Installation Manual

EDACS® MASTR®III

Basic or Level 1 System
Trunked Repeater Site

ERICSSON

MANUAL REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE
R1A	1/97	Original issue. Replaces LBI-39074B

NOTE

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

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1. GENERAL INFORMATION

1.1 IMPORTANT SAFETY INFORMATION

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Ericsson Inc. assumes no liability for the customer's failure to comply with these standards.

- **SAVE THIS MANUAL** - It contains important safety and operating instructions.

1. Before using this equipment, please follow and adhere to all warnings, safety and operating instructions located on the product and in the manual.

2. **DO NOT** expose equipment to rain, snow or other type of moisture.

3. Care should be taken so objects do not fall or liquids do not spill into the equipment.

4. **DO NOT** expose equipment to extreme temperatures.

5. **DO NOT** connect auxiliary equipment to the EDACS System that is not recommended or sold by Ericsson INC. To do so may result in a risk of fire, electric shock or injury to persons.

6. **GROUND THE EQUIPMENT**-To minimize shock hazard, the station equipment cabinet must be connected to an electrical ground.

   If AC powered, the correct type of AC power cable and plug is to be used. This cable and plug assembly must conform to local standards and the installation of power cords must conform to local standards and practices.

7. To reduce risk of damage to electrical cords, pull by plug rather than cord when disconnecting a unit.

8. Make sure all power cords are located so they will not be stepped on, tripped over, subjected to damage or stress, or located such they may be harzardous to health.

9. An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If an extension cord must be used, ensure:

   a) The extension conforms to local standards and practices.

   b) The pins on the plug of the extension cord are the same number, size, and shape as those of the plug on the power supply.

   c) The extension cord is properly wired, in good condition, and

   d) The wire size is capable of handling the AC ampere rating of unit/s being supplied.

10. **DO NOT** operate equipment with damaged power cords or plugs - replace them immediately.

11. **DO NOT** operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

12. To reduce risk of electric shock, isolate the unit and unplug from outlet before attempting any maintenance or cleaning.

13. **DO NOT** operate this product with covers or panels removed. Refer all servicing to qualified service personnel.

14. Use only fuses of the correct type, voltage rating and current rating as specified in the parts list. Failure to do so can result in fire hazard.

15. **GROUNDING AND AC POWER CORD CONNECTION** - To reduce risk of electrical shock use only a properly grounded outlet. The system components are equipped with electric cords having an equipment grounding conductor and a grounding plug. Be sure all outlets are properly installed and grounded in accordance with all local codes and ordinances.

16. **DANGER** - Never alter the AC cord or plug. Plug into an outlet properly wired by a qualified electrician. Improper connection or loss of ground connection can result in risk of an electrical shock.

17. **ELECTROSTATIC DISCHARGE SENSITIVE COMPONENTS** - This station contains CMOS and other circuit components which may be damaged by electrostatic discharge. Proper precaution must be taken when handling circuit modules. As a minimum, grounded wrist straps should be used at all times when handling circuit modules.

1.2 GENERAL SPECIFICATIONS

Table 1 - Repeater Cabinet

Type:	69” Indoor Cabinet	83” Indoor Cabinet
Size		
Height:	175 cm (69-1/2 in.)	209 cm (83 in.)
Width:	59 cm (23-3/16 in.)	59 cm (23-3/16 in.)
Depth:	53.3 cm (21 in.)	53.3 cm (21 in.)
Number of Rack Units	33	41
Weight (min.)		
Continuous Duty:	520 lb (w/3 repeaters per cabinet)	520 lb (w/3 repeaters per cabinet)
Packed for Domestic Shipping:	550 lb (w/3 repeaters per cabinet)	550 lb (w/3 repeaters per cabinet)
Ambient Temperature: (for full spec. performance per EIA)	-30°C to +60°C (-22°F to +140°F)	
Humidity (EIA)	90% at 50°C (122°F) non-condensing	
Altitude	Operable: Up to 4,570 m (15,000 ft.)	Shippable: To 15,250 m (50,000 ft.)
Input Power Source:	120 Vac (±20%), 60 Hz, 9 Amps per channel (max.) 220 Vac (±15%), 50 or 60Hz 85-260 Vac (±15%), 50/60 Hz 24 Vdc and 48Vdc.	
Source Power Drain @ 121 Vac	600 Watts per channel (max.) 600 Watts per channel (max.)	for 800 MHz channel for UHF/VHF channel
Receiver:		
Standby:	139 Watts	
Rated Audio:	145 Watts	
Transmitter:	300 Watts	

Table 2 - Site Controller Cabinet

Type:	Indoor Cabinet (Floor Mount)
Size	
Height:	175 cm (69-1/2 in.)
Width:	59 cm (23-3/16 in.)
Depth:	53.3 cm (21 in.)
Number of Rack Units	33
Weight (min.)	
Standard (basic no options):	73 kg (160 lb.)
With options:	91 kg (200 lb.)
Ambient Temperature:	5°C to 50°C (41°F to 122°F)
Humidity (EIA)	10% to 90% non-condensing
Altitude	
Operable:	Up to 4,570 m (15,000 ft.)
Input Power Source:	120 Vac (±20%), 60 Hz 230 Vac (±15%), 50 Hz (±2%)
Source Power Drain @ 121 Vac	750 Watts

1.3 INTRODUCTION

An Enhanced Digital Access Communications System (EDACS) Basic or Level 1 System consists of individual EDACS radios and a single EDACS Basic or Level 1 trunked repeater site. The EDACS Level 1 system may also include an optional System Manager computer for access to user management features.

This manual covers the installation and testing of the trunked repeater site and the System Manager. Before attempting to install or checkout the equipment, you must become familiar with the contents of this manual. The manual is divided into the following sections:

- **General Information** - This includes information on safety, systems specifications, a listing of related documentation, and a list of test equipment required for testing, aligning , and maintaining the radio equipment.
- **Site Preparation** - This section identifies site requirements and installation practices for the antenna tower, transmissions lines, and the equipment shelter.
- **Equipment Installation** - This section provides instructions for unpacking and physically installing the electronic equipment cabinets.
- **Site Power** - This section provides information regarding the application of types of power systems.
- **System Cabling** - This section provides detailed instructions for installing interior transmission lines and inter-cabinet cabling.
- **Station Configuration** - This section provides detailed instructions for setting up the equipment prior to applying power.
- **Site Controller - System Manager Link** - This section provides site requirements, installation and configuration instructions for the optional System Manager.
- **Base Station Test And Alignment Procedures** These procedures provide detailed instructions for testing and aligning each of the individual system components.
- **System Functional Tests** - This section provides detailed instructions for verifying the overall operation of the equipment as a system.
- **Extender Card and Bench Test Alignment** - This section provides details of the tests and alignments to be performed using the Extender Cards and during Bench Tests.
- **Changing Base Station Frequencies** - This section defines the requirement for changing Base Station Frequencies.
- **Preventative Maintenance** - This section defines those tests to be performed as part of Periodic Preventative Maintenance.
- **Appendices** - The Appendices include support features such as; Installation and Preventative Maintenance Checklists, Typical Floor Plans, and Cabinet and punchblock Interconnection Diagrams.

1.4 REFERENCE MANUALS

It may be necessary to consult one or more of the following manuals. These manuals will also provide additional guidance if you encounter technical difficulties during the installation or testing processes.

LBI-38984	- System Manager User's Guide
LBI-38985	- EDACS Site Controller Maintenance Manual
LBI-39167	- Orion Test Unit Radio
LBI-38988	- EDACS Station GETC Configuration Manual
AE/LBZ 119 1915/1	EDACS Systems Levels and Alignment
LBI-39076	- Enhanced Local Interconnect (ELI) System Manual
LBI-39077	- Enhanced Local Interconnect GTI Configurator Manual
SRN-	- Software Release Notes as applicable for release of Software in customer system
SC PERS	- Site Controller Personality for each site.
TQ-3353	- MIIe and MIII Programming Guide
TQ-3357	- GETC Shelf Programming Guide
LBI-39076	- ELI Programming Guide

LBI-38540 - Utility PC Programming Manual

LBI-39203 - GETC Trunking Card Maintenance Manual

LBI-38550 - Base Station Power Supply Maintenance Manual

LBI-38636 - MASTR III Base Station Installation Manual

LBI-38703 - System Manager Installation, Setup, and Troubleshooting

LBI-39025 - MASTR III RF Package, 800 MHz

LBI-38675 - MASTR III RF Package, 380-512 MHz

LBI-38754 - MASTR III RF Package, 130-170 MHz

LBI-39122 - MASTR III RF Package, 900 MHz

LBI-39128 - EDACS Power Monitor Unit Installation/ Operation

AE/LZT 119 1911/1 - EDACS VAX Site Controller Software (Release 8.0 and later)

AE/LZT 119 1914/1 - System Interface Cabinet (VAX Site Controller Hardware-Sofware release 8.0 and later)

SRN-1010 - Software Release Notes for GETC Turbo Board Software

SRN-1060 - Software Release Notes for GETC 1e Software

SRN-1062 - Software Release Notes for Turbo Board Software

LBI 38805 - RF Test Fixture

LBI-39067 - Standards for Site Grounding and Protection

LBI-38737 - Electrostatic Discharge Protection

LBI-38775 - MASTR III Base Station System Combination Maintenance Manual

LBI-38812 - EDACS Interface Panel Maintenance Manual

LBI-38822 - Turbo Board (GETC 1e) Maintenance Manual

LBI-38875 - EDACS Cable Duct System Maintenance Manual

LBI-38983 - Antenna Systems Assembly Manual

LBI-38894 - GETC Trunking Card Maintenance Manual

LBI-38599 - Utility Handset Manual

The following vendor manuals should also be available when installing equipment into the RF Equipment cabinet:

- DECIBEL PRODUCTS, Inc. User's Manual for the **DB8843** Remote Site Monitor.
- DECIBEL PRODUCTS, Inc. maintenance manual for the **DB8900** Tower Top Amplifier Family.
- DECIBEL PRODUCTS, Inc. maintenance manual for the **DB8000** Receiver (RX) Multicoupler Family.
- DECIBEL PRODUCTS, Inc. Installation & Operations Manual for the **DB8061H/8062H** Transmitter (Tx) Combiners.
- "Other Vendor" User's Manual for any other Vendor equipments installed as part of the EDACS Site.

1.5 TOOLS AND TEST EQUIPMENT

The items listed in Table 3 are the tools and test equipment for use during alignment, testing, and maintenance of the EDACS, RF system and other installed equipment. Test equipment other than that recommended may be substituted, providing it is electrically equivalent in accuracy and operating range, and capable of maintaining the tolerances specified for the recommended test equipment.

Table 3 - Tools and Test Equipment

ITEM	QTY	DESCRIPTION	VENDOR	MODEL NO.	WHERE USED (DETAILED)
1	1	Deluxe Tool Kit	Ericsson	TXCTC3	Technician Tool Kit
2	1	Crowbar			Required to open shipping crates.
3	1	Hammer drill and 3/4 inch bit			Drill holes for mounting cabinets.
4	1	RF Communications Test Set (Including test probe, (2) 10 ft. BNC-to-BNC cables, and (2) BNC-to-N type adapters	HP	8920A EDACS option	Test and Alignment.
5	1	Ladder or step stool			System cabling.
6	1	Wire Inserter	Amphenol		25 pair cable to punch block (CHAMP) connectors.
7	1	1/4 / 1/2 inch Heliax Stripper	Andrew	207865	Preparing RF Cables.
8	1	Replacement blade - 5 pack	Andrew	209874	Preparing RF Cables.
9	1	PC Programming Adapter	Ericsson	TQ3374	
10	1	PC Programming Software	Ericsson	TQ3353 TQ3357 TQ3364	MASTR III. GETC Programming. EDACS PC Product Program.
11	1	Programming Cables	Ericsson	**TQxxxx**	Programming Cable as applicable for portables, mobiles and Test Unit radios in use.
12	1	Laptop or portable computer		486/33	Running EDACS Programming Software.
13	3	Portable radios	Ericsson	Use Customer Radios or similar	Talk Tests using radios that will operate on the system
14	1	RS-232 Adapter Cable DB9(F) to DB25(M)	NEWARK	50F6410	Interconnection between Laptop computer and Interface modules
15	2	Transmission Impairment Measuring Set (TIMMS) (w/(2) 10 ft. cables terminated with alligator clips	HP	4934A	Test and alignment.
16	1	Punch Block	Ericsson	19B851899P2	Test and alignment.
17	1	Adapter, Punch block	Amphenol	284-1	Test and alignment.
18	2	Bird RF Directional Wattmeter Bird Model 43 Plug-in Elements, 400 - 1000 Mhz		TBR 43N TBR8001 - 1W TBR5E - 5W TBR10E - 10W TBR50E - 50W TBR100E - 100W TBR250E - 250W	Test output power.
19	1	Extender board (optional)	Ericsson	188D5338G1 188D5338G2	Use with System and Power modules. Use with RF modules.
20	1	Test and Troubleshooting Fixture	Ericsson	TQ0650	Test, align, and troubleshoot MASTR III Station.
21	1	RF Coaxial Load Resistor	Bird	8135	Test and alignment.
22	1	Attenuator. 10 dB, 100 W	Bird	8343-100	Test and alignment.
23	1	Punch Down Tool	Newark	50F6281	Terminate and cut wires to Type 66 terminal blocks.
24	1	Spectrum Analyser			
25	1	Modulation Analyser			

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2. SITE PREPARATION

2.1 INTRODUCTION

This section provides instructions for preparing the site and other considerations which must be completed prior to installing an EDACS Basic or Level 1 system equipment. The areas covered include the following:

Antenna System - This includes installation of the antenna tower, receive and transmit antennas, and the installation of the transmission lines from the antenna to the equipment shelter.

Site Requirements - Information is provided concerning various factors which may affect the physical location of the equipment facility.

Facility Preparation - This section provides information for preparing the facility prior to installing the equipment. This information includes proposed equipment layout, environment; electrical power; and telephone line installation.

2.2 ANTENNA SYSTEM

NOTE

Refer to LBI-39185 for Tower Requirements and General Specifications

This section covers installing the antenna system, including RF cables from the antennas to the equipment room wall feedthrough connector.

Antenna systems are generally installed by crews trained and equipped for working on antenna towers. As a result, this manual assumes the Antenna Systems are installed by crews with the specialized equipment and skills required for working on towers and installing the antenna cables. However, it may be necessary for the system installer to provide information and directions to the crew installing the antenna system and to verify proper installation.

2.2.1 Antenna Mounting

The antenna tower must allow antenna mounting that provides isolation of at least 25 dB between the Tx and Rx antennas. This is necessary to avoid interference in the trunked receivers caused by the trunked transmitters. An isolation of greater than 25 dB is easily obtained by placing one antenna directly above the other on the tower (minimum 10-foot separation).

2.2.2 Transmission Lines

When installing the transmissions lines, refer to the block diagram for UHF/800 MHz Antenna Systems contained in LBI- 38983.

2.2.2.1 Length

The length of the main coaxial cable for each antenna is planned as a continuous run with no connectors or splices between the antenna and the equipment room. Each cable includes a 50-foot allowance for the distance from the bottom of the tower to the equipment room. Smaller diameter, more flexible coaxial cables are used at both ends of the main coaxial cable to facilitate installation.

2.2.2.2 Minimum Bending Radius

Always adhere to the minimum bending requirements provided by the manufacturer. For Andrew Products, the values are:

CABLE SIZE	BENDING RADIUS	
1/4-inch	1-inch	(25 mm)
1/2-inch	1.25-inch	(32 mm)
7/8-inch	10-inches	(250 mm)
1 5/8-inch	20-inches	(510 mm)

2.2.2.3 Hoisting Grips

Hoisting grips provide the means to attach a lifting mechanism to the coaxial cable without damaging the cable. Each hoisting grip is capable of safely lifting 200 feet of cable without causing damage. Therefore, one hoisting grip is required for every 200-foot section of cable. The grips may be left attached to the cable after the cable installation is completed.

(Continued on next page)

Some situations may require more hoisting grips, such as:

- An installation to a tower which is on top of another structure.
- Any installation where the length of cable that must be lifted is greater than the height of the tower.

In these situations, additional hoisting grips should be ordered.

2.2.2.4 Hangers And Adapters

Coaxial cables on the tower should be secured at intervals of 3 feet (maximum).

Securing 7/8 inch and 1-5/8 inch diameter coaxial cables is accomplished by using either hangers or hanger-adapter combinations. The hangers secure the cables to the tower structure by using prepunched holes or attachment adapters.

- When the tower structure is prepunched with 3/4-inch holes, snap-in hangers are used (preferred method).
- When the tower is prepunched with 3/8 inch holes, the hanger is secured by a 3/8 inch bolt.

For towers without prepunched holes, the hangers are attached with adapters. The type of adapter depends on the type of tower structure. Adapters are available for either angle tower members or round tower members.

Adapters for each antenna system are selected when ordering the system. If the coaxial cable must be attached to a structure that is not compatible with any of the above hangers or adapters, then additional materials or other special considerations may be required

To secure 1/4-inch or 1/2-inch vertical or horizontal coaxial cables of any size, use nylon cable ties.

2.2.2.5 Weatherproofing

A kit of weatherproof tape is provided to protect coaxial connectors from the outside elements. One roll of tape is sufficient to weatherproof four exposed outside connector joints.

2.2.3 Antenna Grounding

Grounding kits are installed to prevent the radio system from being damaged by lightning. A grounding kit should be installed at the top end of each coaxial cable run on the tower. A second kit should be installed on each cable at the bottom of the tower and a third kit on the cable at the point where the cable enters the building, if the tower-to-building length is greater than 20 feet. For cable runs on the tower greater than 200 feet, additional kits should be installed at each 200-foot interval.

2.3 SITE REQUIREMENTS

This section provides information for preparing the facility prior to installing the equipment. This information includes proposed equipment layout, environment, electrical power and telephone line installation

2.3.1 Floor Plan

Direct access (for antenna cables and personnel) between the tower and the equipment room is necessary for installation purposes.

Standard floor plans for the equipment cabinets are shown in the Appendix B. Equipment positioning will be agreed with the customer prior to installation and Floor Plan drawings will have been signed off. Any variation proposed once equipments are delivered to site must be referred to the relevant Project Manager.

The strength of the floor must be addressed in conjunction with the list of proposed equipments for the site. Weights of equipments are shown in the Specifications list of the relevant LBI.

The lengths of interconnect cables supplied are based on these standard floor plans. If a floor plan other than a standard floor plan is used, longer interconnect cables may be required. These can be calculated from an accurate Site Survey and therefore correctly ordered.

Interconnect cabling may be routed via ducting (above and below cabinets) or on cable ladder systems. The proposed method will be included on the floor plan, overlaying the equipment positioning plan. Interconnect cable lengths will be calculated for the method proposed.

When creating the floor plan and positioning cabinets, ensure consideration is given to safety, lighting, fire suppression systems, access to other equipments and storage facilities in the room, etc.

2.3.2 Operating Environment

The equipment room where the RF Equipment, Repeater and Site Controller equipment is installed must meet the environmental conditions listed in the Station Specifications section of this manual. In addition, the site grounding must conform to the requirements of the Standards for Site Grounding and Protection document.

Although the temperature requirements for individual pieces of trunked equipment may be broader, when several units are assembled together in a cabinet more heat is generated. Because of this condition, the ambient room temperature outside the cabinet must be lowered to ensure the temperature inside the cabinet does not exceed the limits for the equipment.

2.3.3 Electrical Power

In all cases where the customer provides a single AC supply input to a site, for AC or DC systems, the input must be protected with a Joselyn AC protector, or equivalent, placed after the disconnect switch. This protector must be connected to the external ground system.

If the AC supply is provided from wall outlets, the fuse panel breaker for the room must be sized for the load of the proposed equipments to be installed in the site.

NOTE

During installation, all circuit breakers must be left open.

2.3.3.1 AC Power

Each EDACS cabinet is equipped with its own AC power cord. Each of these power cords should be connected to a separate circuit breaker. The following circuit breakers are recommended.

- 115 Vac (60 Hz) - a 20-amp circuit breaker for each power cord.
- 230 Vac (50 Hz) - a 15-amp circuit breaker for each power cord.

Receptacles must be installed within reach of the power cords and should be individually fused. They may be installed on the wall behind the cabinets, in the floor under the cabinets, on the cable ladder above the cabinets, or in the cabinet top cable ducts. The power cords must not be installed such that they cause a hazard to persons in the site.

The Site Controller power cord is about 4.5 meters (15 feet) long, starting from a point within the rear of the cabinet about one foot above the floor. Each repeater power supply power cord is about 3 meters (9.7 feet) long, starting at the back of each power supply (two or three different heights) within the rear of each repeater cabinet. Each cord plugs into an AC Outlet which has a cord length of about 3 meters (9.7 feet) long.

AC Power Installation must conform to local Installation Regulations.

2.3.3.2 DC Power

When required, DC options for supply are available but will be customized for the particular system. The power supplies will be omitted from the cabinets and replaced by a fused DC panel. In this case, power must be supplied to the repeaters from an external 13.8 or 24 Vdc power source through a separate 30-amp circuit breaker for each repeater.

The supply system will normally comprise Invertor, Circuit Breaker Panel and various DC-DC Convertors sized for the equipment. DC feeds to those equipments will be direct from the circuit breaker panel. The Site Controller computor and associated modem require AC power. DC Power Installation must conform to local Installation Regulations.

2.3.3.3 Generators

Some systems, predominately remote sites, will require emergency generators with automatic switch-over systems. The generators must be connected to the external site grounding system and should be located external to the equipment room.

Automatic switch-over systems must be disabled during installation.

2.3.3.4 Battery Backup

Some systems will require a Battery backup connected to the supply system in case of input power failure. The battery bank should be located either separate from the equipment room or within the room but at a point furthest from the entrance. It should either have a separate fume extraction system or should be located below the air Extraction system for the site.

2.3.4 Inter-Site Communications

There are various types of Inter-Site Communication Systems which require interfaces to be pre-installed within the site. These interfaces will be the agreed demarcation points to which the Customer, Sub-Contractor and EDACS Installer will make connections.

There are two types of interconnection:

- Hardwire/Leased Line

  Direct Connection

  Leased/dedicated Telephone Line

- T1/E1

  Leased T1/E1

  Microwave

  Fiber Optic Cable

2.3.4.1 Hardwire/Leased Line

When the media specified for Inter-Site Communication is to be Hardwire or Leased Telephone Line, the line requirement is for 2/4 wire audio/modem and RS232/422 data.

2.3.4.1.1 Hardwire

When the media specified is to be Hardwire, the following specifications apply:

- Audio: 2 or 4 wire screened cable, screen connected to site ground system and cable core is to be solid in order that it may be punched-down.

- Data: Screened twisted pair, screen connected to site ground system and cable core is to be solid in order that it may be punched-down.

If the distance for the data cable is less than about 50 feet, a standard RS-232 data cable may be used to connect the System Manager computer to the Site Controller computer. If greater than 50 feet but less than 500 feet, RS422 connection should be made.

However, RS422 connection is unavailable, modems will be installed with interconnecting cable laid within the building as specified by the customer. The cable is to be 2 pair, twisted and screened.

2.3.4.1.2 Telephone Line

When the media specified is to be Leased-Line via the local telephone company, request a 4-Wire 43202 Type 5 Data-Grade line from the local or regional telephone carrier. If using an equivalent line (old specification is 3002 Data Grade), it must meet the following specifications:

- Frequency response:

1000 Hz	Reference
500 - 2400 Hz	-1 to +3 dB
300 - 2700 Hz	-2 to +6 dB

- Max Frequency Error = ±5 Hz
- Max Net Loss = 16 dB
- Max Group Delay (800-2400Hz) = 2000µS
- Min S/N Ratio = 24 dB

The telephone company or customer will normally provide a point of interface for the telephone system within the site known as the Demarcation Point. The installer will make the necessary connections between this Demarcation Point and the EDACS equipment.

For the System Manager to Site Controller data link and Control (Downlink) where Uplink GETC is not used, modems are to be installed at each end of the link. The line requirements for this link are a 2-wire Dial-up or 4-Wire Leased 43202 Type 5 Data-Grade Telephone Line (or equivalent).

2.3.4.2 T1/E1

A T1/E1 link may be leased from the Local or Regional Telephone Carrier, may be via a Microwave System or may be via Fiber Optic cable. The Microwave/Fiber Optic system may be provided by the customer or sub-contracted by the company. Whichever is the case, the EDACS voice, data and modem audio will be presented to the Mux and multiplexed onto a T1 or E1 carrier. Punchblocks are NOT to be used as an interface for T1 or E1 communications once multiplexed.

2.3.4.2.1 Leased T1/E1

If the link is Leased-Line T1 or E1, the carrier may provide the Multiplex (Mux) equipment and Channel Service Unit (CSU). If so, they will connect to an agreed Demarcation Point (Punchblock) and collect the EDACS voice, data and modem audio as appropriate. If they do not provide the Mux or CSU, a Mux and CSU will be provided and the demarcation point will be the appropriate T1/E1 interface on the Mux or CSU. The EDACS installer will make connections to the Mux and T1/E1 connections to the CSU.

2.3.4.2.2 Microwave

The Microwave system may be provided by Customer, Ericsson or Sub-Contractor. Whichever is the case, the Inter-Site Communications System should be in place prior to EDACS installation and the system provided will have a Demarcation Point to which the installer will connect the EDACS Inter-Site Communications. This may be Punchblocks or the input connection to the multiplexor and the length of the cross-connect cabling must be calculated to allow for the agreed location of the interface.

The Inter-Site Communications links, including Loop Switched and Main Hot Standby links, are to be tested as per the Acceptance Test agreement (included in the sub-contract) prior to connecting the EDACS System. If the links are not acceptable, has too much loss or has excessive bit error rate, the sub-contractor is to be recalled to realign the affected link.

It is normal for the microwave radio to be close to it's antenna and, in some installations, this may mean some distance between radio and multiplexor. If the distance between radio and multiplex equipment is excessive, consideration must be given to type of cable used for the connection, cable screen/ground, grounding through in-building cable routes, etc. This subject is to be discussed with microwave provider and must conform to local installation regulations.

2.3.4.2.3 Fiber Optic

It is a requirement that the demarcation point for fiber optic cable is the fiber optic interface on the multiplexer. If the multiplexer is not equipped with such an interface, a fiber optic line driver will be provided and will be the point to which the cable is to be connected.

All other considerations are as for Microwave.

2.4 QUALITY AUDIT

2.4.1 Antenna System

After the Antenna System is installed, it should be inspected before the installers leave. A checklist of tasks performed on the antenna system is provided in Appendix A. Be sure to complete this visual inspection before the installers leave, so any obvious errors can be corrected.

Using field glasses, if necessary, view the Antenna System from various positions on the ground. Using copies of the Antenna System Installation Checklist found in Appendix A, fill out a checklist for each antenna as you go through the following inspection procedure. This will provide a record of the inspection, and of some antenna information for future reference.

- Record the make of antenna.
- Record the type of antenna (omni or directional).
- Record the design gain of the antenna.
- If the antenna is directional, record the bearing of the main lobe. If it is omni, write "Omni" in the data entry line.
- Record the height of the antenna above ground.
- Confirm that cable hoisting grips were installed as required to prevent damage to the coaxial cable. Hoisting grips should have been installed at the antenna end of the cable plus one for each 200 feet of cable length.
- Confirm the cable is secured to the tower at intervals which do not exceed 3 feet.
- Confirm the cable is grounded at the top of the tower.
- Confirm the cable is grounded at the point where it leaves the tower.
- Confirm the cable is grounded at the point where it enters the building.
- Confirm the coaxial cable run looks OK. The cable must be tight (nothing to flap in the breeze), have no kinks, be one continuous run (no connectors or splices), and not exceed the minimum bending radius on any bend.

- Confirm the cable feedthrough is properly installed where the cable enters the building.
- Confirm the coaxial connectors have been properly weather sealed with tape.
- Confirm the cable entrance to the building has been properly weather sealed.

2.4.2 Electrical System

If the electrical supply system has been installed by other than the company, it must be inspected to ensure that it is safe and complies with both local regulations and the requirements of the site.

- Confirm that the supply system is rated to handle the full operating load of the equipment.
- Confirm that all outputs to which the site equipment will be connected have suitably rated breakers installed.
- Confirm that electrical cabling to the equipment is correctly rated, installed and meets local regulations.
- Confirm that the system is correctly grounded.
- Confirm that cables, bus-bars and associated equipments are not a hazard to installers or maintenance teams.
- Confirm that manuals for the supply system have been provided at the site.

2.4.3 Intersite Communications System

- Confirm that the EDACS Site Inter-Site Communications Demarcation Point is installed as agreed.
- Confirm that the Inter-Site Communications System meets the requirements of both EDACS system and sub-contract.
- Confirm that the cables are correctly grounded where appropriate that the cables are of the correct type and length, are installed in the Site ducting/cable ladders such that they are not a hazard and conform to local regulations.

3. EQUIPMENT INSTALLATION

3.1 INTRODUCTION

NOTE

AC power adequate to meet system requirements, environmental control, civil works and site preparation, and digital or voice grade phone lines must be available at the site prior to installation.

This section is divided into the following sub-sections:

- Unpacking the Equipment
- Antenna System
- RF Equipment Installation and Cabling
- EDACS Cabinet Installation
- Quality Audit

3.1.1 Layout

The installer will position the cabinets according to the Site Layout Plan provided. Where possible, a site layout will be designed with the following in mind:

- The Power System and Batteries are furthest from the point of access to the room or in a separate room/enclosure.
- The Microwave Radio (if located in the EDACS Site) is closest to the grounded bulkhead panel to minimize waveguide bends. RF cabinet should be next to the microwave cabinet to reduce to length of coaxial cable required to the bulkhead.
- The EDACS equipments are positioned such that the Site Controller is closest to the door with the repeaters between Site Controller and RF cabinets.
- The Multiplex/CSU equipments are positioned next to the Site Controller/1st Repeater cabinet.

3.2 UNPACKING EQUIPMENT

EDACS equipment is generally packed in one of the following two ways:

- Bolted vertically to a mini pallet approximately 36" deep x 32" wide, with a corrugated cardboard cover held down with two plastic straps. This technique is generally used for domestic shipments of 69-inch and 83-inch cabinets. The mini pallet adds approximately three inches to the overall cabinet height. The weight varies according to the content, but generally runs from 300 pounds to 600 pounds.
- Crated vertically or horizontally. This technique is generally used for open-racked equipment and overseas shipments of 69-inch and 83-inch cabinets. Crates may contain one or several cabinets or racks, and the dimensions and weight will vary accordingly. If size and weight limits are required, contact the factory for special packing instructions.

Cabinets packed on mini pallets can be moved with a hand-truck, crates may need a fork lift or pallet jack, depending on the size. Wrenches will be needed to unbolt the cabinets from the mini pallets, and a crowbar and hammer will be useful in opening the crates. Do not leave packed or unpacked equipment exposed to the weather.

Upon receipt of the EDACS station equipment, carefully examine each carton. If any Packaging damage is detected, note the damage on the Bill of Lading.

Move the cartons as close as possible to their mounting location.

Carefully unpack the equipment and examine each item. If there is any damage to the equipment, contact the carrier immediately and have their representative verify the damage. If you fail to report the shipping damage immediately, you may forfeit any claim against the carrier.

When unpacking the equipment, check the contents against the packing list. Contact your Ericsson Inc. representative and the carrier if any discrepancies are noted.

Carefully open each cabinet and inspect the contents to ensure that enclosed equipments have not been damaged during delivery. If damage has occurred, note details of the damage and, if necessary, contact the carrier immediately and have their representative verify the damage. Contact your Ericsson Inc. representative if the damage is such that installation cannot proceed.

3.3 ANTENNA SYSTEM

The Antenna System is normally installed by qualified antenna installers and riggers. They are responsible for that system from antenna element to the grounded bulkhead panel at the cable entrance to the site.

The detailed requirements and quality audit for the antenna system are covered in the previous section.

3.4 RF EQUIPMENT INSTALLATION

NOTE

Refer to LBI-39067 for Site Grounding and Protection Standards.

NOTE

These procedures are for Ericsson Inc. standard installation. If the system is non-standard, installation procedures may differ. In this event, installers should consult with Ericsson Inc. System Engineering.

Refer to the Trunked Equipment sub-section, RF Equipment cabinet(s) for detailed information for fabricating and installing RF cables within the equipment room.

This section provides instructions for installing the RF Equipment and for running the necessary RF cables to the equipment room wall Tx and Rx feedthrough connectors. The RF Equipment Cabinet consists of the following components:

- Vertical Cabinet/Rack
- Top Cover 69/83 inch cabinet
- Tower Top Amplifier or Receiver Filter
- Receiver Multicoupler
- Transmitter Combiner

3.4.1 Surge Protection Equipment

- Tx Coax Surge Protector, IS-DC50LNZ-MA (400-960 Mhz)
- Rx Coax Surge Protector, IS-UT50HN-MA (450-512 MHz)
- Rx Coax Surge Protector, IS-CT50HN-MA (800-900 MHz)

3.4.2 Mounting Vendor Supplied RF Equipment

RF Equipment used for interfacing the Antenna System to the Repeaters may be pre-racked by Ericsson Inc. or dropped shipped from the individual vendors directly to the customer. If the RF equipment is supplied directly from the vendor, it will be necessary to install the equipment into the RF Equipment Cabinet.

NOTE

The system is designed to use either a Tower Top Amplifier or a Receiver Filter. When a Tower Top Amplifier is used, the Receiver Filter is not required.

1. Install the vendor supplied RF equipment into the RF Equipment cabinet. The Cabinet Layout Diagram in Appendix B shows a typical equipment rack-up of the RF Equipment cabinet. (For specially engineered systems, refer to the "As-Built" Site Floor Plan and Equipment Rack Elevation Diagrams for the particular site as supplied by Application Engineering.)

2. Secure each component to the cabinet using standard mounting screws and clips that come as part of the cabinet hardware kit.

3. Mount the Receive Surge Protector (IS-DC50LNZ-MA), if not previously installed, to the grounded bulk head panel, located at the wall feedthru where the antenna system enters the building. This panel should have already been installed by other installers (Refer to Surge Protector Diagrams in Figures 1 and 2).

4. If the system includes a Power Monitor Unit, install the Antenna Power Sensor by connecting it directly to the output of the Tx Combiner. The Antenna Power Sensor allows the Site Controller to monitor the forward and reflected power of the transmit antenna. (The Antenna Power Sensor is shipped in the bottom of the Site Controller cabinet.) Sensor cabling will be installed later. For systems with more than one Tx antenna, the appropriate quantity of Sensors will be provided and must be installed directly to the output of each combiner.

5. Mount the transmit surge protector (IS-CT50LNZ-MA) to the grounded bulkhead panel, located at the wall feedthru where the antenna system enters the building. This panel should have already been installed by installers. (Refer to Surge Protector Diagrams in Figures 1 and 2.)

