be assigned to each receiver. The valid range for address_*nnnnn* is 1 to 16383. An individual 0 for the address clears the logical address assignment. The receiver responds to all logical addresses assigned and its unique physical address (unit ID).

The default value is No Logical Addresses Assigned.

Example:

The following command configures logical address 3 to 9312. The remote receiver will then act upon network control messages addressed to unit 9312.

```
LA 3,9312
```

LC Local Format Change Permission

Syntax: ***LC n***
LC ?

This command allows the receiver channel to be configured via the three external TTL inputs and works in conjunction with the preset definition (PD) command.

A value of 1 enables the receiver to enact format changes via the external TTL inputs. A 0 disables this feature. The default value is 0.

LO Local Oscillator Offset

Syntax: ***LO ?***
LO

Front Panel:

Interfaces >Demod Status >

Receive Offset: LO value

The LO value represents the difference between the start acquisition frequency and the frequency where the carrier was actually located. The LO value represents the sum of the offsets that are present at the receive site. These offsets include the offset present in the LO of the LNB and the LO of the receiver. With a knowledge of the actual offsets present at the receive site, the ABR can optimize its acquisition process. When performing a channel change acquisition, the receiver uses the offset specified in the LO value to calculate the frequency at which it will start its search for the new RF carrier.

LR Left/Right Channel Toggle

Syntax: ***LR n***
LR ?

Front Panel:

Interfaces > Audio >

Left/Right: <Normal,Right on Both,Left on Both, Reversed>

The LR command configures the receiver so that the receiver directs the:

- Incoming left audio channel to both the left and right audio output channels

  or

- Incoming right audio channel to both the left and right audio output channels

The value for *n* determines the output of the left and right audio channels. The default value for LR is 0. Table 5-26 provides the valid values for *n.*

Table 5.27 Valid Values for the LR Command

n	Audio Output Status
0	Normal output. Left input goes out on the left channel, and the right input goes out on the right channel.
1	Reversed output. Left input goes out on the right channel, and the right input goes out on the left channel.
2	Left input goes out on both the right and left channels.
3	Right input goes out on both the left and right channels.

LT LNB Type

Syntax: ***LT n***
LT ?

Front Panel:

Interfaces > Demod Control >

LNB Type: <Auto,DRO,PLL>

The LNB-type command allows the user to select a mode in which the receiver automatically selects the LNB type.

The selection of the proper LNB type modifies receiver parameters that are needed to perform carrier tracking properly. The two types of LNBs that are used at the remote site system are DRO and PLL. A value of 0 for *n*

configures the receiver for a DRO-type LNB, whereas a value of 1 for *n* configures the receiver for a PLL-type LNB.

A value of 2 for *n* instructs the receiver to automatically select the type of LNB. The receiver uses the current modulation type, as specified in the CC command, to determine for which LNB type to configure. If the current modulation type is BPSK, the receiver configures for a DRO-type LNB, whereas if the modulation type is QPSK, the receiver configures for a PLL-type LNB. The receiver automatically selects the LNB type prior to every RF acquisition attempted.

LV LNB Voltage

Syntax: ***LV n***
LV ?

Front Panel:

Interfaces > Demod Control >

LNB Voltage: <Off,13V,14V,18V,19V>

The LNB Voltage can be disabled or adjusted to +13VDC, +14VDC, +18VDC, +19VDC. Most LNBs require +18VDC although some only require +13VDC. If a cable run is extremely long, it may be necessary to provide an additional volt to compensate for the voltage loss.

A value of 0 for *n* disables the LNB voltage output. A value of 1 for *n* outputs an LNB voltage of +13V. A value of 2 for *n* outputs an LNB voltage of +14V. A value of 3 for *n* outputs an LNB voltage of +18V. A value of 4 for *n* outputs an LNB voltage of +19V.

The default value for LV is 0.

M0 Eb/No Mute On

Syntax: ***M0 n.n***
M0 ?

Front Panel:

Interfaces > Audio >

Mute Eb/No: <enter 0.1 – M1>

This command mutes the output audio based on the received signal strength (Eb/No) and is used in conjunction with M1, which enables the output audio. The audio is muted when the Eb/No value is at or below the specified Eb/No value.

The default value for M0 is 4.0. Valid range is 0.1 to < M1 value.

M1 Eb/No Mute Off

Syntax: ***M1 n.n***
M1 ?

Front Panel:

Interfaces > Audio >

Unmute Eb/No: <enter M0 – 20.0>

This command allows for unmuting the output audio based on the received signal strength, Eb/No. It is used in conjunction with the M0, which mutes the output audio. The audio is unmuted when the Eb/No value is at or above the specified Eb/No value. The default value for M1 is 4.5. Valid range is > M0 to 20.0.

MR Master Reset

Syntax: ***MR n***
MR ?

The value of *n* determines the type of reinitialization that will occur. A value of 0 reinitializes the receiver for a DRO LNB, whereas a value of 1 instructs the receiver to reinitialize for a PLL LNB. As a safety feature, two identical MR commands must be issued within 10 seconds of each other before the receiver begins to reinitialize its parameters.

This command initializes all ABR parameters to factory default settings. All user-specific configuration information (i.e., FD, CC) are lost. For the receiver to achieve RF and audio sync, this user-specific information must be re-entered.

MU Audio Mute

Syntax: ***MU n***
MU ?

The audio mute command now includes independent muting (disabling) of left and right audio channels.

The value for *n* determines the mute condition of the receiver. The default value for MU is 0. Valid values for *n* are listed in Table 5-27.

Table 5.28 Valid Values for the MU Command

n	Mute Condition
0	Both the left and right channels are enabled
1	Both the left and right channels are muted
2	The left channel is muted
3	The right channel is muted

NF Number of RF Signal Fades

Syntax: ***NF ?***
NF
NF 0

This command displays the number of RF signal fades since the counter was last cleared. Channel changes do not increment this counter. NF 0 resets the counter.

NS Network Status

Syntax: ***NS ?***
NS

This command displays the current network parameters received over the control channel. The network ID number, the channel ID number, and the relay contact closure status are displayed.

OM ODU Fault Mask

Syntax: ***OM n***
OM ?
OM

This command controls the indication of an ODU Fault. A 1 enables the ODU Fault indicator; 0 disables the ODU Fault indicator; the default value is 1. This command is typically used (i.e., OM 0) when the RF input is connected to a test translator or similar equipment in which the ABR +18 V output is not used. This configuration normally causes an ODU fault indicated in ST and FL registers since no current is drawn by the RF output of the first ABR.

P1 User Data Port Configuration

Syntax: ***P1 baud,parity,data bits,stop bits***
P1 ?
P1

Front Panel:

Interfaces > User Data >

Baud Rate: <0,300,1200,2400,4800,9600>

Data Bits: <7,8>

Parity: <Odd,None,Even>

Stop Bits: <1,2>

This command configures the user data port for the specified operating parameters. Valid values for these parameters are shown in Table 5-28.

Table 5.29 Valid Parameter Values for the P1 Command

Parameter	Valid Values
Baud	0,300,1200,2400,4800,9600
Parity	O (odd), N (none), or E (even)
Data bits	7 or 8
Stop bits	1 or 2

A 0 for the baud rate parameter disables the user data port independent of the unit authorization. The default value is 2400,O,7,1.

P2 M&C Port Configuration

Syntax: ***P2 baud,parity,data bits,stop bits***
P2 ?

Front Panel:

Management > Console Port >

Baud Rate: <0,300,1200,2400,4800,9600,19200,38400,57600,115200>

Data Bits: <7,8>

Parity: <Odd,None,Even>

Stop Bits: <1,2>

This command configures the diagnostic port for the specified parameters. Valid values for these parameters are shown in Table 5-29.

