

Chapter 1

INTRODUCTION

This manual explains the procedures for installing and operating the 289H Loop Surveillance System (LSS)[™]. It addresses both new installations and conversions from existing systems. The manual is divided into the following six sections and six appendices:

1. **Overview** — identifies the components of the 289H LSS[™] and explains how it operates with the PressureMAP[™]/PressureWEB[™] software to provide device information for office dispatching, alarming, system quality indexing, and numerous other functions. It also explains the monitor's pair diagnostics and tone generation capabilities.
2. **Site Planning** — defines the prerequisites and physical requirements for installing the 289H LSS monitor.
3. **289H Installation** — describes how to assemble the 289H LSS and make the necessary power connections.
4. **Connector Block Wiring** — illustrates and explains how to wire device pairs to the 289H connector block(s) and make the proper cable connections from the block to individual 289H relay card(s).
5. **Start Up and Card Test Procedures** — illustrates and explains how to power on the monitor, run the Card Calibration Test, the Ping Relays Test, and any additional tests needed to ensure the correct setup of the 289H. Other procedures in this section include: removing/replacing dedicated and subscriber relay cards, replacing and testing blown fuses, and setting up network communication for the LAN Controller Card.
6. **Technical Notes** — contains documentation that pertains to the setup, operation and use of the 289H monitoring system. Most of the documents included here were originally published as *Release Notes* or excerpts from *System Studies' Gazette* and *AirTalk* newsletter articles.

Appendix 1 — **Equipment Ordering Information**. This section includes a list of available central office monitors, including the 289H-M LSS[™] and the uM260[™] Micro Monitor . It also describes various 289H LSS components and their identifying product numbers.

Appendix 2 — **Troubleshooting**. This appendix section describes both corrective and preventive 289H LSS maintenance methods. It also explains how the options in PressureMAP's 289H LSS Diagnostics utility can be used in a number of 289H-related applications.

Appendix 3 — **289H Reading Messages**. This section contains examples of possible output readings from the 289H monitor.

Appendix 4 — **289H Alert Modem Status Codes.** This section explains the possible status codes received from the 289H alert modem.

Appendix 5 — **289H Diagnostics.** This appendix explains each test in PressureMAP's 289H LSS Diagnostics function.

With the exception of PressureMAP's data entry requirements and the data conversion process, both of which are described in the *PressureMAP System Data Entry Manual*, this manual provides the key information required to place the 289H LSS monitor in operation. The sections have been structured to convey only the essential information needed to perform a particular task or procedure.

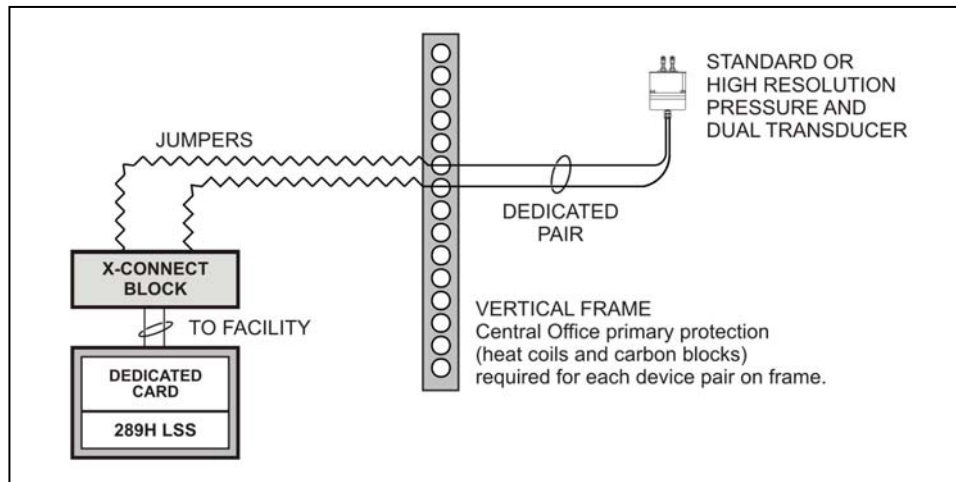
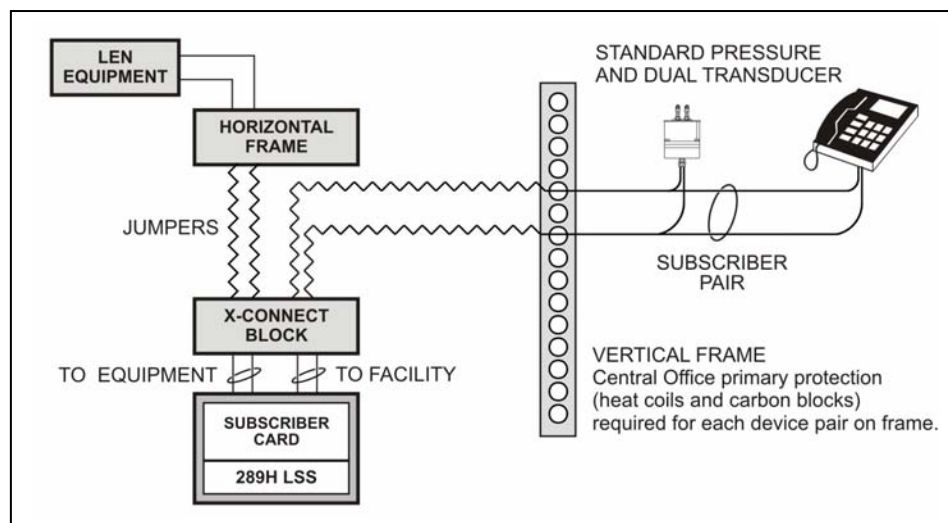
If you have any questions regarding any of the information or procedures in this manual, please contact System Studies Incorporated at (800) 247-8255, (831) 475-5777, or via email at support@airtalk.com. Our Technical Support personnel are available for assistance Monday through Friday, excluding weekends and national holidays, from 6:00 a.m. to 4:00 p.m., Pacific Time. Supporting documentation is available on our website at www.airtalk.com.