6. Install Top Cover (if cabinet).

3.5 EDACS CABINET INSTALLATION

This section provides general instructions for the physical installation of the following standard cabinets in the equipment room:

- Site Controller cabinet/Racks (if supplied)
- Failsoft Repeater cabinet(s)/Racks
- RF Equipment cabinet(s)/Racks

An Equipment Room Installation Checklist, see Appendix A, is provided which suggests the installation task sequence and provides a method for tracking task completion.

3.5.1 Cabinet Mounting (Typical)

The following tools and materials are typically needed to fasten the cabinets to concrete floor (if installing on wood flooring - do not use lead anchors):

- 1/2" x 2" Lag screws (4 per rack).
- 1/2" Flat washers (4 per cabinet/rack).
- Lead anchor for 1/2" lag screws (4 per rack).
- Measuring tape.
- Heavy duty marker (suitable for marking coarse concrete).
- Eye protection.
- Ear protection.
- Drill with masonry bit (see size marked on anchor).
- 1/4" x 24" Flexible plastic tubing (blow debris out of hole).
- Hammer (seat anchor in hole).
- Wrench (screw lag screw into anchor).

The lag screws, washers, and anchors are supplied with each cabinet. The installer normally provides the tools but may purchase what is required from the company.

The following additional materials are supplied with each optional open-type equipment rack to fasten adjacent side rails together at the top and bottom:

- 3/8" x 1 1/2" Hex machine screws (2 per open-rack).
- 3/8" Hex nut (2 per open-rack).
- 3/8" Flat washers (4 per open-rack).
- 3/8" Lock washer (2 per open-rack).

Refer to the floor plans in the Appendix B for typical floor plans or to Site Plans if they differ. These floor plans aply to cabinet placement for sites having up to 20 MASTR III trunked repeaters (channels), in 69-inch or 83-inch cabinets using cable ducting. If other than a standard configuration is used or cable ladders are required, alternative length interconnect cables may be required.

When the number of repeaters (mounted three per cabinet) is 12 or less, or (when mounted 4 per cabinet) up to the maximum of 20, the standard placement of the Site Controller, Failsoft Repeater, and RF Coupling cabinets is in a single row. When the number of repeaters (when mounted three per cabinet) is 13 to 20, the standard placement of the Site Controller, Failsoft Repeater, and RF Coupling cabinets is in two rows (cabinet backs of one row facing cabinet fronts of the other row) with a three-foot isle between.

The RF Equipment cabinet(s) may be installed at either end of a row but it is preferrable that they are beyond the last repeater cabinet. For optimum performance, RF Equipment cabinet should be located on the end at a point nearest the RF Bulkhead, where the antenna cables enter the building. This allows the antenna cable lengths to be minimized.

Position all the cabinets on the floor exactly where they are to be mounted. Allow one (1) meter (3 feet) of free space in front of and behind each cabinet, to allow the cabinet doors to swing completely open. Also allow one (1) meter (3 feet) of free space around at least one end of each row of cabinets, to get to the back of the cabinets. If the 13 to 20 channel site requires cabinets to be mounted in one row, a break is required in the lineup to allow ease of access and safety.

Mark the position of the mounting bolt holes on the floor using the four holes in the bottom of each cabinet as a template. Move the cabinets, drill the holes in the floor for the screw anchors, seat the anchors in the holes, reposition the cabinets, and fasten the cabinets down with lag screws (use a flat washer under each lag screw head, to prevent damage to the cabinet).

3.5.2 Cable Routing

If cabinet-top cable ducts are supplied, install per LBI-38875 using the hardware provided. However, leave the duct covers off until the site wiring is complete. These cable ducts are not available for open-type equipment racks.

Larger systems should make use of cable ladders for ease of installation and maintenance. It is preferrable that dual ladders be used for large systems such that audio and data may occupy one level of the ladder and RF and power occupy the other. If dual systems are not available, ensure maximum separation between Audio/Data runs and RF/Power runs.

Install as shown on the site plans and install all grounding leads across ladder section connections.

3.5.3 Protective Ground Connections

Protective grounding outside the equipment room is beyond the scope of this manual but is available in LBI-39067. This manual provides general information for internal grounding only and detailed information on site grounding is available in LBI-39067.

However, a general rule for the external grounding system is that the resistance to ground should be five (5) ohms or less, as measured with a Biddle DET2/2 Megger or equivalent, per IEEE STD 81-1983 or local equivalent.

All equipments within the site must be connected to an internal halo ground of No. 2 AWG copper wire six (6) inches below the ceiling. This interior halo ground must be connected to the external ground system at each corner, using separate No. 2 AWG copper wires. The halo may be mounted on the cable ladder, in the ducting or beneath the false floor.

All metal (electrically conductive) objects within the equipment room must be grounded. These objects are divided into the following three (3) groups.

- Room Fixtures
- Power Supply
- EDACS and associated equipment

All metallic fixtures and room parts, such as door frames, sheet metal, ventilation louvers, air conditioning units, light fixtures, etc., should be connected to the internal halo ground.

In addition to all other AC power protection, the AC power must be equipped with a Josilyn AC protector, or equivalent, placed immediately after the main disconnect switch. This protector must be connected to the external ground system using a separate No. 2 AWG copper wire.

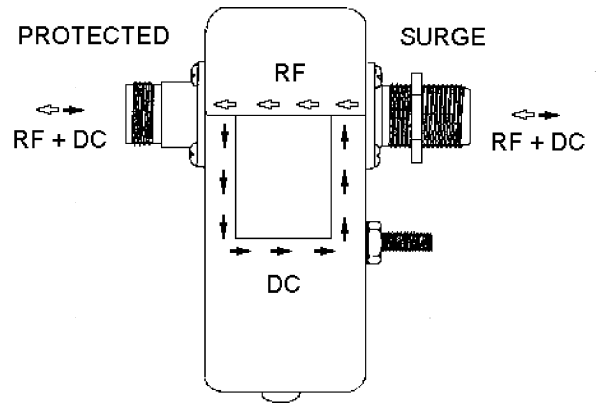
All EDACS cabinets, cable trays, and protectors for cables connecting to this equipment, must be connected to a single grounding plate or bulkhead panel mounted on the wall where the antenna cables enter the equipment room. This grounding plate must be connected to the external ground system using two (2), two-inch wide copper strapping, or equivalent. A separate No. 2 AWG copper wire must be used for each EDACS cabinet, each cable tray/ladder, and each group of cable protectors.

A few general rules of thumb are as follows:

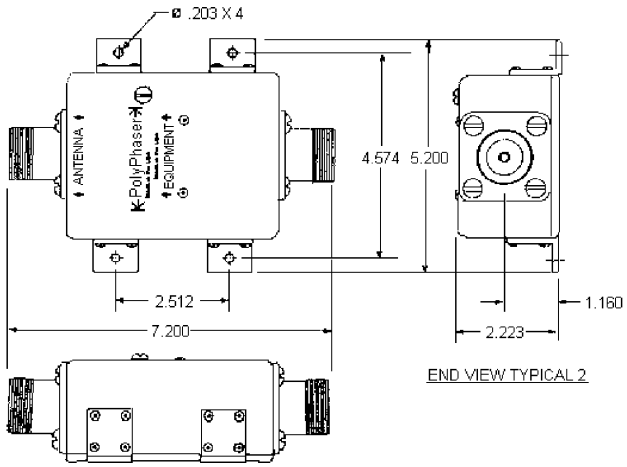
- Make ground wires as short as possible and direct as possible - avoid bends if possible - absolutely no bends with a radius of less than eight (8) inches.
- Surface area of ground wires is more important than cross sectional area.
- All connections must be clean, free of non-conductive coatings, and be coated with an anti-oxidant.

3.6 QUALITY AUDIT

The repeater site equipment room should be inspected before the installers leave. Use an ohm meter, if necessary, to check for continuity or shorts. Using copies of the Equipment Installation Checklists found in Appendix A, complete a checklist for each equipment cabinet as you go through the inspection procedure.



RX SURGE PROTECTOR IS-DC50LNZ-MA
Suffix: **-MA** for male connector bulkhead port (not threaded like female shown)



Tx SURGE PROTECTOR IS-CT50HN-MA
Suffix: **-MA** for male antenna port (not threaded like female shown)

Figure 1 - Surge Protectors

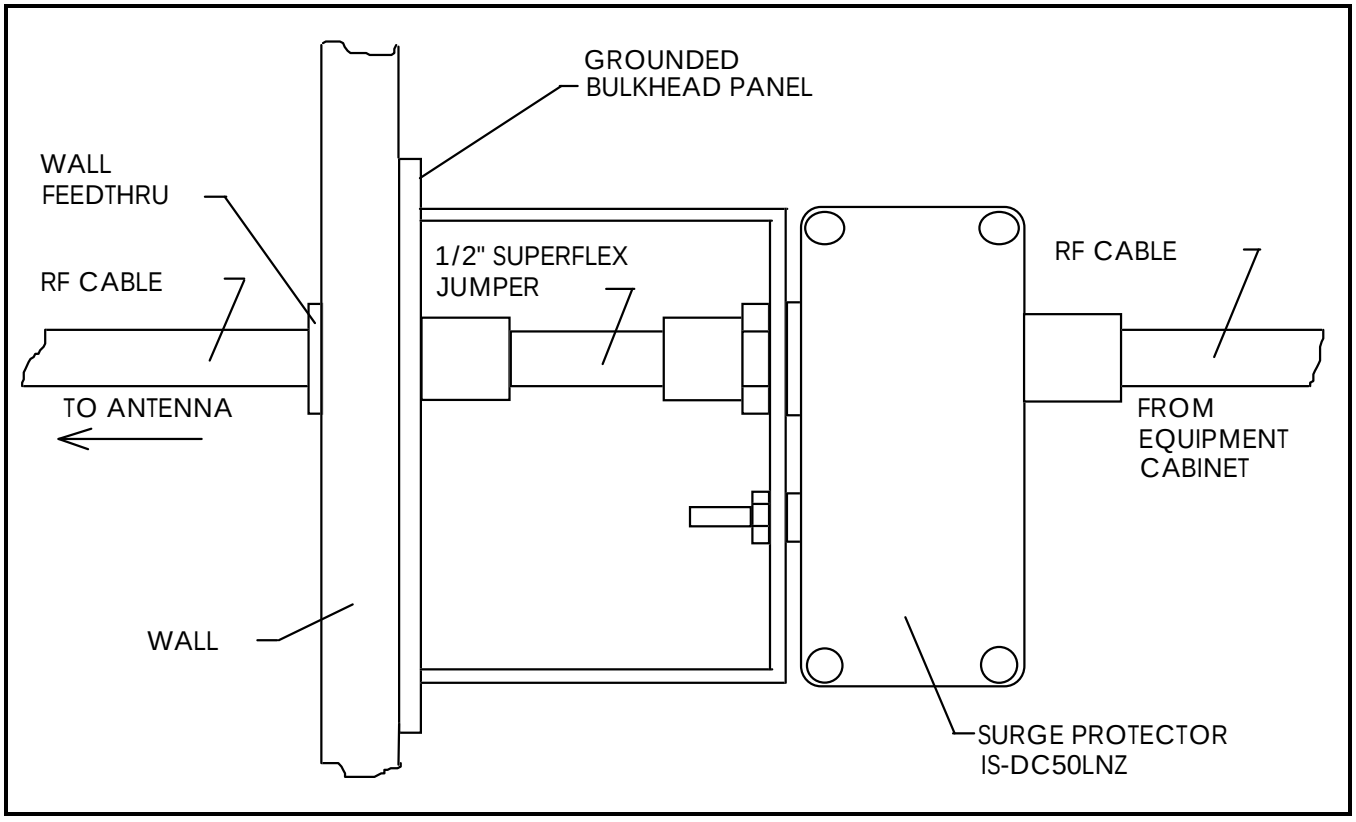


Figure 2 - Typical Mounting of the Rx Surge Protectors

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4. SITE POWER

4.1 INTRODUCTION

CAUTION

To prevent damage to equipment, ensure power is not accidentally applied at this time. Make sure all equipment circuit breakers are in the OPEN position. There is NO requirement for the installer to apply power to the equipment cabinets.

DO NOT apply power at this time!

Power is provided to a site in a variety of ways. Whether AC or DC supplied, the site may require no extra equipment or may require UPS, Battery System and/or Generator backup. This section will address those variations but will not be too detailed due to the variance of equipments used to provide site power.

The site, regardless of complexity of equipment, is to be powered-up in a controlled fashion. This is to ensure that, should a power problem occur, possible damage can be limited and the problem can be quickly located and resolved. In general, a site is to be powered-up with all breakers open and site equipments isolated. Breakers will be closed in a logical progression through the power system until it can be applied direct to the site equipments.

Note that some equipments on the site require AC supply; i.e., both Site Controller and its modem.

4.2 POWER INSTALLATION

4.2.1 Existing Input Power

If the site already has an existing Input Power Source, that power supply is to be tested to ensure that it conforms to the EDACS site requirements and is equipped with the necessary breakers to conform to both design and local regulatory standards.

If the site Input Power Source does not conform to the EDACS site requirements or is not equipped with the necessary breakers to conform to both design and local regulatory standards, refer the matter to the Site Manager.

With the site related power supply cabinet isolated, apply power to the site from customer's breakers.

4.2.2 AC distribution

If the site already has an AC distribution system that conforms to requirements, the AC distribution is to be tested and all individual output breakers must be left open.

If the site requires an AC distribution system to be installed, this is to be performed by qualified installers in agreement with the customer. The drawings containing the installation requirement will be provided to the Site Manager by the Applications Engineer.

The input supply is to be isolated and not re-applied until installation is complete.

4.2.3 Generator System

If the system already has a backup generator system providing backup supply to the site, this is to be inspected and tested as defined in the Power System Test section.

The Site Design will require either a manual or an automatic transfer switch system with a generator system. Inspect the customer system to ensure that it is fitted with the appropriate transfer switch system. This is to be inspected and tested as defined in the Power System Test section.

If a generator system is to be installed, this is to be performed by qualified generator installers in agreement with the customer. If remote control and/or alarms are to be installed for the generator system, ensure that the EDACS installer understands the correct connections on the generator. The drawings containing the installation requirement will be provided to the Site Manager by the Applications Engineer.

4.2.3.1 Manual Transfer Switch

If a Manual Transfer Switch is to be installed, this should be installed by the same team who installed the generator. If this is an additional/new feature, the system is to be modified by qualified engineers in agreement with the customer. The drawings containing the installation requirement will be provided to the Site Manager by the Applications Engineer.

4.2.3.2 Automatic Transfer Switch

If an Automatic Transfer Switch is to be installed, this should be installed by the same team who installed the generator. If this is an additional/new feature, the system is to be modified by qualified engineers in agreement with the customer. The drawings containing the installation requirement will be provided to the Site Manager by the Applications Engineer.

4.2.4 AC-DC Supply

If the system already has an AC-DC conversion system which complies with the requirements of the EDACS System, this is to be inspected and tested as defined in the Power System Test section.

If the site requires an AC-DC conversion system to be installed, this is to be performed by qualified installers in agreement with the customer. The drawings containing the installation requirement will be provided to the Site Manager by the Applications Engineer.

The system will normally comprise input breakers, rectifier stage, convertors and individual output breakers all of which will be voltage and/or current specified in the site design drawings. Ensure that input supply is isolated and not re-applied until installation is complete.

4.2.5 Battery Backup

Battery backup is normally provided either to ensure smooth supply voltages during normal operation or when alternate supply switches into circuit or for short-term site power supply when input supply to the site has failed.

If the site already has a battery backup system which complies with the requirements of the EDACS System, this is to be inspected and tested as defined in the Power System Test section.

The battery backup system will normally comprise a battery cell system - such that the desired voltage can be provided for a specified time, inverter/charger equipment, input and output breakers, and either manual or automatic switch to switch the system into circuit. The installation requirements will be in the site design drawings agreed by customer and Application Engineers.

4.2.6 UPS Supply

An UPS system may be provided as an alternative to other supply options. It may comprise some or all of the following components:

- Input supply and protection
- Various DC outputs (additional equipments required)
- Output protection
- Battery backup
- Bypass switch
- Automatic switch-over to generator

If the site already has an UPS system which complies with the requirements of the EDACS System, this is to be inspected and tested as defined in the Power System Test section.

If the site requires an UPS system to be installed, this is to be performed by qualified installers in agreement with the customer. The drawings containing the installation requirement will be provided to the Site Manager by the Applications Engineer.

4.3 POWER SYSTEM TEST

4.3.1 Existing Input Power

The input power supply to the site is to be tested to ensure correct voltage level and breaker operation.

1. Inspect the customer's power distribution panel. Test the input supply and confirm from customer's documentation that the input supply can provide the correct voltage and current.

2. Inspect the customer's breakers on the input to the site. Confirm that they are rated as required for the site loading. The requirement is stated in the site survey requirements document.

3. Confirm that the power cabling is sufficient for the expected load.

4. If the customer's breaker can be tested for breaker action, test that now.

4.3.2 AC Distribution

If the system has direct AC distribution to the equipment via circuit breakers only, open all individual output breakers.

1. Confirm operation of input AC protection breaker.

2. Close each breaker in turn to provide AC power to individual equipments. If the breakers are fitted with an overvoltage test facility, perform the test once an equipment has been powered up.

3. Confirm that each station and/or cabinet supply is operating correctly and that output voltages are as required.

4.3.3 Generator Backup

If the generator system has remote control or alarms to be connected to the EDACS Site equipment, ensure that these are connected prior to test. Ensure that the fuel system is ready for operation and that the system is correctly grounded.

1. Switch the generator on.
2. Confirm output supply is as specified in the drawings.
3. If remote control option is installed, remotely control the operation of the generator.
4. If alarms are configured, toggle the alarm conditions and confirm that the alarm system correctly reports the conditions.

4.3.3.1 Manual Transfer Switch

If the system has a generator providing backup supply to the site, isolate the generator output to the site and confirm cabling to the site input. Isolate the site from the generator by opening the main breaker and the manual transfer switch. Power up the generator. Locate the user manual for the generator and follow recommended tests.

1. Confirm that the voltage output is correctly rated for the site.
2. Confirm operation of manual tranfer switch.
3. Confirm that generator voltage is applied to the site on operation of transfer switch.

4.3.3.2 Automatic Transfer Switch

If system is fitted with automatic transfer switch to generator power, this is to be tested. Isolate all output breakers to site equipments. With the generator off, apply customer AC power to site. Confirm that site power is present at the site equipment output breakers. Fail the customer AC power input by operating the associated breaker.

1. Confirm that the generator starts.
2. Confirm that the automatic transfer switch operates.
3. Confirm that AC power is provided by the generater to the site power system.

4.3.4 AC-DC Supply

Ensure that each converter output breaker to the EDACS equipment is open.

1. Confirm operation of input AC protection breaker.
2. Confirm that the rectifier output is at the desired voltage.
3. Confirm that the rectifier output breaker operates.
4. With converter output breakers open, confirm each convertor output is as rated/required for the associated equipment.
5. Close each breaker in turn to provide DC power to individual equipments.
6. Confirm that each station and/or cabinet supply is operating correctly and that output voltages are as required.

4.3.5 Battery Backup

Prior to powering on the site, it is essential that the battery system is inspected to confirm that the installation is safe, that the connectivity is correct, that the cells are serviceable and that the installation conforms to regulatory and site requirements.

1. Confirm that the battery system connectivity is correct as detailed in the Site Drawings.
2. Confirm the battery system is electrically safe.
3. Confirm that “wet” cells have been prepared and have adequate fume extraction capability provided.
4. Confirm that all cabling is safely installed such that it is not a hazard.
5. Confirm that output voltage is as specified across all the cells.
6. With site equipment breakers disconnected, connect the battery system to the site power system.
7. Confirm that the battery system is in Charge mode.
8. Confirm that the power system is providing power to the open site equipment breakers by checking voltage across breakers.
9. Close the Repeater Cabinet #1 equipment breakers to connect power to that cabinet only. Confirm that

equipment powers up correctly and that there are no abnormal indications.

10. Confirm that battery power has been applied to site equipment power distibution equipments.

11. Confirm that the battery supply applied on site equipment is as specified.

12. When the battery cell system has fully charged, disconnect the AC input to the site by opening the site supply protection breaker.

13. Confirm that the battery supply applied to site equipment is as specified.

You may wish to leave the batteries supplying the site to test the duration of supply. When tests are complete, open the Repeater Cabinet #1 equipment breakers to isolate the EDACS equipment and shutdown the Battery system.

4.3.6 UPS Supply

Use the vendor installation manual test instruction to test the operation of the facilities of the UPS under test. Complete the Data Sheet referring to the UPS test manual. Isolate EDACS equipment at end of tests.

4.4 POWER-UP SEQUENCE

Open all site equipment power distribution breakers or power down station/cabinet power supplies.

1. Close customer power breaker to apply power into site power system. Confirm that input power is at rated voltage and that there are no abnormal indications.

2. If the system is fitted with auxillary or backup power systems, connect these to the power system. Check backup power is at the rated voltage, is correctly applied to the main power source equipments either in normal or emergency modes and that there are no abnormal indications.

3. If the system provides DC to the site, connect the power source to the converters. Check the outputs of each converter and confirm that the output is as designed and rated for the equipments.

4. Apply power to each Repeater, or to Repeater cabinets if power is not provided individually to stations. Switch repeaters on, one-by-one. Confirm that there are no abnormal ndications.

5. Apply power to Site Controller cabinet and confirm that there are no abnormal indications.

6. Apply power to the remainder of the ancilliary cabinets on site and confirm that there are no abnormal indications.

4.5 QUALITY AUDIT

Using a copy of the Power System Installation Checklist found in Appendix A, complete a checklist for each type of power system used.

4.5.1 Input AC Power

1. Verify that the site can be completely isolated from customer/utility input power. Verify that input AC power is protected by a Josilyn AC protector, or equivalent, which is located immediately after the main disconnect switch. Verify that input DC power is protected by a protector which is located immediately after the main disconnect switch.

2. Verify that specifications for the existing input power; i.e., voltage, current, etc, are correct.

3. Verify that customer's input power breaker is correctly rated for the site power load.

4. Verify that input power cabling is sufficient for site loading.

5. Verify operation of customer's input power breaker.

6. Verify distribution to individual cabinets and equipments, voltages and individual breaker operation.

4.5.2 Generator

1. Verify operation of generator, remote control, alarms, bypass switch and automatic switch-over.

2. Verify that generator output voltages are as specified.

4.5.3 AC-DC System

1. Verify that rectifier output to convertors is as specified.

2. Verify that rectifier output breaker operates correctly.

3. Verify that convertor output breakers operate correctly.

4. Verify that convertor output voltages are as specified.

5. Verify that each associated equipment or cabinet is operating correctly.

4.5.4 Battery Backup System

1. Verify that the battery system connectivity is correct as per design document.

2. Verify that the battery system is electrically safe.

3. Verify that "wet" cells have been prepared and have adequate fume extraction capability provided.

4. Verify that all cabling is safely installed such that it is not a hazard.

5. Verify that output voltage is as specified across all the cells.

6. Verify that the battery system will Charge from input system.

7. Confirm that battery power has been applied to site equipment power distibution equipments.

8. Confirm that battery voltage applied to site equipment is as specified.

4.5.5 UPS Supply

1. Confirm that installation is complete as per the instructions in the Vendor's Installation Manual.

2. Confirm that the installation is electrically safe before applying power to the site equipment.

Verify that UPS system successfully completes all Vendor's installation tests as specified in the accompanying manual.

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5. SYSTEM CABLING

5.1 INTERIOR RF CABLING

Some RF coaxial cables may be pre-made and included with the system. However, most cables, must be custom made, on site, to the required length. Table 4 lists the cables and associated connectors, which will typically be fabricated in the field.

The coaxial cable and connectors are supplied in bulk. To cut the cable properly for easy connector attachment, use an Andrew's "EASIAX" coaxial cable cutting tool (or equivalent).

When installing the RF cables, refer to the Antenna System Block Diagrams in LBI 38983 or the Site Antenna System drawing to locate and identify the specific cable called for in these installation instructions.

5.1.1 Installing RF Cables

Assemble and install the RF coaxial cables. Be careful not to exceed minimum bend radius (refer to Site Preparation - Antenna System for specifications).

Refer to the Antenna Systems Assemble Manual LBI-38983, MASTR III Base Station Installation Manual LBI-38636, and applicable vendor manuals for Tx and Rx connection points. (For specially engineered systems, refer to the Site Antenna System drawings for the site.)

Use cable ties to secure the coaxial cables to the back rails of the cabinets. Ensure cables do not impede access to the internal equipment and the installation appears neat and orderly. Route cables away from the sharp ends of mounting screws (on the back side of the equipment rails), and allow room for equipment mounting screws to be removed and re-installed without damaging the cables.

NOTE

If overhead cable ladders are used, ensure the RF cable are of sufficient length to run from point A to point B via the cable ladder. Do not loosely ‘drape’ cables on top of cable ladders or racks.

Begin the cable installation by installing receiver cables first. Then complete the installation by installing the transmitter cables.

5.1.1.1 Receive Section

Use the following procedures to install the RF cables for the receive section of the system. Refer to Table 4 for cable references.

1. Route receiver RF cables ① from the RX Multicoupler to the receiver RF input connectors. One cable is required for each receive channel as labeled (RX CH 1, RX CH 2, RX CH 3, etc.).

NOTE

These cables may be connected inside the repeater cabinets at the factory. If they are already connected to the repeaters, they only need to be routed to the RX Multicoupler. Pay close attention to cable labeling and connect to the correct port on the Multicoupler.

2. Make sure any unused ports on the Rx Multicoupler are terminated with 50 ohm loads (refer to the vendor Maintenance Manual).

3. Connect a 1/2-inch Superflex RF cable ② from the output of the Rx Multicoupler to the input of the Tower Top Amplifier Power Supply (or RX Filter if installed).

4. Connect a 1/2-inch Superflex RF jumper ⑥ from the surge protector to a wall feedthru (refer to the Antenna System Block Diagram in Appendix F).

5. Connect a 1/2-inch Superflex RF cable ④ from the output of the Tower Top Amplifier Power Supply (or Rx Filter) to the receive surge protector.

6. Connect the Tower Top Amplifier Power Supply and the RX Multicoupler to the appropriate supply source or power strip. (Ensure the circuit breaker is OFF prior to plugging cord into power source.)

Table 4 - RF Cables and Connectors Supplied (10 Channel System)

Cable Ref. Number*	Cable Description	Cable Type	Connectors	Cable Length (ft.)	QTY
1.	Rx RF coax cables. (Connects between the Rx Multicoupler and Receiver RF inputs.)	[V] 1/4-inch Superflex RF coaxial cable (FSJ1-50A).	[U] Type BNC (M) - 41ASWB 1/4-inch Superflex connector. [W] Type N (M) - 41ASW 1/4-inch Superflex connector.	As Required	10
2.	Rx RF coax cable. (Connects between the Rx Multicoupler and the Tower Top Amplifier Power Supply/Rx Filter.)	[M] 1/2-inch Superflex RF coaxial cable (FSJ4 -50B).	[L] Type N (M) - 44ASW 1/2-inch Superflex connectors (qty. 2).	As Required	1
3.	Tx RF coax cables. (These cables connect between the transmitter outputs and the Tx Combiner.)	[M] 1/2-inch Superflex RF coaxial cable (FSJ4 -50B)	[L] Type N(M) - 44ASW Superflex connector. [Y] Type N(M) - 49600-1, 1/2-inch Superflex right angle connector.	As Required	10
4.	Rx RF coax cables. (Connects between the Rx Tower Top Amplifier Power Supply and the Rx surge protector.)	[M] 1/2-inch Superflex RF coaxial cable (FSJ4 -50B)	[L] Type N(M) - 44ASW 1/2-inch Superflex connectors (qty. 2).	As Required	1
5.	Tx RF coax cables. (Connects between the Antenna Power Sensor and the Tx surge protector.)	[M] 1/2-inch Superflex RF coaxial cable (FSJ4 -50B)	[L] Type N(M) - 44ASW 1/2-inch Superflex connectors (qty. 2).	As Required	1
6.	Tx RF coax cables. (Connects between the Surge Protector and the wall feedthru connector.)	[M] 1/2-inch Superflex RF coaxial cable (FSJ4 -50B)	[L] Type N(M) - 44ASW 1/2-inch Superflex connectors. [N] Type N(F) - 44ASN 1/2-inch Superflex connectors.	As Required	2

* - Reference numbers used in Table correspond to reference numbers used in the text.

[ ] - Refer to material callouts referenced in LBI-38983, 19D904223 sheet 1.

5.1.1.2 Transmit Section

1. Route the Tx RF (1/2-inch Superflex) cables ③ from the power output connector of each transmitter to the RF Equipment Cabinet/rack.

2. Connect each Tx RF cable ③ to the Tx Combiner input corresponding to the channel number as labeled (Tx CH1, Tx CH2, Tx CH3, etc.).

3. To make any other required connections to the Tx Combiner, refer to Installation & Operation Manual supplied by vendor.

4. Connect the Tx Combiner channels as instructed in the vendor manual.

5. Connect a 1/2-inch Superflex RF jumper ⑥ from the surge protector to the Bulkhead Panel. (Refer to the Antenna System Block Diagram in Appendix F.)

6. Connect a 1/2-inch Superflex RF cable ⑤ from the Tx Combiner - RF Power Sensor (if supplied) output to the Tx surge protector.

5.1.1.3 Test Unit Radio

The Test Unit Radio is located in the Site Controler Cabinet in a pull-out shelf. The radio RF termination is connected to an attenuator on the rear of the shelf. The Test Unit Radio antenna is either connected to the attenuator with the antenna itself (Magmount type) located either on or above the cabinet or is hard-coupled to the RF system depending on the site design.

The coaxial cable is provided with the antenna and is installed to ensure enough slack coax allowing the shelf to be withdrawn for service. The cable is to be tied to the cabinet's rear mounting rail, routed through the cabinet-top port and installed on the cable ladder to the antenna. If too much cable remains, the cable is to be cut to length and re-terminated.

5.2 EDACS INTERFACE CABLING

Most non-RF cabling between cabinets connect from the EDACS Interface Panel in the top of one cabinet, to the panel in the top of the next , to the top of the next, etc. In this way, the cabinets are daisy-chained, by row, to the Site Controller cabinet. For ELI, refer to LBI-39076.

NOTE

The information given in this section defines cables for standard cabinet layouts. If the site layout is non-standard, refer to the table below and select the correct length for the site. The order should include the correct length cables.

Table 5 - 25-Pair Interconnect Cables

19D903880Pxxx	LENGTH IN FEET
P120	5
P121	15
P122	7
P123	10
P124	20
P125	25
P126	30
P127	35
P128	40
P129	50

Each EDACS Interface Panel is made up of one or more modules with labels such as POWER SENSOR, STATION AUDIO, MODEM DATA, etc. The panels for the site may contain extra modules for options not required of the site. This depends on the role of the site. However, the site will be provide with enough cables to daisy-chain only those modules you need.

Refer to Cabinet Interconnection Diagrams in Appendix C to determine which interface cables are required and how to install the cables between the interface panels. If a non-standard floor plan is used, longer cables may be required. The cables listed in Table 5 are the same length as those required for interconnection but are of varying length.

5.2.1 Power Sensor

If the site does not contain the Power Monitor Unit (PMU) option, skip this section. If the site will be upgraded to include a PMU, follow PMU upgrade kit installation instructions.

The Station Interface modules 19C852204G1 (labeled **POWER SENSOR**) collect and route relevant Tx output power data to the Power Monitor Unit (PMU) via the Power Sensor Interface module located in the the Site Controller cabinet.

The Station Interface Modules are daisy-chained together using 25-Pair cable (refer to Table 5), with a Channel Termination board in the Interface Module for the cabinet enclosing the 'highest numbered channel', and with the Interface Module for the cabinet enclosing the 'lowest numbered channel' connected to the Site Controller Power Sensor Interface module. The specific cabling scheme depends on the number of repeater cabinets installed in the site and the number of repeaters per cabinet. Refer to the applicable Power Sensor Module interconnect diagram in Appendix C.

Additionally, a cable is routed from the Antenna Power Sensors to the PMU via the Site Controller Interface module (see Figure 3). Refer to LBI-38812.

Old PMU's (pre-March 1995) use Power Sensor Interface module 19C852213G1. New PMU's use Power Sensor Interface module 19C852632G1.

NOTE

The Site Controller cabinet may be provided with Channel Termination boards (jumper boards) 19D852379G1 already installed in Power Sensor module connectors J1 and J2. Temporarily remove these jumpers. They will be reinstalled later.

5.2.1.1 Systems With 1 To 12 Channels

1. Install the 5-foot 25-Pair cables 19D903880P120 between the Power Sensor modules as shown in Appendix C (EDACS Interface Cabling Diagrams).

2. Install a 5-foot 25-Pair cable 19D903880P120 between the Power Sensor module J1 in the Site Controller and the Power Sensor module in the adjacent Repeater cabinet; i.e., Site Controller J1 to Repeater CH. 1-3 (J14).

5.2.1.2 Systems With 13 To 20 Channels

1. Install the 5-foot 25-Pair cables 19D903880P120 between the Power Sensor modules as shown in Appendix C (EDACS Interface Cabling Diagrams) for channels 1 thru 12.

2. Install the 5-foot 25-Pair cables 19D903880P120 between the Power Sensor modules as shown in Appendix C (EDACS Interface Cabling Diagrams) for channels 13 thru 20.

3. Install a 15-foot 25-Pair cable 19D903880P121 cable between the Site Controller Power Sensor module J1 and J14 on the Power Sensor module in the end Repeater cabinet in the second row.

4. Install a 15-foot 25-Pair cables 19D903880P121 between the Site Controller Sensor module J2 and J14 on the Power Sensor module in the end repeater cabinet of the first row.

5.2.1.3 Antenna Power Sensor Cable

Install the Antenna Power Sensor (Combiner Forward Power) cable between the Antenna Sensor and the Site Controller Interface module (POWER SENSOR) using the following procedure and Figure 3:

1. Connect the DB-9 end (P6) of the cable to the Site Controller Interface module (POWER SENSOR) connector J6.

NOTE

If the Antenna Power Sensor cable is not supplied, it will need to be fabricated on site. Refer to Appendix C and the vendor's PMU manual for details. Ensure that the appropriate parts are included in the order.