Table 5.30 Valid Parameter Values for the P2 Command

Parameter	Valid Values
Baud	0,300,1200,2400,4800,9600,19200,38400,57600,115200
Parity	O (odd), N (none), or E (even)
Data bits	7 or 8
Stop bits	1 or 2

The default value is 2400,O,7,1.

This setting affects both RS-232 and RS-485 drivers and receivers.

P3 Printer Port Configuration

Syntax: ***P3 baud,parity,data bits,stop bits***
P3 ?

Interfaces > Printer Port >

Baud Rate: <0,300,1200,2400,4800,9600>

Data Bits: <7,8>

Parity: <Odd,None,Even>

Stop Bits: <1,2>

This command configures the printer data port for the specified parameters. This function is implemented on the user data port. For information on the pinouts used, refer to the appendix on Interface Pinouts. Valid values for the P3 parameters are shown in Table 5-30.

Table 5.31 Valid Parameter Values for the P3 Command

Parameter	Valid Values
Baud	0,300,1200,2400,4800,9600
Parity	O (odd), N (none), or E (even)
Data bits	7 or 8
Stop bits	1 or 2

The default value is 2400,O,7,1.

This setting affects both RS-232 and RS-422 drivers and receivers.

PA Packet Address

Syntax: ***PA n***
PA ?

Front Panel:

Management > Console Port >

Packet Address: <enter 1 - 31>

This command is used to set the packet address of the receiver. The packet address is the external device address to which the receiver responds when attached to an RS-485 multidrop bus. Using a terminal program that supports Tiernan/ComStream packet protocol, each receiver on the bus can receive commands that are specifically addressed to that receiver, addressed to a group of receivers (of which the receiver is a member), or addressed to all receivers.

Valid values for *n* are 1 to 31 and the default value is 31.

PC Password Change

Syntax: ***PC current password,new password,new password***

This command allows the user to change the password of the receiver. A password must be between five and 10 alphanumeric characters.

Example:

To change the default password HOMEYD to the new password ABC123, enter the following:

```
PC HOMEYD, ABC123, ABC123
```

Do not forget that changes made to the password, upon logoff or power cycle, require the entry of the password to access any other user commands.

PD Preset Definition

Syntax: ***PD preset_n,format_n***
PD preset_n ?
PD

Front Panel:

Format Setup > Presets >

Number: <enter 0 – 7>

Selects: <enter 0 - 63>

This command allows the receiver to be configured for eight format presets. The presets are used in conjunction with the receiver's external status inputs in selecting formats. The LC command enables or disables the ability of the receiver to change formats via presets.

The valid range for preset_*n* is 0 to 7, and the valid range for format_*n* is 0 to 63. By using the external TTL inputs, the user can select the desired preset. SI3 through SI1 (pins 11, 10, 9 relay control port) have internal 4.7 K pull-up resistors. A dry closure to ground (pin 25) creates a logical address of 0, and a 1 represents an open circuit (no connection).

The TTL input mappings to particular preset settings are shown in Table 5-31.

Table 5.32 TTL Input Mapping

TTL Inputs			Preset Number
SI3	SI2	SI1	
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

PO Packet-Only

Syntax: ***PO n***
PO ?

Front Panel:

Management > Console Port >

Packet Mode: <Auto Detect,RS-485 Only>

The packet-only command is used to place the receiver in a mode so that the receiver will only accept commands from the M&C port that are formatted in the Tiernan/ComStream packet protocol format. Tiernan/ComStream packet protocol contains addressing information that allows the ABR to be placed on a 485 multidrop bus. When on a multidrop bus, it is recommended that the receiver be placed in packet-only mode to eliminate the possibility of the receiver responding to a command that was not addressed to it.

A value of 1 for *n* directs the receiver to accept packet commands. A value of 0 for *n* instructs the receiver to accept packet, as well as nonpacket, formatted commands. The default is 0.

CAUTION!!

Once the receiver is set to Packet Only mode (PO = 1) all further communication (including commands to exit packet mode) must be in Tiernan/ComStream Packet Protocol. Attempts to communicate in standard ASCII text will be ignored.

To escape from inadvertent entry into Packet Only mode, refer to the M&C port reset procedure in the chapter on System Installation and Startup.

Q0 Low Signal Quality Threshold Level

Syntax: ***Q0 n.n***

Q0 ?

Q0

Front Panel:

Events > Alarm Settings >

Low Signal: <enter 0.0 – Q1>

This command sets or reads the lower limit signal strength threshold. The receiver uses the values set in Q0 and Q1 to report the current status of the signal strength via the front panel Signal indicator. The receiver compares the present value of the measured Eb/N0 with the user values of Q0 and Q1. The receiver displays the signal strength via the front panel Signal indicator, as shown in Table 5-32.

Table 5.33 Signal Strength and Sync LED Indication

Signal Strength	Sync LED Indication
Eb > Q1	On
Q0 < Eb < Q1	Blinking
Eb < Q0	Off

The default value for Q0 is 4.0 dB.

Q1 High Signal Quality Threshold Level

Syntax: ***Q1 n.n***

Q1 ?

Q1

Front Panel:

Events > Alarm Settings >

High Signal: <enter Q0 – 21.0>

This command sets or reads the upper limit signal strength threshold. The receiver uses the values set in Q0 and Q1 to report the current status of the signal strength via the front panel Signal indicator.

The default value for Q1 is 7.0 dB.

RB Read Calculated Bit Error Rate

Syntax: ***RB ?***

RB

This query displays the decoder estimated output bit error rate in the format *n.n* which represents the estimated bit error rate in scientific notation. The first number represents the integer portion of the rate. The second number represents the negative of the exponent (i.e., 26 represents 2 x 10-6, or 0.000002).

RE System Reset

Syntax: ***RE***

Front Panel:

Management > General >

Reset System?: <Yes,No>

The RE command resets the unit to a known state as defined by the stored parameters in nonvolatile memory. This command does not reset the unit to the factory default settings.

RF Read RF Value

Syntax: ***RF ?***
RF

The RF command queries the C- or Ku-band frequency to be received at the input of the ODU LNB. The range of downlink frequencies received by the ABR are 3.7 to 4.2 GHz, 10.95 to 11.699 GHz, 11.7 to 12.2 GHz, and 12.25 to 12.75 GHz. The RF frequency is set via the CC command and selected via the FS command.

SI TTL Sensor Input Query

Syntax: ***SI ?***

This command queries the receiver for the status of the seven TTL inputs. The reported value is a seven-character string, each character representing the status of an input line. The first character corresponds to the TTL input #1, the last character corresponds to TTL input #7.

SL Audio Sync Loss Count

Syntax: ***SL 0***
SL ?

This command allows the receiver to maintain a record of the number of audio sync losses since the last time the value was reset. The sync loss count will not exceed 65535. SL 0 resets the sync loss value.

SR Status Relay Mask

Syntax: ***SR nnnn***
SR ?
SR

This command sets or reads the status relay mask. The value *nnnn* is a decimal number that represents the bit map of the faults to be monitored by the status relay. For example, to set faults 6, 7, and 8, you would input 224 (32+64+128) as the value of *nnnn*. (For a listing of fault monitors and their decimal weighting, refer to the FL command.)

The default value is 4286578687, which enables all faults but FL 24 (ODU fault) to activate the relay and front panel IDU Fault indicator.

SS Status Relay Sense

Syntax: ***SS n***
SS ?

This command configures the remote status relay sense. A value of 0 for *n* configures the relay as true sense (i.e., when there is no alarm, the relay is active). A value of 1 configures the relay to be inverted when there is no alarm condition.

Table 5-33 shows the status relay contact states for the individual conditions.

Table 5.34 Condition and Status Relay Contacts

Condition	Normally Open Pin 2 Status Relay Contacts	
	(SS=0)	(SS=1)
Power Off	Open	Open
Alarm	Open	Closed
Normal	Closed	Open
Condition	Normally Open Pin 1 Status Relay Contacts	
	(SS=0)	(SS=1)

Power Off	Closed	Closed
Alarm	Closed	Open
Normal	Open	Closed

The default value is 0 (true sense).