289H LSS OVERVIEW

The 289H Loop Surveillance System is a simple, multi-application loop system monitor that obtains electrical resistance, electrical current, and binary data from remote monitoring devices installed throughout a pressurized cable system. The data received from these monitoring devices is converted into air pressure, air flow, and/or contact alarm information by the PressureMAP software.

Dedicated and subscriber conductor pairs are used to obtain device readings. These pairs are terminated in the central office between the vertical frames and switching equipment at a connector block. *All pairs must be protected by primary limiting heat coils and voltage limiting devices such as carbon blocks at the frame.*

Circuit connections between the connector block and the 289H chassis are accomplished by means of individual 25-pair, pre-wired connector/cable assemblies. EXAMPLE 1-1 on the following page illustrates a typical transducer installation on a dedicated conductor pair, and EXAMPLE 1-2 shows the same type of installation on a subscriber pair.

**EXAMPLE 1- 1: DEDICATED INSTALLATION****EXAMPLE 1- 2: SUBSCRIBER INSTALLATION**

The 289H scans each of the monitoring points wired to its various relay cards, placing the incoming raw data into memory. This function is performed continually throughout the day and night to provide updated information for determining device readings. PressureMAP calls the 289H every two hours to obtain the latest readings for each of the scanned devices. This data is transmitted to the PressureMAP computer via modem or network connection, depending on the 289H monitor's hardware configuration. The data is then converted into meaningful pressure, flow, contact alarm or other information by the PressureMAP software.

The 289H LSS also has the ability to alert PressureMAP via modem (or network connection) of any possible alarm conditions (i.e. device output that crosses a defined threshold value) that it may have detected during its routine scan of devices. This 289H LSS alerting function is controlled by user-definable sensitivity levels, which are set in the PressureMAP Program.

Unlike old-style monitoring systems which contain expensive memory, computing power, and report generation capabilities, the 289H is designed to take advantage of the power and analytical capabilities of the PressureMAP software. It contains only the minimum equipment necessary to provide device data for PressureMAP. It does not attempt to convert its scanned readings into pressure and flow information, store data for reading comparisons, or provide status or alarm reports. These basic tasks, as well as more complex system analysis, task dispatching and indexing functions, are performed automatically by the PressureMAP software.

The 289H monitor offers a choice of two equipment options for communications with PressureMAP. The 289H Controller Card equipped with on-card modem communicates at 2400 or 9600 baud. The newer LAN Controller Card utilizes a network connection, reducing telephone expenses for monitoring remote locations.

In addition to collecting device data, the 289H significantly reduces the burden of having to manually test conductors. When addressed through PressureMAP, the 289H provides access to a device pair or multiple pairs in order to perform functions similar to mechanized line testing (MLT). Circuits on the 289H LSS controller board enable PressureMAP to obtain resistance readings across a pair, read resistance of each side of a pair to ground, and determine the presence of battery (both AC and DC) on a pair. With this user-initiated function, if the 289H reports a SHORT on a flow transducer circuit, for example, the person in charge of analyzing readings can use PressureMAP to determine the actual resistance of the pair. He or she will be able to determine if there is truly a short on the pair (resistance lower than 100k ohms) or if the flow transducer is pegged.

The 289H also provides continual monitoring of both AC and DC voltage sources. The special PressureMAP "VO" and "VD" device types are used to designate this monitoring function. The 289H, via PressureMAP, can be set up to provide voltage readings (either AC or DC) from tip to ground and from ring to ground.