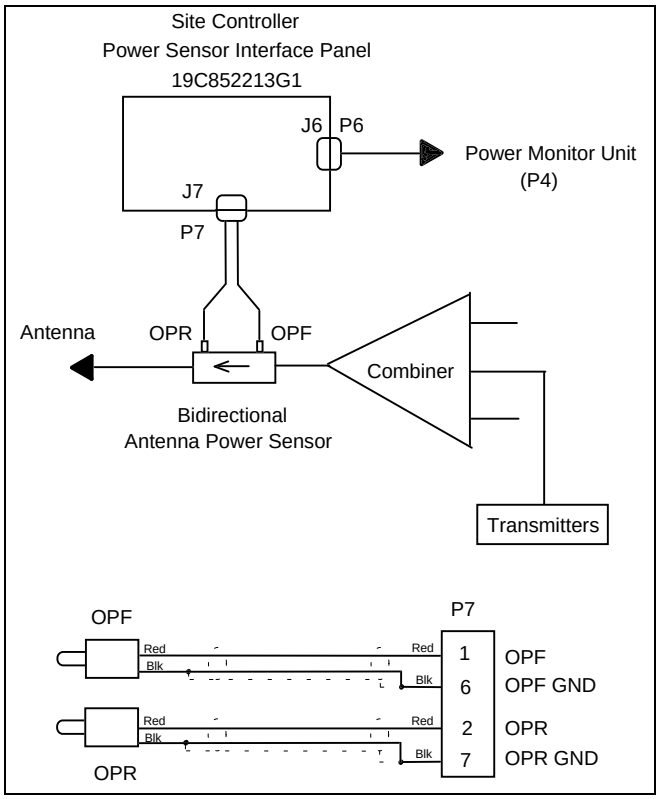


Figure 3 - Antenna Power Sensor Interconnection

2. Route the cable to the RF Equipment Cabinet via the installed cable route.

3. Connect the lead for **OPF** (**"Output Power Forward")** to the Antenna Power Sensor's OPF phono connection.

4. Connect the lead for **OPR** (**"Output Power Reversed")** to the Antenna Power Sensor's OPR phono connection.

5. To fabricate the cables to connect to up to 4 Antenna Power Sensors, refer to pin-out information in the relevant PMU vendor handbook.

5.2.2 Station Audio

The Interface modules 19C852204G1 labeled **STATION AUDIO** collects Tx and Rx audio at each repeater for distribution at the punchblock.

5.2.2.1 Systems With 1 To 12 Channels

1. Install the 5-foot 25-Pair cables 19D903880P120 between the Station Audio modules as shown in Appendix C (EDACS Interface Cabling Diagrams) for channels 1 thru 12.

2. Install a 25-Pair cable between J14 on the Station Audio module in repeater cabinet #1 and the punchblock.

5.2.2.2 Systems With 13 To 20 Channels

1. Install the 5-foot 25-Pair cables 19D903880P120 between the Station Audio modules as shown in Appendix C (EDACS Interface Cabling Diagrams) for channels 1 thru 12.

2. Install a 25-Pair cable between J14 on the Station Audio module in repeater cabinet #1 and the punchblock. The cable must be cut to length and the Amphenol connector reattached.

3. Install the 5-foot 25-Pair cables 19D903880P120 between the Station Audio modules as shown in Appendix C (EDACS Interface Cabling Diagrams) for channels 13 thru 20.

4. Install a 25-Pair cable between J14 on the Station Audio module in repeater cabinet #5 and the punchblock.

If a non-standard floor plan is used, longer cables may be required. The cables listed in Table 5 - 25-Pair Interconnect Cables are the same as those specified above except for their length.

5.2.3 IDA Interconnect

5.2.3.1 RIC Audio

If the site does not contain the RIC Local Telephone Interconnect option, skip this section.

The Interface modules 19C852204G1 labeled **RIC AUDIO** collect telephone interconnect audio data from each repeater. The RIC Audio modules are daisy-chained together using 25-pair cables, as shown in the applicable RIC Audio Module Interconnect Diagram in Appendix C.

5.2.3.2 Systems With 1 To 12 Channels

1. Install 5-foot 25-Pair cables 19D903880P120 between the RIC Audio modules as shown in Appendix C (EDACS Interface Cabling Diagrams).

2. Install a 5-foot 25-Pair cable 19D903880P120 between the Site Controller RIC Audio module J14 and J14 on the RIC Audio module for Repeater Channels 1-3.

5.2.3.3 Systems With 13 To 20 Channels

1. Install 5-foot 25-Pair cables 19D903880P120 between the repeater RIC Audio modules as shown in Appendix C (EDACS Interface Cabling Diagrams).

2. Install a 15-foot 25-Pair cable 19D903880P121 between J14 on the Site Controller RIC Audio module for channels 1-12 and J14 on the RIC Audio module for Repeater Channels 1-3.

3. Install a 15-foot 25-Pair cable 19D903880P121 between J14 on the Site Controller RIC Audio module for channels 13-20 and J14 on the RIC Audio module for Repeater Channels 13-15.

If a non-standard floor plan is used, longer cables may be required. Refer to Table 5 for longer cables.

5.2.3.4 RIC Phone Line

If the site does not contain the Local Telephone Interconnect option, skip this section.

The Interface modules 19C852204G1, labeled **PHONE LINE 1-16** and **PHONE LINE 17-20**, provide Local Telephone Interconnect telephone line connections. The PHONE LINE modules are located in the Site Controller cabinet.

1. Install a 25-pair cable from the PHONE LINE module J14 in the Site Controller cabinet to the punchblock as shown in Appendix C (EDACS Interface Cable Diagrams). Refer to Appendix D for Phone Line Punchblock Diagrams.

This cable must be cut to length and the Amphenol connector reattached.

5.2.4 ELI

For complete installation information, refer to LBI 39076.

5.2.4.1 ELI Data

The ELI Control cable connects directly between Master GTI and the Site Controller.

1. Connect the RIC Data Link cable between J4 on the back of the Master GTI and Site Controller port 30.

2. Connect the LIC Data Link cable between J5 on the back of the Master GTI and Site Controller port 31.

5.2.4.2 ELI Audio

If the site does not contain the ELI Local Telephone Interconnect option, skip this section.

The Interface modules 19C852204G1 labeled **ELI AUDIO** interface the incoming telephone lines with RJ11 cables connected to the repeater's GTI. The ELI Audio modules are daisy-chained together using 25-pair cables and connected to the the demarcation point for the telephone lines from the telephone provider. If the site requires that telephone lines are connected directly to the GTI's, this cable will not be required.

Refer to the applicable ELI Audio Module Interconnect Diagram in Appendix C. Refer to LBI-39076 for detailed installation of ELI.

5.2.4.3 Systems With 1 To 20 Channels

1. Install 5-foot 25-Pair cables 19D903880P120 between the ELI Audio Modules as shown in Appendix C (EDACS Interface Cabling Diagrams).

2. Install a 25-Pair cable 19D903880Pxxx between the ELI Audio Modules and the interface punchblock to the PSTN. If line protection is required between ELI and telephone system, install the specified protective devices at the punchblock.

3. If GTI's are mounted in different repeater cabinets, install the PCM data bus cable 19B803828P2 connecting Master GTI and uppermost GTI in the next cabinet.

4. Install the 2 Serial Data cables between Master GTI and Site Controller Computer. Connect 19B803826P1 cable between left female RJ11-6 connector on the back of the Master GTI to Port 30 on the back of the Site Controller Computer. Connect 19B803826P2 cable between right female RJ11-6 connector on the back of the Master GTI to Port 31 on the back of the Site Controller Computer.

If a non-standard floor plan is used, longer cables may be required. Refer to Table 5 for longer cables.

Table 5**Upgrading Site to ELI**

To upgrade a site with ELI option, follow the steps shown in LBI-39076.

5.2.5 GETC Data

The Interface modules in the Repeater cabinets, 19C852204G1, labeled **GETC DATA** collect GETC data from each repeater and connect to Site Controller cabinet Interface module 19C852313G1. The GETC DATA modules are daisy-chained together using 25-pair cables, as shown in the applicable GETC Data Module Interconnect Diagram in Appendix C.

5.2.5.1 Systems With 1 To 12 Channels

1. Install 5-foot 25-Pair cables 19D903880P120 between the GETC Data modules as shown in Appendix C (EDACS Interface Cabling Diagrams).

2. Install a 5-foot 25-Pair cable 19D903880P120 between the GETC Data module (channels 1-12) J14 in the Site Controller cabinet and GETC Data module J14 in the adjacent Repeater cabinet.

5.2.5.2 Systems With 13 To 20 Channels

Channels 13-20 connect to a separate interface module in the Site Controller cabinet.

1. Install 5-foot 25-Pair cables 19D903880P120 between the GETC Data modules as shown in Appendix C (EDACS Interface Cabling Diagrams).

2. Install a 5-foot 25-Pair cable 19D903880P120 between the GETC Data module (channels 13-20) J14 in the Site Controller cabinet and GETC Data module J14 in the adjacent Repeater cabinet.

3. Install a 15-foot 25-Pair cable 19D903880P121 between the GETC Data module (channels 1-12) J14 in the Site Controller cabinet and the GETC Data module J14, in the end Repeater cabinet in the first row.

If a non-standard floor plan is used, longer cables may be required. Refer to Table 5 for longer cables.

5.2.6 Serial DATA

The Serial Interface modules 19C852447G1 labeled **SERIAL MODULE** collect and route Backup Serial Data, Frame Sync Line, GETC Reset Line and Failsoft Status Line between the GETCs. If a Site Controller is present, connect to the Serial Module in the Site Controller cabinet, 19C852323G1.

The SERIAL MODULE modules are daisy-chained together using 15-conductor cables, as shown in the applicable SERIAL MODULE Modules Interconnect Diagram in Appendix C. Ensure that the Downlink and Redundant Downlink GETCs are connected to J7 and J8 of the module respectively.

5.2.6.1 Systems With 1 To 12 Channels

1. Install the 5-foot 15-conductor cables 19D903880P130 between Serial modules in adjacent Repeater cabinets as shown in Appendix C (EDACS Interface Cable Diagrams).

2. If the system includes a Site Controller, install a 5-foot 15-conductor cable 19D903880P130 between the Serial module J1 in the Site Controller and the Serial module J1 in the adjacent Repeater cabinet.

5.2.6.2 Systems With 13 To 20 Channels

1. Install the 5-foot 15-conductor cables 19D903880P130 between Serial modules in adjacent Repeater cabinets as shown in Appendix C (EDACS Interface Cable Diagrams).

NOTE

Perform steps 2 and 3 if the system includes a Site Controller.

2. Install a 5-foot 15-conductor cable 19D903880P130 between Serial module J2 in the Site Controller and Serial module J1 in the adjacent Repeater cabinet.

3. Install a 15-foot 15-conductor cable 19D903880P131 between the Serial module J1 in the Site Controller and the Serial module J1 in Repeater cabinet of the first row.

If a non-standard floor plan is used, longer cables may be required. The cables listed inTable 6 Table 6 are the same as those specified above, except for their length:

Table 6 - 15-Conductor Interconnect Cables

19D903880Pxxx	LENGTH IN FEET
P132	20
P133	25
P134	30
P135	35
P136	40
P137	45
P138	50

5.2.7 Downlink Data

The Interface module 19C852204G1 labeled **DWNLINK DATA** module is supplied either in Repeater cabinet #1 for a multisited Basic Site or in the Site Controller cabinet for a multisited Level 1 Site. The Downlink and Redundant Downlink GETCs are connected to J1 and J2 of the DWNLINK DATA module respectively.

1. Install a 25-pair cable between the DWNLINK DATA module J14 and the Downlink Data punchblock. Refer to Appendix D for punchblock connections.

5.3 SITE CONTROLLER CABINET CABLING

Some external connections to the Site Controller cabinet are connected directly to the appropriate equipments. The following direct connections to the Site Controller cabinet may be required:

- ELI RIC Data to SC port 30
- ELI LIC Data to SC port 31
- System Manager Data Link to SC port 0
- System Manager Modem Link to Modem Shelf J6
- Alarm Inputs A1-A16 to ACU J4
- Alarm Inputs A17-A32 to ACU J5
- Alarm Outputs C1-C8 to ACU J3
- Test Unit Radio Antenna to TU J8
- Guardog Telephone line to Guardog J5
- Guardog External Alarm to Guardog J4

The locations of these direct connections to user-supplied devices are shown in LBI-38985 Site Controller Cabinet.

NOTE

Special care must be taken to ensure that all outside wiring, alarm inputs and control outputs are connected via protected punchblocks, or equivalent protection, before being connected to the Site Controller cabinet equipments.

Use cable ties to secure the cables to the side rails of the EDACS Site Controller cabinet so that access is allowed to the internal equipment without moving the cables, and so that the appearance is neat and orderly.

NOTE

Avoid routing any cables near the sharp end of mounting screws, and route the cables so that mounting screws can be removed and re-installed without damaging the cables.

5.3.1 Alarm and Control Unit (ACU)

NOTE

Never make a direct connection between a power circuit or ground in the external equipment and a power circuit or ground in the ACU.

The Alarm and Control Unit provides one 50-pin connector for up to 8 control outputs (C1 through C8) to user-supplied control devices. Typical control output configurations and connections are shown in Figure 4 and Table 7.

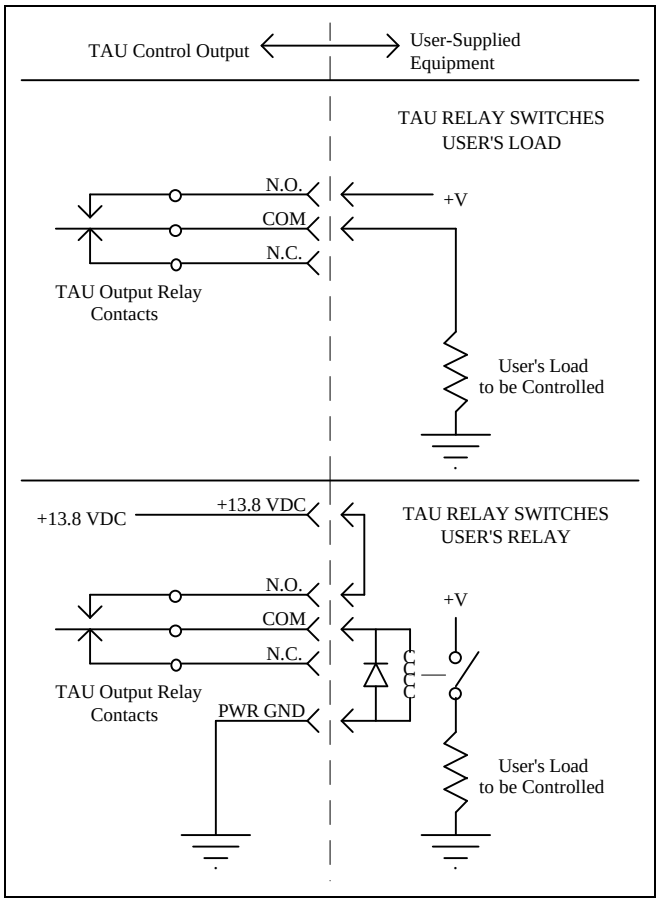


Figure 4 - Typical Control Output Configurations

Table 7 - Control Output Connections Pin Identification

Function	Connector J3			
	Pin#	Control #	Pin #	Control #
N.O. COM N.C.	26 1 27	A1	32 7 33	A5
N.O. COM N.C.	2 28 3	A2	8 34 9	A6
N.O. COM N.C.	29 4 30	A3	35 10 36	A7
N.O. COM N.C.	5 31 6	A4	11 37 12	A8
+5 VDC +5 VDC LOG GND LOG GND +13.8 VDC +13.8 VDC PWR GND PWR GND	13 38 14 39 15 40 16 41	+5 VDC requires jumper P38 on the Alarm/Control Interface Board. +13.8 VDC requires jumper P39 on the Alarm/Control Interface Board. See cautions about power circuits in text.		

The Alarm and Control Unit also provides two 50-pin connectors for up to 32 alarm inputs (A1 through A32) to user-supplied, alarm-sensing devices. Typical alarm input configurations and connections are in Figure 5 and Table 8.

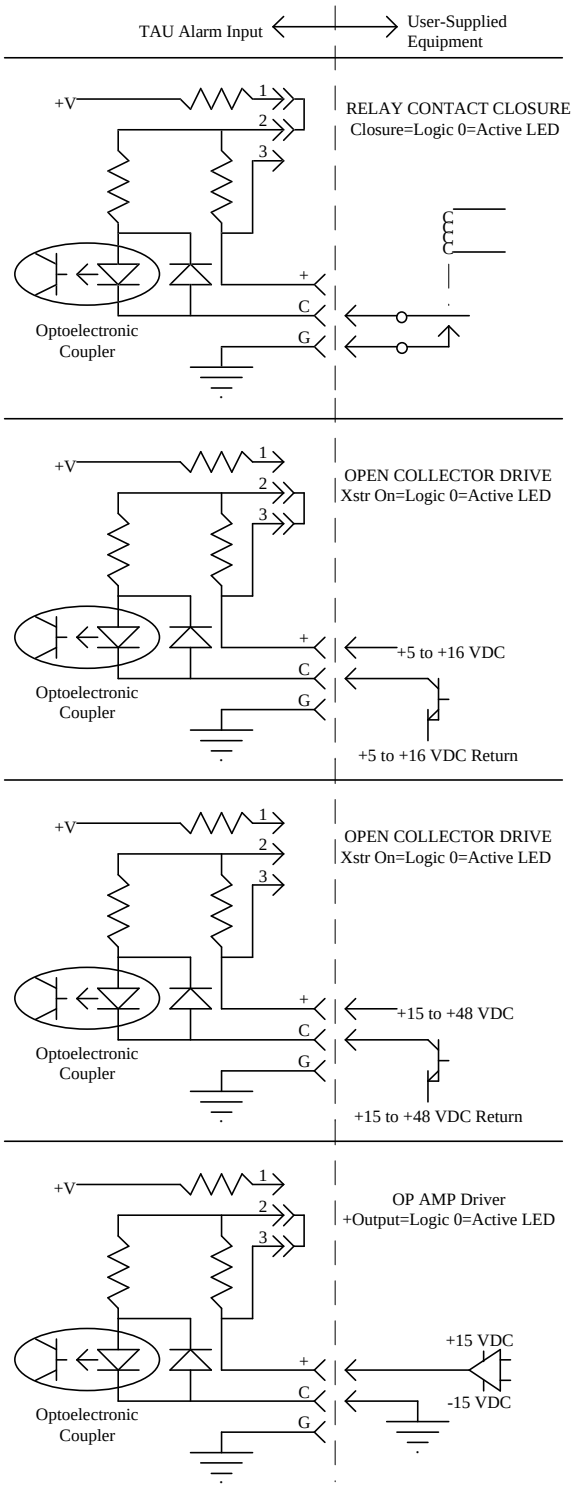


Figure 5 - Typical Alarm Input Configurations

Table 8 - Alarm Input Connections Pin Identification

Function	Connector J4		Connector J5	
	Pin#	Alarm #	Pin #	Alarm #
+ C G	26 1 27	A1	26 1 27	A17
+ C G	2 28 3	A2	2 28 3	A18
+ C G	29 4 30	A3	29 4 30	A19
+ C G	5 31 6	A4	5 31 6	A20
+ C G	32 7 33	A5	32 7 33	A21
+ C G	8 34 9	A6	8 34 9	A22
+ C G	35 10 36	A7	35 10 36	A23
+ C G	11 37 12	A8	11 37 12	A24
+ C G	38 13 39	A9	38 13 39	A25
+ C G	14 40 15	A10	14 40 15	A26
+ C G	41 16 42	A11	41 16 42	A27
+ C G	17 43 18	A12	17 43 18	A28
+ C G	44 19 45	A13	44 19 45	A29
+ C G	20 46 21	A14	20 46 21	A30
+ C G	47 22 48	A15	47 22 48	A31
+ C G	23 49 24	A16	23 49 24	A32
+13.8 VDC*	25	---	25	---
PWR GND	50	---	50	---

* Requires jumper on the Alarm/Control Interface Board: jumper J40 for connector J4, jumper J41 for connector J5. See cautions about power circuits in text.

5.4 QUALITY AUDIT

The purpose of this section is to double check the cable installation by visually confirming critical points. These checks are to be made before any power is applied to the equipment, and are best made by someone other than the installer.

Verify EDACS Interface Panel and RF cable connections (see the appropriate interconnection diagram in the Appendix C). Use an ohm meter, if necessary, to check for continuity or shorts. Using copies of the System Cabling Checklists found in Appendix A, complete a checklist for each equipment cabinet as you go through the inspection procedure.

6. STATION CONFIGURATION

6.1 INTRODUCTION

Prior to placing the equipment into operation, the position of jumpers and the setting of DIP switches on the GETC and RIC (Repeater Interconnect Controller) boards must be verified with the applicable SRN. Hardware and software revisions and part numbers are to be recorded during station configuration and setup on the Customer System Audit Form.

Appendix B shows a typical 12-Channel Level 1 EDACS system and identifies the shelves and channel numbers.

6.1.1 Station GETC'S

The station GETC's are located above each repeater in the repeater cabinets. One GETC is required for each channel. The position of the jumpers on the GETC board control the data processing functions performed by the GETC and whether it operates as a working channel or control channel. The position of the DIP switches is determined by the system type; i.e., trunked failsoft, conventional, or voted and whether or not it is connected to a Site Controller. The jumpers are normally installed at the factory and the DIP switches set.

Configuring the GETC involves verifying the jumper positions and DIP switch settings. Refer to LBI-38988 - Station GETC Configuration Manual and relevant SRN for the appropriate jumper positions and switch settings.

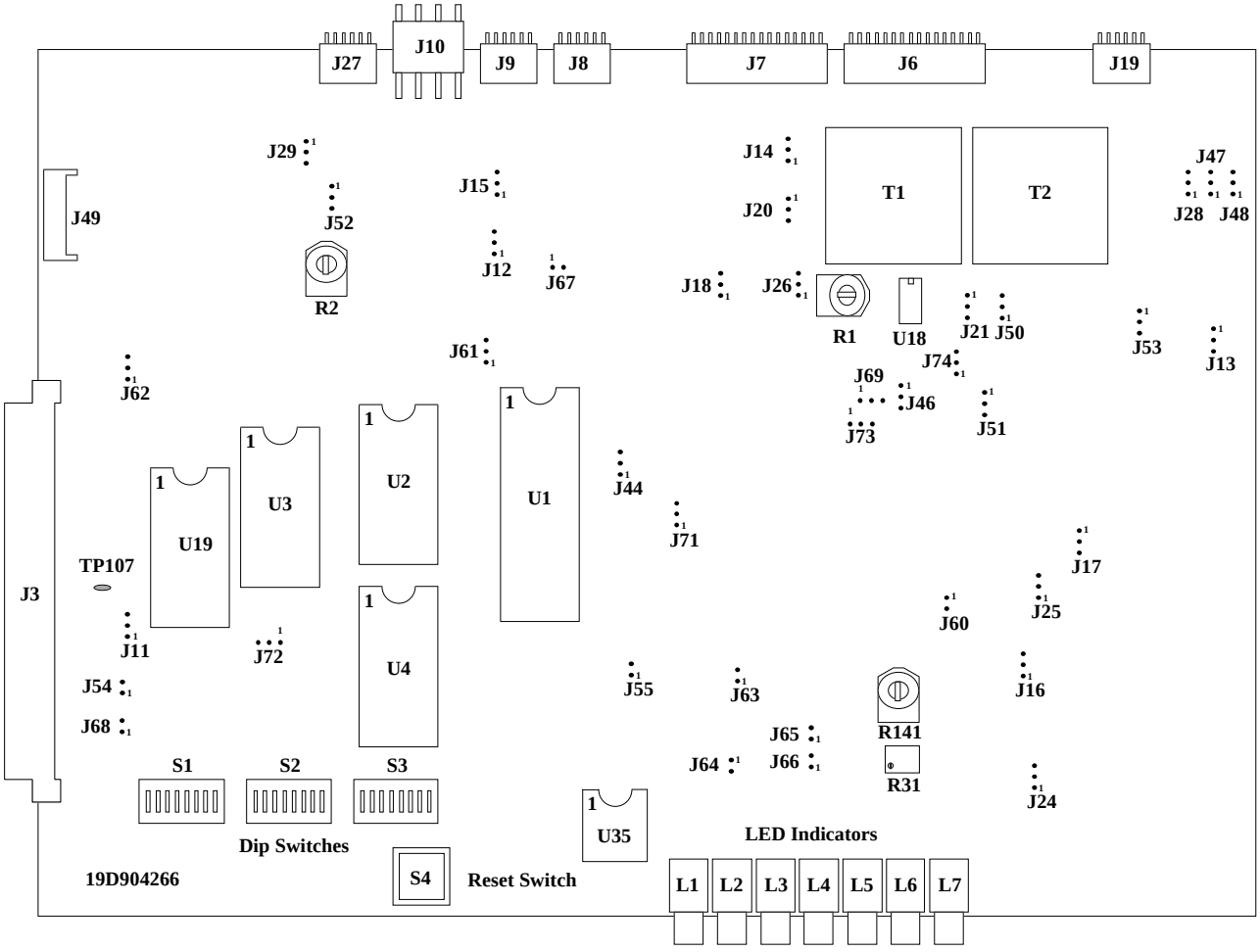


Figure 6 - GETC Shelf

7

6.1.1.1 Jumper Position Verification

1. Refer to the Station GETC Configuration Manual LBI-38988 and relevant SRN.

2. Slide the GETC shelf for repeater No. 1 out into the service position, to gain access to the GETC board.

3. Confirm that all jumpers are in the correct position.

6.1.1.2 Dip Switch Position Verification

Three DIP switches, S1, S2, and S3, on the GETC Logic Board are used to define proper repeater operation and for repeater tests. These switches are located on the GETC Logic Board as shown in Figure 6.

Through improvements in software and hardware, fewer changes in DIP switch settings are required. As a result more switch positions are being ignored and their functionality is being programmed into the GETC via the Personality Programming.

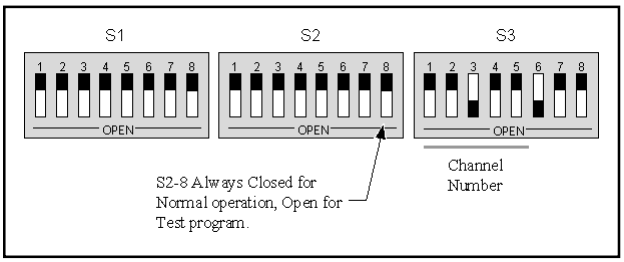


Figure 7 - Operational DIP Switch Settings

NOTE

Be sure the DIP switch settings correspond to the Personality data programmed into the repeater, Site Controller or System Manager.

1. Set the GETC DIP switches as required using the relevant SRNs. and perform the required tests.

2. Record the GETC DIP Switch settings on the Trunked Repeater Test Data Sheet (Appendix A) for each channel being configured.

3. Record the part number and revision number for the GETC Logic board and the Turbo board and record the GETC firmware Group number on the Customer Systems Audit form.

Refer to Table 9 for Channel Number settings:

Table 9 - GETC Channel Number Settings

	SWITCH SETTINGS				
CHANNEL NUMBER	**S3-1**	**S3-2**	**S3-3**	**S3-4**	**S3-5**
1	O	C	C	C	C
2	C	O	C	C	C
3	O	O	C	C	C
4	C	C	O	C	C
5	O	C	O	C	C
6	C	O	O	C	C
7	O	O	O	C	C
8	C	C	C	O	C
9	O	C	C	O	C
10	C	O	C	O	C
11	O	O	C	O	C
12	C	C	O	O	C
13	O	C	O	O	C
14	C	O	O	O	C
15	O	O	O	O	C
16	C	C	C	C	O
17	O	C	C	C	O
18	C	O	C	C	O
19	O	O	C	C	O
20	C	C	O	C	O

6.1.2 DOWNLINK GETC

For Level 1 systems, the Downlink and Redundant Downlink GETCs are installed in the Site Controller cabinet. For BASIC EDACS systems, the Downlink and Redundant Downlink GETCs are installed in the first repeater cabinet.

The jumpers are normally installed at the factory and the DIP switches set. Configuring the Downlink GETCs involves verifying the jumper positions and DIP switch settings. Refer to LBI-38896 - Site Downlink GETC Configuration Manual and relevant release notes for the current jumper positions and DIP switch settings applicable to the type of multisite system and software issued.

6.1.3 Radio Interface Controller (RIC)

If the RIC option is not installed, go to next section.

Four switches are located on the RIC which are used to set operating characteristics and to control power and audio routing. SW1 is a power on/off switch, SW2 and SW3 are preset at the factory and should not be tampered with in the field. SW4 is an eight position DIP switch used to control the operation of the RIC in the system environment. All jumpers are installed at the factory and do not require repositioning.

At the time of installation, the RIC address must be set to match the channel number of the associated repeater. This involves setting the eight section DIP switch SW4 to the binary number equivalent of the associated repeater channel number. The switch positions are arranged in binary digital weight. Therefore, the sum of the switch positions equals the channel number of the repeater selected. For example, if switches 1 & 3 were selected, the channel number selected would be 5. See Figure 8 RIC Board Switch Locations.

6.1.3.1 Dip Switch Settings

1. Refer to Equipment Layout Diagrams in Appendix B to locate the RIC associated with channel 1.

2. Slide the RIC shelf out of the cabinet to gain access to the RIC board.

3. Refer to Figure 8 for the location of SW1 thru SW3. Verify SW1 thru SW3 switch positions as follows:

   - SW1 - Towards front of board - Power switch ON.

   - SW2/SW3 - left position, DISABLE and RESET

4. Locate SW4 on the left edge of the RIC board and set SW4 to the channel number under configuration (see Figure 9).

5. Slide RIC board back into the cabinet.

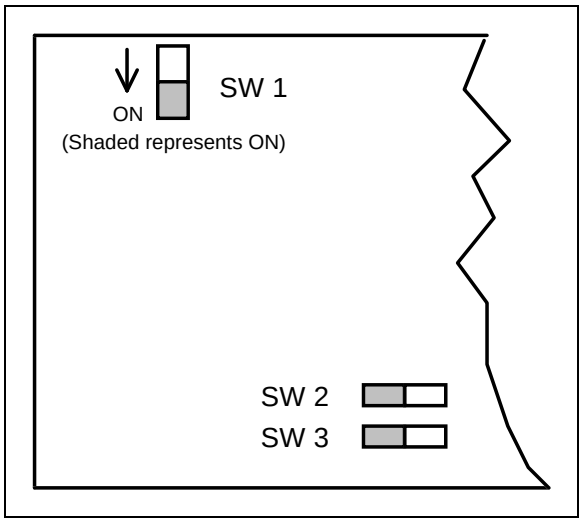


Figure 8 - RIC Board Switch Locations

6. Repeat the above procedure for all remaining channels.

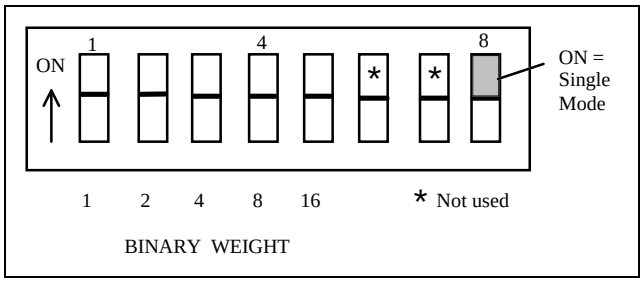


Figure 9 - SW4 DIP Switch Binary Weight Assignment

6.1.4 PMU Channel Terminations

If the site does not contain the Power Monitor Unit (PMU) option, go to next section.

There are two types of PMU, both of which use the same Channel Termination board:

- DB8843 which has been superceded,

- DB8860 which is the current model.

The Channel Termination board (19C852379G1) is used to ground those unused power sensor inputs for the Power Monitor Sensor Modules. Two termination boards, each providing terminations for up to 12 channels, are provided. The Channel Termination boards plug into the POWER SENSOR module on the back of the EDACS Interface Panel.

Table 10 - Jumper Settings

Jumper	Wideband	Narrow Band	
P11	1 & 2[3]	1 & 2[3]	Enables Receive Data from 9600 baud modem board.
P12	1 & 2[3]	1 & 2[3]	Enables Clear-To-Send (CTS) from 9600 baud modem board.
P13	1 & 2	1 & 2	BSL Tx output to BSL Rx input.
P14	1 & 2	1 & 2	Master site controller path selection enable.
P15	1 & 2	1 & 2	Backup site controller path selection enable.
P16	1 & 2	1 & 2	BSL selection enable.
P17	1 & 2	1 & 2	LSD encode path enable.
P18	1 & 2	1 & 2	LSD decode path enable.
P21	1 & 2	1 & 2	Enable high-speed data acquisition rate control, HSACQ.
P24	1 & 2	1 & 2	BSL selection (Failsoft) enable.
P25	1 & 2	1 & 2	LSD encode path enable.
P26	1 & 2	1 & 2	Lock-detect path enable.
P28	1 & 2	1 & 2	Sync line input path enable.
P29	1 & 2	1 & 2	Enable site controller RxD, J8-4.
P44	1 & 2	1 & 2	Use for 256K or 512K EPROM.
P46	1 & 2	1 & 2	Used for normal communications.
P47	1 & 2	1 & 2	BSL select.
P48	1 & 2	1 & 2	BSL select.
P50	1 & 2	1 & 2	Enable tone control for voted system
P52	2 & 3	2 & 3	TxD polarity invert.
P53	1 & 2	1 & 2	RxD polarity normal.
P54	1 & 2	1 & 2	Enable MODCNTL local control.
P60	1 & 2	1 & 2	Enables HSD path.
P61	2 & 3	2 & 3	Use for 512K EPROM.
P62	1 & 2	2 & 3	1 & 2 selects 11 MHz clock Freq. for 9600 baud data (Wideband).
P63	OMIT	1 & 2	1 & 2 for 4800 baud (900 MHz Narrow band)
P64	OMIT	1 & 2	1 & 2 for 4800 baud (900 MHz Narrow band)
P65	OMIT	1 & 2	1 & 2 for 4800 baud (900 MHz Narrow band)
P66	OMIT	1 & 2	1 & 2 for 4800 baud (900 MHz Narrow band)
P68	1 & 2	1 & 2	Selects Local (on)/Remote (off) control of station PTT.
P69	1 & 2	1 & 2	Enables COMB PTT IN.
P71	1 & 2	1 & 2	Enables phone modem RTS control.
P72	1 & 2	1 & 2	Selects internal oscillator.
P73	2 & 3	2 & 3	Enables NOR gate U22B for EDACS applications.
P74	2 & 3	2 & 3	CAS polarity normal.

Legend: LSD = Low Speed Data BSL = Backup Serial Link RxD = Receive Data
HSD = High Speed Data MSL = Main Serial Link TxD = Transmit Data

NOTES:

1. Use for EDACS Wideband CC/WC, WB Downlink, and WB/NB Uplink.
2. Use for EDACS Narrow Band CC/WC and NB Downlink.
3. P11 & P12 are shown for GETC's with Rockwell Modems installed. For GETC's using RS-232 communication links (Rockwell Modem not installed), move P11 to J11-2 & 3 and P12 to J12-2 & 3.
4. Omit (remove) the following jumpers: P20, P51, P55, & P67.