ST Status Query

Syntax: ***ST ?***
ST

This command causes the receiver to display the current content of the status register. The FL ? command gives the faults that have occurred since the last time the fault register was cleared. The ST ? command gives the current condition of those fault monitors. Bits in the status register are defined exactly as the fault register. The ST command will display a decimal or hexadecimal encoded value of the bits in the status register depending on the HM command value.

T1 Backlink Telephone Number 1

Syntax: ***T1 string***
T1 ?

The T1 command specifies the telephone number the receiver uses in a backlink attempt initiated by a fault that is a member of fault mask 1 (F1 command).

String is a character string that contains the telephone number and any subcommands for the ComStream-approved, Hayes-compatible telephone modem (TPN 30-0120-194). When initiating a backlink, the receiver sends ATD followed immediately by the string entered by the user. The following is a list of valid characters that can be entered:

0 to 9
A to Z
* (asterisk)
# (number/pound symbol)
@ (at symbol)
! (exclamation mark)
; (semicolon)
, (comma)

The following is an example of the T1 command:

```
T1 9,5553333
```

T2 Backlink Telephone Number 2

Syntax: ***T2 string***
T2 ?

The T2 command specifies the telephone number the receiver uses in a backlink attempt initiated by a fault that is a member of fault mask 2 (F2 command).

String is a character string that contains the telephone number and any subcommands for the ComStream-approved, Hayes-compatible telephone modem (TPN 30-0120-194). When initiating a backlink, the receiver sends ATD followed immediately by the string entered by the user. The following is a list of valid characters that can be entered:

0 to 9
A to Z
* (asterisk)
# (number/pound symbol)
@ (at symbol)

! (exclamation mark)
; (semicolon)
, (comma)

TB Terrestrial Backlink

Syntax: ***TB n***
TB ?

The TB command allows the user to manually initiate a terrestrial backlink or terminate a backlink that is in progress. A value of 1 for *n* instructs the receiver to establish a link using the telephone number defined by the T1 command. Likewise, a value of 2 for *n* instructs the receiver to establish a backlink using the phone number defined by the T2 command. A value of 0 for *n* instructs the receiver to terminate any active backlinks.

TI Telco Initialization

Syntax: ***TI string***
TB ?

This command allows the user to enter a specific initialization string for the telco modem. This string is sent to the telco modem prior to every backlink attempt. When a backlink is attempted, the ABR sends a basic initialization string followed immediately by the user-defined initialization string. The following sequence of strings is sent prior to every backlink attempt:

```
AT&D3&C1S0=1E0Q0V1&Y0
AT user-defined string
```

The user-defined string can be a maximum of 40 characters. The valid characters that can be sent are:

0 to 9
A to Z
&
=

The default string for TI is &Q5W0&R1&Y0.

TIME Time

Syntax: ***TIME hour_nn,minutes_nn,seconds_nn***
TIME ?

Front Panel:

Management > General >

Time: <enter hour_nn.minutes_nn.seconds_nn>

This command allows the user to enter the current time of the real time clock. The clock uses 24-hour time format. The valid range for *hour_nn* is 1 to 23. The valid range for *minutes_nn* is 1 to 59. The valid range for *seconds_nn* is 1 to 59.

VC Volume Control

Syntax: ***VC n***
VC ?

Front Panel:

Interfaces > Audio >

Volume: <enter 0 – 18>

The Volume Control command allows the user to vary the analog output gain. The audio output on the ABR has been optimized to source a 600 ohm load when set to VC 18. This optimization ensures that the full dynamic range of the ABR is available to the end user along with unity gain.

Table 5-34 lists the allowable VC values and the corresponding gain assuming a 100K ohm load. When selecting a value other than the maximum value for the audio output a slight degradation in dynamic range occurs. The table provides a sample of the dynamic range values. The default value for VC is 9, which corresponds to unity gain for a 100K ohm load.

Table 5.35 Volume Control

n Value	DB in relation to unity gain at 100K ohm load	Notes
18	+8.5	Unity gain with 600 ohm load
17	+7.5	
16	+6.5	
15	+5.6	
14	+4.5	
13	+3.5	
12	+2.5	
11	+1.5	
10	+0.5	
9	+0.0	Unity gain with 100K ohm load
8	-0.8	
7	-1.6	
6	-2.5	
5	-3.5	
4	-5.0	
3	-6.5	
2	-7.6	
1	-8.5	
0	MUTE	

X1 Exercise User Data Port

Syntax: ***X1 value***

Front Panel:

Interfaces > User Data >

Test Pattern: <Enable,Disable>

This command allows the user data port to be exercised by providing a repeating test pattern. A value of 1 enables the user data port test. A value of 0 disables the test. The test pattern that will be issued to the port is:

```
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789
```

The default value is 0.

X2 Exercise M&C Port

Syntax: ***X2 value***

Front Panel:

Management > Console Port >

Test Pattern: <Enable,Disable>

This command allows the M&C port to be exercised by providing a repeating test pattern. A value of 1 enables the M&C port test. A value of 0 disables the test. The test pattern that will be issued to the port is:

```
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789
```

The default value is 0.

X3 Exercise Printer Port

Syntax: ***X3 value***

Front Panel:

Interfaces > Printer Port >

Test Pattern: <Enable,Disable>

This command allows the printer port to be exercised by providing a repeating test pattern. A value of 1 enables the printer port test. A value of 0 disables the test. The test pattern that will be issued to the port is:

```
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789
```

The default value is 0.

Chapter 6 Maintenance and Troubleshooting

6

This chapter provides:

- ABR maintenance information
- An alphabetical listing of ABR key performance monitoring commands and fault conditions, including a detailed description of each command and fault condition
- Troubleshooting tips

6.1 Maintenance

The ABR does not require periodic or preventive maintenance. There are no adjustments or configuration switches or jumpers external or internal to the unit. The power input is protected with an inline fuse located within the power supply inside the receiver. The fuse is designed to protect the unit from internal damage in the event of a severe power line condition or internal failure. This fuse is not serviceable by the user.

A battery-backed SRAM memory is used to store the nonvolatile user configuration while power is off. The average battery life at 25 degrees Celsius is 10 years. The battery is not serviceable by the user.

6.2 Performance Monitoring

The ABR receiver has a number of commands that provide performance monitoring of key system parameters. By interrogating these parameters for key receiver sites on a periodic basis, the overall system performance level can be determined and changed if necessary.

In implementing performance monitoring, key downlink sites would be selected. At these sites, telephone modems would be connected to the ABR receiver so that the required two-way communication link is established. For connecting a telephone modem to the receiver, refer to the appendix on Telephone Modem Operation. The key performance monitoring commands and how they can be used in measuring symptom performance are detailed in the following paragraphs.

6.2.1 Eb/No Minimum Receive Level (EM)

The minimum receive signal level Eb/No is measured and recorded using the EM command. This parameter indicates how weak the receive signal has become due to local weather conditions and fades, antenna misalignment, etc., since the last time the parameter was reset. By monitoring key receive sites across the network, a determination of actual system availability can be made based on measured fades.

If actual numbers differ from the desired availability, corrective action can be taken. Either the satellite downlink power can be increased or the receive antenna size can be increased for the affected locations.

6.2.2 Number of RF Signal Fades (NF)

This command records the number of RF signal fades that have occurred since the last time the counter was reset. While the EM command records the lowest signal level, this command records the number of signal fade events. A fade event occurs when the receiver loses RF signal lock for any reason other than channel changes. A fade causes a disruption in audio, data, and relay cue signals. Typically, a fade occurs due to weather conditions,

although any event causing the signal to be temporarily interrupted could be the cause. Examples of this would be antenna obstruction by a large truck, IFL cable damage causing intermittent connections, and so on.