In addition to the mechanized line testing capabilities, the 289H has the ability to detect open circuits on device pairs (open IN or open OUT). If, during its scanning of monitoring points, the 289H identifies an OPEN on a device pair, PressureMAP will force a capacitance reading to determine if the OPEN is located in the central office or in the field. The information is then made available to PressureMAP for greater accuracy in alarm generation and task dispatching.

In order to prevent device pairs from being "stolen" and used for other purposes and/or to assist in locating assigned device pairs in the field, the 289H's Tone Utility Card is equipped with a tone generator. This device makes it possible to transmit a pseudo-data tone or selected tone frequency on the monitoring device pairs wired to the 289H monitor. Using PressureMAP's Diagnostic utility, a technician can route a selected "locater" tone to specified pairs or place "pair-saver" tone on all monitoring devices connected to a standard dedicated relay card.

Note: The full tone generation capability is available only on dedicated pairs and only for 289H monitors equipped with a tone-capable Controller Card (EPROM version B05 or greater), a Tone Utility Card, and one or more dedicated tone relay cards (all cards manufactured since December, 1998). To utilize the pair-saver tone capability, the dedicated relay cards must be equipped with tone capacitors. However, the user-directed locater tone can be used with older "non-tone" dedicated relay cards, as well as with the current model relay cards. In addition, locater tone capability for subscriber pairs was made available with the release of PressureMAP Version 24.

The 289H monitor is also able to obtain readings from System Studies' solid-state, high resolution pressure, flow and dual transducers. These transducers, which provide readings in loop current output in the range of 4 to 20 milliamperes (mA), are more accurate and versatile than conventional resistive transducers. The 289H monitor provides the technology needed to read these types of transducers on dedicated pairs.

The 289H LSS may be configured to monitor either a single office or multiple offices. In either configuration, a fully equipped 289H chassis can monitor up to 400 subscriber devices or 800 dedicated devices. Combinations of dedicated and subscriber devices can also be read by a single 289H.

289H LSS COMPONENTS

The 289H consists of a main chassis (21.5 x 12.5 x 12 inches) that has been designed to fit into a standard 23-inch equipment rack (FIGURE 1-1). This chassis contains a backplane, one controller card, one utility card, and up to sixteen (16) relay cards.

Backplane Panel

Located across the back of the 289H chassis is a horizontal panel which consists of twenty female card connector slots. This backplane panel provides the means of physically connecting the various 289H cards and transporting data between cards (FIGURE 1-2). Built-in guide rails located at the top and bottom of the unit make it possible to guide the cards into position. When seated properly in the backplane's connector slots, the cards can be securely fastened in the 289H chassis by pressing inward on the plastic card ejector tabs located on the top and bottom of the cards (FIGURE 1-2).