One board terminates the daisy chain at the last repeater cabinet in the first row for channels 1 to 12. The second terminates the daisy chain at the Site controller cabinet (single row configurations) or at the last repeater cabinet in the second row (double row configurations) for channels 11 - 20. The exact location of these boards is determined by the system configuration. Refer to the Power Sensor Module Interconnection Diagram in Appendix C.

NOTE

As shipped, the termination board is plugged into J1 of the POWER SENSOR module in the Site Controller Cabinet. All jumpers are shipped in place. Do not move the termination board unless the Site Controller is equipped with a PMU.

6.1.4.1 Systems With 1 To 12 Channels

1. Locate the termination board in the last repeater cabinet in row 1 (end of 25-Pair cable). The termination board is plugged into J15 of POWER SENSOR module.

2. Refer to Channel Termination Board Figure 10 and remove all jumpers corresponding to active channels (CH. 1 - J1/P1, CH. 2 - J2/P2,...CH. 12 - J12/P12). Verify that jumpers are installed on all unused channels.

3. Locate the termination board in the Site Controller cabinet and remove the jumpers for all active channels. NOTE: The jumper configuration should be the same as in step 2.

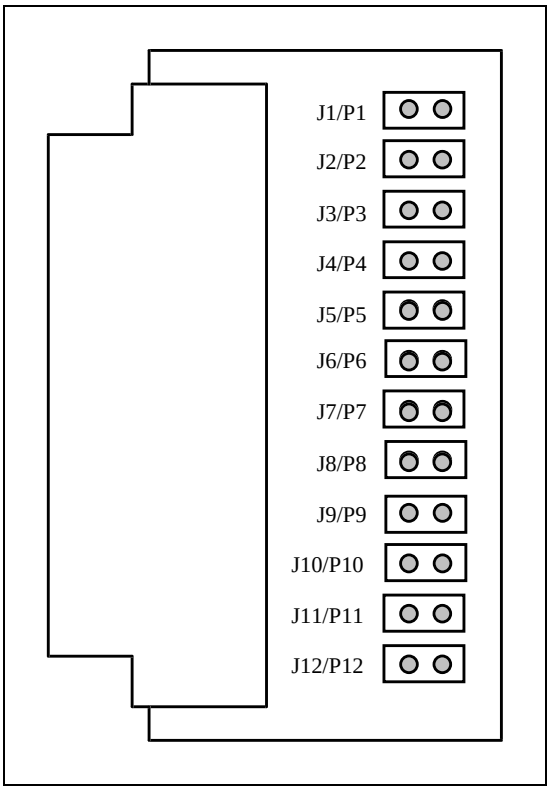


Figure 10 - Channel Termination Board

4. Verify that the termination board is plugged into J2 of the POWER SENSOR module in the Site Controller cabinet.

6.1.4.2 Systems with 13 to 20 Channels

1. Locate the termination board in the last repeater cabinet in row 1 (end of 25-Pair cable). The termination board is plugged into J15 of POWER SENSOR module.

2. Refer to Channel Termination Board Figure 10 above and remove all jumpers corresponding to active channels (CH. 1 - J1/P1, CH. 2 - J2/P2,...CH. 12 - J12/P12). Verify that jumpers are installed on all unused channels.

3. Locate the termination board in the Site Controller cabinet and remove the jumpers for all active channels. NOTE: The jumper configuration should be the same as in step 2.

NOTE

Channels 11 and 12 overlap; if channel 11 or 12 is used, the corresponding jumpers must be removed from both termination boards.

4. Verify that the termination board is plugged into J2 of the POWER SENSOR module in the Site Controller cabinet.

5. Locate the termination board for the second row of cabinets. It will be in the Site Controller cabinet or the last repeater cabinet in the second row.

6. Remove all jumpers corresponding to the active channels 11 to 20 (CH. 11 - J1/P1, CH. 12 - J2/P2, CH. 13 - J3/P3, CH. 20 - J10/P10).

7. Verify that the termination board is plugged into J15 of the POWER SENSOR module in the last repeater cabinet (highest number channel) in the second row. (end of 25-Pair cable).

6.1.5 PMU Setup

Refer to LBI-38985 for setups for DB8843. Refer to LBI-39128 for setups for DB8860 PMUs. The former has a Dip switch setup, the latter has no Dip switches.

6.1.6 Site Controller Modem

The Site Controller modem, if supplied, requires programming and have the DIP switches setup, based on the type of communications link (dial-up or dedicated line) to the System Manager. Follow the appropriate procedure in System Manager section.

6.2 QUALITY AUDIT

The purpose of this section is to double check the switch settings, and jumper positions. These checks are to be made before any power is applied to the equipment, and are best made by someone other than the installer.

Using a copy of the Configuration Checklist, found in Appendix A, record and verify the following switch settings and jumper positions in the following equipment:

1. Verify the switch settings and jumper positions are correct (refer to the Configuration section of this manual). (Applies to repeater cabinets only.)

2. Verify the DIP switches are set correctly (refer to the Configuration section of this manual.) Applies only to repeater cabinets.)

3. Each Channel Termination board 19C852379G1 (qty. 2), for grounding the unused power sensor inputs, should be plugged into a Power Sensor module in separate EDACS interface panels. Each board has 12 grounding jumpers. See the Channel Termination Boards section for details. (Applies to the repeater cabinets only.)

4. The DB8843 Power Monitor Unit contains an 8-section DIP switch on the back of the unit (labeled OPTION SELECT). Section 1 (farthest to the left) and section 4 should be in the ON (up) position. All other switches should be in the OFF (down) position. See the Power Monitor Unit section for details. (Applies only to the Site Controller cabinet.)

7. SITE CONTROLLER - SYSTEM MANAGER LINK

7.1 INTRODUCTION

This section should be read in conjunction with System Manager LBIs 38703 and 38984 and the Site Controller LBI-38985 or AE/LZB 119 1911/1. The System Manager is an optional part of an EDACS Level 1 System and is usually located away from the Trunked Repeater site equipment.

7.1.1 Connectivity

If the distance between the System Manager and the Site Controller is less than about 50 feet or via microwave or fiber-optic cable and associated multiplex equipments, a standard RS-232 data cable may be used to Hardwire connect the System Manager and Site Controller computers.

However, if the distance between the System Manager and Site Controller computers (or microwave/fiber-optic multiplex equipments) exceeds 50 feet, a 2-Wire Dial-up or 4-Wire Leased Bell 43202 Type 5 (old specification - 3002 Data-Grade) Telephone Line (or equivalent) with a data modem at each end is required.

If modems are required, the default equipment provided for modem communications is the ZyXel U-1496+. Older systems may be equipped with US Robotics V32 or V34 modems. For modem programming and configuration, see LBI-33031.

To accommodate the variation in communications paths, the communications link between Site Controller and System Manager may be one of the following forms:

- **HARDWIRE** RS232 Serial connection

  Either Direct Cable

  Or Multiplex Link

- **DEDICATED LINE** modem connection

  Either Direct Cable

  Or Leased Line Link

  Or Multiplex Link

- **DIALUP LINE** modem connection

  Phone line Link

LINE ISOLATION AND PROTECTION

If prone to lightning strikes or due to local regulations, provision of line isolation and protection may be required. This requirement may be met by installing protection and isolation transformer devices onto punchblocks interfaces.

7.2 PERSONALITIES

The communications information programmed into the Site Controller personality must agree with what is programmed into the System Manager Site Communications definition and with the mode of communications to be installed.

- Password
- Site ID/Device Internal ID
- Phone Number of other computor
- Baud Rate/Port Speed
- Connection type

7.3 INSTALLATION

7.3.1 Hardwire Communication

Hardwire connection is modemless. Connection is to be either via single RS232 cable - DEC BC22E, if the distance between equipments is less than 50 meters, or the link is via multiplexed link.

The connection for RS232 Null Modem as shown in Figure 11.

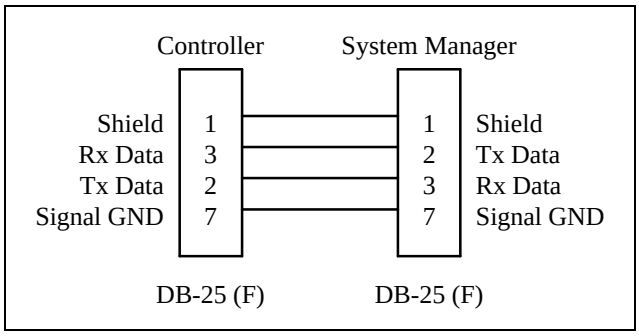


Figure 11 - System Manager to Site Controller Using RS232 Direct Connection

CABLE SHIELD GROUNDING

Installation regulations in some regions require that the shield of a cable that is routed through metal risers/cable enclosures must be grounded to the enclosure at point of entry and point of exit.

7.3.1.1 RS232 CABLE INSTALLATION

1. Route the RS232 shielded cable from Site Controller direct to System Manager.
2. Firmly attach one end of the shielded cable to Port 0 (dB25 (F)) on the Site Controller.
3. Firmly attach the other end of the shielded cable to the appropriate port on the System Manager or Decserver.
4. Securely tie the cable within the cabinet to the frame and externally to the cable ladder or ductwork.
5. Label the cable and, if used, the punchblock.
6. If connection contains punchblocks, ensure that cable shield continuity is maintained. This must be connected to ground on one end of the cable only.

7.3.1.2 Multiplexed Link

If the link is multiplexed, for either a microwave, leased-T1/E1 or fiber-optic link, it is normal for the mux to provide the Null Modem (2-3 and 3-2).

If the mux does not provide Null Modem capability, the connection of Tx to Rx should be made at the Site Controller Site; i.e., System Manager to link is Full Modem, Site Controller to link is Null Modem. This is to be accomplished at the punchblock interface to the mux equipment.

1. Route the RS232 shielded cable from Site Controller to the mux.
2. Firmly attach one end of the shielded cable to Port 0 [(dB25 (F)] on the Site Controller.
3. Firmly attach the other end of the shielded cable to the appropriate input port on the mux interface for serial (Asynch) data to the System Manager.
4. Securely tie the cable within the cabinets to the frame and externally to the cable ladder or ductwork.
5. Label the cable and, if used, the punchblock.
6. If connection contains punchblocks, ensure that cable shield continuity is maintained. This must be connected to ground on one end of the cable only.
7. Make the corresponding installation connections between the mux at the System Manager site and the appropriate port on either System Manager or Decserver.

7.3.2 Dedicated Line

Dedicated line communication requires modems. The inter-modem link may be direct cable, dedicated leased-line or via multiplexed link.

7.3.2.1 DIRECT CABLE INSTALLATION

1. Confirm that the factory installed RS232 shielded cable from Site Controller to the modem is in place.
2. Route the shielded phone line between Site Controller and System Manager modems.
3. Firmly attach one end of the shielded phone line to the Dedicated Line port on the Site Controller modem .
4. Firmly attach the other end of the shielded phone line to the Dedicated Line port on the System Manager modem.
5. Securely tie the shielded phone line to the cable ladder or ductwork and as required within the building cable route.
6. Label the phone line and, if used, punchblocks.

The shield for the phone line must be connected to ground within one of the sites. If connection contains punchblocks, ensure that phone line shield continuity is maintained. This must be connected to ground on one end of the phone line only.

7.3.2.2 Leased-Line Installation

1. Confirm that the Factory installed RS232 shielded cable from Site Controller to the modem is in place.

2. Route the shielded phone line between Site Controller modem and the agreed demarcation point for the phone line from the local phone company. This may be a punchblock

3. Firmly attach one end of the shielded phone line to the Dedicated Line port on the Site Controller modem .

4. Firmly attach the other end of the shielded phone line to the appropriate place at the agreed demarcation point

5. Securely tie the shielded phone line to the cable ladder or ductwork.

6. Label the phone line and, if used, punchblock.

7. The shield for the phone line must be connected to ground within the site. Ensure that phone line shield is connected to ground at the agreed demarcation point.

7.3.2.3 MULTIPLEX INSTALLATION

1. Confirm that the factory installed RS232 shielded cable from Site Controller to the modem is in place.

2. Route the 4 wire phone line from the Site Controller modem to the mux interface.

3. Firmly attach one end of the 4 wire phone line to the Dedicated Line port on the Site Controller modem .

4. Firmly attach the other end of the 4 wire phone line to the appropriate analog input port on the mux interface for analog connection to the System Manager.

5. Securely tie the 4 wire phone line within the cabinets to the frame and externally to the cable ladder or ductwork.

6. Label the cable and, if used, the punchblock.

7. Make the corresponding installation connections between the mux at the System Manager site and the appropriate port on either System Manager or Decserver.

7.3.3 Dial-Up Communication

Dialup communications requires modems and provision of a phone line into the site. There will be an agreed demarcation point for connection to the local phone line and this normally will normally be a phone line socket on the wall of the site.

Note the phone number provided at each site and ensure that the number at one site is relected in the communications parameters of the equipment personalities at the other site.

Test the line by connecting a telephone to the incoming Phone line socket and make a call to test the line.

7.3.3.1 DIAL-UP INSTALLATION

1. Confirm that the factory installed RS232 shielded cable from Site Controller to the modem is in place.

2. Route the local phone line from Site Controller modem to the phone line socket. This may require a punchblock.

3. Firmly attach one end of the phone line to the Dialup Line port on the Site Controller modem .

4. Firmly attach the other end of the phone line to the phone line socket.

5. Securely tie/fasten the phone line to the cable ladder or ductwork.

6. Label the phone line and, if used, the interface punchblock.

7.4 MODEM PROGRAMMING

The modems must be setup to allow data transfer to remote equipments using dedicated or dialup line (subscriber line). Determine the type of line used at the System Manager location, ensure the personalities reflect the chosen mode of communication and then setup the modems accordingly.

See LBI-33031 for programming requirements for both types of modem.

7.5 LINK TEST

The Communications link must be verified to ensure that both equipments can transmit and receive data. If communications cannot be correctly established, perform the steps shown in the troubleshooting section.

7.5.1 Link Verification

Follow the procedure below to ensure that correct communications have been made. If the screen indicates that the System Manager can correctly communicate with the Site Controller, the site is ready for operational tests:

1. Access screen 20 for the site under test and ensure that the site responds with the current configuration.

2. Access screen 32 for the site under test, key up test radios and ensure that the site can be monitored.

3. Access screen 30 and upload LID and GID databases to the Site Controller. Ensure that there are no reported errors at the System Manager Terminal.

4. Access screen 31 and force an activity download from the Site Controller. Ensure that there are no reported errors at the System Manager Terminal.

5. Access screen 63 and run an Activity Report for the period of the test calls. Ensure that valid data has been downloaded.

7.5.2 Troubleshooting

If communications cannot be established, perform the following tests:

1. If link has modems, ensure that the modems have synchronized. If not, test the line.

2. If link has modems, observe Tx and Rx Data LEDs to ascertain whether data transfer is taking place. If Site Controller Tx data is OK but Rx data is not, go to System Manager site and test System Manager Rx and Tx data. If Site Controller Tx data is bad but Rx data is OK, check out local Site Controller connections.

3. Disconnect the link to the System Manager and connect a dumb terminal or Protocol Analyzer to the Site Controller Tx Data pair at the punchblock. Monitor for Site Controller polling messages on the Tx Data pair at the interval specified in the Site Controller personality. Confirm the message is comprised of Site Password and Site ID number. The baud rate of the terminal may need to be changed to conform to that programmed in the personality.

4. Connect the dumb terminal or Protocol Analyzer to the Site Controller Rx Data pair at the punchblock. Monitor for System Manager polling messages at the interval specified in the System Manager Site definition. The Polling will be comprised of Site Password and Site ID number. The baud rate of the terminal may need to be changed to conform to that programmed in the personality.

5. If Site Controller Tx data is OK but Rx data is not, go to System Manager site and test System Manager Rx and Tx data. If Site Controller Tx data is bad but Rx data is OK, check out local Site Controller connections.

7.6 QUALITY AUDIT

Using a copy of the Site Controller-System Manager Link Installation Checklist in Appendix A, fill out the checklist as you go through the following inspection procedure.

1. Verify that either the Data Modems connecting System Manager to Site Controller are correctly connected, or that the RS232 link is correctly connected. Confirm that System Manager site connection is correct.

2. Verify the Data Modems are correctly configured (refer to the Data Modem part of the Installation Section). Confirm that System Manager site modem configuration is correct.

3. Confirm that a hardcopy of the Site Controller personality is in the site documentation.

8. STATION TEST AND ALIGNMENT PROCEDURES

8.1 INTRODUCTION

This Section details how to perform Base Station Alignment. A Base Station is defined as Trunked Repeater and GETC as one unit. The procedure will require the user to have surveyed the Multisite Link for Link Losses and to have calculated the Line Input and Output levels. The factory provides the equipment pre-aligned for a given requirement for a base station input and output audio level of -10 dBm and it is adviseable to check whether the base station is operating to the required specification prior to performing a complete re-alignment if the level requirement differs.

Table 11 shows the tests and alignments required and will be required for both the Installation Checksheets and the Customer's Periodic Preventative Maintenance Records (as shown in the Appendices). All Deviation readings, except Low Speed Data, are measured with LSD **OFF**. Refer to the Station Alignment section for more detail. Repeater Line Input and Ouput levels will be the actual (calculated) levels once the Multisite Link is connected. GETC Modem Line Input and Output levels will at some dBm difference to Repeater Line levels but the difference must be constant across all channels in the system.

Table 11 - Installation Tests and Alignments

Alignment/Test		Pot	Units	Required Value	Measured Value	Pot Value
Low Speed Deviation	WB	CG	Hz	750 ± 25		
	NPSPAC			600 ± 25		
	NB			500 ± 25		
Transmit Limiting	WB	TX	kHz	3.75± 0.1		
	NPSPAC			3.0 ± 0.1		
	NB			1.75± 0.1		
Repeater Gain	WB	RG	kHz	3.0 ± 0.1		
	NPSPAC			2.4 ± 0.1		
	NB			1.5 ± 0.1		
Repeater Line Output Level		LO	dBm	-10 ± 1		
DSP Line Input Level			dBm	-10 ± 1		
DSP Line Input Deviation	WB	DLI	kHz	2.8 ± 0.1		
	NPSPAC			2.25 ± 0.1		
	NB			1.4 ± 0.1		
Compressor Gain	WB	CP	kHz	3.0 ± 0.1		
	NPSPAC			2.4 ± 0.1		
	NB			1.5 ± 0.1		
Compressor Threshold	WB	CT	kHz	3.65 ± 0.1		
	NPSPAC			2.9 ± 0.1		
	NB			1.65 ± 0.1		
GETC Modem Line Input (-15 dBm)		R1	dBm	-15		
High Speed Data	WB	R31	kHz	3.0 ± 0.1		
	NPSPAC			2.4 ± 0.1		
	NB			1.5 ± 0.1		
GETC Modem Line Output (-15 dBm)		R2	dBm	-15		
SINAD @ 12 dB	800 MHz		dBm	-119		
SINAD @ 12 dB	UHF, VHF		dBm	-116		
Squelch		Squelch	dB	9		
Transmit Forward Power		PA	Watts	50-100%		
Transmit Reverse Power			Watts	<4		

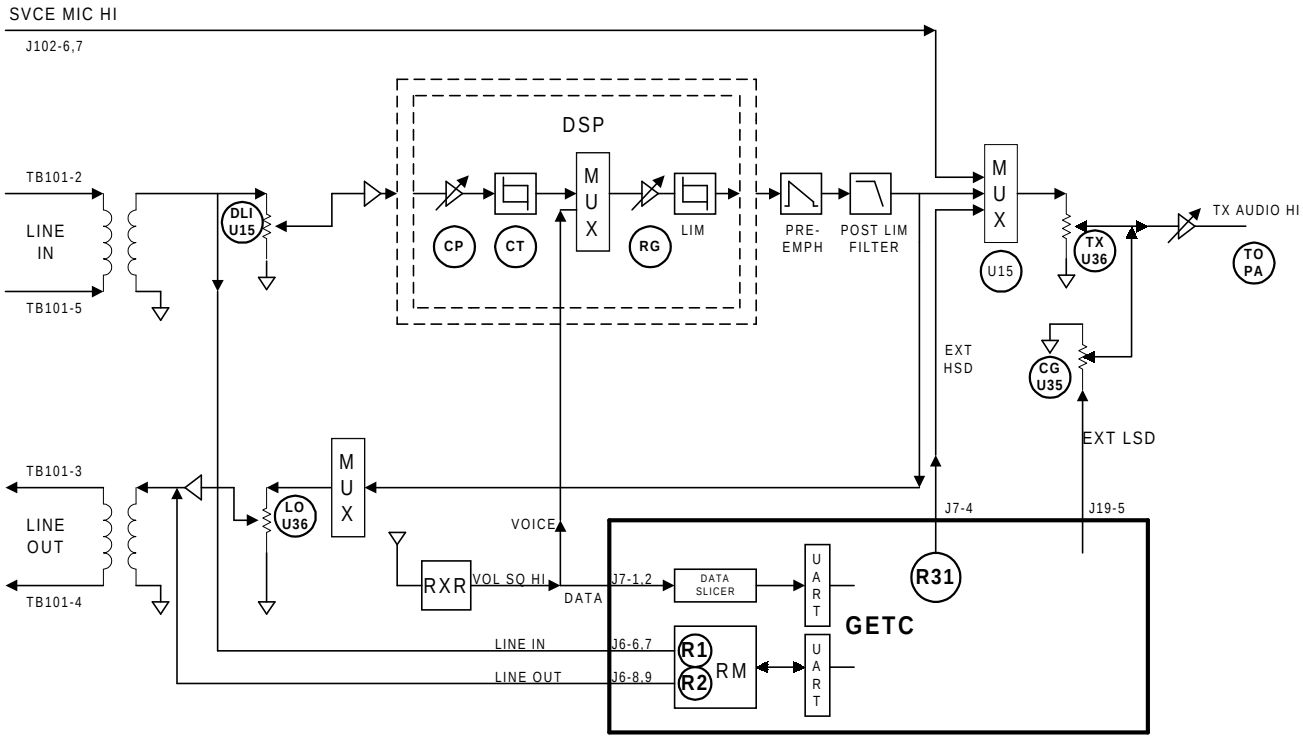


Figure 12- Station Alignment Level Controls

Figure 12 shows the relationship of the alignment pots in the station

NOTE

Refer to Technical Manual AE/LZB 117 1915/1 for details of System Levels and Alignment. Refer to SRNs specific to release of software and hardware in this system for details on test setup and jumpers.

These procedures should only be performed by qualified field service technicians. Each test has step by step procedures, along with visual aids when necessary, to check the performance or make alignment adjustments if needed to the individual system elements.

Data sheets are provided in Appendix A for each Repeater test. These sheets should be completed while performing each test and should be retained for future reference. These sheets will sometimes require numerical data be recorded or a simple check mark be entered to indicate the equipment performed properly. In cases where a particular test is not applicable at the repeater site under test, N/A must be entered to indicate the test was considered but was not applicable.

Each data sheet contains a section number and title as identification. All data sheets are located in Appendix A. It may be helpful to make copies of the applicable data sheets for use during the tests. Prior to beginning the tests ensure that enough copies of each data sheet are available for all the repeaters, transmitter combiners, etc., in the system.

8.2 TEST EQUIPMENT

A test equipment list (Table 3) is located in the front of this manual. The alignment procedures provided in this manual were written for the test equipment listed in Table 3. If test equipment other than that in the table is used, special care must be taken with filter settings, level settings and connectivity.

The following setups are for HP 8920 and 4934A only. Other types of test equipment must be setup for the relevant tests as defined in TIA/EIA 603. The HP 8920 RF

Communications Test Set, or equivalent, and the HP 4934A TIMMS, or equivalent, should be setup as follows before starting the test and alignment procedures. The calibration dates of the Test Equipments to be used are expected to be current.

8.2.1 HP 8920 Setup

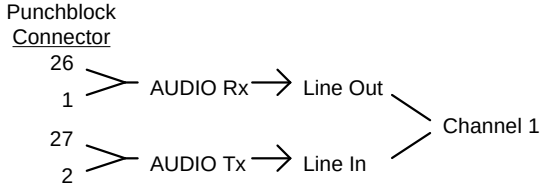
SCREEN CONTROL... DUPLEX
TUNE MODE..... MANUAL
TUNE FREQ..... SET TO TX FREQ.
I/P PORT..... ANT
IF FILTER..... 15K
EXT TX KEY..... OFF
RF GEN FREQ..... SET TO RX FREQ.
AMPLITUDE..... 1.0 mV
ATTEN HOLD..... OFF
O/P PORT..... DUPLEX
AF GEN 1 ..... 1.0 kHz
AF GEN 2 TO..... FM
AF GEN 2 FREQ..... 3.0 kHz
FM COUPLING..... AC
AUDIO OUT..... AC
AF ANALYZER I/P..... FM DEMOD
FILTER 1..... <20 Hz HPF
FILTER 2..... 3 kHz LPF
DE EMPHASIS..... OFF
DETECTOR..... PK+ –/2

8.2.2 HP 4934A - TIMMS Setup

POWER..... ON
DISPLAY..... TRMT
LEVEL..... -60 dBm
FREQ..... 1004 Hz
TRMT IMP..... 600 Ohm
RCV IMP..... 600 Ohm
MEAS..... LEVEL FREQ

8.2.3 General Setup

1. The Line Input and Line Output measurements and adjustments should be made from the Station Audio Type 66 Punchblock. To aid in testing, connect the TIMMS (HP 4934A) (item 15) to the Station Audio Punchblock using the test cable to punchblock adapter. Refer to Appendix D and the following example.



   Terminate the output of the transmitter with an RF Coaxial Load Resistor (item 21).

2. Unless otherwise stated, all adjustments and alignments in this section are to be made using the MASTR III PC Programming Utility Software (TQ-0619). Tests may be made using the Utility Handset (SPK9024). Refer to the Utility PC Programmer Manual (LBI-38540) or the Utility Handset Manual (LBI-38599) whenever necessary.

3. Plug the Utility PC Programmer cable into the DATA connector, or Utility Handset cable into the MIC jack, both located on the front of the T/R Shelf.

NOTE

The Utility Handset and the Utility Programmer cannot be connected to the T/R Shelf at the same time.

8.3 POWER UP

Perform a controlled power up if not performed already. Check equipment for any abnormal indications.

8.4 GETC PROGRAMMING

Prior to operating the system, ensure the GETC personalities are properly programmed to the particular customer requirement for Failsoft and Trunking operation. Ensure that the GETC and Site Controller Personalities meet the customer's operational requirements. Refer to the Hard Copy Site Controller Personality shipped in the Site Controller cabinet.

1. Using the PC Programmer, TQ-3357 and appropriate cables, read and save each GETCs' personality. Copy details from the saved personality to the GETC Programming Data Sheet in Appendix A. All the specific customer information must be available prior to programming to overwrite the default settings.

2. Record the Software revision number of the Turbo board on the Trunked Repeater Data Sheet.

3. Repeat the programming/read procedure for each Station GETC and the Downlink GETC (if applicable). Refer to the Link SRNs for details on Downlink GETC personality.

MORSE CODE ID AND CHANNEL

FCC regulations require each site have a valid Morse Code ID (Call Sign) prior to transmission from site. This Morse Code ID is to be programmed into both GETC and Site Controller.

FCC regulations require that the Morse Code ID (Call Sign) be transmitted on the lowest transmit frequency at the site. Control Channel should, therefore, default to channel 2 or the lowest frequency should be allocated to the least used (highest) channel.

8.5 PREPARATION

These test procedures provide for the minimum alignment required at installation to compensate the factory alignment settings in the station for site-specific connectivity and link losses. It is to be completed prior to performing the Functional Checkout of the system or placing the system into service.

Make copies of the Trunked Repeater Test Data form, see Appendix A, (one copy for each repeater) and enter the following pertinent data:

1. **Record** the customer's name, site name, station number, channel number, test operator name, and date on the data sheet.

2. **Record** the GETC operating dip switch settings (S1 - S3) for the station under test on the data sheet.

3. **Record** the Model Number and Serial Number from the equipment identification plate.

4. **Record** the TX and RX FCC identification number from the equipment identification plate.

5. **Record** the transmitter and receiver frequencies.

6. **Locate** the Site Controller Personality shipped with the equipment and store in the site documentation for reference.

8.5.1 Station Pot

1. Adjust the following Station level control POT settings to the value indicated:

   - Transmit Limiter (TX) 150
   - Repeater Gain (RG) 1023
   - Compressor Threshold (CT) 32767
   - Compressor Gain (CP) 1023
   - DSP Line Input (DI) 100
   - Line Input (LI) 0

LINE IN POT

The **LINE IN** pot is no longer used. It **MUST**, however, **be set to 0** for all applications of MASTR III station.

2. Disconnect the Multisite Link Line In at the punchblock and test across the incoming lines for noise. Noise on the line must be negligible. If noise is detected on the line, check the link to the IMC and reduce the noise.

3. Note the operating, factory set, GETC Dip Switch configuration for each GETC. Switch these Dip Switches as specified for each test.

4. To load the test defined by the DIP switches, the reset button (S4) in the GETC shelf must be pressed after the DIP switches have been set. The transmitter should be keyed and unkeyed by toggling the TX Enable/Disable switch on the System Module (LED on/off).

8.5.2 Audio Levels

Define the Audio Input and Output levels for the Station at either Average Voice or Voice Peak levels. The difference is that Voice Peak is 10dBm higher than that of Average Voice. Note that the transmitter will be aligned to go into limiting at a level 3dBm higher than Voice Peak or 13 dBm higher than Average Voice.

LINE LEVEL ADJUSTMENT

In order to align the line input/output levels, the losses of the inter-site communication link (Link Loss) must first be evaluated. Refer to Technical Manual AE/LZB 119 1915/1 System Levels and Alignment.

Equip Output + Link Gain (Loss) = Line Input

Excessive Link Loss may have to be compensated by use of Line Amplifiers.

USEFUL LEVELS

dBm	mVrms	Vp-p	dBm	mVrms	mVp-p
0	775	2.17	-13	173	
- 3	545		-16	123	
- 6	388		-20	77.5	
-10	245	686m	-30	24.5	

8.6 STATION ALIGNMENT

NOTE

The procedure for Station Alignment is to be performed in the order shown. For test requiring a reading of deviation, the test should be performed with Low Speed Data (LSD) initially off and may be checked with LSD on.

8.6.1 Low Speed Data Deviation (CG)

The Channel Guard (CG) Pot, with the station in conventional repeat mode with LSD on, sets the level of deviation due to LSD for the particular system type. This test invokes a test mode on the GETC which routes low speed data from the GETC to the transmitter and keys the transmitter. Ensure that the Receiver is squelched for this test as Rx Audio is routed to the Transmitter

1. Set the GETC Dip Switches to Conventional Mode Transmit with LSD @ 25 Hz waveform. Press the reset button (S4) in the GETC shelf after the DIP switches have been set.

2. Connect the HP 8920A ANT IN to the repeater Tx Synthesizer RF OUT.

3. Measure the deviation out of the transmitter and adjust the **CG Pot** for 750 Hz ±25 Hz of deviation.

4. If your test equipment filters will pass 10 Hz, check LSD with 10 Hz waveform from GETC. Set the GETC Dip Switches to Conventional Mode Transmit with LSD @ 10 Hz waveform. Refer to Bench Test and Alignment for LSD Waveform tests.

LSD DEVIATION VARIANTS	
Wide Band	750 Hz
NPSPAC	600 Hz
Narrow Band	500 Hz

8.6.2 Transmit Limiter (TX)

The Transmit Limiter (TX) Pot adjusts the limit of deviation for either Line In or Repeat Audio. LSD must be accounted for in the measurement as it is injected post-limiter stage. These tests align the Tx Pot for max deviation without LSD component and then verifies deviation with LSD added.

The transmitter will be aligned to go into limiting with an audio input at a level 3 dBm higher than the Voice Peak level expected for normal operation of this channel and at a level no higher than +10 dBm. This equates to TX Limiting being set at +3 dBm for an input AVTT level of -10 dBm (Voice Peak at 0dBm).

If the Site is Stand-alone, align Tx Pot with Repeat Audio. If the Site is Multisited, align Tx Pot for either Line In or Repeat Audio, whichever level is the higher.

8.6.2.1 TX Limiter With Line In Audio

1. Set the GETC Dip Switches for Conventional Mode Transmit with LSD off.

2. Set the RG pot to 4000.

3. Apply a balanced, 600 ohm, 1 kHz (AVTT) tone at a level 3 dBm higher than the input Voice Peak level expected for normal operation of this channel (a level no higher than +10 dBm) to the Line Input of the station under test.

4. Measure the transmit deviation and adjust the **TX Pot** for the desired system deviation maximum of 3.75 kHz ±100 Hz.

LIMITER MAX DEVIATION (LESS LSD)	
Wide Band	3.75 kHz
NPSPAC	3.0 kHz
Narrow Band	1.75 kHz

5. Select the GETC Dip Switch settings for LSD On @ 25 Hz and measure system deviation again. The reading will be more than previous measurement by the value for LSD for the system type.

LIMITER DEVIATION (PLUS LSD)	
Wide Band	4.5 kHz
NPSPAC	3.6 kHz
Narrow Band	2.25 kHz

6. Disconnect the Line Input signal source.

7. Reset the RG pot to 1023.

8.6.2.2 TX Limiter With Repeated Audio

1. Set the GETC Dip Switches for Conventional Mode Transmit with LSD off.

2. Set the RG pot to 4000.

3. Using the HP 8920, apply an "on frequency" RF signal to the Receiver Front End Module jack J2

(RF IN) at a steady signal level of -47 dBm or 1 mV, with a 1 kHz tone at 60% of system deviation.

4. Measure the transmit deviation and adjust the **TX Pot** for the desired system deviation maximum of 3.75 kHz ±100 Hz. Refer to tables in 8.6.2.1.

5. Select the GETC Dip Switch settings for LSD On @ 25 Hz and measure system deviation again. The reading will be more than previous measurement by the value for LSD for the system type. Refer to tables in 8.6.2.1.

6. Reset the RG pot to 1023.

8.6.3 Repeater Gain (RG)

The Repeater Gain (RG) Pot sets the gain from the receiver audio to the modulation input to the transmitter.

1. Set the GETC Dip Switches to Conventional Mode Transmit with LSD Off.

2. Using the HP 8920, apply an "on frequency" RF signal to the Receiver Front End Module jack J2 (RF IN) at a steady signal level of -47 dBm or 1 mV, with a 1 kHz tone at 60% of system deviation.