Receiver sites that record fade events should be investigated to determine the cause so that uninterrupted service can be provided.

6.2.3 Audio Sync Loss Count (SL)

This command records the number of audio decoder sync losses since it was last reset. An audio sync loss would normally occur when a fade condition exists. However, there could be instances where the decoder loses synchronization with the uplink audio encoder. Very low signal levels (between 3.0 to 3.5 dB Eb/No) could cause sufficiently high bit error rates causing the decoder to lose sync, but not an RF sync loss. Additionally, if the uplink encoder began to operate marginally, then typically all receive sites would record decoder sync loss events, although not all may record the same number of events.

By monitoring audio sync losses, troubleshooting system-wide or individual receive site problems is made easier.

6.3 Fault Condition Descriptions

This section provides a detailed description of each fault condition to aid in troubleshooting.

FL 5 - AGC Range Fault

This fault indicates the input signal to the demodulator is less than -75 dBm or greater than -20 dBm (approximately).

FL 6 - Bit Time Lock Fault

An FL 6 fault means the demodulator bit time loop has lost lock. The receiver output data is disabled when this fault occurs.

FL 7 - Carrier Tracking Lock Fault

This fault means the demodulator carrier tracking loop has lost lock. The receiver output data is disabled when this fault occurs.

FL 8 - FEC Decoder Sync Fault

An FL 8 fault indicates the FEC decoder output BER is greater than 10^{-2} (approximately).

FL 9 - Acquisition Range Fault

This fault means the demodulator has completed a search of all frequencies out to the limits defined by the B3 parameter and was unable to acquire a carrier.

FL 10 - Carrier Tracking Range Fault

An FL 10 fault means the demodulator carrier tracking register has reached its maximum (or minimum) setting.

FL12 - Bit Time Range Fault

This fault indicates the demodulator bit time accumulator has reached its maximum (or minimum) setting.

FL 13 - Nonvolatile Memory Fault

An FL 13 fault means one of the parameters in the demodulator nonvolatile memory may have become corrupted. If this indication occurs repeatedly, the nonvolatile memory is defective and the unit should be returned for servicing.

FL 16 - Watchdog Timer Fault

This fault indication means the demodulator microprocessor fault timer has failed to reset. FL 16 normally indicates a memory fault, meaning the unit may be operating in an unintended manner. When this fault occurs, the system automatically resets.

FL 17 - Audio PLL Lock Fault

This fault occurs when the narrow band phase lock loop that operates the audio D/A converter is not locked. It is usually caused when RF sync is not achieved. If this alarm occurs by itself and will not clear by cycling power, the receiver should be returned for servicing.

FL 18 - Audio Decoder Sync Fault

An FL 18 fault indicates the receiver audio decoder is not in synchronization with the audio encoder at the uplink. This condition will normally occur if RF sync is not achieved.

FL 19 - DSP Watchdog Fault

This fault means the DSP audio decoder is not functioning normally. If this fault persists, the unit should be returned for servicing.

FL 20 - DSP BIT Failure

This fault indicates the DSP audio decoder built-in tests did not successfully pass during startup. If this fault persists, the unit should be returned for servicing.

FL 21, FL 22, FL 23 - External Alarm Monitoring

All three of these faults are caused from monitoring an external device that asserts a TTL logic low on Sensor Inputs 4, 5, and 6. (These signals are on the relay control port pins 22, 23, and 24.)

FL 24 - Outdoor Unit Fault

This fault occurs when the LNB is not drawing power from the receiver. If the receiver is connected to another ABR unit, this will be a normal condition. The front panel ODU Fault light or indicator tracks this fault condition.

FL 25 - Eb/No Threshold Fault

An FL 25 fault indicates the measured RF signal level (Eb/No) has dropped below the level set by the ET command.

FL 27 - Flash Memory Checksum Fault

This fault means the main control processor memory has been corrupted and is not functioning normally. If this fault persists, the unit should be returned for servicing.

FL 28 - Software Download Failure

This fault indicates a software download was not successful. The control processor continues to operate from the currently operating software while this fault is active. Once the download is successful, this fault automatically clears.

FL 29 - Channel Change Fault

An FL 29 fault occurs when a channel change has been attempted but RF and audio synchronization on the new RF carrier have not occurred within the first bin. Acquisition reverts to the previous signal and, once locked, normal operation is restored. The channel change may be initiated from any one of three sources:

- Local FS command
- FS command from the uplink
- Remote (external) channel change

For more information, refer to the LC command section in the chapter on Remote Monitor and Control Information. This is an abnormal condition and indicates there may be a configuration error within the receiver, a mismatch with the actual RF carrier parameters, or the RF carrier is not present.

FL 30 - Network ID Timeout Fault

This fault condition exists if the channel and network ID information is not received over the control channel every 30 seconds. Typically, this indicates a problem exists at the uplink concerning the audio multiplexer. However, if other receivers in the network are not showing this alarm condition, then the unit may need servicing.

FL 31 - Acquisition Network ID Fault

An FL 31 fault is declared when the receiver achieves RF sync but there is an invalid or missing network/channel ID. This fault indicates that one or more of the following conditions is true:

- The receiver FD and/or CC commands are not configured properly.
- The uplink is not transmitting or is transmitting an invalid network/channel ID.
- There is a hardware problem with the audio decoder portion of the ABR.
- The receiver is locked onto an adjacent audio carrier that is within its frequency search range, but is not the carrier specified in the selected format definition.

6.4 Troubleshooting

This troubleshooting section is provided to aid in isolating equipment problems and suggesting appropriate actions toward solving problems. If a particular problem cannot be resolved after reviewing the following material, or if a Tiernan equipment failure is suspected, then seek further assistance by contacting your Tiernan distributor or uplink provider. If equipment is purchased directly from Tiernan, contact Tiernan customer service for assistance.

6.4.1 Before Troubleshooting

Before troubleshooting the unit, go through the following questions:

- Have there been any power or bad weather problems in the area? Snow-filled dishes need to be manually swept out, even if they have a Velox coating.
- Is the ABR mounted on a rack or is it free-standing? Is it located in a closet? If so, is there sufficient air circulation in the closet? Is the ABR near a heat-generating source? Does it exceed the Tiernan ambient temperature specifications? The receiver requires sufficient space for proper ventilation.
- Is the receiver connected to an uninterruptible power source (UPS)?
- Was anyone recently working on the equipment or has anyone been near the satellite dish? If so, visually check the equipment to ensure the power has not been turned off, there are no loose cables, or any damaged connectors.
- Is the receiver located at the uplink or is it a downlink in a network? If it is a downlink, are other downlinks experiencing any problems?

6.4.2 Symptoms and Actions

This section has been developed to help you diagnose and correct minor problems in the unlikely event that you experience difficulties with your ABR. A quick reference troubleshooting flow chart is also provided in the appendix on Troubleshooting Flow Charts. If you decide to use the flow chart and find that you need additional information, refer to the information provided in this section.

Power light is not illuminated

1. Ensure the unit is plugged into an active AC outlet and the power cord is firmly plugged into the rear panel receptacle.
2. Verify the AC power source is supplying 85 to 264 VAC, 47 to 63 Hz.
3. Ensure the power cord is not at fault by replacing it with a known working cord.
4. If the problem persists, it indicates a possible internal fuse failure-do not attempt to repair it. Contact Tiernan for technical support.

Unable to communicate with the receiver

1. If a modem is being used, verify that the correct cable is being used and that the connections are correct. Refer to the appendix on Telephone Modem Operation.
2. Ensure the correct terminal, cable, and configuration is being used:
    - Ensure an ASCII terminal or a PC with a terminal emulator program, such as PROCOMM®, is being used.
    - Ensure the RS-232 cable is connected to the M&C port via the DB-9 to DB-25 adapter cable (TPN 30-0120-093). If the adapter cable is too short, extend it with a straight-through cable.
    - Verify the connection between pins 2 and 3 at both ends of the cable. Ensure pin 4, Data Terminal Ready (DTR), is an active input (high) of the M&C port.
    - Check to see if the terminal is configured properly: full-duplex ASCII communications at 2400 baud, 7 data bits, odd parity, and 1 stop bit (default).
3. Once the terminal has been connected and configured, press the Enter key to see if the login message displays.