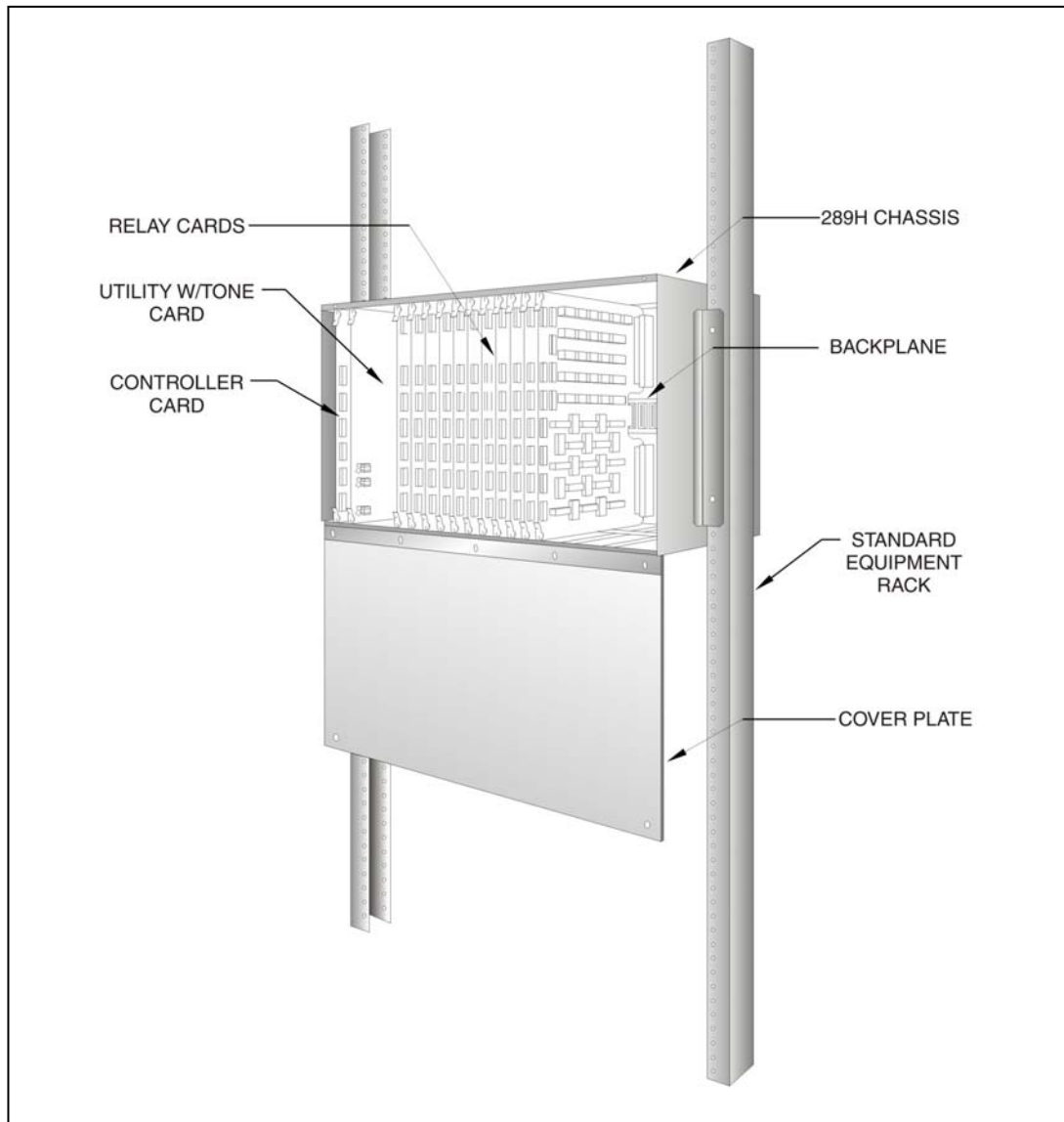
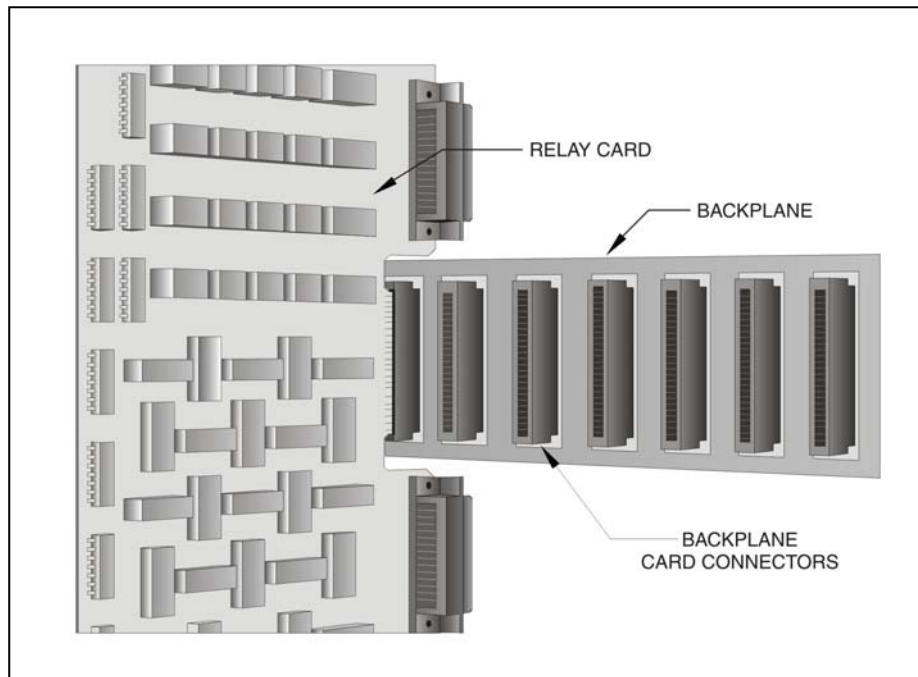


FIGURE 1-1: 289H LSS MONITOR IN EQUIPMENT RACK

Note: The controller, utility and relay card illustrations that appear in the following pages and throughout this manual depict the key components located on each 289H LSS card. Although these drawings were created several years ago, they still provide relevant reference information for setting up and, if necessary, troubleshooting the 289H monitor.

It is possible that one or more of the cards shipped with your 289H LSS will differ slightly in appearance from what is shown in the drawings. If you find it difficult to locate any of the necessary components on your cards, please contact the System Studies Technical Support Department at (800) 247-8255 or (831) 477-8945 for assistance.

**FIGURE 1-2: 289H LSS BACKPLANE**

Controller Card

As the name implies, the Controller Card performs most of the tasks which direct the operation of the 289H and its interaction with PressureMAP. The Controller Card contains the 289H's measurement circuitry, communications hardware (modem or network connection), and a micro controller (which switches and stores device data, and activates the modem). The standard 289H Controller Card (P/N 9010-0010) is equipped with on-board modem which communicates with PressureMAP at either 2400 baud or 9600 baud. The newer LAN Controller Card (P/N 9800-0030) utilizes a 10 Base-T Ethernet connection, and must be configured with IP address information for the 289H monitor.