3. Verify the transmitted tone is 1 kHz and adjust the **Repeater Gain (RG) Pot** for 3.0 kHz ±100 Hz deviation.

RG DEVIATION VARIANTS (LESS LSD)	
Wide Band	3.0 kHz
NPSPAC	2.4 kHz
Narrow Band	1.5 kHz

4. Set the GETC Dip Switches to Conventional Mode with LSD On @ 25 Hz. Ensure that the deviations measured above have increased by the appropriate value of LSD deviation for this system type.

RG DEVIATION VARIANTS (PLUS LSD)	
Wide Band	3.75 kHz
NPSPAC	3.0 kHz
Narrow Band	2.0 kHz

5. Disconnect the HP 8920 from the (RF IN) J2.

8.6.4 Line Output (LO)

The Line Output (LO) Pot sets the level of demodulated audio to the link.

1. Set the GETC Dip Switches to Conventional Mode with Low Speed Data Off.

LO DEVIATION VARIANTS	
Wide Band	3.0 kHz
NPSPAC	2.4 kHz
Narrow Band	1.5 kHz

2. Using the HP 8920, apply an "on frequency" RF signal to the Receiver Front End module jack J2 (RF IN), at a steady signal level of -47 dBm or 1 mV, with a 1 kHz tone at 60% of system deviation.

3. Setup the HP 4934A (TIMMS) for Receive and 600Ω terminal mode. Connect the TIMMS to the Receive Audio on the punchblock (bridging clips removed).

4. Measuring with the TIMMS, adjust the Line Output (LO) Pot to produce that audio level which has been calculated to provide the necessary level at the input to the IMC across the link. Ensure that this level is within the specifications of either link equipment or phone company.

5. If Link Loss cannot be compensated, adjust this level to 0 dBm or the maximum input level specified by the link equipment, and provide gain at the destination equipment.

8.6.5 Line Input Sensitivity - DSP Line Input (DLI)

The DSP Line Input (DLI) Pot adjusts the transmitter deviation sensitivity to audio on the line input.

1. Set the GETC Dip Switches to Conventional Mode Transmit with Low Speed Data Off.

2. Connect the HP 8920A ANT IN to the repeater Tx Synthesizer RF OUT.

3. Apply a 1004 Hz tone to the Line Input at the punchblock at peak level equivalent to the Voice peak level expected from the multisite link. This level will be 3 dBm lower than that used for TX Pot alignment.

4. Adjust the **DSP Line Input (DLI) Pot** for 2.8 kHz ±100 Hz transmitter deviation.

DLI DEVIATION VARIANTS (LESS LSD)	
Wide Band	2.8 kHz
NPSPAC	2.25 kHz
Narrow Band	1.4 kHz

5. Set the GETC Dip Switches to Conventional Mode Transmit with Low Speed Data on @ 25 Hz and confirm that the measured level of deviation increases by the frequency of Low Speed Data.

DLI DEVIATION VARIANTS (PLUS LSD)	
Wide Band	3.55 kHz
NPSPAC	2.85 kHz
Narrow Band	1.9 kHz

8.6.6 Compressor Gain (CP)

The Compressor Gain (CP) Pot adjusts the level of gain in the compressor stage required to produce 60% of system deviation.

1. Set the GETC Dip Switches to Conventional Mode Transmit with Low Speed Data Off.

2. Connect the HP 8920A ANT IN to the repeater Tx Synthesizer RF OUT.

3. Apply a 1004 Hz tone to the Line Input at the punchblock at the level used for DLI.

4. Adjust the **Compressor Gain (CP) Pot** for 3.0 kHz ±100 Hz transmitter deviation.

CP DEVIATION VARIANTS (LESS LSD)	
Wide Band	3.0 kHz
NPSPAC	2.4 kHz
Narrow Band	1.5 kHz

5. Set the GETC Dip Switches to Conventional Mode Transmit with Low Speed Data @ 25 Hz and confirm that the measured level of deviation increases by the frequency of Low Speed Data.

CP DEVIATION VARIANTS (PLUS LSD)	
Wide Band	3.75 kHz
NPSPAC	3.0 kHz
Narrow Band	2.0 kHz

8.6.7 Compressor Threshold (CT)

The Compressor Threshold (CT) Pot adjusts the threshold at which compression takes place.

1. Set the GETC Dip Switches to Conventional Mode Transmit with Low Speed Data Off.

2. Connect the HP 8920A ANT IN to the repeater Tx Synthesizer RF OUT.

3. Apply a 1004 Hz tone to the Line Input at the punchblock at a level 10 dB higher than the level used for DLI.

4. Adjust the **Compressor Threshold (CT) Pot** for 3.65 kHz ±100 Hz transmitter deviation.

CT DEVIATION VARIANTS (LESS LSD)	
Wide Band	3.65 kHz
NPSPAC	2.9 kHz
Narrow Band	1.65 kHz

5. Set the GETC Dip Switches to Conventional Mode Transmit with Low Speed Data @ 25 Hz and confirm that the measured level of deviation increases by the frequency of Low Speed Data.

CT DEVIATION VARIANTS (PLUS LSD)	
Wide Band	4.4 kHz
NPSPAC	3.5 kHz
Narrow Band	2.15 kHz

8.6.8 GETC Modem Line Input

This adjusts the GETC Modem Line Input level from the link to that acceptable to the Rockwell Modem. The Input level will normally be 5 dB below that of the Voice Audio (DLI) input to the station.

8.6.8.1 Without IMC Link In Place

1. Connect the HP 8920 oscilloscope between U18 pin 1 and ground on the GETC Logic Board.

2. Connect the TIMMS to the Line In at the punchblock, generating 1004 Hz at a level 5 dB below that of the expected multisite Voice Audio.

3. Adjust R1 on the GETC Logic Board for a level of 355 mVpp ±30 mV (65 mVrms).

8.6.8.2 With IMC Link In Place

1. Connect the HP 8920 oscilloscope between U18 pin 1 and ground on the GETC Logic Board.

2. Confirm presence and level of modem audio on input.

3. Adjust R1 on the GETC Logic Board for a level of 355 mVpp ±30 mV (65 mVrms).

8.6.9 High Speed Data Deviation (R31)

This sets the level of station deviation due to GETC High Speed Data.

1. Set the GETC Dip Switches High Speed Data On @ 4800/9600 Hz.
2. Connect the HP 8920A ANT IN to the repeater Tx Synthesizer RF OUT.
3. Adjust **GETC R31** for 3.0 kHz ±100 Hz deviation.

HSD DEVIATION VARIANTS	
Wide Band	3.0 kHz
NPSPAC	2.4 kHz
Narrow Band	1.5 kHz

8.6.10 GETC Modem Line Output (R2)

With the GETC DIP Switches set for normal operation, force the Modem to emit audio to the Line Output:

1. Move jumper J71 from 1 & 2 to 2 & 3.
2. Remove Line Input signal.
3. Reading the level on the TIMMS, adjust **GETC R2** for a level 5 dB below the Line Output level set in Receiver Line Output test.

   If the link has excessive loss, this level may be increased but must not exceed that of the Station Line Output. Ensure that this level is within the specifications of the either Link equipment or phone company.
4. Return the jumper J71 to it's original position.

8.6.11 SINAD Test

There are different SINAD values depending on the frequency band of the equipment.

8.6.11.1 800 MHz

1. Reset the GETC Dip Switches to the conventional mode positions.
2. Connect the HP 8920 Duplex to the RF IN (J2) on the Receiver Front End module. Connect the HP 8920 Audio Input to the Line Output at the punchblock. Open the squelch.
3. Set the HP 8920 to measure SINAD and adjust the RF level until an average 12 dB SINAD is attained.
4. Confirm level is less than -119 dBm.
5. If the SINAD is greater than -115 dBm, service the receiver. Record the 12 dB SINAD value on the data sheet in Appendix A.

8.6.11.2 UHF and VHF

1. Reset the GETC Dip Switches to the conventional mode positions.
2. Connect the HP 8920 Duplex to the RF IN (J2) on the Receiver Front End module. Connect the HP 8920 Audio Input to the Line Output at the punchblock. Open the squelch.
3. Set the HP 8920 to measure SINAD and adjust the RF level until an average 12 dB SINAD is attained.
4. Confirm level is less than -116 dBm.
5. If the SINAD is greater than -115 dBm, service the receiver. Record the 12 dB SINAD value on the data sheet in Appendix A.

8.6.12 Squelch Adjustment

1. Connect the HP 8920A as for the previous test.
2. Adjust the HP 8920A RF level for an average 10 dB SINAD reading.
3. Adjust the **Squelch** until it just closes.
4. Remove the HP 8920 from the station.

8.6.13 Transmitter Forward And Reverse Power (except MASTR III 800 Mhz)

PREPARATION

Leave the power for all repeaters OFF except the repeater under test. This test must be performed **AFTER** the Combiner system alignment has been verified.

This test requires measurement of Forward and Reverse power of each channel. The station forward power requirement must be calculated to provide the required ERP. VSWR will be calculated at the RF Output of the station.

EFFECTIVE RADIATED POWER

Effective Radiated Power (ERP) is the result of the calculation of Station Forward Power, Combiner loss, Feeder loss and Antenna gain.

8.6.13.1 TX Forward Power (TX)

1. Connect the Bird 8343-1 RF Directional Wattmeter to the Combiner Output (Antenna) port.
2. Key the station.
3. Measure the Transmitter Output Power and adjust the **Transmitter Power Pot (PA)** for the forward power level required to achieve the required ERP.
4. Toggle the **Tx DISABLE** switch and disable transmission (Tx Disable LED on).

8.6.13.2 TX Reverse Power

1. Connect the Bird 8343-1 RF Directional Wattmeter to the Station Output port.
2. Key the station and note the station forward power level.
3. Set the sensing direction to REVERSE. Read the reflected power and record this value on the RF System data sheet. If this value is greater than 4 watts, service is required to reduce the reflected power. Toggle **Tx DISABLE** to disable transmission.
4. Remove Wattmeter and reconnect cable to RF Combiner.

8.6.14 Transmitter Forward And Reverse Power (MASTR III 800 MHz only)

This test requires measurement of Forward and Reverse power of each channel. The Station forward power requirement must be calculated to provide the required ERP. VSWR will be calculated at the RF Output of the station. (19D901841G3 modules ONLY)

8.6.14.1 TX Forward Power (TX)

1. On the System Module of the Repeater under test, toggle the **Tx DISABLE** Switch to disable transmission (TX disable LED should be on).
2. Connect a RF Directional Wattmeter (item 18) between the PA output and the TX Combiner. Put the Wattmeter into FORWARD mode. Attach a 150 watt RF load (item 21) onto the output of the TX Combiner.
3. Turn off all other Repeater Stations connected to the combiner to prevent overloading the RF load.
4. Toggle the **Tx DISABLE** switch to enable transmission (TX disable LED should be off). Toggle the **REM PTT** switch on the front of the System Module (Transmit LED should be on).
5. Remove the top two screws securing the PA Assembly to the rack. This will allow the top of the PA Assembly to swing down and permit access to the PA adjustment.
6. Using a non-inductive tuning tool, adjust R11 on the PA Assembly for the forward output power required to effect the required ERP (see Figure 13). Record the final output power.

WARNING

Final adjustment of the PA Assembly for output power should be made with potentiometer R11 only. DO NOT adjust any other pots on the PA assembly. The remaining pots are set at the factory and do not require adjustment.

7. Toggle the **Tx DISABLE** switch and disable transmission (Tx Disable LED on).

8.6.14.2 TX Reverse Power

1. Set the sensing direction to REVERSE.
2. Toggle the **Tx DISABLE** again to enable transmission (Tx Disable LED off). Read the reflected power and record this value on the RF System data sheet. If this value is greater than 4 watts, service is required to reduce the reflected power. Toggle **Tx DISABLE** to disable transmission.

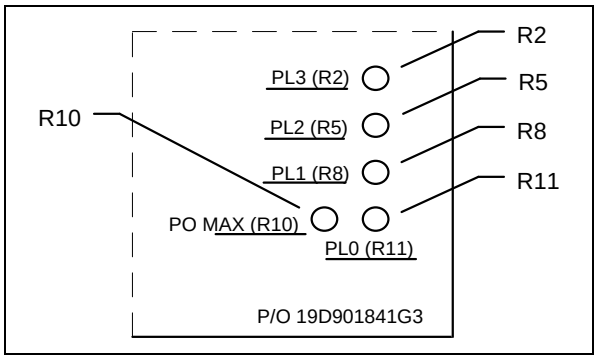


Figure 13 - Power Amplifier Adjustment Locations

3. Remove the RF Directional Wattmeter and reconnect cable to RF Combiner

8.7 RF SYSTEM CHECK

8.7.1 Transmitter Combiner

The transmitter combiners must be tested to ensure the cavities have been tuned to the proper frequencies and do not have losses that exceed specifications.

1. On the RF System Test Data sheet, record the cabinet number of the cabinet which contains the transmitter combiner.

2. Connect a second Wattmeter terminated into a 50 ohm load at the output of the transmitter combiner.

3. Toggle the **Tx DISABLE** again to enable transmission (Tx Disable LED off).

4. Measure the output power of the transmitter combiner. Record this value on the data sheet. The input power to the Combiner (from the Repeater PA) should be 100 ±5 watts as adjusted in the previous section. With 100 watts input power to the Combiner, the maximum Combiner loss for any one channel should not exceed the following limits:

Combiner Type	Loss Per Ch.	Watts Max.
5 Ch	-2.2 dB	60
10 Ch	-3.2 dB	50

The dB loss can be calculated by the following formula:

dB loss = 10 log [(input power)/(output power)]

The difference between the channel with the highest output and the channel with the lowest output should not exceed 1 dBm.

5. If the output power does not meet the minimum requirement, the transmitter combiner cavity requires retuning.

6. Toggle **Tx DISABLE** to disable transmission.

7. Repeat steps 3-6 for the remaining Station Repeaters.

8. Toggle the **Tx DISABLE** switch and disable transmission (Tx Disable LED on). Remove the RF load from the output of the combiner.

9. Replace the 250 watt element with a 10 watt element between the output of the transmitter combiner and the antenna system. Select the REVERSE direction.

10. Toggle the **Tx DISABLE** again to enable transmission (Tx Disable LED off). Record the reflected power from the antenna system. This must be less than 1/25th of the forward power. If not, service the antenna system. Toggle the **Tx DISABLE** switch and disable transmission again (Tx Disable LED on).

VSWR LEVEL

The reflected power must be less than 1/25th of the forward power. If not, the antenna system must be serviced.

11. Remove the Thru-line Wattmeter and power down all repeaters.

8.7.2 Receiver Multicoupler Test

The receiver multicoupler must be tested as described in the following procedure.

1. Record the number of the cabinet in which the multicoupler is located.

2. All output ports except the one being tested must be terminated with a receiver or a 50 ohm load.

3. Connect an RF signal generator to the input of the receiver multicoupler. Set the frequency of the generator to the center frequency of the repeaters. Set the generator output level to -90 dBm.

4. Use a 50 ohm RF voltmeter to measure the signal level present at each output port on the multicoupler and record these levels on RF System data sheet. There must be no more than 1.0 dB variation in the output levels at the different ports.

MULTICOUPLER NET GAIN

The net gain through a 5 or 10 channel receiver multicoupler is typically 6.0 dB.

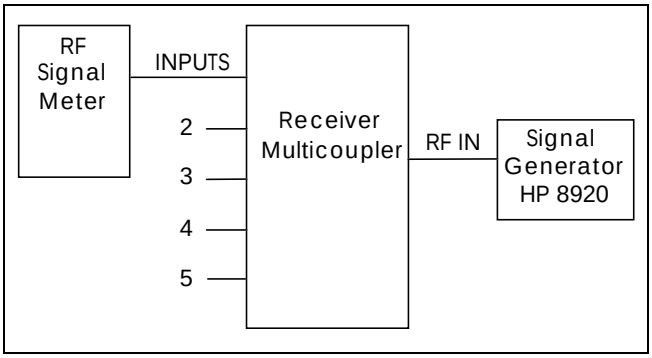


Figure 14 - Receiver Multicoupler Test Setup

8.7.3 Tower Top Amplifier Test

The Tower Top Amplifier (TTA) must be tested as described in the following procedure. A power supply mounted in the Transmitter combiner cabinet provides DC power to the tower mounted amplifier via the receiver coaxial cable.

1. Record the number of the cabinet in which the TTA power supply is located.

2. Remove the antenna connection from the multicoupler/injector unit located with the repeater equipment.

3. With the injector turned on, use a DC Multimeter to measure the voltage present at the N connector on the multicoupler/injector output. Record the voltage level on the RF Systems Test Data Sheet.

WARNING

Do not inadvertently short out the center pin of the N-connector to the ground as this will result in a blown fuse in the injector.

4. Reconnect the antenna.

5. Disable the transmitter on all repeaters with the TX Disable switch.

6. Disconnect the transmitter antenna from the transmitter combiner and connect the RF Output of the HP 8920.

7. Set the HP 8920 to the receive band center frequency and maximum output level.

8. Disconnect one output from the receiver multicoupler port.

9. Connect the receiver multicoupler port to the antenna input port on the HP 8920.

10. Set the HP 8920 to Spectrum Analyzer mode.

11. A signal spike should be present at the RF generator frequency.

12. Record the amplitude of the spike with the TTA ON in Appendix A-15.

13. Put the TTA in bypass mode by turning the DC Injector Voltage OFF.

14. Record the amplitude of this spike.

15. Record the difference between the values recorded in steps 12 and 14.

8.8 RF POWER MONITOR TEST

8.8.1 PMU Set Up - MODEL 8843

The RF Power Monitor unit monitors the RF power from each transmitter as well as the input and reflected power for the transmit antenna coax line. An alarm is fed from the RF Power Monitor via an RS 232-C connection to the Site Controller if any parameter is outside its specified limit. Appendix C provides the interconnections between the Power Monitor and the Site Controller.

Whenever DC power is removed from the RF Power Monitor, the unit must be reprogrammed; therefore, at the initial installation of a repeater site the RF Power Monitor must be reprogrammed. If the site is equipped with an RF Power Monitor, the Power Monitor unit will need to be set up and programmed as follows:

1. On the back panel option switch, set switch 1 and 4 on (up) and all other switches off (down).

2. The Power Monitor unit will be powered from the site +12 Vdc supply; and the front panel 110 VAC-OFF-12 Vdc switch must be in the 12 Vdc position.

3. In order to clear the memory, press the following keys in order:

   (1) (3) (5) (7) (CLEAR)

   This will cause all RAM locations in memory to be set to zero.

4. Clear all alarm memory by pressing the following keys in order:

   (9) (9) (9) (9) (CLEAR)

5. Set the clock to the proper current time. As an example, to set the time to 2:39 PM, press the following keys:

   (SET) (TIME) (1) (4) (3) (9) (ENTR)

   NOTE: The clock operates on 24-hour time.

6. Set the date to the current date. As an example, to set the date to May 26, depress the following keys:

   (SET) (DATE) (0) (5) (2) (6) (ENTR)

7. Assign the repeater stations to the proper antenna for the Power Monitor. Designate radio station #1 as Channel 1 and assign it to the transmit antenna (Antenna #1) by depressing the following keys:

   (0) (1) (0) (1) (CHNL/DES) (ENTR) (ch 1)

   (0) (1) (0) (2) (CHNL/DES) (ENTR) (ch 2)

   NOTE: The first two digits always defines the antenna, while digits 3 and 4 define the channel number.

8. Repeat step 7 for remaining channels at the site.

9. This step will adjust the sensors at the transmitter power output and the transmitter combiner output so they will monitor the power output correctly.

10. Connect an in-line watt meter between a station PA output and the input to the transmitter combiner (locate at the output of the PA). Connect a second watt meter terminated in a 50 ohm load at the output of the transmitter combiner.

11. Toggle the **Tx DISABLE** again to enable transmission (Tx Disable LED off)

12. Depress the following keys on the power monitor:

    (0) (1) (0) (1) (IPF) (DUAL) (OPF) (ENTR)

    This will display the transmitter output power and combiner in real time.

13. Adjust the transmitter power sensor to obtain the same reading on the display of the RF Power Monitor as the watt meter on the output of the transmitter.

14. Adjust the antenna power sensor (lower screw) to obtain the same reading on the display of the RF Power Monitor as the watt meter on the output of the transmitter combiner.

15. Repeat steps 9 through 14 for each channel, using the correct antenna/channel keystrokes for the transmitter under test.

16. Connect two 50 ohm dummy loads together using a tee and terminate the watt meter on the output of the transmitter combiner with them. On the power monitor enter the keystrokes:

    (0) (1) (0) (1) (OPF) (DUAL) (OPR) (ENTR)

    Substitute the correct antenna/channel combination for the station under test. Adjust the reverse antenna power sensor (upper screw) to match the reflected power reading.

8.8.2 PMU Set Up - Model 8860

Refer to LBI-39128 for PMU Setup.

8.8.3 ELI Set Up

Refer to LBI-39077 for ELI Configurations.

The following tests are to be made for each ELI equipped channel to test both connection and levels for each Telephone Line to it's RF channel:

- Radio originated Interconnect call: Radio Interconnect call channel connects to channel telephone line.
- Inbound telephone originated Interconnect call: Telephone line connects to own RF channel for line originated Interconnect call.

The following tests are to be made for the site as a whole and test cross-connection of channels and telephone lines:

- Radio originated Interconnect call: Each RF channel connects to each telephone line.
- Inbound telephone originated Interconnect call: Each telephone line connects to each RF channel.

CUSTOMER SYSTEM SURVEY FORM

At this time, the Installer is to complete the Customer System Survey Form for this Site. This is a record of all hardware and software installed on this Site.

9. SYSTEM FUNCTIONAL TESTS

9.1 INTRODUCTION

This chapter describes the Functional Test Procedures for EDACS Basic and Level 1 equipment. The procedures should be performed in the order presented. Upon successful completion of this section, the EDACS site equipment is considered to be fully operational and ready for service.

NOTE

Before proceeding, verify all equipment has been mechanically installed, electrically interconnected and configured in accordance with this installation manual.

The Installer/Verification Engineer will perform the following tests:

Table 12 - Function Tests

	FAILSOFT		TRUNKED	
	SS	**MS**	**SS**	**MS**
CV R - R	Y	Y	Y	Y
CV R - C	N/A	Y	N/A	Y
CV C - R	N/A	Y	N/A	Y
CV R - T	N/A	N/A	Y	Y
CV T - R	N/A	N/A	Y	Y
DV R - R	Y	Y	Y	Y
DV R - C	N/A	Y	N/A	Y
DV C - R	N/A	Y	N/A	Y

Legends: SS =Single Site MS = Multisite

CV=Clear Voice DV=Digital Voice

R-R=Radio to Radio Call R-C=Radio to Console Call

R-T=Radio to Local Interconnect Call N/A=Not Applicable

T-R=Local Interconnect Call to Radio

C-R=Console Call to Radio

9.2 PROGRAMMING THE EDACS TEST RADIOS

The following system functional tests require four (4) EDACS portable or mobile radios of the type to be used on this system - ideally they should be specimens from the customer's order. Many of the tests will only require two of these to be used. At least one of these radios must be equipped with a numeric keypad; i.e., System Radio, which must be programmed as a "Supervisory" radio.

All test radios must be programmed with a minimum generic personality before testing can begin but should closely reflect the personalities of the customer's radios where possible. In addition to other basic programming of the radio, the personality is to include:

- Site frequencies
- Site ID
- 4 Test talk groups
- Unique LIDs
- Emergency button enabled
- Home group = Group 1
- Auto-login enabled

Refer to the table below or GETC SRNs for the GETC LED indications:

Table 13 - Station GETC Front Panel LED Indicators

MODE	L1 (H7)	L2 (H6)	L3 (H5)	L4 (H4)	L5 (H3)	L6 (H2)	L7 (H1)
Failsoft Trunking:							
Control Channel	●	❍	❍	❍	❍	●	●
Idle Working Channel	●	❍	❍	❍	❍	❍	●
Assigned Clear Voice Call	●	❍	❍	❍	❍	●	❍
Assigned Digital Voice Call	●	❍	❍	❍	❍	●	●
Trunking:							
Control Channel	❍	❍	❍	❍	❍	●	●
Idle Working Channel	❍	❍	❍	❍	❍	❍	●
Assigned Clear Voice Call	❍	❍	❍	❍	❍	●	❍
Assigned Digital Voice Call	❍	❍	❍	❍	❍	●	●

Legends: ● =Off ❍ = On ■ = Flashing on Data

Table 14: Downlink GETC Front Panel LED Indicators

MODE	L1 (H7)	L2 (H6)	L3 (H5)	L4 (H4)	L5 (H3)	L6 (H2)	L7 (H1)
Failsoft Downlink:	●	❍	❍	❍	■	■	●
Trunking Downlink:	❍	❍	❍	❍	■	■	●

Legends: ● =Off ❍ = On ■ = Flashing on Data

NOTE

For sites not programmed for automatic channel rotation, each Working Channel must be selected manually by turning all the other Working Channels OFF.

9.3 BASIC/FAILSOFT SITE TEST

This section tests Single-Site and Multisite Failsoft operations for Basic and Level 1 Failsoft Sites. For Level 1 Failsoft tests, disable the Site Controller and disconnect it's power.

9.3.1 Stand-Alone Site Test

This is to verify that the Site operates correctly in Single-Site Failsoft mode. Use one radio to Transmit and one to Receive.

1. Verify that one of the channels is operating as a Control Channel (CC) and all the other station GETC's are in idle or Working Channel (WC) mode. See Table 12 for specimen Failsoft Indications or refer to GETC SRNs for specific indications.

2. Verify that each Working Channel can be assigned to a radio call by performing a PTT on a portable radio. Confirm that the transmission can be heard in the receiving radio. Confirm that the GETC indications are correct for Working Channel assignments.

3. When the site is idle, reset the Control Channel GETC and verify that the Control Channel rotates to the next available Channel.

4. Repeat steps 2 and 3 and verify each GETC will operate as the Control Channel.

9.3.2 MULTISITE FAILSOFT TEST

This is to verify that the Site operates correctly in Multisite Failsoft Mode. Use two radios and a Dispatch Console. Perform the Stand-Alone site tests prior to these tests.

Use two radios, one transmit and one receive, and a Dispatch Console.

1. Make a sequence of radio calls to the Console to verify that each Working Channel can be assigned to a Multisited radio call. Confirm that the transmission can be heard both in the receiving radio and at the Console.

2. Make a sequence of Dispatch calls to the radios to verify that each Working Channel can be assigned to a Multisited Console call. Confirm that the transmission can be heard in the receiving radio.

3. Verify that the Downlink GETCs indicate Tx and Rx data communication.

9.4 LEVEL 1 SITE TEST

This section tests Single-Site and Multisite operations of an EDACS Level 1 Site. These tests should only be performed *after* the Failsoft tests described in the previous section have been completed.

See Table 12 for specimen Trunked Indications or refer to GETC SRNs for specific indications.

1. Apply power to the Site Controller computer.

2. Verify the front panel power indicator is ON.

3. Verify the two Fail LED's on the rear of the Site Controller are OFF.

4. Reset the Control Channel GETC. Verify the site goes into Full Trunking mode (L1 turns OFF). If not, reset Control Channel GETC and all Station GETCs and verify the site goes into Full Trunking mode.

9.4.1 Stand-Alone Site Test

This is to verify that the Site operates correctly in Stand-alone Fully Trunked Mode. Use one radio to Transmit and one to Receive.

1. Verify that one of the channels is operating as a Control Channel (CC) and all the other station GETC's are in idle or Working Channel (WC) mode.

2. Verify that each Working Channel can be assigned to a radio call by performing a PTT on a portable radio. Confirm that the transmission can be heard in the receiving radio. Confirm that the GETC indications are correct for Working Channel assignments.

3. When the site is idle, reset the Control Channel GETC and verify that the Control Channel rotates to the next available Channel.

4. Repeat steps 2 and 3 and verify each GETC will operate as the Control Channel.

NOTE

For Sites not programmed for automatic channel rotation, each Working Channel must be selected manually by holding the other Working Channel GETCs in RESET until the required channel is assigned.

9.4.2 Multisite Level 1 Test

This is to verify that the Site operates correctly in Multisite Fully Trunked Mode. These tests should only be performed *after* the Stand-alone Fully Trunked Mode tests described in the previous section have been completed.

Use two radios, one transmit and one receive, and a Dispatch Console.

1. Make a sequence of radio calls to the Console to verify that each Working Channel can be assigned to a Multisited radio call. Confirm that the transmission can be heard both in the receiving radio and at the Console.

2. Make a sequence of Dispatch calls to the radios to verify that each Working Channel can be assigned to a Multisited Console call. Confirm that the transmission can be heard in the receiving radio.

3. Verify that the Downlink GETCs indicate Tx and Rx data communication.

9.5 LOCAL TELEPHONE INTERCONNECT TESTS

In order to verify Local Telephone Interconnect operation, RF Channels will have to be disabled to force Interconnect calls to certain channels or the channel and radio must be placed into a test partition. To test GTIs, cycle through the GTIs with each test until all GTIs are tested.

9.5.1 Radio-Originated Calls

Test radio-originated Interconnect calls to each RF Channel and confirm that the call can be routed from that channel to each GTI.

1. Using a portable radio programmed for Interconnect capability, perform an interconnect call.

2. Observe that the call is allocated to an RF Channel and is routed to a GTI. Confirm that the call is successfull. End the call.

3. Repeat steps 1 & 2 ensuring that each GTI is allocated to the call for this RF Channel.

4. Repeat steps 1, 2 & 3, for each RF Channel ensuring that each GTI is allocated to the call for each RF Channel.

9.5.2 Telephone-Originated Calls

Test telephone-originated Interconnect calls to each GTI and confirm that the call can be routed from that GTI to each RF Channel. For each GTI to be tested, the telephone number will be different.

1. Make a telephone-originated call to the site and overdial the 5-digit LID of the test radio.

2. Observe that the call is allocated to an RF Channel and confirm that the call is routed to a GTI. Verify that the portable rings and, when answered, the call is processed. End the call.

3. Repeat steps 1 & 2 for this GTI ensuring that each RF Channel is allocated to the call.

4. Repeat steps 1, 2 & 3, for each GTI ensuring that each RF Channel is allocated to the call for each GTI

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10. EXTENDER CARD AND BENCH TEST REALIGNMENT

10.1 GENERAL

Certain modules, depending on frequency band, may be tested and aligned "In Station" using the extender cards. The preferred method for retuning and realigning modules is to perform Bench Test and Alignment by removing the modules from the Station and using the RF Test Fixture following the alignment guide in LBI-38805 and technical manual for the module in question.

Refer to the Technical Manual for the module under test for detailed alignment requirements. When module realignment is complete, confirm the station realignment as shown in Station Alignment section.

If modules are suspected of being faulty, they should be tested and realigned as listed below.

- IN-STATION TESTING using the extender cards: **All modules**
- IN-STATION ALIGNMENT using the extender cards: **Tx Synthesizer ONLY**
- BENCH by removing the modules from the Station and using the RF Test Fixture: **All modules**

The Tx Synthesizer Module may be realigned for LSD Waveform but such alignment must not be made without realigning the entire Base Station.

The Extender Cards are:

- 19A903197G1 RF Module Extender Card
- 19A903197G2 System Module Extender Card

WARNING

Before removing or replacing a module, power to the station must be switched off.

10.2 IN-STATION TESTING

For In-Station Testing, reference is to be made to the appropriate LBI for the module under test.

To prepare the module for In-Station Testing, the following steps are to be taken:

1. For operational systems, use the System Manager to place the channel into a Test Partition.
2. For non-operational systems, go to step 3.
3. Power to the affected channel must be switched off.
4. The module is to be removed and the appropriate Extender Card placed into the T/R Shelf.
5. The module is to be placed onto the Extender Card.
6. Power is to be reapplied to the channel.
7. Tests may now be performed.

When testing is complete, replace the module and re-check alignment as follows:

1. Power to the channel must be switched off.
2. The Extender Card is to be removed and the module replaced into the correct slot in the station.
3. Power is to be reapplied to the channel.
4. Alignment must be verified and station realigned if necessary.
5. Place the channel into service by removing the channel from the Test Partition and make test calls on that channel.

10.3 IN-STATION REALIGNMENT

For In-Station Realignment, reference is to be made to the appropriate Tx Synth Module LBI.

To prepare the module for In-Station Realignment, the following steps are to be taken:

1. For operational systems, use the System Manager to place the channel into a Test Partition.
2. For non-operational systems, go to step 3.
3. Power to the affected channel must be switched off.
4. The module is to be removed and the RF Module Extender Card placed into the T/R Shelf.
5. The module is to be placed onto the RF Module Extender Card.
6. Power is to be reapplied to the channel.
7. Re-alignment may now be performed

When testing is complete, replace the module and re-check alignment as follows:

1. Power to the channel must be switched off.

2. The Extender Card is to be removed and the module replaced into the correct slot in the station.

3. Power is to be reapplied to the channel.

4. Alignment must be verified and station realigned if necessary.

5. Place the channel into service by removing the channel from the Test Partition.

10.3.1 Low Speed Data Waveform

NOTE

This is not a standard test or a maintenance requirement. The waveform is factory set and incorrect/incomplete waveform alignment can seriously affect system operation.

This alignment is to be performed if the Low Speed Data waveform has been observed to be distorted or the frequency of the Base Station has been changed.

1. Perform a complete station alignment.

2. Remove power from the station, remove the Tx Synth Module from the station and place the Tx Synth Module on the RF Extender Card.

3. Connect the HP 8920 ANT IN to the repeater TX Synth RF OUT. Set HP8920 AF Analyzer 'Scope To' options to INPUT.

4. Connect analog Oscilloscope to HP8920 Audio Monitor Output ensuring that both equipments are connected to the same power source. Scope is to be DC coupled. View the waveform on the scope. If it is not square, check scope coupling.

5. Configure the GETC Dip switches for Conventional Mode, Transmit and Low Speed Data @ 25Hz (Refer to the appropriate GETC SRN). This invokes a test mode on the GETC which keys the transmitter with receiver audio and low speed data from the GETC routed to the transmitter. To load the test, the reset button (S4) in the GETC shelf must be pressed after the Dip switches have been set.

WARNING

Ensure that oscilloscope is DC coupled. If AC coupled, the waveform will be distorted and the realignment will be incorrect

1. Adjust VR601 on Tx Synth for squarest possible waveform.

2. Replace Tx Synth into shelf as expalained in the previous section.

10.4 BENCH TESTING

Bench Testing is to be performed in a clean environment using the RF Module Test Fixture TQ-0650. Refer to LBI-38805 for instructions on use. The affected channel is to be placed out of service and the failed module is to be removed to a Maintenance Facility to be bench tested. If a replacement module is available, this should be installed, the station completely realigned and the channel returned to service.

Refer to the Technical Manual for the module under test for detailed alignment requirements. There are no bench tests for the System Module. Should this module fail during in-station alignment, it is to be replaced and the failed module returned for repair.