    If the login message:
    - Does not display, using the front panel, change the console port settings as appropriate for your terminal settings. Press the Enter key again. If the login message still does not display, contact Tiernan Customer Service.
    - Enter commands to see if the responses are displayed. If the commands are not echoed to the display, ensure the command echo is enabled by entering EE 1. If they do not display after enabling the echo feature, contact Tiernan for technical support.

Power light is not illuminated

1. Verify cable connectivity between the two cable ends. Use a multimeter to ohm-out after disconnecting the cable. Examine the connectors for improper assembly. If the problem persists, contact Tiernan for technical support.

Rx Sync light is not illuminated

1. If there is no outdoor unit fault (FL24), ensure the configuration parameters are correct for the installed application using the CC, FD, FS, and DI commands.
2. If the configuration parameters have been confirmed:
    - Connect the spectrum analyzer to the LNB output via a DC coupled splitter.
    - Ensure a proper L-band signal is present.
    - If required, repeak the antenna.

TS Sync/Audio 1 light is not illuminated

If the Sync light is illuminated, check with the uplink station to ensure the audio encoder unit is functioning properly. If it is, the unit may need servicing. If not, the problem is at the uplink station.

If the Sync light is off, follow the actions for that symptom.

Signal Quality light is illuminated or is blinking

This indicates the receive signal strength is below the value set by the Q0 or Q1 commands.

If the Sync light is not illuminated, the signal is too weak. Check the signal strength by entering each of the following commands: Q0 ?, Q1 ?, EB ?.

If the value for EB is less than the default value for Q1, repeak the antenna for maximum signal strength.

Status light is blinking or illuminated red

If the light is illuminated:

1. Connect a terminal to the M&C port on the receiver.
2. Enter FL ? to determine what type of fault is occurring.
3. Follow the action descriptions associated with each fault type.
    - Faults 6, 7, 8, 9, and 10 are common faults and may indicate the following:
        - CC or FD are not configured correctly for carrier acquisition
        - The carrier is not present
    - If the above faults are present, verify carrier status and configuration before contacting Tiernan for technical support.

No audio, but the Rx Sync and TS Sync/Audio 1 Sync lights are illuminated

1. Ensure the audio is not being muted by the M0, M1, and MU commands.
2. Check the audio status (AS) to ensure audio operation is permitted. If it is not, check with the uplink operator for audio authorization.
3. Verify connector integrity and ensure the proper connections are made to the audio output (DB-9 male) connector.
4. Use the built-in audio tests (AT command) to generate audio tones. Monitor the audio output at the connector. If no tones are present, the unit may need servicing. If no audio is present, contact Tiernan for technical support.

Audio is highly distorted or garbled

- If the Signal Quality light is illuminated or is blinking, then a low signal strength may be the problem. Follow the procedure for when the Signal Quality light is illuminated or is blinking.
- If the Signal Quality light is illuminated, check the external connections to the audio port to ensure no shorts or intermittent connections are present.

Audio has unusually high background noise

When operating in joint stereo mode, a high background (common mode) noise indicates there is a phase reversal at the encoder's audio inputs.

- Recheck the encoder wiring to ensure the input leads, (+) and (-), for both channels are properly connected.
- Recheck the wiring connections at the output of the receiver to ensure the correct phase for the audio outputs has been connected.

Audio is at a low volume

Ensure the connections at the uplink and downlink are correct for both signal polarities (+ and -). When operating with a single connection (e.g., + only), the output level is down 6 dB when compared to balanced operation.

Using the M&C terminal, check the audio volume command for the proper setting for the particular installation.

No data, but the Rx Sync and TS Sync/Audio 1 Sync lights are illuminated

1. Check the unit authorization setting using the FD and FS commands for the current format and ensure data operation is permitted. If the current FD value, as selected by the FS parameter, does not have a 2, 3, 6, or 7 as the last digit, then data is not enabled. If it is not enabled, check with the uplink operator for proper authorization.
2. Verify the interface cable and connector integrity by ensuring the proper connections are made to the data port output connector (DB-25 female) and that the interconnecting cable is properly wired (straight-through). The Data port pinouts are described in the appendix on Interface Pinouts.
3. Ensure the external data terminal equipment (DTE) and data port configuration P1 parameter (i.e., baud rate, stop characters, parity) match by using the P1 command.
4. Test the user data port by entering the command X1 1. A test pattern should be output to the DTE.
    - If data output is observed, turn off the test pattern by entering X1 0 and then contact the uplink operator to verify data transmission.
    - If data output is not observed, try connecting another type of DTE (i.e., video terminal); if data is still not available, contact Tiernan for technical support.

No relay closure operation, but the Rx Sync and TS Sync/Audio 1 Sync lights are illuminated

1. Check the unit authorization setting using the FD command for the current format and ensure relay closure operation is permitted. If the FD value does not have a 4, 5, 6, or 7 as the last digit, then the relays are not enabled. If they are not enabled, check with the uplink operator.
2. Enter CO ?:
    - If a 1 or 0 appears, then the cue signal from the uplink cannot be processed properly. Enter CO XXXXXXXX to allow the uplink to control the relays.
    - If CO is XXXXXXXX, ensure the proper connections are made to the Relay/Control port connector (DB-25 male) and that the interconnecting cable is properly wired.
3. Use the built-in relay test (CO command) to individually activate and deactivate the relay closures. Monitoring contact closure with a multimeter at the connector is preferred; this eliminates any misconnections. If proper operation is still not observed, contact Tiernan.

* The modem connection to the M&C port requires a crossover connection.

** If a DB-9 to DB-9 cable is being used, the pin assignment is straight through.

*** If EB > Q1, the Signal Quality light is not illuminated
If Q0 < EB < Q1, the Signal Quality light blinks
If EB < Q0, the Signal Quality light is illuminated
The default values are 4.0 dB for Q0 and 7.0 dB for Q1.

**** If the output feeds several pieces of equipment, disconnect the external equipment and monitor the audio at the connector.
If the problem no longer exists, then a wiring problem to the external equipment exists and you should operate the external equipment via a distribution amplifier.

Chapter 7 Technical Specifications and Port Information

7

LNB Downconverter (Outdoor Unit - ODU)	Input frequency range:	11.7 to 12.2 GHz 12.25 to 12.75 GHz 10.95 to 11.7 GHz 3.7 to 4.2 GHz
	Output frequency range:	950 to 1450 MHz 950 to 1700 MHz
	Conversion gain:	55 to 70 dB
	Local oscillator:	DRO (BPSK) or PLL (QPSK)
L-band Demodulator (Indoor Unit - IDU)	Input frequency range:	950 to 1700 MHz, F connector, 75 ohm
	Output power (to LNB):	+13,14,18,19 VDC ±7%, 500 mA maximum current – or OFF
	Input signal level:	-75 to -20 dBm
	Frequency step size:	1 kHz steps
	Demodulation type:	BPSK or QPSK
	FEC decoding:	Sequential rate ½ Optional: Viterbi rate 1/2, 2/3, or 3/4; or concatenated Viterbi and Reed Solomon rate 187/204
	BER performance:	128 kbps (BPSK) 1x10-5 at 4.0 dB Eb/No, Sequential rate ½ 128 kbps (QPSK) 1x10-5 at 4.5 dB Eb/No, Sequential rate ½
	Audio threshold:	3.8 dB Eb/No (BPSK) 4.3 dB Eb/No (QPSK)
	Symbol rates:	64 - 384 ksps variable in 1 sps increments
Audio Performance	Frequency response:	20 Hz to 20.0 kHz
	Audio output channels:	One or two
	Operating modes:	Mono, dual mono (stereo), joint stereo
	Compression technique:	ISO/MPEG Layer II/IIA
	Compression factor:	12:1, 8:1, 6:1
	ISO/MPEG Layer II/IIA data rates:	64, 96, 112, 128, 192, 256, 384 kbps
	ISO/MPEG Layer II/IIA modes:	Mono, dual mono, joint stereo
	Channel change time:	< 450 msec*