The version of the modem Controller Card, shown in FIGURE 1-3, features some advances in the board's layout compared with earlier designs. The modem indicator lights have been moved toward the front of the card, so that they are visible from the front of the 289H chassis when troubleshooting. A visual key, identifying each modem light, is silkscreened on the front edge of the card.

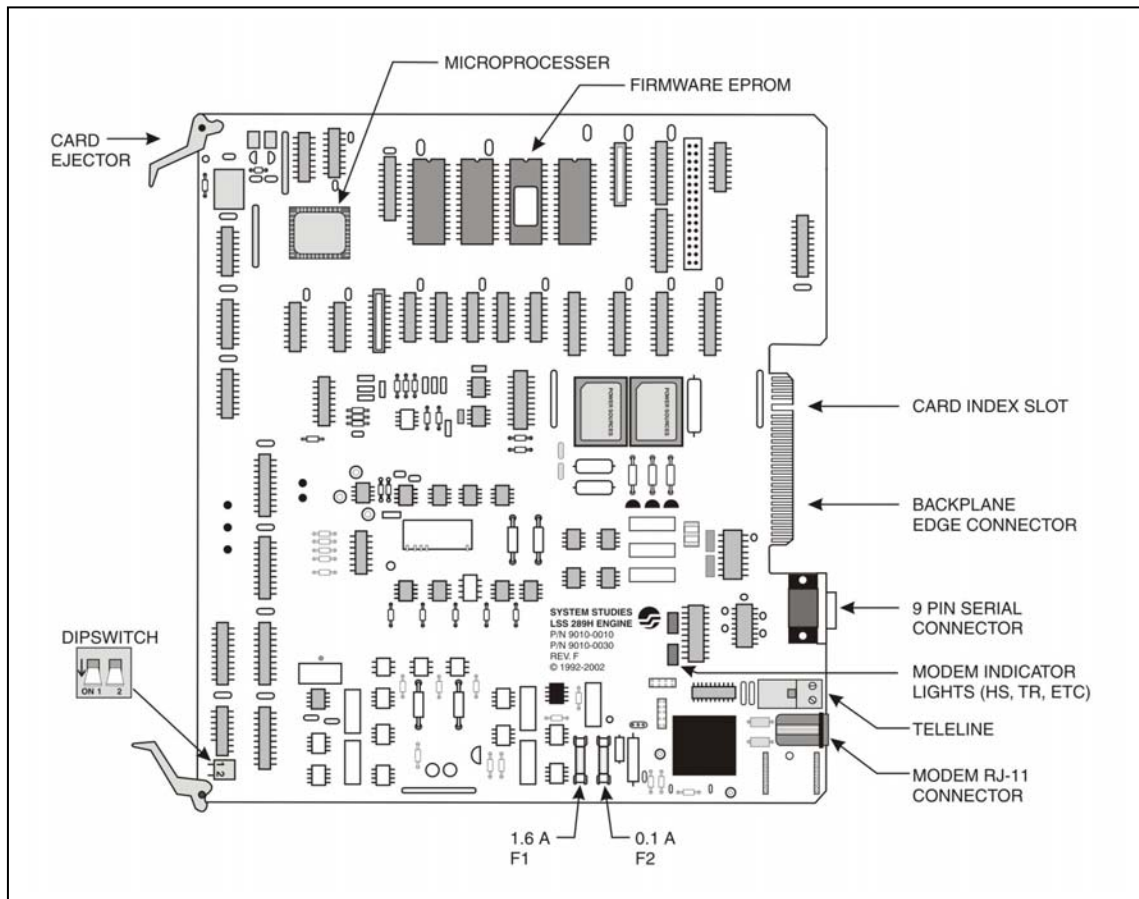


FIGURE 1-3: 289H LSS MODEM CONTROLLER CARD

The LAN Controller Card, shown in FIGURE 1-4, includes a LAN module located in the lower right corner. The dipswitch set module used in the configuration process (see lower left corner) allows settings to be changed without removing the board from the chassis. Modem indicator lights, which are used in diagnostics for the LAN module, are visible from the front of the 289H chassis.

Procedures for setting up the LAN Controller Card are located in the Start Up and Test Procedures section of this manual.

Note: As new capabilities were added to the 289H LSS, new versions of the firmware EPROM chip on the Controller Card have been introduced. In addition, new versions have been necessary as suppliers continually upgrade their products and discontinue old parts. EPROM versions, compatibility requirements and capabilities are described in hardware *Release Note 68* (2570701.*HD), which is available on our website and in hard copy. To verify that you have the most current information, please contact System Studies Technical Support.