To remove a module for bench testing, the following steps are to be taken:

1. For operational systems, access screen 10 on the System Manager and define that affected channel as OFF. Upload site database to site. Access screens 20 and 32 for that site and confirm that the channel is OFF.

2. For non-operational systems, go to step 3.

3. Power to the affected channel must be switched off.

4. The module is to be removed and connected to the RF Module Test Fixture.

5. The module is to Bench Tested as per instructions in LBI-38805. If it passes the tests, it may be realigned in-station and placed back into service. If it fails the tests, it should be sent for warranty repair and/or replacement.

When testing is complete, replace the module and re-check alignment as follows:

1. Power to the channel must be switched off.
2. The module is to be placed into the correct slot in the station.
3. Power is to be reapplied to the channel.
4. For operational systems, access screen 10 on the System Manager and define that affected channel as ON. Upload site database to site.
5. Perform complete station alignment.
6. Return the channel into service.

WARNING

Before removing or replacing a module, power to the station must be switched off.

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11. CHANGING BASE STATION FREQUENCIES

11.1 GENERAL

Changing the frequencies in a Base Station requires frequency planning, examination of the specifications of the Vendor Products in the antenna system, realignment of the RF system, changes to the GETC personalities and realignment of the Base Stations. If the system is 800Mhz, program the station GETC with the new frequencies and reset the GETC.

The preferred method for retuning modules is to remove the modules from the Station and to use the RF Test Fixture following the alignment guide in LBI-38805. When module realignment is complete, confirm complete station alignment as shown in Station Alignment section.

The only modules that require realignment are the TX and RX Synthesizer modules, but the remaining modules should be checked to ensure that they still operate correctly. When module realignment is complete, confirm complete station alignment as shown in Station Alignment section.

TX and RX Synthesizers can be tuned using the metering functions available with MASTRUTL (TQ-0619) or MSEDIT (TQ-0653). The VCO tune voltage from the RX Synthesizer slot in the T/R shelf is connected to the external metering jack (EXT-JCK) in the System Module and the synthesizers can be tuned using the External Metering functions of MASTRUTL or MSEDIT.

If the RF Test Fixture is not available, the modules may be realigned "In Station". The following defines "In-Station" realignment.

11.2 VENDOR EQUIPMENT

The specifications of the following equipments, if used, must be checked for Frequency Isolation and Frequency Seperation issues and should be realigned where necessary:

- Combiner
- Multicoupler
- Filter
- Antenna element

11.3 MODULE REALIGNMENT

11.3.1 800 MHz Stations

NOTE

There is no requirement to tune 800 MHz Station Front End or IF Modules.

1. Place the RX Synthesizer on an extender card.
2. Program the station for the desired TX and RX frequencies.
3. Adjust the RX Synthesizer trimmer until the LED on the front of the module goes out.
4. Monitor the EXT metering field and adjust the trimmer for a V Test reading of 5V DC on either the EXT Metering field or on J3 pin 23A.
5. Remove RX and TX Synthesizers. Place the RX Synthesizer in slot farthest to the left and the TX Synthesizer in the slot next to the RX Synthesizer. Connect the Ref In/Out U-Link.
6. Key the station with the REM PTT switch on the System Module.
7. Adjust the trimmer on the TX Synthesizer for a reading of 5V DC on either the EXT Metering field or on J3 pin 23A.
8. Verify and align Low Speed Data waveform shape.
9. Replace all modules into the Station and confirm complete station alignment as shown in Station Alignment section.

11.3.2 UHF Stations

NOTE

There is no requirement to align UHF Station TX Synthesizer or IF Modules.

1. Remove the cover of the RX Synthesizer and place on an extender card.
2. Program the station for the desired TX and RX frequencies.
3. Adjust the RX Synthesizer trimmer until the LED on the front of the module goes out

4. Monitor J2 and align FL1 for peak output level using a Spectrum Analyser or RF Voltmeter. Programmable bandwidth is ± 1Mhz.

5. Place the Front End Module on an extender card and connect the LO out of the RX Synthesizer and the IF out of the Front End to the IF Module with 50Ω Coax cable.

6. Preset the Front End tuning slugs as stated in the RX Front End technical manual and apply an "on frequency" signal into the RF In on the Front End Module.

7. Monitor the RSSI metering function and adjust the level of the "on frequency" signal to the responsive range of the meter.

8. Tune the Front End tuning slugs for a peak on the RSSI meter while reducing the input signal level to keep the meter in the responsive reading range.

9. Verify and align Low Speed Data waveform shape.

10. Replace all modules into the Station and confirm complete station alignment as shown in Station Alignment section.

11.3.3 VHF Stations

NOTE

There is no requirement to tune VHF TX Synthesizer Modules.

1. Ensure that the TX Synthesizer Dip switches are set for the required frequency range.

2. Align the RX Synthesizer trimmers until the LED on the front panel of the module goes out.

3. Align the Front End Module as for UHF Station (11.3.2).

4. Verify and align Low Speed Data waveform shape.

5. Replace all modules into the Station and confirm complete station alignment as shown in Station Alignment section.

11.4 BASE STATION TEST

Refer to 'Station Test and Alignment' and 'System Functional Checkout' Sections and perform Base Station and Site tests to confirm that the Station is operating correctly. Complete the Installation Checksheets for the affected channel and place the Channel into service.

NOTE

Ensure that the RF System performance, and specifically combiner performance and alignment, is verified according to the specifications and instructions defined in the vendor manuals.

12. PREVENTATIVE MAINTENANCE

12.1 GENERAL

Preventative Maintenance comprises a check of the operation of all equipments at the site and re-alignment where performance has drifted from either the installation values or that documented in the previous inspection.

It allows for:

- Operational test and re-adjustment of each Base Station's alignment,
- Operational test and re-adjustment of RF System equipments,
- Operational test and re-adjustment of Site Controller equipments,
- Operational test and re-adjustment of the Local Interconnect system,
- Operational test and re-adjustment of the Power System.

Preventative Maintenance should be performed every 6 months, or sooner if required by the customer. The tests will follow those defined in this manual and will require the test engineer to refer to the Installation Checksheets or last Preventative Maintenance Checksheets to determine any variance in performance.

The results of these tests are to be recorded on the Preventative Maintenance Checksheets in Appendix F.

12.2 BASE STATIONS

12.2.1 Test Equipment

The Test Equipment requirement is as defined in the 'Station Test and Alignment' Section. Ideally, the same test equipment should be used for every channel at the site. If more than one of a particular type of Test Equipment is used, ensure that they are calibrated to each other.

12.2.2 Channel Preparation

12.2.2.1 With System Manager

Prior to commencement of tests, the channel-under-test must be removed from general service. Using the System Manager, access the site database and place the channel-under-test into a Test Partition. Upload the modified Site Database. Ensure that the LIDs of the Radios to be used during testing, and an associated GID, are also placed into the Test Partition.

Confirm that the Test Partition is working by observing the Site Monitor on the System Manager and making calls with the Test Radios on the Test Group.

NOTE

Ensure that when all tests are complete, the Test Partition is disabled and that the Channel, Radios and Group are returned to normal operation.

12.2.2.2 Without System Manager

If the site is not connected to a System Manager, the channel-under-test must be made unavailable to other users. PTT a test radio until the required channel is accessed and confirm that the channel has been captured. On un-keying the radio, quickly press and hold the GETC reset. Turn power to the station off, configure the GETC into Test Mode and reapply power.

NOTE

When all tests are complete and the GETC is reconfigured into operating mode, press GETC reset and the channel will return to normal operation.

12.2.3 Tests

Refer to the 'Station Test and Alignment' Section for detail of the tests. Perform tests to ascertain current levels and note these on the Checksheet. If adjustment is necessary, perform the re-alignment and note the new levels and Control Pot settings for each test.

12.3 RF SYSTEM

This test does not address RF System between the bulkhead and the antenna elements. The RF System comprises:

- Combiner
- Multicoupler
- Receive Filter
- RF Cabling to Bulkhead

12.3.1 COMBINER

Follow the test procedures defined in the Combiner vendor manual to ensure correct performance for each and for all channels. If alignment is required, follow the procedures defined in the same manual and collate and file the results documents as for Base Station Checksheets.

12.3.2 Multicoupler

Follow the test procedures defined in the Multicoupler vendor manual to ensure correct performance for each and for all channels. If alignment is required, follow the procedures defined in the same manual and collate and file the results documents as for Base Station Checksheets.

12.3.3 Receive Filter

Follow the test procedures defined in the Receive Filter vendor manual to ensure correct performance for each and for all channels. If alignment is required, follow the procedures defined in the same manual and collate and file the results documents as for Base Station Checksheets.

12.3.4 RF Cabling to bulkhead

RF Cabling includes coaxial cables, power sensors and RF protection. If tests indicate that the RF Cabling is in error, follow the test procedures in this manual for power sensors and RF protection to ensure correct performance. If alignment is required, follow the same procedures and collate and file the results documents as for Base Station Checksheets.

12.4 SITE CONTROLLER

Test the operation of the Site Controller equipments as defined in the Site Controller Technical Manual. If adjustment is necessary, document that on the appropriate Installation checksheet and collate and file the results documents as for Base Station Checksheets.

The major elements are as follows:

- Site Controller
- Alarm and Control Unit
- Test Unit
- Power Monitor Unit
- Guardog
- Downlinks
- System Manager Modem

12.5 LOCAL INTERCONNECT

Follow the Local Interconnect test procedures defined in the Functional Test section of this manual to ensure correct performance. If adjustment is required, follow the procedures defined in the ELI Technical Manual and collate and file the results documents as for Base Station Checksheets.

12.6 POWER SYSTEM

Follow the Power System test procedures defined in the Power System section of this manual to ensure correct performance. If adjustment is required, follow the procedures defined in the vendor manuals and collate and file the results documents as for Base Station Checksheets.

APPENDIX A
INSTALLATION CHECKLISTS

SITE DATA SHEET

Customer Name: _____
Local Customer Contact Name: _____
Local Customer Phone: _____

Site Name: _____
Site Address: _____
_____
_____

Site Telephone Number: _____
If Site is Leased, Owner's Name\Tel: _____
Access Controlled by (Name, Phone): _____
Site Latitude (Deg., Min., Sec.): _____
Site Longitude (Deg., Min., Sec.): _____
FCC License ID/Call Sign: _____

Site Equipment Type: BASIC ❑ LEVEL 1 ❑ SCAT ❑
Number of Channels: _____

Check Installed Options: Redundant Downlink ❑ Power Monitor Unit ❑
Test and Alarm Unit ❑ Local Interconnect ❑

Site Controller Personality Hardcopy available in Site Documentation: ❑
If Local I/C, Number of PSTN Cct: _____
If Local I/C, List GTI equipped Channels: _____
Uplink Link Loss (dB) _____
Multisite Audio Link Loss (dB) _____

Multisite Link type: Leased Line ❑ Microwave ❑ FiberOptic ❑
Installation Date: _____
Installed By (Company Name): _____

Tower Type: Self Supporting ❑
Guyed ❑
Monopole ❑
Other ❑

Tower Height: _____

Tower FAA Options: Painted ❑ Lights ❑

Antenna System: Single ❑ Multi ❑

If Multi-Antennas, Number of Transmit: _____ Transmit Antenna Height: _____
If Multi-Antenna, Number of Receive: _____ Receive Antenna Height: _____
Transmit Helix Type: _____ Transmit Antenna Azimuth: _____
Receive Helix Type: _____ Receive Antenna Azimuth: _____
Transmit Antenna Model _____ Transmitter Combiner Model: _____

Receive Antenna Model: _____ Tower Top Amplifier: YES ❑ NO ❑

If Tower Top Amplifier, Model: _____
Receiver Multicoupler Model: _____

INSTALLER PROFILE DATA SHEET

Installer's Company Name: _____

Installer's Telephone Number: _____

Installer's Name (s): _____

_____

Technician's Name (s): _____

_____

Date of Testing Complete: _____

Test Equipment Used,
if other than specified: _____

_____

_____

_____

_____

_____

_____

ANTENNA SYSTEM INSTALLATION CHECKLIST

SITE _____

ANTENNA _____

INSPECTED BY _____

DATE _____

CHECKLIST:

1. What is make of antenna? _____
2. What is type of antenna? _____
3. What is design gain of antenna? _____ dB
4. What is bearing of antenna? _____
5. What is height of antenna above ground? _____ ft
6. Are hoisting grips installed as specified? _____
7. Is cable secured to tower at specified intervals? _____
8. Is cable grounded at top of tower? _____
9. Is cable grounded at bottom of tower? _____
10. Is cable grounded at point where it enters building? _____
11. Is cable feed-through properly installed? _____
12. Are coaxial connectors weather-sealed? _____
13. Is cable entrance weather-sealed? _____
14. Is there an AM mast within 2 miles of this site? _____

EQUIPMENT INSTALLATION CHECKLIST

SITE _____

CABINET _____

INSPECTED BY _____

DATE _____

CHECKLIST 1:

1. Verify that the cabinets are installed as located in the site plan drawing. _____
2. Verify each cabinet/rack is correctly fastened to the floor in all four (4) corners. _____
3. For cabinets, verify the optional cable ducts have been correctly installed. _____
4. For racks, verify all racks are bolted to adjacent rack at the top and bottom. _____
5. For cabinets, verify the top plate is correctly installed on the RF cabinet. _____
6. Verify the RF equipment is correctly installed. _____
7. Ensure all special installation requirements, provided by System Engineering, have been completed correctly. _____
8. Verify all metallic fixtures and room parts are connected to the internal ground HALO. _____
9. Verify the AC power is equipped with a Josilyn, or equivalent, AC protector in addition to all other AC power protection. _____
10. Verify all EDACS cabinets, cable trays, and/or cable duct system are connected to the internal ground HALO. _____
11. Verify the GETC lightening circuitry is properly installed for each GETC. _____
12. Ensure all special installation requirements, provided by System Engineering, have been completed properly. _____

POWER SYSTEM INSTALLATION CHECKLIST

AC SYSTEM	YES/NO	**SITE**	_____
GENERATOR	YES/NO		_____
AC/DC SYSTEM	YES/NO	**INSPECTED BY**	_____
BATTERY SYSTEM	YES/NO	**DATE**	_____
UPS SYSTEM	YES/NO		

CHECKLIST:

AC SYSTEM

1. Site isolation and protection is installed and operating _____
2. Input AC power,(voltage and current) is as specified _____
3. Input AC power breaker is correctly rated for the site power load _____
4. Input AC power cabling is sufficient for site loading _____
5. Customer's input AC power breaker operates correctly _____
6. AC distribution , voltages and individual breaker operation to equipments _____

GENERATOR SYSTEM

7. Generator, bypass switch and automatic switch-over operates correctly _____
8. Generator output voltages are as specified _____

AC / DC SYSTEM

9. Rectifier output to convertors is as specified _____
10. Rectifier output breaker operates correctly _____
11. Convertor output breakers operate correctly _____
12. Convertor output voltages are as specified _____
13. Each associated equipment or cabinet is operating correctly _____

BATTERY SYSTEM

14. Battery system connectivity is correct as per design document _____
15. Battery system is electrically safe _____
16. "Wet" cells prepared and adequate fume extraction provided _____
17. Cabling is safely installed such that it is not a hazard _____
18. Output voltage is as specified across all the cells _____
19. Battery system will Charge _____
20. Battery power applied to power distibution equipments _____
21. Battery voltage applied to site equipment is as specified _____

UPS SYSTEM

22. UPS system installed to specifications and successfully completes all Vendor manual tests _____

SYSTEM CABLING CHECKLIST

SITE _____

CABINET _____

INSPECTED BY _____

DATE _____

CHECKLIST:

1. Are RF coaxial connections correctly installed? (Does not apply to Site Controller cabinet.) _____
2. Is the daisy-chain correctly connected to the EDACS Interface Panel's POWER SENSOR module? (Does not apply to RF cabinet.) _____
3. Is the bi-directional power sensor in the RF cabinet connected correctly to the EDACS Interface Panel's POWER SENSOR module in the Site Controller cabinet? (Does not apply to the Failsoft Repeater cabinets.) _____
4. Is the daisy-chain correctly connected to the EDACS Interface Panel's STATION AUDIO module? (Applies only to Failsoft Repeater cabinets.) _____
5. Is the STATION AUDIO module in the first Failsoft Repeater cabinet in each row correctly connected to a Punchblock? _____
6. Is the daisy-chain correctly connected to the EDACS Interface Panel's RIC AUDIO module(s)? (Does not apply to RF cabinet.) (Site Controller cabinet has two modules - one for each row of cabinets.) _____
7. Is the DOWNLINK DATA module correctly connected to a Punchblock? (Applies only to the first Failsoft Repeater cabinet in the first row.) _____
8. Is the daisy-chain correctly connected to the EDACS Interface Panel's GETC DATA module? (Does not apply to RF cabinet.) (Site Controller cabinet has two modules - one for each row of cabinets.) _____
9. Is the daisy-chain correctly connected to the EDACS Interface Panel's SERIAL MODULE? (Does not apply to RF cabinet.) _____
10. Is the daisy-chain correctly connected for the Local Interconnect System and individual Phone Lines connected to the correct Interconnect modules (GTIs)? _____
11. Is the DWNLINK DATA module correctly connected to the Punchblock? (Applies only to Site Controller cabinet.) _____
12. Is the Data Modem correctly connected to the DOWNLINK module? (Applies only to Site Controller cabinet.) _____
13. Are alarm inputs A1-A16 correctly connected to J4 on the back of the Alarm and Control Unit? (Applies only to Site Controller cabinet.) _____
14. Are alarm inputs A17-A32 correctly connected to J5 on the back of the Alarm and Control Unit? (Applies only to Site Controller cabinet.) _____
15. Are control outputs C1-C8 correctly connected to J3 on the back of the Alarm and Control Unit? (Applies only to Site Controller cabinet.) _____

CONFIGURATION CHECKLIST

SITE _____

CABINET _____

INSPECTED BY _____

DATE _____

CHECKLIST:

1. Are the DIP switches and jumpers in the Station GETC set correctly? (Applies only to the Repeater cabinets.) _____
2. Are the DIP switches and jumpers in the Downlink GETC set correctly? (Applies to the Site Controller only.) _____
3. Are the GTIs correctly configured and setup? (Applies only to the Repeater cabinets.) _____
4. Are the jumpers on the Channel Termination Boards (19C852379G1) correct? (Applies to the Site Controller and repeater cabinets.) _____
5. Is the Power Monitor Unit setup correctly? (Applies to the Site Controller cabinet only.) _____
6. Is the Site Controller Modem setup correctly? _____

DOWNLINK GETC CHECKLIST

SITE _____

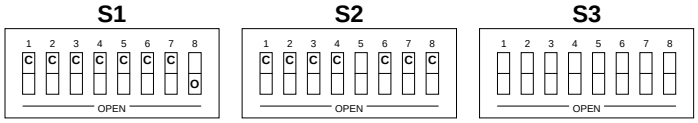
CABINET _____

INSPECTED BY _____

DATE _____

DOWNLINK GETC CONFIGURATION:

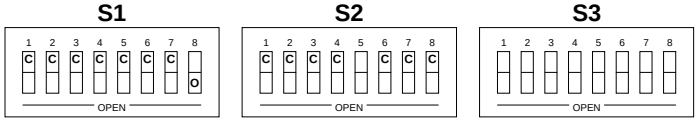
Mark a **C** in a switch position if that switch is **CLOSED**. Mark an **O** if that switch is **OPEN**.



	Part (group) No.	Rev. No.
Logic Board:	_____	_____
Firmware (U2):	_____	_____
Firmware (U35):	_____	_____
Turbo Board:	_____	_____
Turbo Software:	_____	_____

REDUNDANT DOWNLINK GETC CONFIGURATION:

Mark a **C** in a switch position if that switch is **CLOSED**. Mark an **O** if that switch is **OPEN**.



	Part (group) No.	Rev. No.
Logic Board:	_____	_____
Firmware (U2):	_____	_____
Firmware (U35):	_____	_____
Turbo Board:	_____	_____
Turbo Software:	_____	_____

SYSTEM MANAGER INSTALLATION CHECKLIST

INSPECTED BY _____

DATE _____

CHECKLIST:

1. Is the System Manager equipment connected correctly? _____
2. Are the Data Modems correctly connected? _____
3. Is the DIP switch on the Data Modem set correctly? _____
4. Can the System Manager monitor each of the the sites? _____
5. Can the System Manager reconfigure the site channels? _____
6. Can the System Manager successfully upload data to the sites? _____

GETC PROGRAMMING DATA SHEET

CUSTOMER: _____ **SITE NAME:** _____

CHANNEL NUMBER: _____ **PROGRAMMED BY:** _____ **DATE:** _____

CHANNEL ALLOCATION:

Channel Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Control Channel	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Clear Voice	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Digital Voice	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Data	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Pager	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Interconnect	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Allow DV telephone	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Multisite Downlink	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
Downlink to TSIN	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_

SITE OPTION: Default settings in ( )

SITE NAME: _____ **SITE ID:** _____

DATE: _____ **MORSE ID*:** _____

IMC Platform: _____ (IMC/CEC)

I-Call Updates: _____ (One Slot)

WB Power Sense: _____ (Disabled)

Channel Assignment: _____ (Descending)

Rotate Channel: _____ (No)

Multisite: _____ (N)

Simulcast: _____ (N)

CTIS: _____ (N)

SCAT: _____ (N)

Voter (non-Simulcast) System: _____ (N)

Logical ID >8191: _____ (N)

Jam Detect Threshold: _____ (0)

* Required by FCC prior to putting site on air.

GETC PROGRAMMING DATA SHEET (CONTINUED)

SITE OPTION: Default settings in ( )

Individual Call Hang:	_____ (∅)	Group Call Hang:	_____ (∅)
Telephone Call Hang:	_____ (∅)	Digital Voice Hang:	_____ (∅)
Emergency Call Hang:	_____ (2)	System All-Call Hang:	_____ (2)
Transmission Trunked Timer:	_____ (300)	Message Trunked Timer:	_____ (300)
Morse Interval Timer:	_____ (30)		

CONFIRMED		GROUP		INDIV		TELEPHONE	
CALL	CV	_____ (N)	CV	_____ (N)	CV	_____ (N)	
STATUS	DV	_____ (N)	DV	_____ (N)	DV	_____ (N)	

Max Interconnect:	_____ (∅)	Rem DV Delay:	_____ (∅)

EXTENDED OPTION: Default settings in ( )

CV C-Call Timeout:	_____ (5)	DV C-Call Timeout:	_____ (5)
Wide Area DV:	_____ (N)	Data Mode:	_____ (RF Data)
Polarity Invert:	_____ (None)	Baud Rate:	_____ (9600)
Digital Voted Interconnect:	_____ (NA)	Data Protocol:	_____ (Normal)
Data Queuing: (Disabled)	_____	Msg Trunked Data:	_____ (Disabled)
Data Call Call Hangtime:	_____ (∅)	FS Patch Enable:	_____ (Disabled)
LSTX Polarity:	_____ (Normal)	MII/MIIE 900MHz:	_____ (No)
Conv. FS Enable: (Disabled)	_____	MS Confirmation:	_____ (0)

TRUNKED REPEATER TEST DATA

CUSTOMER: _____ **SITE NAME:** _____

CHANNEL NUMBER: _____ **TESTED BY:** _____ **DATE:** _____

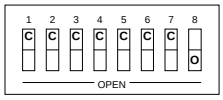
REPEATER IDENTIFICATION:

MODEL NO.:	RX FCC ID #:	RX FREQUENCY (MHz):
SERIAL NO.:	TX FCC ID #	TX FREQUENCY (MHz):

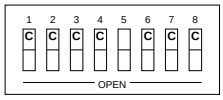
STATION GETC CONFIGURATION:

Mark a **C** in a switch position if that switch is **CLOSED**. Mark an **O** if that switch is **OPEN**.

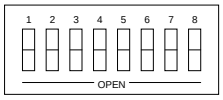
S1



S2



S3



	Part (group) No.	Rev. No.
Logic Board:	_____	_____
Firmware (U2):	_____	_____
Firmware (U35):	_____	_____
Turbo Board:	_____	_____
Turbo Software:	_____	_____

STATION ALIGNMENT

ALIGNMENT/TEST	POT	UNITS	LEVEL	POT VALUE
LOW SPEED DEVIATION	CG	Hz	_____	_____
TRANSMIT LIMITING	TX	kHz	_____	_____
REPEATER GAIN	RG	kHz	_____	_____
LINE OUTPUT	LO	dBm	_____	_____
DSP LINE INPUT	DLI	kHz	_____	_____
COMPRESSOR GAIN	CP	kHz	_____	_____
COMPRESSOR THRESHOLD	CT	kHz	_____	_____
GETC MODEM LINE INPUT	R1	mVp-p	_____	_____
HIGH SPEED DATA	R31	kHz	_____	_____
GETC MODEM LINE OUTPUT	R2	mVp-p	_____	_____
SINAD	SINAD	dB	_____	_____
SQUELCH	SQUELCH	dB	_____	_____
TRANSMIT FORWARD POWER	PA	Watts	_____	_____
TRANSMIT REVERSE POWER		Watts	_____	_____

RF SYSTEM TEST DATA

CUSTOMER: _____ **SITE NAME** _____

TRANSMITTER COMBINER TEST

CHANNEL NUMBER	PA OUTPUT POWER (Watts) (REF, 7.5.4 or 7.5.5)	REFLECTED POWER (Watts)	COMBINER OUTPUT POWER (Watts)	COMBINER LOSS (dB)	ANTENNA REFLECTED POWER (Watts)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

RF SYSTEM TEST DATA (Continued)

CUSTOMER: _____ **SITE NAME** _____

RECEIVER MULTICOUPLER TEST
TOWER TOP AMPLIFIER TEST

Pad Installed: _____ dB

Multicoupler Output: _____ dBm

Tower Top Amplifier (gain): _____ dB

Tower Top Injector _____ volts

CHANNEL NUMBER	OUTPUT MULTI-COUPLER (dBm)	SIGNAL TTA ON (dBm)	SIGNAL TTA Bypassed (dBm)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

CHANNEL NUMBER	OUTPUT MULTI-COUPLER (dBm)	SIGNAL TTA ON (dBm)	SIGNAL TTA Bypassed (dBm)
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

ALARM SYSTEM DATA

CUSTOMER: _____ **SITE NAME** _____

ALARM INPUTS:

ALARM INPUT	DESCRIPTION	ALARM INPUT	DESCRIPTION
1		17	
2		18	
3		19	
4		20	
5		21	
6		22	
7		23	
8		24	
9		25	
10		26	
11		27	
12		28	
13		29	
14		30	
15		31	
16		32	

Fill in description for each Alarm Input to the ACU

ALARM OUPUTS:

ALARM OUPUT	DESCRIPTION	ALARM INPUT	DESCRIPTION
1		5	
2		6	
3		7	
4		8	

Fill in description for each Alarm Ouput from the ACU

SYSTEM FUNCTIONAL CHECKOUT PROCEDURES

CUSTOMER: _____ **SITE NAME** _____

	FAILSOFT		TRUNKED	
	SS	**MS**	**SS**	**MS**
CV R - R				
CV R - C	N/A		N/A	
CV C - R	N/A		N/A	
CV R - T	N/A	N/A		
CV T - R	N/A	N/A		
DV R - R				
DV R - C	N/A		N/A	
DV C - R	N/A		N/A	

Legends:
SS =Single Site
MS = Multisite
CV=Clear Voice
DV=Digital Voice
R-R=Radio to Radio Call
R-C=Radio to Console Call
R-T=Radio to Local Interconnect Call
N/A=Not Applicable
T-R=Local Interconnect Call to Radio
C-R=Console Call to Radio

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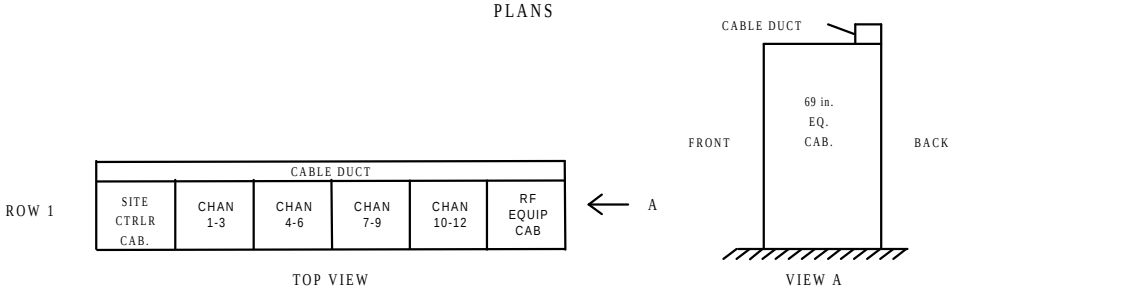
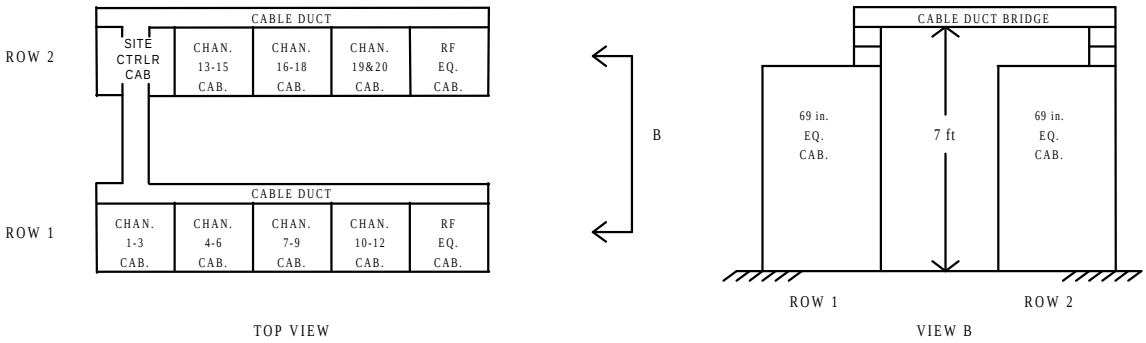
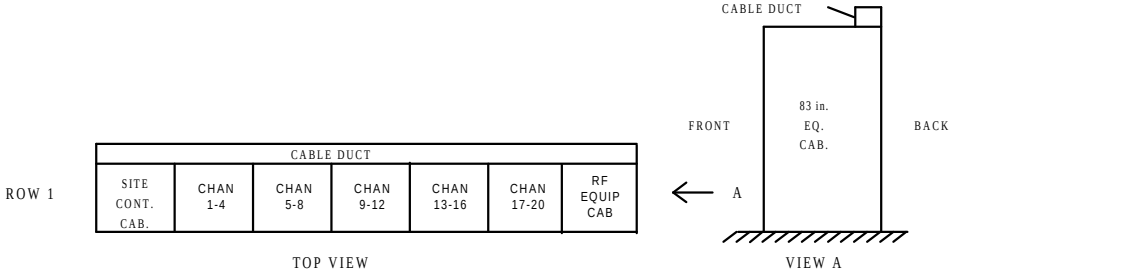
APPENDIX B
EQUIPMENT ROOM LAYOUT DIAGRAMS

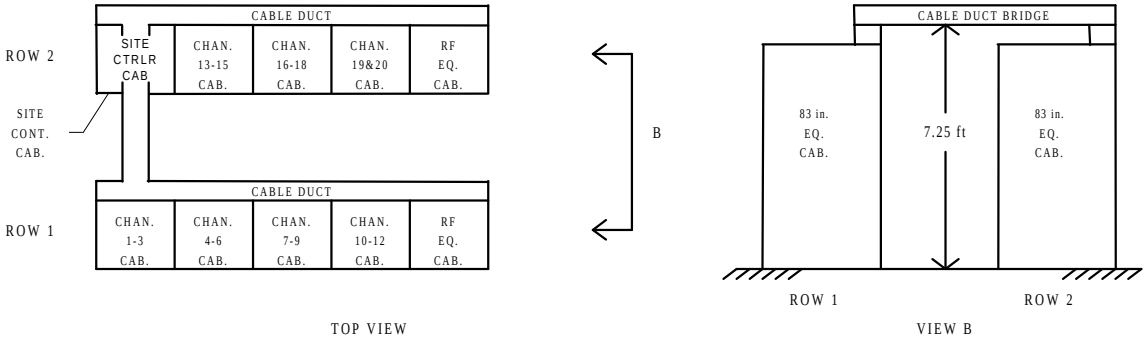
STANDARD 3 CHANNEL RACKUP FOR 12-CHANNEL AND 20-CHANNEL FLOOR PLANS



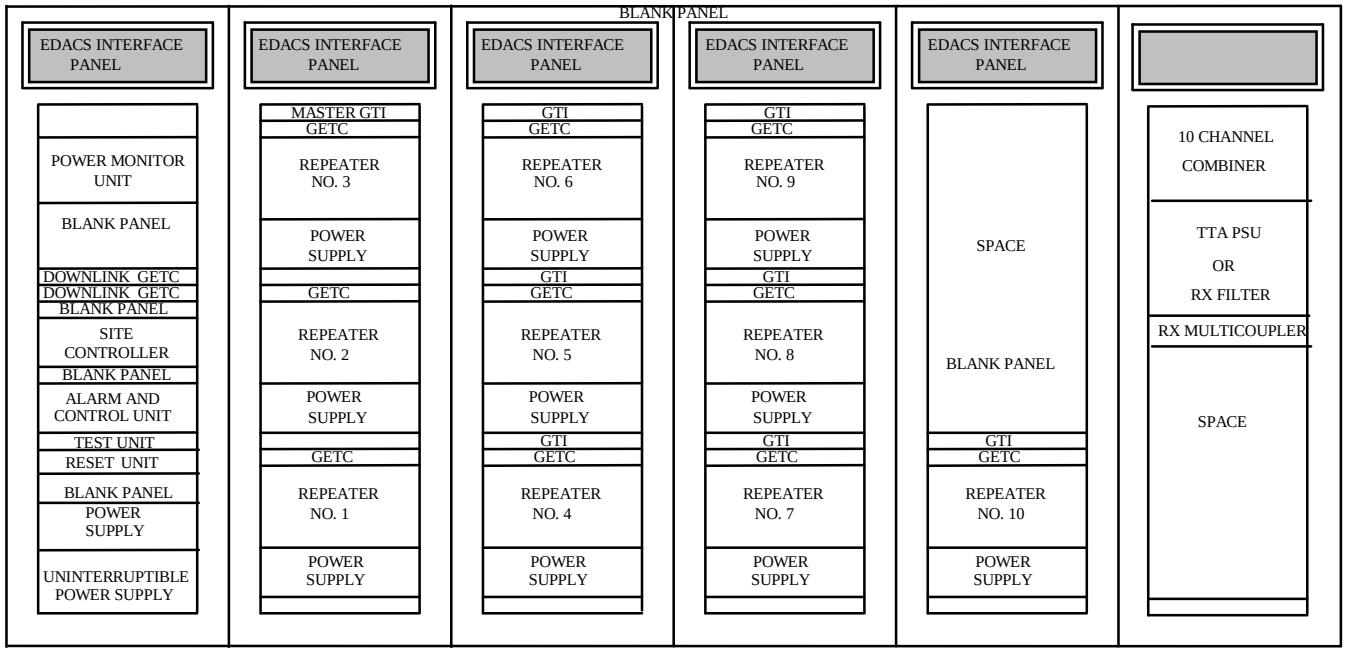


STANDARD 4 CHANNEL RACKUP FOR 12-CHANNEL AND 20-CHANNEL FLOOR PLANS





STANDARD EQUIPMENT ROOM FLOOR PLANS



* NOT USED IN BASIC SITES - DOWNLINKS RELOCATED TO CAB # 1

STANDARD EQUIPMENT CABINET LAYOUT DIAGRAM

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APPENDIX C
EDACS INTERFACE PANEL
INTERCONNECTION DIAGRAMS

INSTALLATION WIRING GUIDE

The following table lists the EDACS Interface Panel modules that are supplied for various standard and optional site configurations. A YES means that the modules need to be daisy-chained to the Site Controller cabinet. A NO means that the module is supplied, but should not be daisy chained. An OPT means that an optional cable to an optional pre-wired punchblock can be connected (cable and punchblock do not come with the Local Telephone Interconnect option).