	Total harmonic distortion:**	< 0.2% at 1 kHz3 (@ +8 dBu signal level)
	Dynamic range:	> 90 dB
	Signal to noise:***	> 85 dB (measured from +18 dBu2)
	Idle channel noise:	< -64 dBu (unweighted)
	Channel mute:	< -80 dBu (unweighted)
	Crosstalk (two channel)	> 80 dB (all frequencies, measured from +18 dBu2)
	Analog sampling rate:	48 kHz
	Stereo phase deviation:	< 1.0° for 20 Hz to 10 kHz; < 3.0° for 10 to 20 kHz
	Audio Outputs:	Direct coupled, L and R differential pairs; output impedance 510 ohms
	Audio Levels:	0 dB throughput gain (encoder input to ABR output) at nominal volume setting and 100 kohm load Volume control may be adjusted for 0 dB throughput gain for 600 ohm load
	Maximum Audio Output:	+18 dBu
	* For signal strength > 9 dB Eb/No (QPSK), > 7 dB Eb/No (BPSK). ** 0 dBu is defined to be 1 mW across a 600 ohm load (0.776 VRms). *** Operating 256 kbps, dual mono, Eb/No > 10 dB (output terminated into 100 kohm).	

7.1 Available Audio Rates and Bandwidths

The available audio rates and bandwidths for the ABR are shown in Table 7-1

Table 7.1 Available Audio Rates and Bandwidths

Audio Rate (kbps)	Mode	Bandwidth (kHz)	Audio Quality	Recommended User Data Rate
64	Mono	8.3	AM	2400
96	Mono	20	CD	4800
112	Mono	20	CD	4800
112	dual mono	10	AM	4800
112	joint stereo	20	CD	4800
128	Mono	20	CD	4800
128	dual mono	10	AM	4800
128	joint stereo	20	CD	4800
192	Mono	20	CD	9600
192	joint stereo	20	CD	9600
192	dual mono	20	CD	9600
256	Mono	20	CD	9600

Audio Rate (kbps)	Mode	Bandwidth (kHz)	Audio Quality	Recommended User Data Rate
256	dual mono	20	CD	9600
256	joint stereo	20	CD	9600
384	Mono	20	CD	9600
384	dual mono	20	CD	9600
384	joint stereo	20	CD	9600

The maximum user data rate is 9600 baud for all audio rates, however, you should select lower user data rates when using audio rates below 128 K to prevent any degradation of the audio quality.

Mechanical (IDU)	Size:	1.75" H x 17.375" W x 15.75" D (1 RU 19" rack-mount)
	Unit weight:	6 lbs
	Shipping weight:	12 lbs
	Power	
	Input voltage (AC):	90 to 264 VAC
	Frequency:	47 to 63 Hz
	Consumption:	< 40 W typical
	Environmental	
	Temperature:	0 to 50°C (IDU, operating) -20 to 75°C (IDU, nonoperating) -40 to +50°C (ODU, operating) -50 to +60°C (ODU, nonoperating)
	Humidity:	0 to 95% noncondensing (IDU, operating) 0% to 100% condensing (ODU, operating)
Regulatory Compliance	Safety	CE marking
	Emissions	CE marking
Control Channel Interface Capabilities	Software network control:	PC AT, Windows-based (optional)
	Addressing:	Unit or logical group
	Receiver control:	Configuration, audio/data port operation, channel selection, etc.
	Operating speed:	4800 default, 9600 capable
Monitor and Control Capabilities	Monitor:	Receive signal level (Eb/No) channel error rate, AGC level, bit error rate, equipment alarms and faults, performance monitoring
	Control:	Receive channel configuration, relay mapping, alarm reporting, etc.

	Status (Front Panel):	Power, RF Sync, Audio Enable, Fault summary
Rear Panel Ports	**Audio Out Port**	
	Connector:	DB-9, male
	Function:	Left and right channel analog audio output
	For more information about audio performance, refer to the "Audio Performance" section in this chapter.	
	Aux Port	
	Connector:	DB-15, female
	Functions:	Receiver fault alarm relay (Form A) Synchronous composite data stream input/output with clock, RS-422 levels Input ISO/MPEG Digital Audio
	AES/EBU Port	
	Connector:	DB-15, female
	Functions:	AES/EBU digital output (48 kHz sampling rate)
	Relay Status Port	
	Relay contact closures:	Eight, individually controlled from DAC codec/mux at uplink
	Relay type:	Form A; 2 wires per contact; maximum rating is 110 VAC at 1 amp.
	Connector:	DB-25, male
	Operation:	< 150 msec latency w.r.t. audio, with error protection
	Status inputs:	7 TTL with reference grounds, active low, internally pulled up 4.7 kohm resistors.
	Status functions:	3 for local RF channel selection, 3 auxiliary alarm inputs, 1 unused (reserved)
	Interface biasing:	+15 V @ 50 mA max available for powering opto-couplers in external equipment
	User Data Port	
	Interface type:	Asynchronous RS-232
	Data rates:	300, 1200, 2400, 4800, and 9600 baud
	Connector:	DB-9, female
	Printer Data Port	
	Interface type:	Asynchronous RS-232 or RS-422
	Data rates:	300, 1200, 2400, 4800, and 9600 baud
	Connector:	DB-25, female
	M&C Port	

	Interface type:	Asynchronous RS-232 and addressable RS-485 multidrop using Tiernan/ComStream's packet protocol
	Connector:	DB-9, female, with DTR control
	Default parameters:	2400, 7 data bits, odd parity, 1 stop bit, RS-232 (programmable)
	Functions:	Unit configuration, diagnostics, and status; connects to ASCII terminal or telco modem.

Appendix A Interface Pinouts

A

Printer Data Port

Table A.1 DB-25 Female, Connector

Pin #	I/O	Name	Description
1	-	-	Not Used (Reserved)
2	I	TD	Transmit Data (Reserved)
3	O	RD	Receive Data
4	I	DTR	Transmit Data Terminal Ready (Reserved)
5	-	-	Not Used (Reserved)
6	O	DSR	Data Set Ready
7	O	AUXIND-	Aux Indicator RS-422 (-) (Reserved)
8	I	AUXCTL-	Aux Control RS-422 (-)
9	O	AUXRT-	Aux RT Clock RS-422 (-)
10	I	AUXTT-	Aux TT Clock RS-422 (-)
11	O	AUXRD-	Aux Rcv Data RS-422 (-) (Reserved)
12	I	AUXTD-	Aux Tsmt Data RS-422 (-) (Reserved)
13	O	SG	Signal Ground
14	-	-	Not Used (Reserved)
15	-	-	Not Used (Reserved)
16	-	-	Not Used (Reserved)
17	-	-	Not Used (Reserved)
18	-	-	Not Used (Reserved)
19	-	-	Not Used (Reserved)
20	O	AUXIND+	Aux Indicator RS-422 (+) (Reserved)
21	I	AUXCTL+	Aux Control RS-422 (+)
22	O	AUXRT+	Aux RT Clock RS-422 (+) (Reserved)
23	I	AUXTT+	Aux TT Clock RS-422 (+)
24	O	AUXRD+	Aux Rcv Data RS-422 (+) (Reserved)
25	I	AUXTD+	Aux Tsmt Data RS-422 (+)(Reserved)