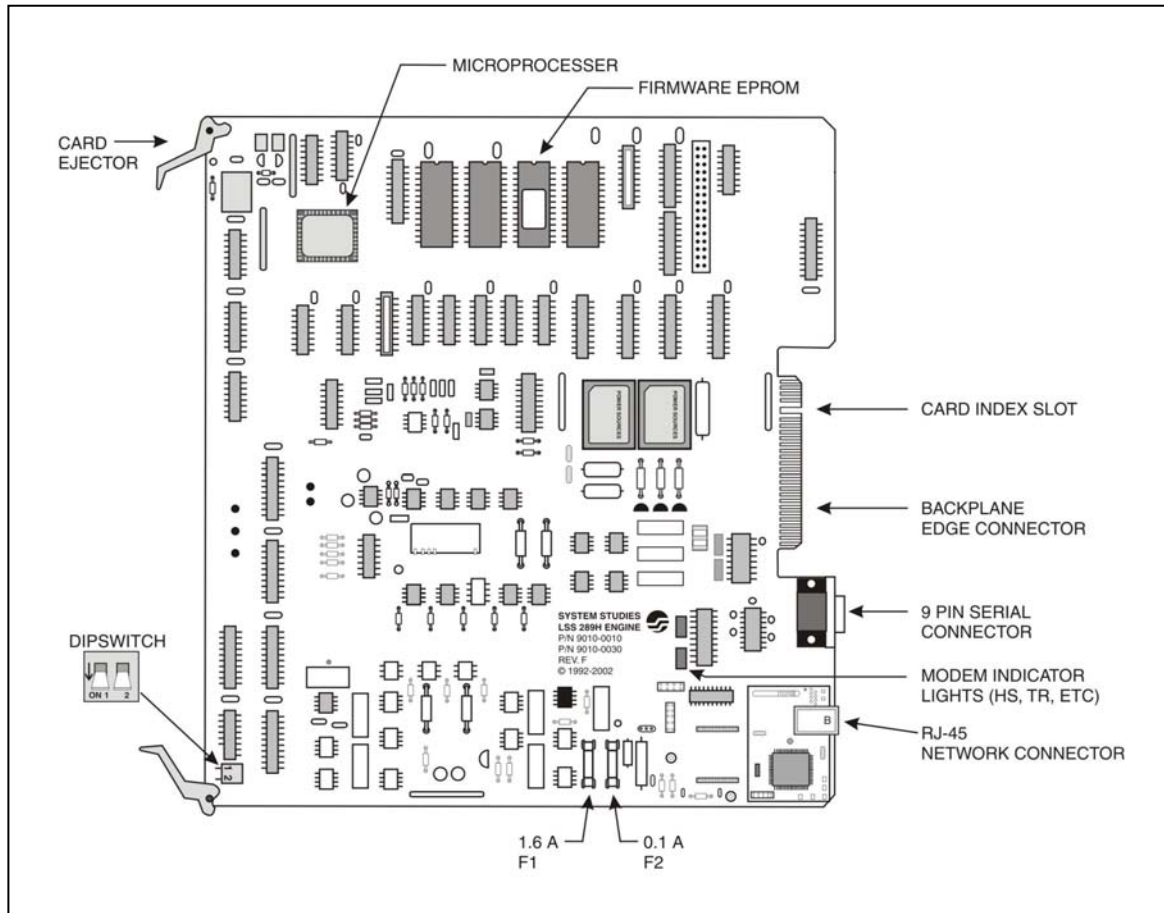


FIGURE 1-4: 289H LSS LAN CONTROLLER CARD

Utility Card

The standard Utility Card contains a -48 volt DC power supply, a power switch, and an alarm enable/disable switch (FIGURE 1-5). The newer model, the Tone Utility Card, contains these same components, but it is also equipped with a tone generator (FIGURE 1-6).