SITE CONFIGURATION	CABINET-TO-CABINET OR CABINET-TO-PUNCHBLOCK CONNECTIONS ARE REQUIRED TO THE FOLLOWING EDACS INTERFACE PANEL MODULES								
	POWER SENSOR	STATION AUDIO	RIC AUDIO	MODEM DATA	GETC DATA	SERIAL MODULE	PHONE LINE 1-16	PHONE LINE 17-20	DWNLINK DATA
BASIC EDACS:									
STANDARD PACKAGE						YES			
LEVEL 1 EDACS:									
STANDARD PACKAGE		NO		NO	YES	YES			NO
OPTIONS:									
POWER MONITOR	YES								
LOCAL TELEPHONE INTERCONNECT:									
1-16 SUBSCRIBER LINES			YES				OPT		
17-32 SUBSCRIBER LINES			YES				OPT	OPT	

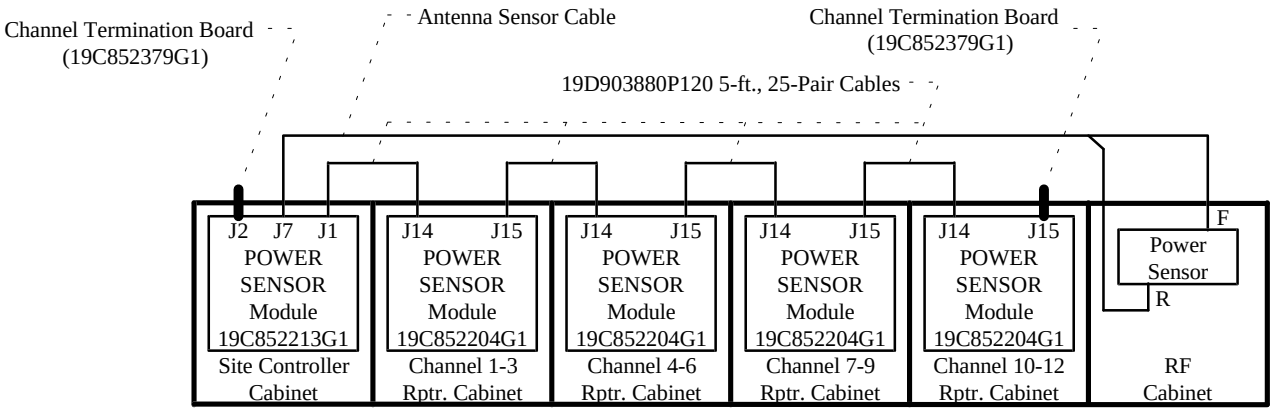
When a non-standard cabinet layout is used, a longer cable will need to be substituted for a cable that is too short. The following tables give alternate cable part numbers and lengths for the two types of cables used in the daisy-chains.

CABINET-TO-CABINET / CABINET-TO-PUNCHBLOCK 25-PAIR SHIELDED INTERCONNECT CABLES WITH 50-PIN MALE TELCO RIGHT-ANGLE CONNECTOR AT EACH END	
ERICSSON PART NUMBER	CABLE LENGTH
19D903880P120	5 FEET
19D903880P121	15 FEET
19D903880P122	7 FEET
19D903880P123	10 FEET
19D903880P124	20 FEET
19D903880P125	25 FEET
19D903880P126	30 FEET
19D903880P127	35 FEET
19D903880P128	40 FEET
19D903880P129	50 FEET

CABINET-TO-CABINET (SERIAL MODULE) 15-CONDUCTOR SHIELDED INTERCONNECT CABLES WITH DB-15 MALE CONNECTOR AT EACH END	
ERICSSON PART NUMBER	CABLE LENGTH
19D903880P130	5 FEET
19D903880P131	15 FEET
19D903880P132	20 FEET
19D903880P133	25 FEET
19D903880P134	30 FEET
19D903880P135	35 FEET
19D903880P136	40 FEET
19D903880P137	45 FEET
19D903880P138	50 FEET

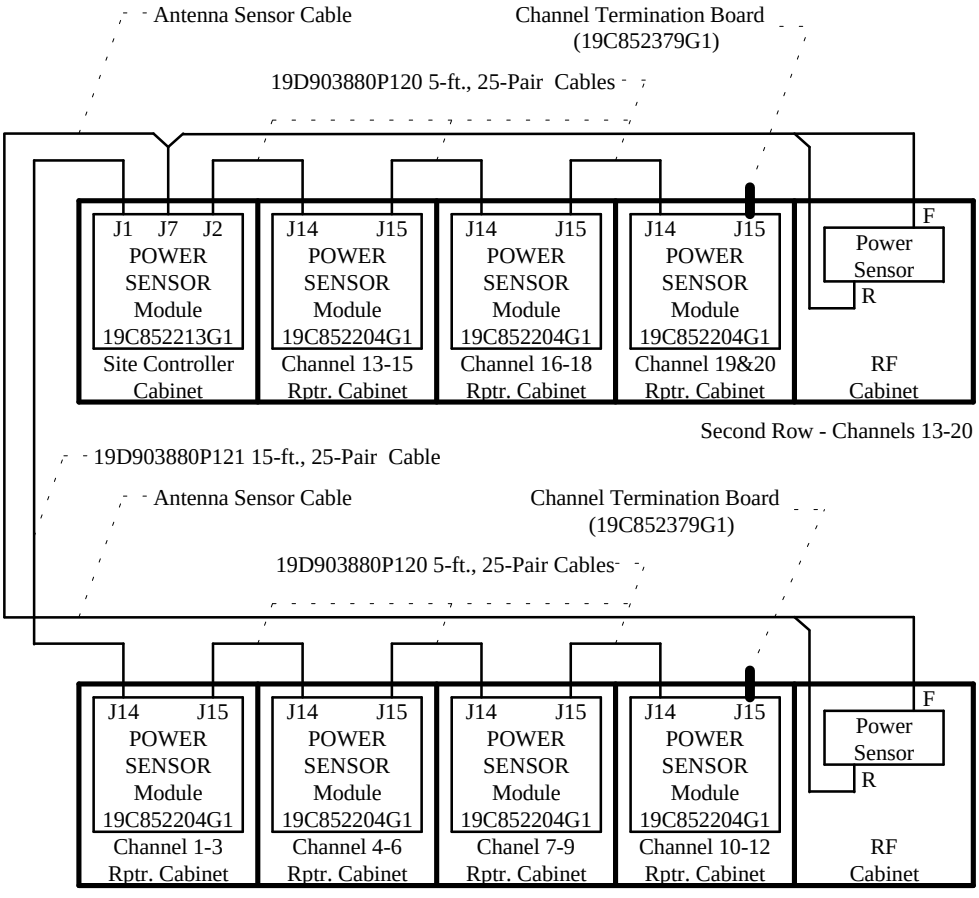
EDACS Interface Panel Interconnections
INSTALLATION WIRING GUIDE

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:



Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:

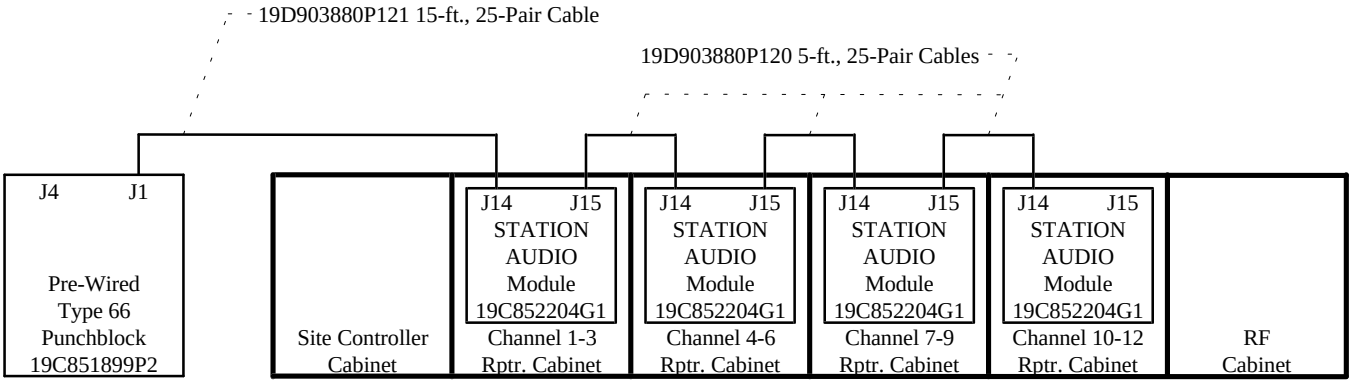


Second Row - Channels 13-20

First Row - Channels 1-12

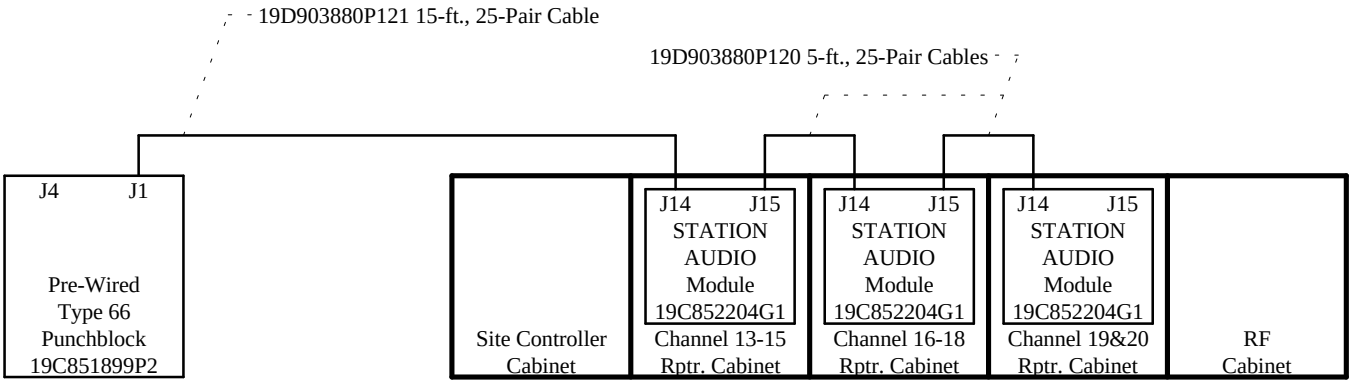
EDACS Interface Panel Interconnections
POWER SENSOR MODULES
(Made from 19D904207, Sh. 2, Rev. 0)

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:

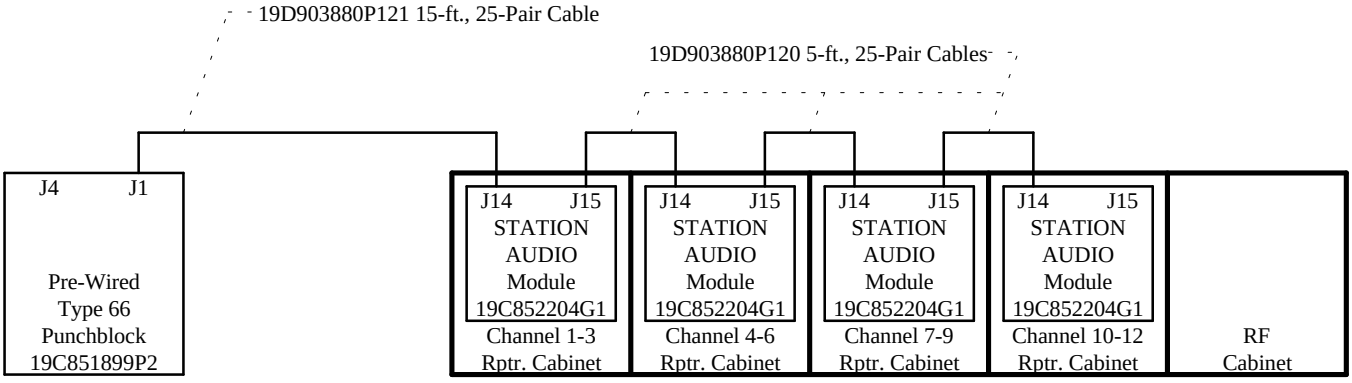


Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:



Second Row - Channels 13-20

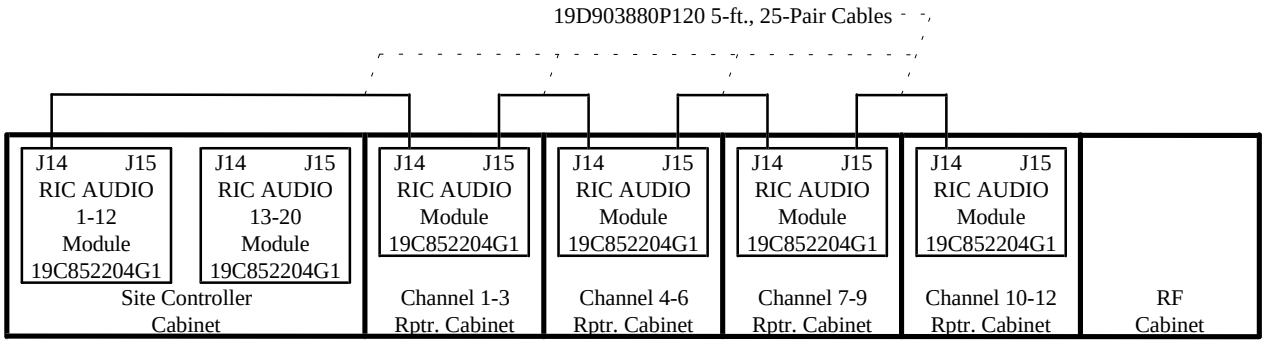


First Row - Channels 1-12

EDACS Interface Panel Interconnections
STATION AUDIO MODULES

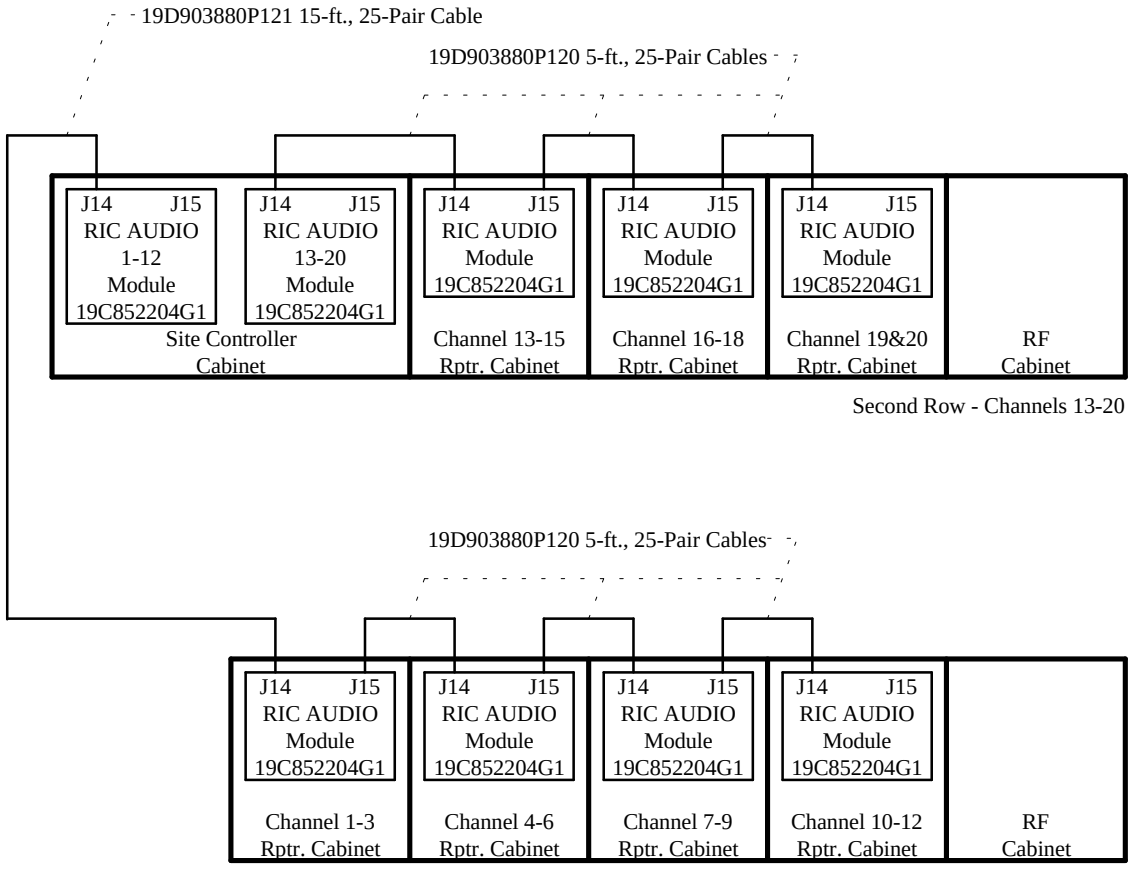
(Made from 19D904213, Sh. 2, Rev. 0)

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:



Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:



Second Row - Channels 13-20

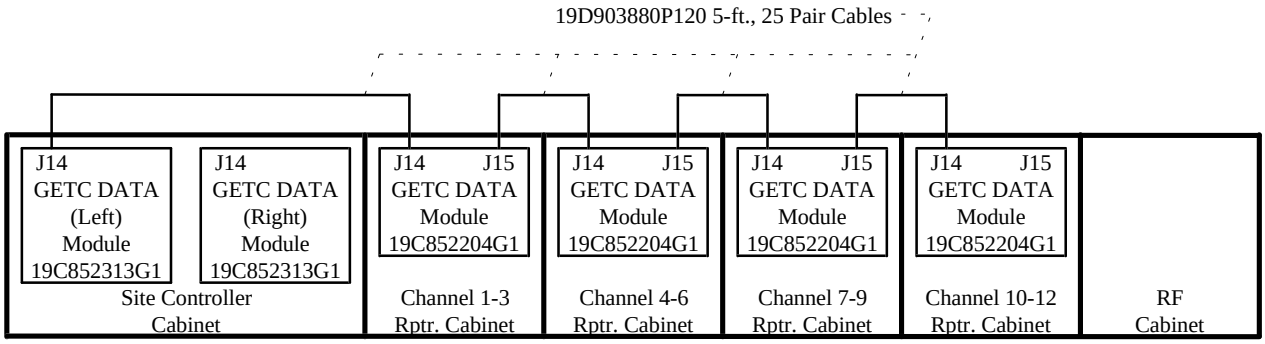
First Row - Channels 1-12

EDACS Interface Panel Interconnections

RIC AUDIO MODULES

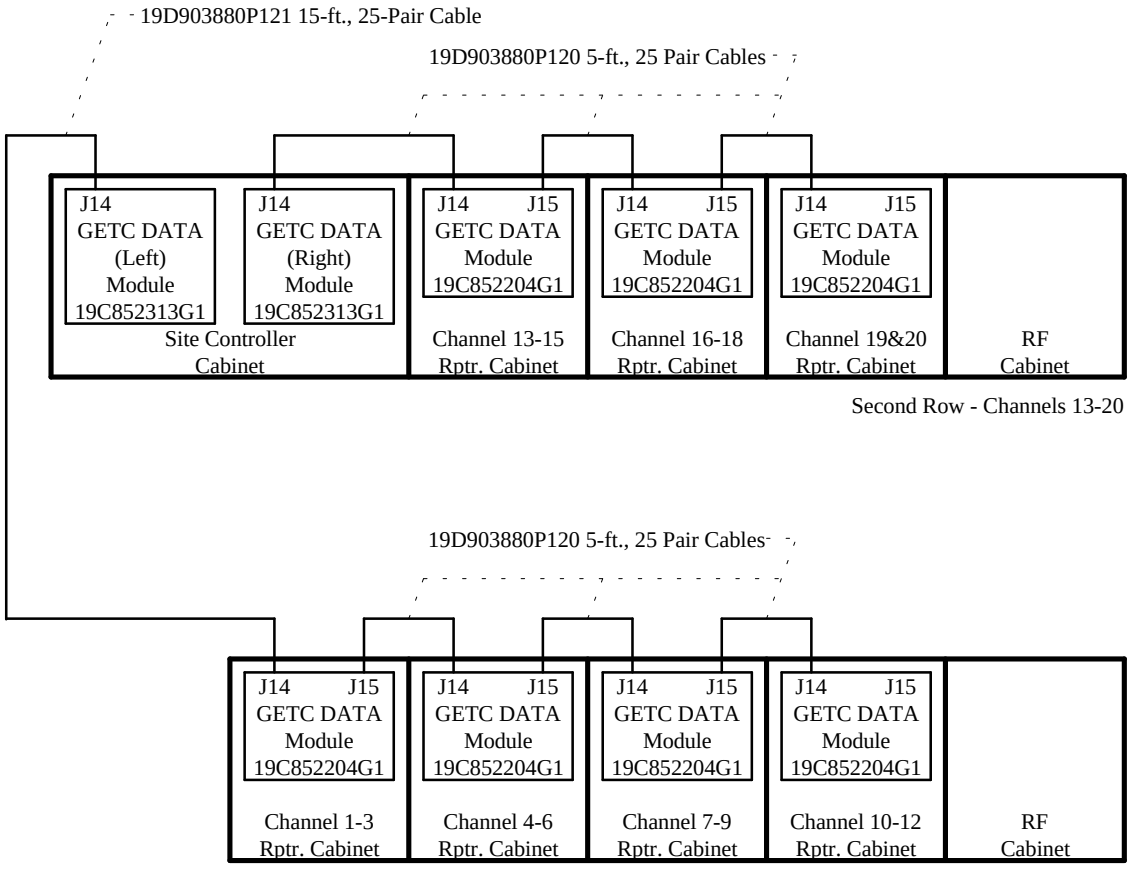
(Made from 19D904209, Sh. 2, Rev. 0)

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:



Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:



Second Row - Channels 13-20

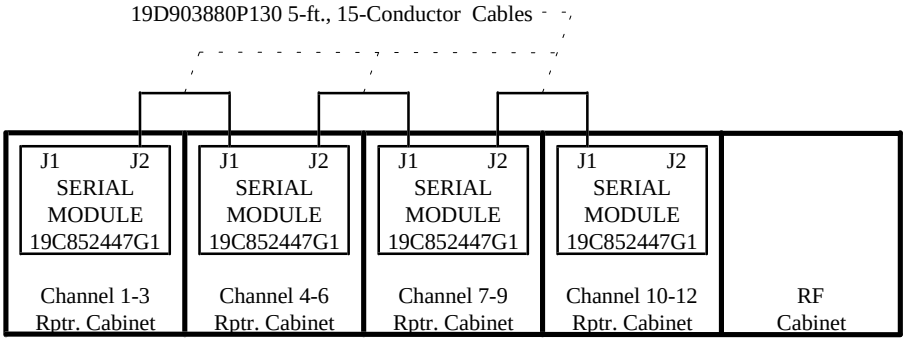
First Row - Channels 1-12

EDACS Interface Panel Interconnections

GETC DATA MODULES

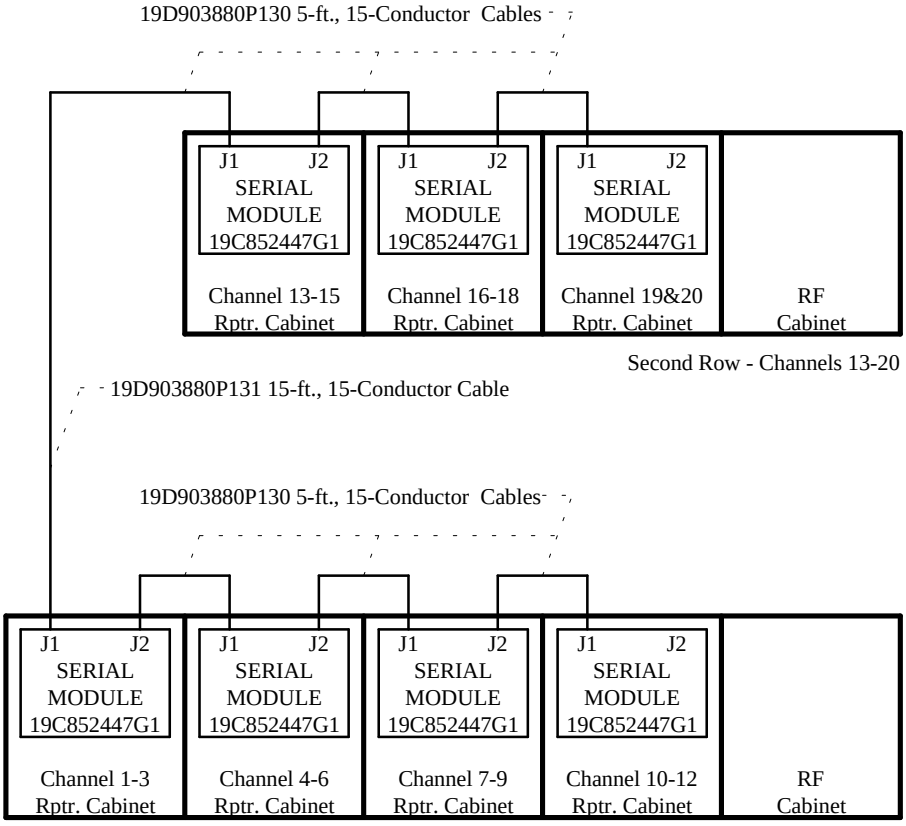
(Made from 19D904208, Sh. 2, Rev. 0)

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:



Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:



Second Row - Channels 13-20

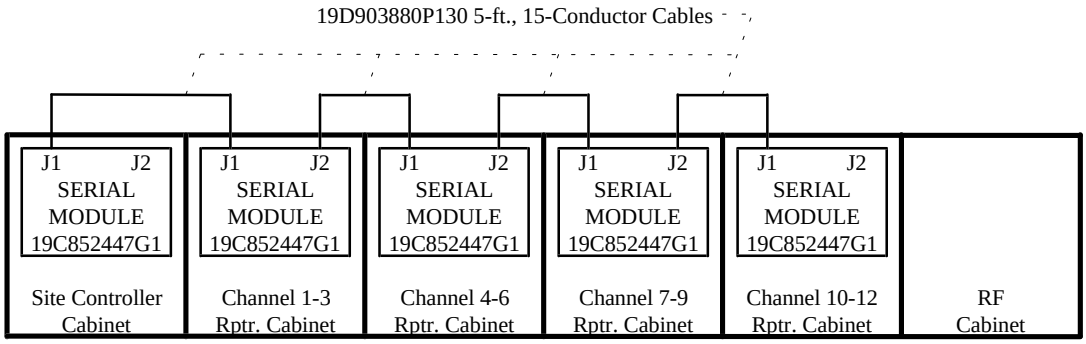
First Row - Channels 1-12

EDACS Interface Panel Interconnections

SERIAL MODULES (BASIC EDACS)

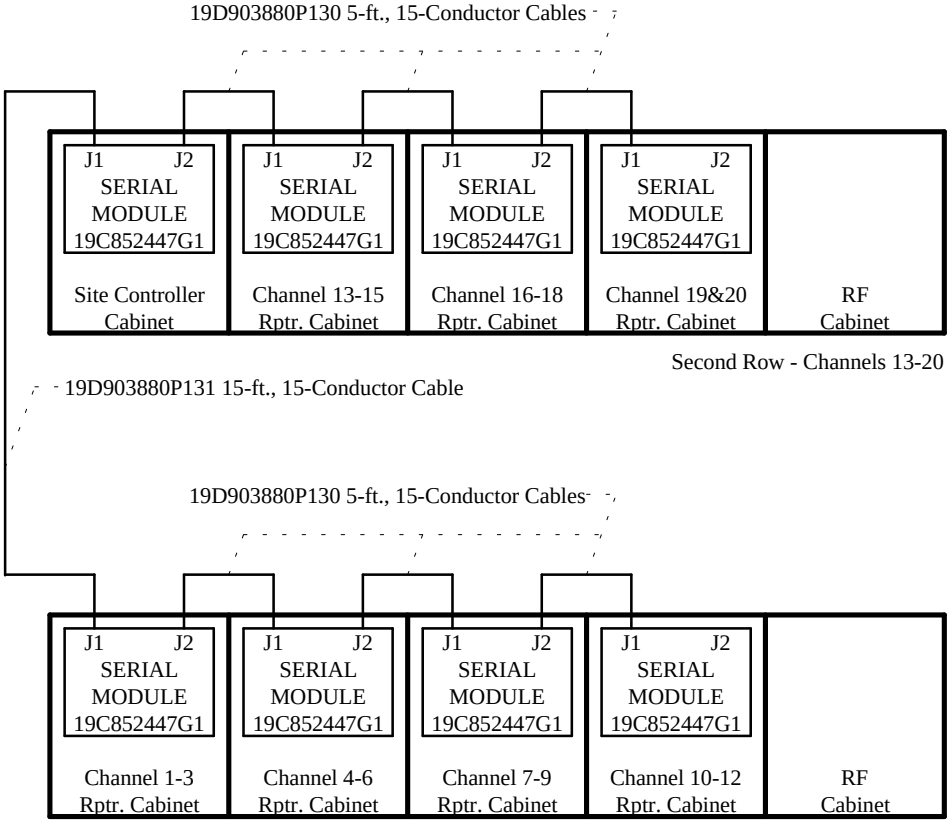
(Made from 19D904206, Sh. 2, Rev. 0)

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:



Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:



Second Row - Channels 13-20

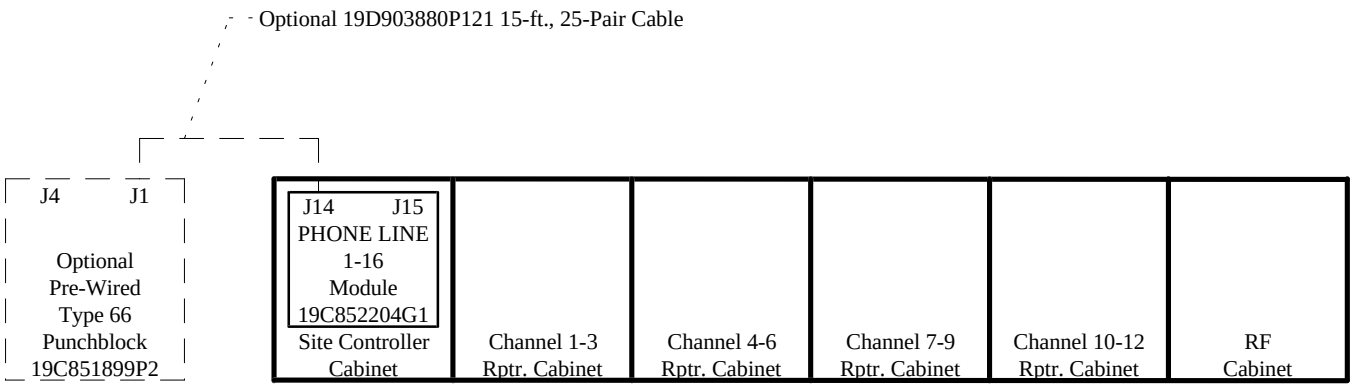
First Row - Channels 1-12

EDACS Interface Panel Interconnections

SERIAL MODULES (LEVEL 1 SYSTEM)

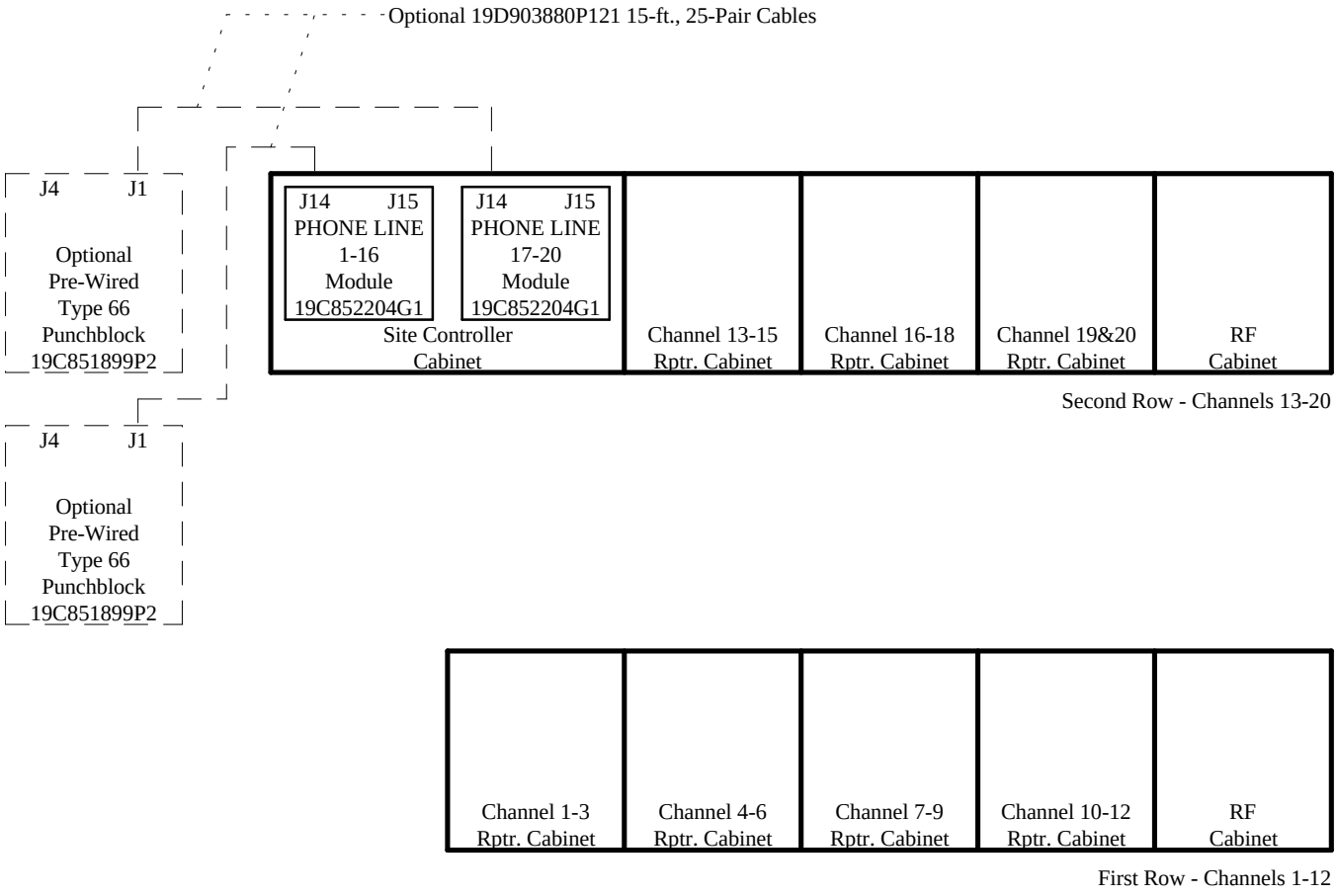
(Made from 19D904211, Sh. 2, Rev. 0)