Relay Control Port

Table A.2 DB-25 Male Connector

Pin #	I/O	Name	Description
1	O	RC1A	Relay Closure Contact 1A
14	O	RC1B	Relay Closure Contact 1B
2	O	RC2A	Relay Closure Contact 2A
15	O	RC2B	Relay Closure Contact 2B
3	O	RC3A	Relay Closure Contact 3A
16	O	RC3B	Relay Closure Contact 3B
4	O	RC4A	Relay Closure Contact 4A
17	O	RC4B	Relay Closure Contact 4B
5	O	RC5A	Relay Closure Contact 5A
18	O	RC5B	Relay Closure Contact 5B
6	O	RC6A	Relay Closure Contact 6A
19	O	RC6B	Relay Closure Contact 6B
7	O	RC7A	Relay Closure Contact 7A
20	O	RC7B	Relay Closure Contact 7B
8	O	RC8A	Relay Closure Contact 8A
21	O	RC8B	Relay Closure Contact 8B
9	I	SI1	Sensor Input 1, TTL
10	I	SI2	Sensor Input 2, TTL
11	I	SI3	Sensor Input 3, TTL
22	I	SI4	Sensor Input 4, TTL
23	I	SI5	Sensor Input 5, TTL
24	I	SI6	Sensor Input 6, TTL
12	I	SI7	Sensor Input 7, TTL
25	O	SG	Signal Ground
13	O	+15V	+12 V through 220 ohm (50 mA max) resistor

M&C Port

Table A.3 DB-9 Female, RS-232/RS-485 Connector

Pin #	I/O	Name	Description
1	O	DSR	Data Set Ready
2	O	RD	Receive Data, RS-232
3	I	TD	Transmit Data, RS-232
4	I	DTR	Data Terminal Ready
5	O	SG	Signal Ground
6	I	TD+	Transmit Data, RS-485 (+)

Pin #	I/O	Name	Description
7	O	RD+	Receive Data, RS-485 (+)
8	I	TD-	Transmit Data, RS-485 (-)
9	O	RD-	Receive Data, RS-485 (-)

M&C Port Adapter Cable (DB-9-to-DB-25)

The M&C Port Adapter Cable connects the ABR with an RS-232 port. This cable is VT-100 compatible and available through Tiernan (TPN 30-0120-093).

Table A.4 M&C Port Adapter Cable

Male DB-9	Female DB-25
1	8
2	3
3	2
4	20
5	7
6	6
7	4
8	5
9	22

Analog Output Port

Table A.5 DB-9 Male Connector

Pin #	I/O	Name	Description
1	O	LO+	Left Audio Output (+)
2	O	LO-	Left Audio Output (-)
3	-	-	Not Used
4	O	RO+	Right Audio Output (+)
5	O	RO-	Right Audio Output (-)
6	O	AGND	Analog Ground
7	-	-	Not Used
8	-	-	Not Used
9	O	AGND	Analog Ground

User Data Port

Table A.6 DB-9 Female Connector

Pin #	I/O	Name	Description
1	O	DSR	Data Set Ready Indicator

Pin #	I/O	Name	Description
2	O	RD	Receive Data
3	I	DTR	Data Terminal Ready Indicator
4	I	TD	Transmit Data
5	O	SG	Signal Ground
6-9	-	-	Not Connected

Auxiliary Port

Table A.7 DB-15 Female Connector

Pin #	I/O	Name	Description
1	O	StatusNC	Status Closure Contact Closed on Fault
2	O	StatusNO	Status Closure Contact Open on Fault
3	I	BBRD-	Baseband Rec. Data RS-422 (-) [A]
4	O	RD-	Receive Data RS-422 (-) [A]
5	O	AGC	AGC Output Voltage 0-10 VDC
6	O	RT-	Receive Timing RS-422 (-) [A]
7	I	BBRT-	Baseband Rec. Timing RS-422 (-) [A]
8	O	SG	Signal Ground
9	O	StatusCOM	Status Closure Common
10	I	BBRD+	Baseband Rec. Data RS-422 (+) [B]
11	O	RD+	Receive Data RS-422 (+) [B]
12	I	M&C Reset	Monitor and Control Port Reset Input
13	O	RT+	Receive Timing RS-422 (+) [B]
14	I	BBRT+	Baseband Rec. Timing RS-422 (+) [B]
15	-	-	Not Used
[A] Denotes inverted signal for differential input/output [B] Denotes true signal for differential input/output			

AES/EBU Port

Table A.8 DB-15 Female Connector

Pin #	I/O	Name	Description
1	O	SG	Signal Ground
8	O	DIGOUT-	AES/EBU Digital Audio Out (-)
15	O	DIGOUT+	AES/EBU Digital Audio Out (+)
2 - 7	-	-	Not Used
9 - 14	-	-	Not Used

Appendix B Telephone Modem Operation

B

Overview

The ABR can be controlled and operated from a remote location by connecting the receiver to the public telephone network using the Tiernan-approved, Hayes-compatible modem (TPN 30-0120-194). This appendix provides the necessary details for configuring the telco modem and connecting it to the ABR.

Modem Configuration

To ensure proper operation of the Tiernan-approved, Hayes-compatible modem (TPN 30-0120-194), the modem must be initialized, as shown in Table B-1, when it is connected to the ABR.

Table B.1 Hayes-Compatible Modem Configuration

Modem Command	Description of Modem Actions
AT&D0	Modem ignores DTR
ATS0=1	Modem answers on one ring
AT&C1	Carrier detect (CD) active when remote carrier detected
ATQ1	Modem does not send result codes
AT&Y0	Select profile 0 as power-up configuration
ATE0	Echo off
AT&W0	Write configuration to profile 0
AT&R1	Modem ignores RTS

Modem Connection

A Hayes-compatible modem (TPN 30-0120-194) connects to the ABR M&C port via a special adapter cable. Table B-2 details the interconnecting cable that should be used. This cable is available through Tiernan (TPN 05-0505-001).

Table B.2 Modem Adapter Cable

DB-9 (Male)	ABR Function	DB-25 (Male)	Modem Function
2	Out-Receive Data	2	In-Transmit Data
3	In-Transmit Data	3	Out-Receive Data
5	Signal Ground	7	Signal Ground
4	In-Data Terminal Ready	8	Out-Carrier Detect
6	Out-Data Set Ready	20	In-Data Terminal Ready

Appendix C Interfacility Link Cable Characteristics

C

Cable Characteristics

General Characteristics

All cables should be uniform in quality and free from any burrs, die marks, chatter marks, foreign material, or other defects that may affect life, serviceability, or appearance.

The cable must be capable of being pulled in one-inch diameter conduit with pull boxes at 90° bends and every 200 feet, without distortion or change in electrical performance or structural integrity.

The cable should have a design life of 10 years after installation in an outdoor environment and be subject to the complete range of industrial pollutants, temperature extremes, precipitation, humidity, solar radiation, and salt water corrosion typically encountered at the installation site.

The minimum bend radius should be five times the cable's outside diameter. The electrical specifications must be met at the minimum bend radius.

Outer Cable Jacket

The jacket should cover the cable tightly and evenly in a manner consistent with the physical, mechanical, environmental, and dimensional requirements. The outer jacket material should be weatherproof and suitable for direct burial. A flooding compound must be applied to the outer braid under the jacket of the coaxial cable to block moisture and resist corrosion.

Polyisobutylene is the recommended flooding compound. Polyvinyl- chloride, Thermoplastic rubber, or Teflon are suitable jacket materials. The jacket must resist abrasion, scuffing, and peeling during the pulling process. The cable must also have sufficient flexibility at 15° F to permit installation.

Maximum shrinkage tolerance of the cable jacket should be sufficient to still allow full termination capability following any shrinkage.

Cable Specifications and Vendors

The following specifications define the required performance parameters of the IFL cable intended for use with the ABR. The IFL cable must conform to these specifications to guarantee that the Tiernan equipment will operate properly. Table C-1 provides the recommended vendors for the RG-11 cable. Table C-2 lists the recommended crimp tool and F-connector vendors.