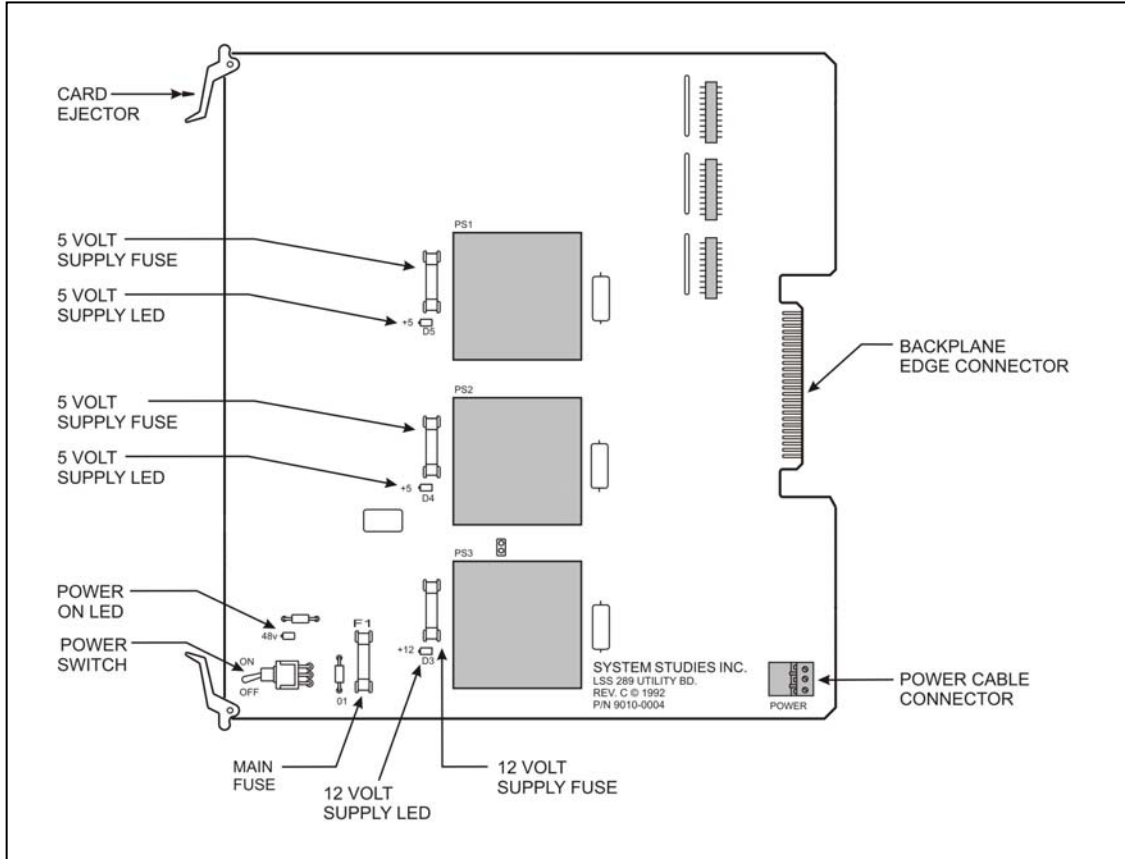


FIGURE 1-5: STANDARD UTILITY CARD

For 289H LSS monitors equipped with an earlier version of the Utility Card, updating the monitor for the tone generation capability requires the replacement of the old Utility Card with the new Tone Utility Card. In addition, the Controller Card must be equipped with EPROM version B05 or greater.