STANDARD ARRANGEMENT FOR UP TO 12 CHANNELS:



Single Row - Channels 1-12

STANDARD ARRANGEMENT FOR 13 TO 20 CHANNELS:



Second Row - Channels 13-20

First Row - Channels 1-12

EDACS Interface Panel Interconnections
PHONE LINE MODULE

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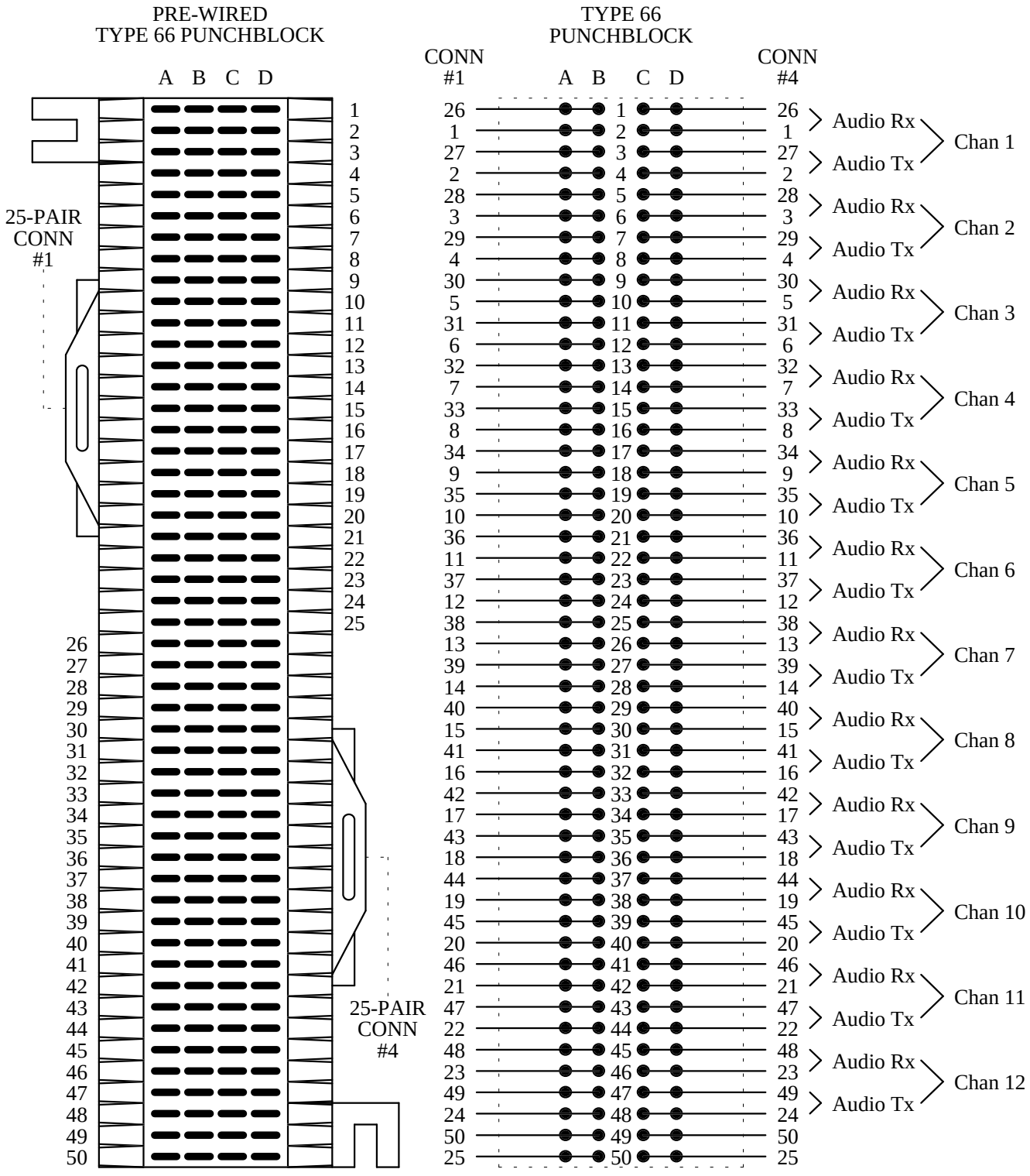
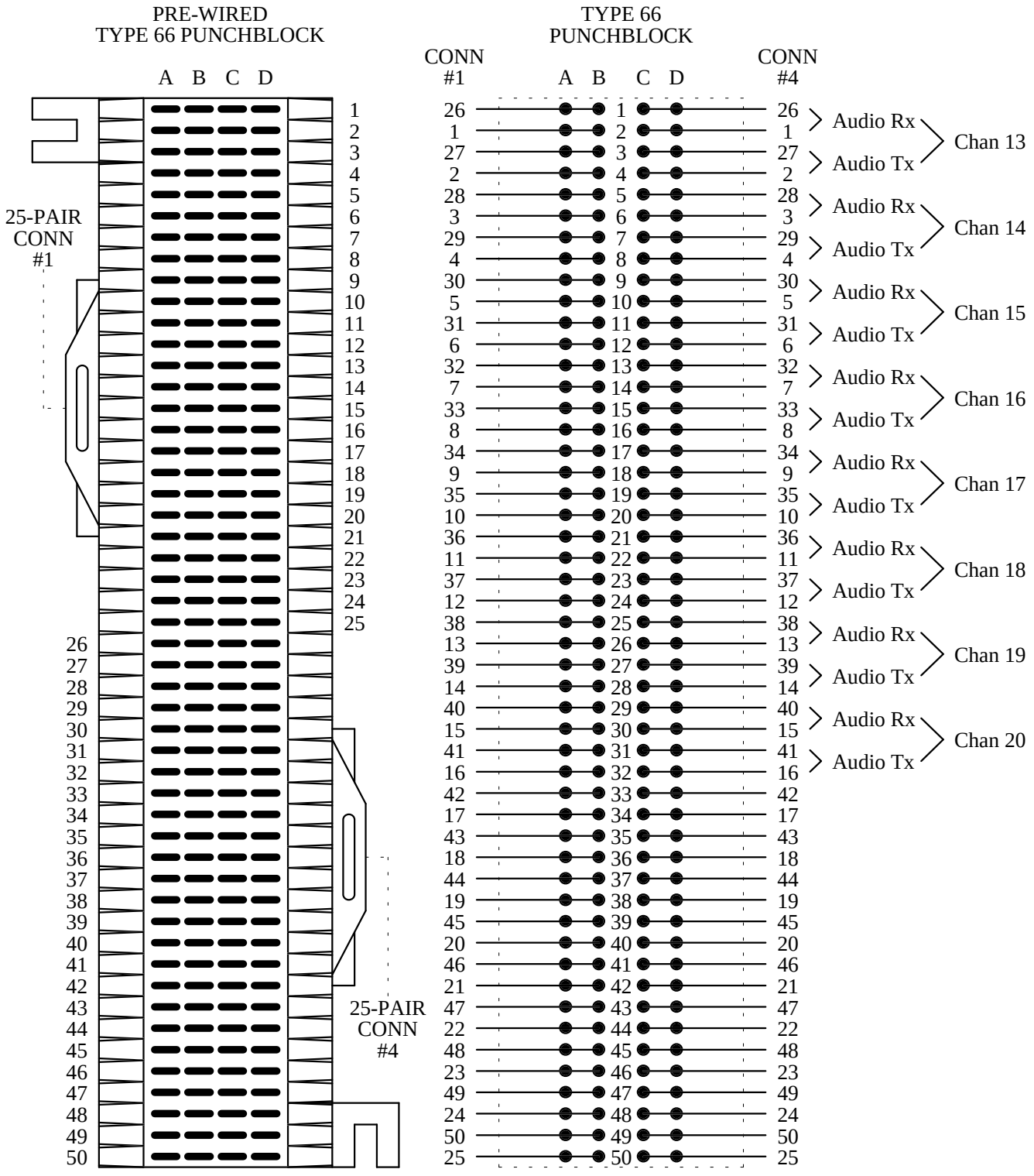
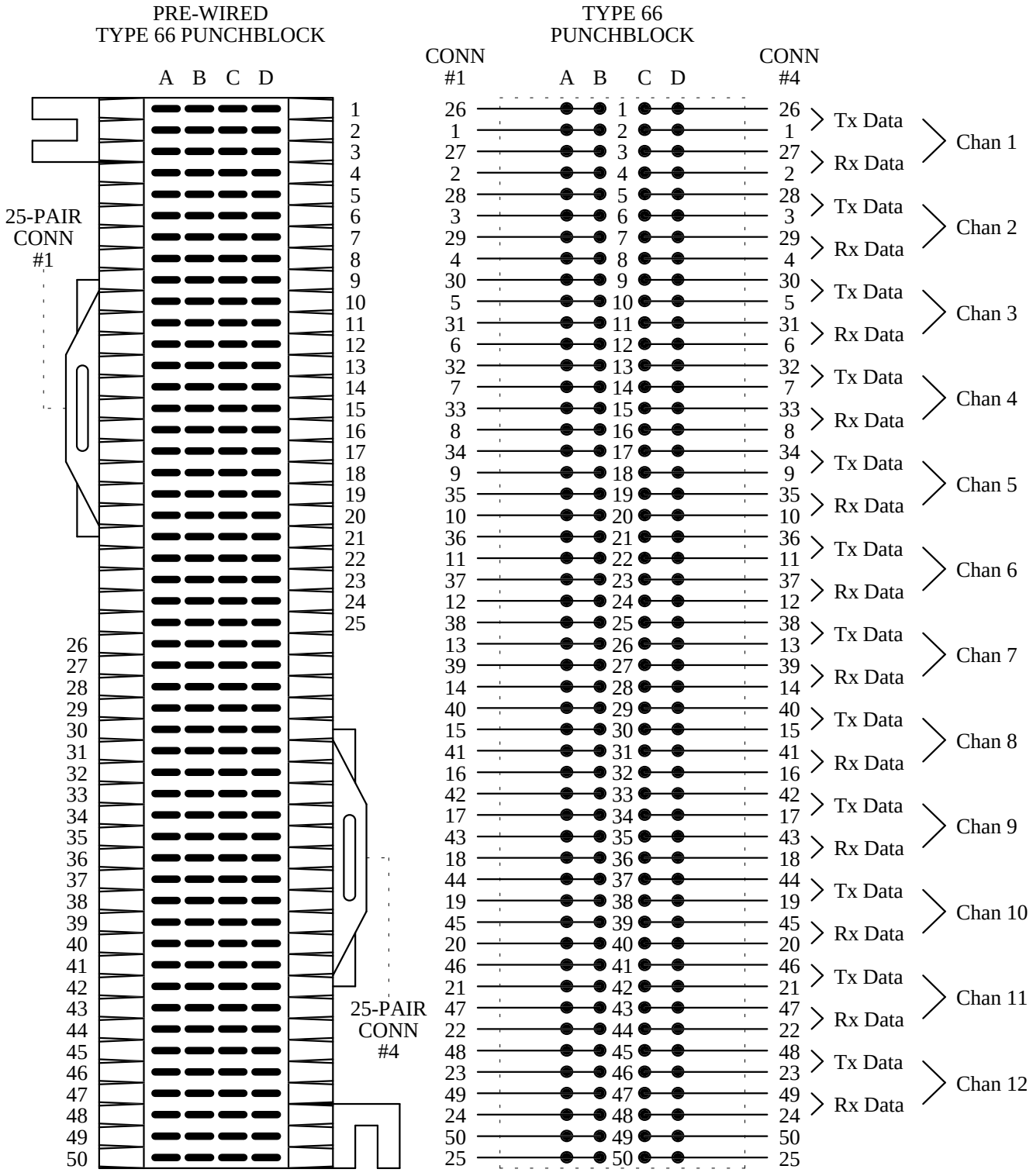
APPENDIX D
PUNCHBLOCK CONNECTION DIAGRAMS



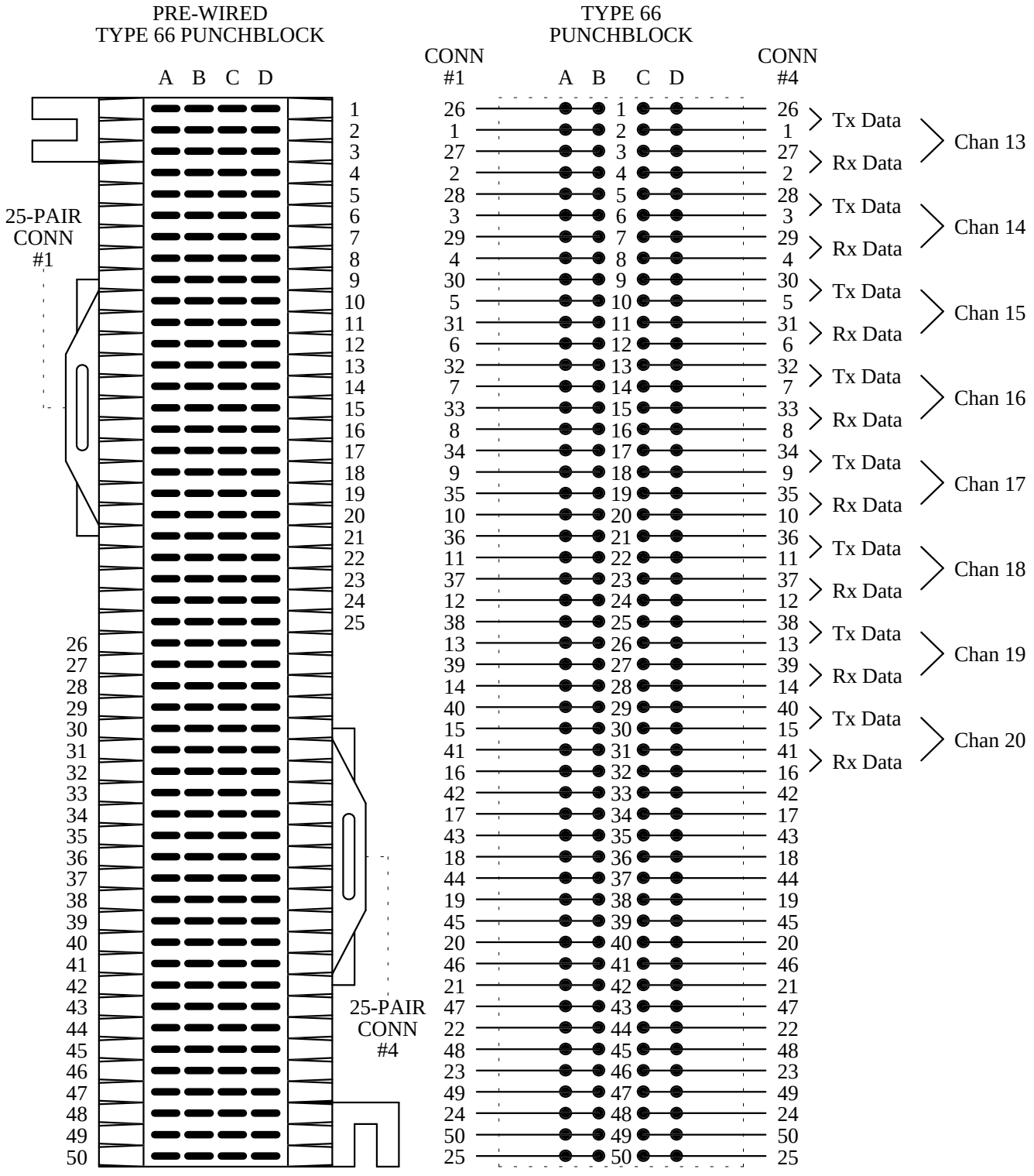
STATION AUDIO CH. 1-12



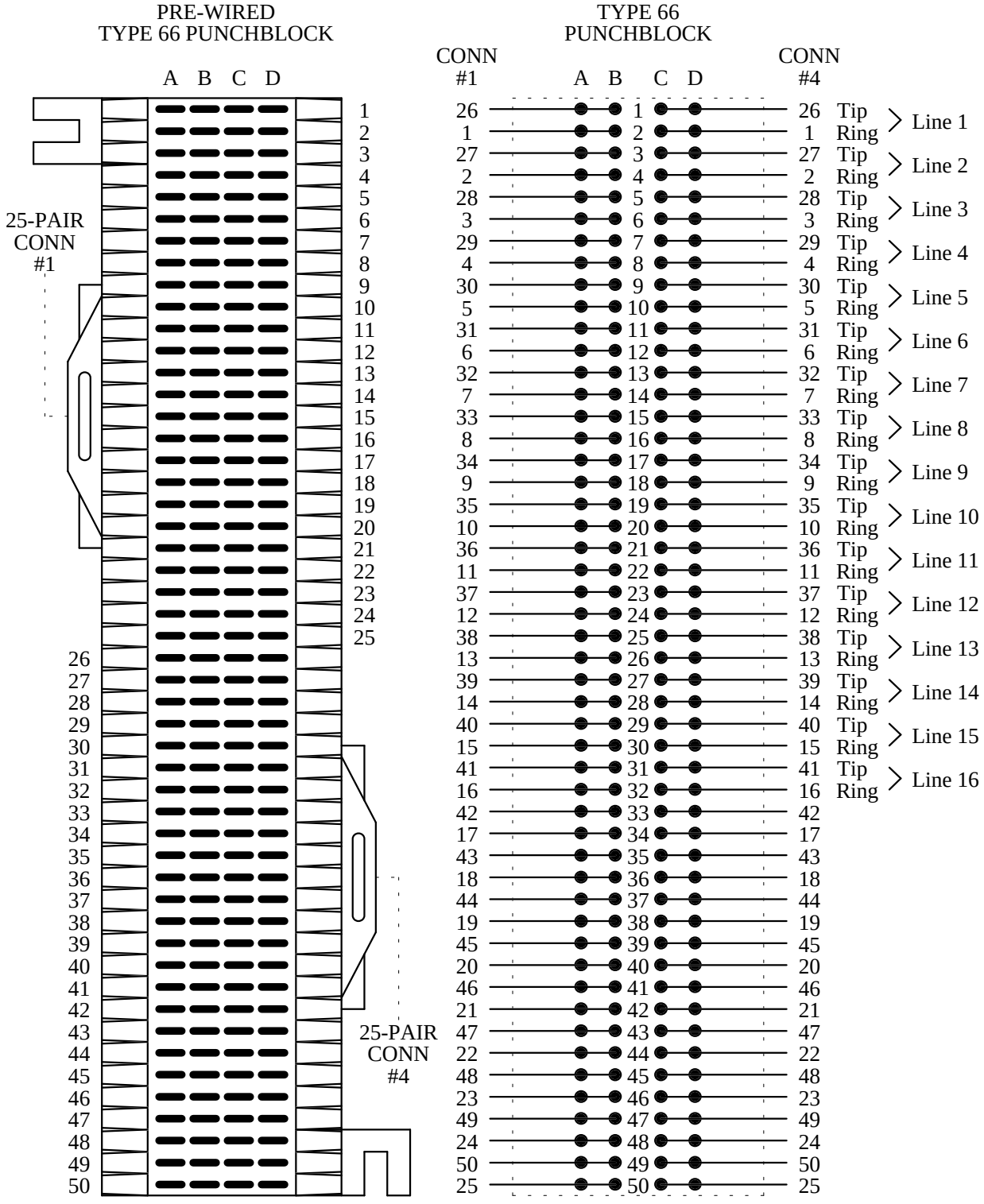
STATION AUDIO CH. 13-20



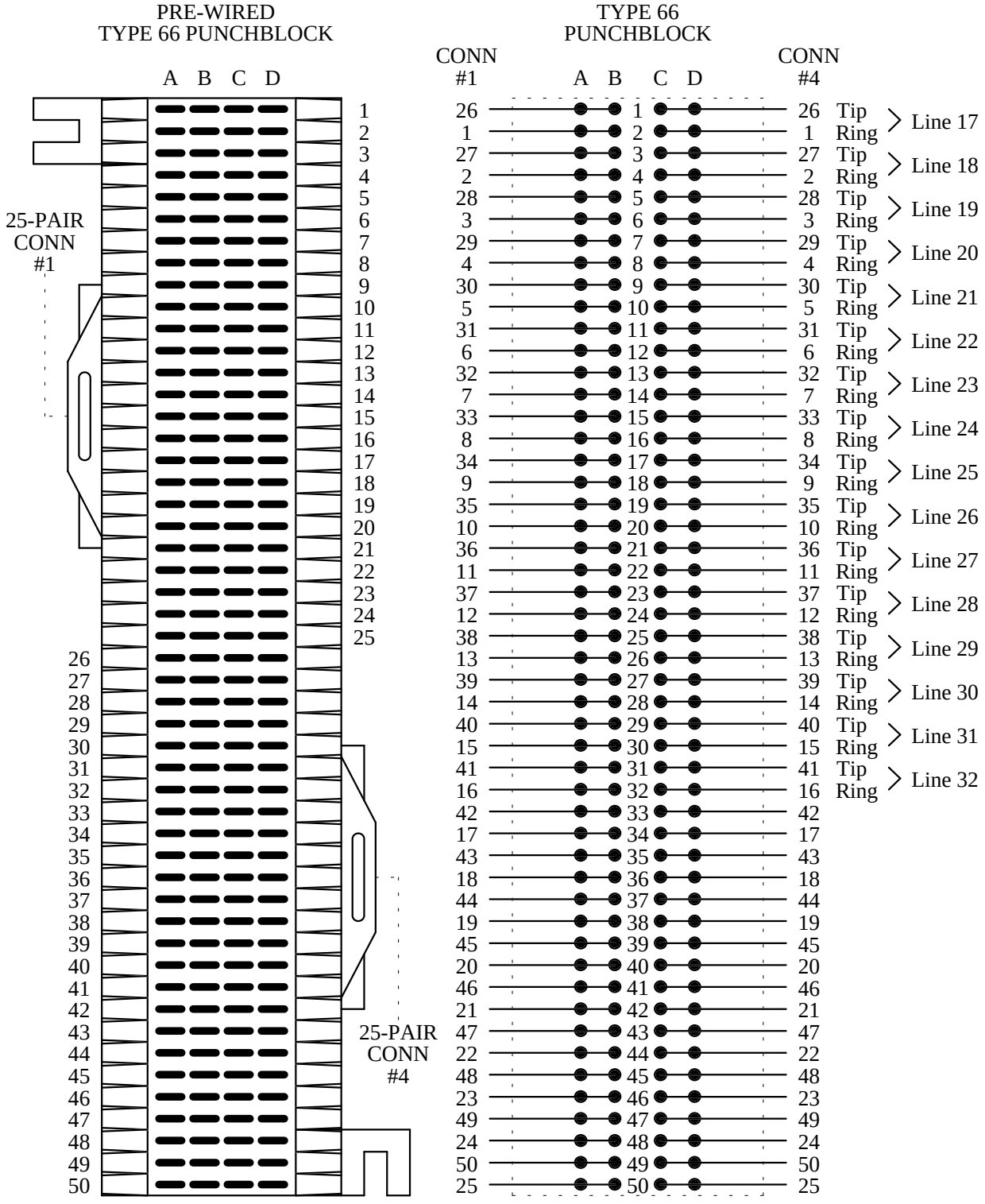
MODEM DATA - CH. 1-12



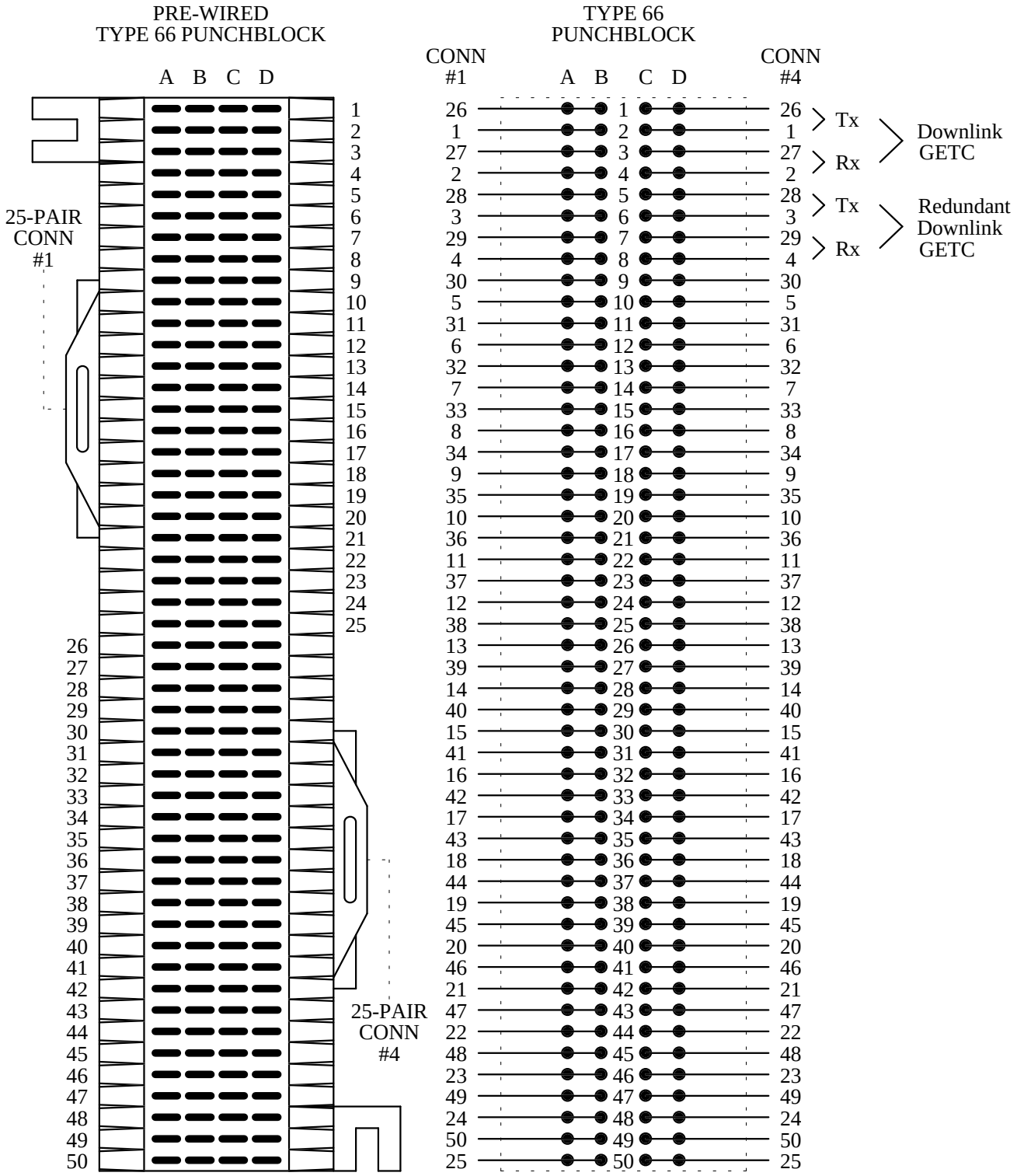
MODEM DATA - CH. 13-20



PHONE LINE 1-16



PHONE LINE 17-32

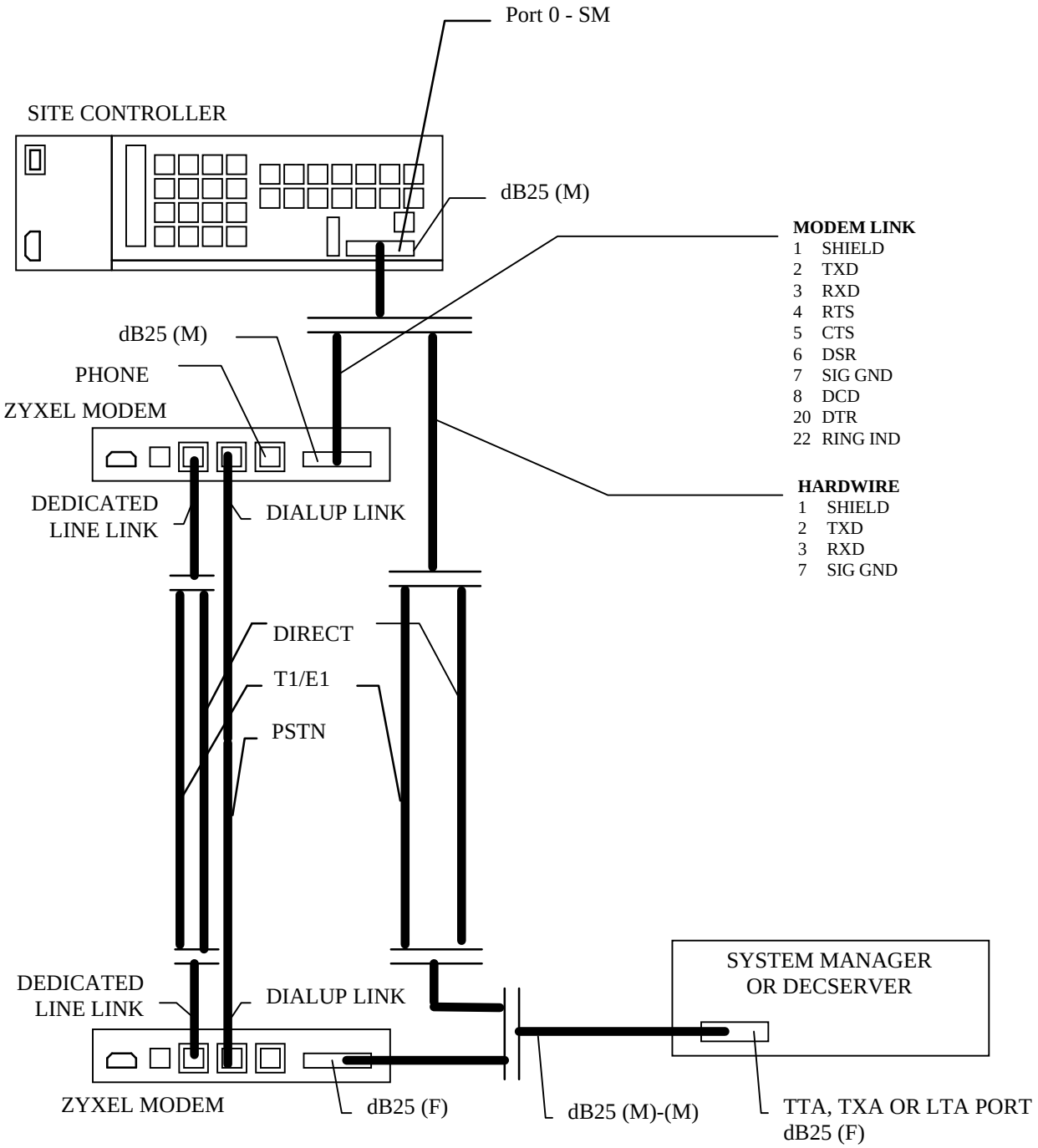


DOWNLINK DATA

APPENDIX E
SYSTEM MANAGER
INTERCONNECTION DIAGRAMS

SITE CONTROLLER- SYSTEM MANAGER LINK

(REAR VIEW OF ALL EQUIPMENT - SEE LBI38703 FOR MORE INFORMATION)



APPENDIX F
PREVENTATIVE MAINTENANCE CHECK SHEETS

PREVENTATIVE MAINTENANCE REPEATER TEST DATA

REPEATER # _____

Alignment/Test		Pot	Required Value	Measured Value	Adjusted Value	Pot Value
Low Speed Deviation	WB	CG	750 ± 25 Hz			
	NPSPAC		600 ± 25 Hz			
	NB		500 ± 25 Hz			
Transmit Limiting	WB	TX	3.75± 0.1 kHz			
	NPSPAC		3.0 ± 0.1 kHz			
	NB		1.75± 0.1 kHz			
Repeater Gain	WB	RG	3.0 ± 0.1 kHz			
	NPSPAC		2.4 ± 0.1 kHz			
	NB		1.5 ± 0.1 kHz			
Repeater Line Output Level		LO	+11 to -20 dBm			
DSP Line Input Level			+11 to -20 dBm			
DSP Line Input Deviation	WB	DLI	2.8 ± 0.1 kHz			
	NPSPAC		2.25 ± 0.1 kHz			
	NB		1.4 ± 0.1 kHz			
Compressor Gain	WB	CP	3.0 ± 0.1 kHz			
	NPSPAC		2.4 ± 0.1 kHz			
	NB		1.5 ± 0.1 kHz			
Compressor Threshold	WB	CT	3.65 ± 0.1 kHz			
	NPSPAC		2.9 ± 0.1 kHz			
	NB		1.65 ± 0.1 kHz			
GETC Modem Line Input		R1	5 dB below DLI			
High Speed Data	WB	R31	3.0 ± 0.1 kHz			
	NPSPAC		2.4 ± 0.1 kHz			
	NB		1.5 ± 0.1 kHz			
GETC Modem Line Output		R2	5 dB below LO			
SINAD @ 12 dB	800 MHz		-119 dBm			
SINAD @ 12 dB	UHF, VHF		-116 dBm			
Squelch		Squelch	9 dB			
Transmit Forward Power		PA	50-100% Watts			
Transmit Reverse Power			<4 Watts			

INSPECTED BY _____

DATE _____

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Ericsson Inc.
Private Radio Systems
Mountain View Road
Lynchburg,Virginia 24502
1-800-592-7711 (Outside USA, 804-592-7711)