Especially important is the use of a quad-shielded coax for the RF cable. Without quad-shielding, your system may be subject to outside radio frequency interference. This interference can degrade the performance of the ABR receiver.

Table C.1 Recommended Vendors, Quad-Shielded RG-11 Coax

Manufacturer Telephone #	Manufacturer Part Number	Preference Rank

Times Fiber	2282[1]	1
(800) 688-6904	2262	2
Comscope	2287[1]	1
(800) 982-1708	5950	2
[1] Suitable for direct burial.		

Table C.2 Recommended Vendors, F Connectors and Crimp Tool

Part	Manufacturer Telephone #	Manufacturer Part Number
F (male) connector	Gilbert Engineering (800) 528-5567	GAF-11-AHS/480
Crimp Tool	Gilbert Engineering (800) 528-5567	GCRT-211

Cable type is determined by the amount of maximum signal loss specified in Table C-3.

Table C.3 Signal Loss per 100 Foot Length for Common Cable Types

Cable Type	Loss Per 100 Feet
RG-11 (preferred)	5.9 dB
RG-35	3.7 dB

Generally, an IFL cable run of 0 to 420 feet (0 to 129 m) requires the following cable specifications:

Cable type:	RG-11
Impedance:	75 ohm
DC resistance:	Less than 16.1 ohm per 1000 feet
Shield:	Quad-shielding system
Shield coverage:	100%
Capacitance:	16.5 picofarads per foot
Jacket:	PVC
Maximum loss:	5.9 dB per 100 feet at 1450 MHz
IDU connector:	F male
ODU connector:	F male

IFL cable runs of 400 to 670 feet (123 to 206 m) require the following cable specifications:

Cable type:	RG-35
Impedance:	75 ohm
DC resistance:	1.15 ohm per 1000 feet
Shield:	Single shield, solid
Shield coverage:	100%
Capacitance:	15.4 picofarads per foot
Jacket:	Standard PVC
Maximum loss:	2.69 dB per 100 feet at 1500 MHz
Outside diameter:	0.63 in over jacket

Weight:	0.14 lbs/ft
IDU connector:	N (male), F (male) available with adapter
ODU connector:	N (male), F (male) available with adapter

Only N and UHF-type connectors are available. An N-to-F adapter must be used. An N-to-F adapter is Tiernan part number 31-0121-032 or Gilbert Engineering's NS-5504-1.

RG-35 cable is provided by Andrew Corporation (Andrew part number: LDF4-75A). The N plug (male) 50 ohm pin is Andrew part number: L4NM-7550, reference L44W-75.

LNB DC voltage drop should be less than 3 V, regardless of length, cable type, LNB type, or data rate.

IFL Cable Preparation

This section assumes an RG-11 coaxial cable is being used in the installation. For any other cable type, the procedures remain the same with only the dimensions changing. Before connecting the coaxial cable, prepare it by attaching the F connectors as described here and as illustrated in Figure C-1:

1. Remove 3/4 inch (9.55 mm) of the cable jacket, being careful not to cut through the braid. Fold the first layer of exposed braid back over the jacket.
2. Cut through the remaining foil, braid, and dielectric to expose 1/4 inch of center conductor. Do not score the center conductor.
3. Remove the first foil, making sure the braid is not cut, and fold the second braid over the jacket.
4. Cut through the foil and dielectric to the center conductor an additional 3/8 inch. Do not score the center conductor.
5. Insert the connector over the foil and dielectric until it bottoms.
6. Crimp the collar using a .470 to .475 hex crimp tool, as shown in Figure C-1.

Use the following steps to complete the connection of the coaxial cable:

1. Cut off approximately two inches of weatherproof, heat-shrink tubing (Alpha Part Number FIT-650-3/4, or equivalent) and place it over the end of the coax cable. When installation is complete, this is used to provide a weatherproof shroud for the outdoor IFL connector, up to the body of the LNB downconverter.
2. Connect the IFL coax cable to the coaxial cable connector.
3. Slide the heat-shrink tubing over the coaxial connector and male F connector on the LNB downconverter so it completely envelops the threaded portion. Apply heat to the heat-shrink tubing in accordance with the manufacturer's instructions.
4. Loop the IFL cable and tie-wrap the cable to the lower feed rod. Loop the cable in such a way that the length of the cable between the LNB downconverter and the tie-wrap nearest it is approximately 10 inches.
5. Add additional tie-wraps along the lower feed rod at the middle and bottom, as required, to secure the IFL cable.

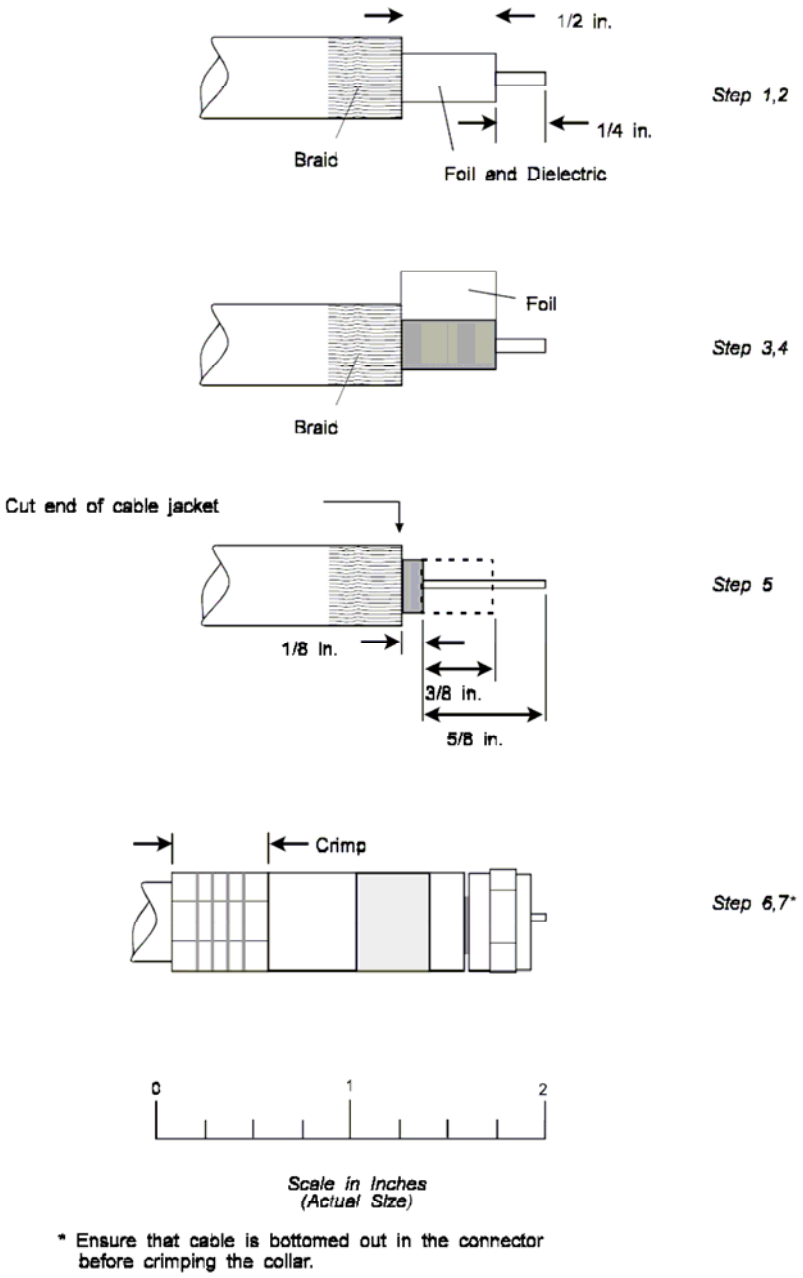

Figure C.1 Coax Cable and F Connector Assembly