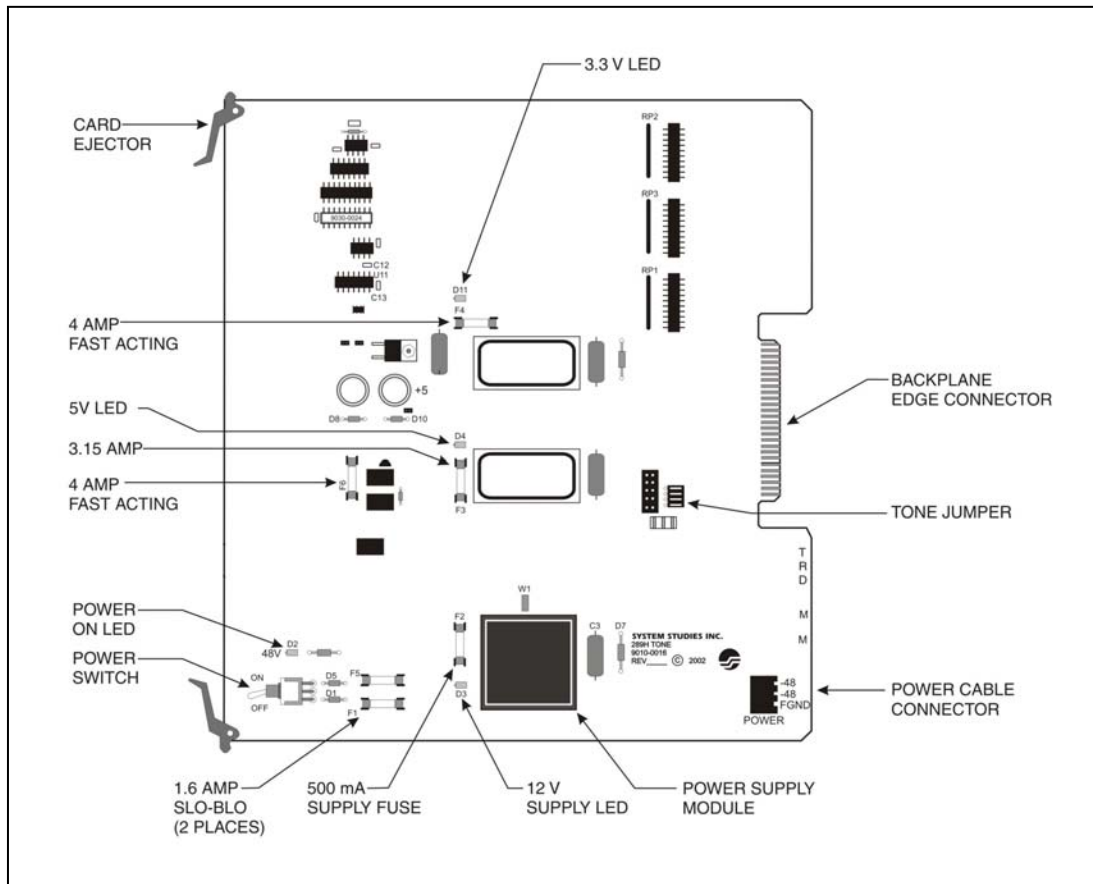


FIGURE 1-6: TONE UTILITY CARD

Relay Cards

There are several types of relay cards available for the 289H: subscriber, dedicated, and Sparton Dedicated Replacement (SPDR). The dedicated card contains relays for 50 monitoring points (FIGURE 1-7). The SPDR Card contains relays for up to 36 dedicated Sparton pairs (FIGURE 1-8). The subscriber card serves 25 monitoring points (FIGURE 1-9).

Note: Standard dedicated cards supplied after December of 1998 (Rev C and above) are equipped with the on-board capacitors and circuitry required for full tone generation capability—both the “pair-saver” and the “locator” tone functions. To utilize the pair-saver tone capability, the dedicated relay cards must be equipped with tone capacitors.

The Sparton Dedicated Replacement relay card (SPDR) streamlines the process of cutting over from a Sparton monitor to the 289H LSS by eliminating time-consuming rewiring, and simplifies converting the device data. The SPDR, shown in FIGURE 1-8, contains relays for up to 36 dedicated Sparton pairs, and connects directly to the existing Sparton dedicated block’s A, B and C cables. The on-card dipswitch can be set for A, B or C configuration (as appropriate) to translate the Sparton cable’s pair arrangement for 289H monitoring. Labeled LED indicator lights at the front edge of the SPDR identify the installed card’s current setting. Sparton Dedicated Replacement card functionality was first supported in PressureMAP Version 23, and the automatic data conversion utility for the

SPDR was made available with Version 24. Data tone can be placed on the card's monitoring pairs but, because of the Sparton block's common tip configuration, locator tone is not available on SPDR pairs.

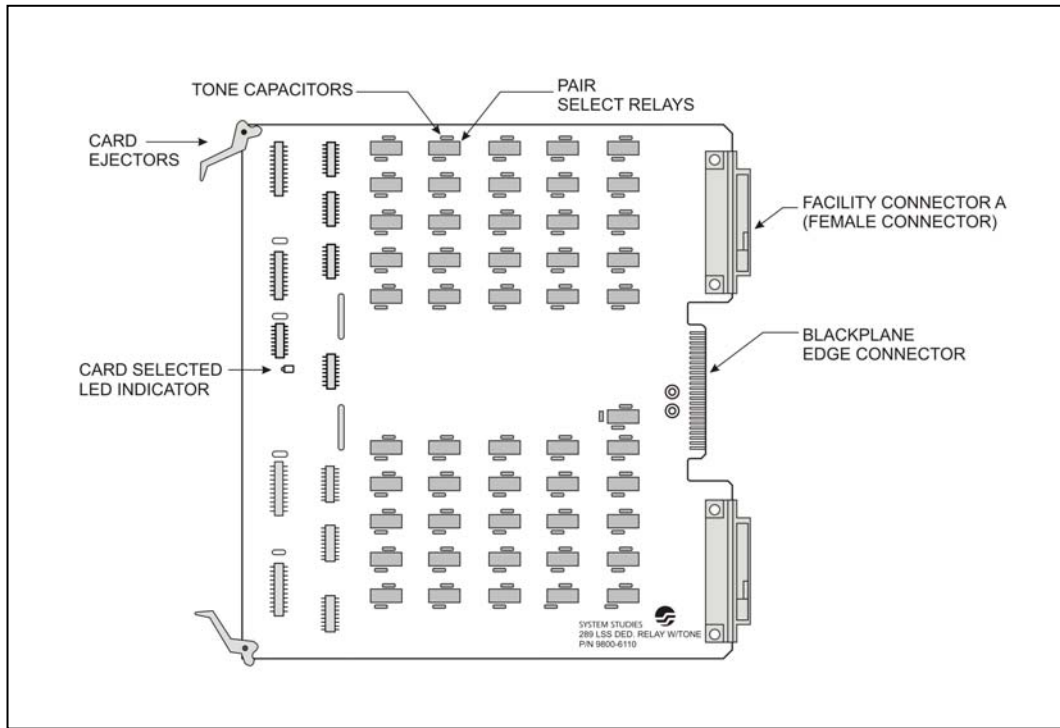


FIGURE 1-7: DEDICATED RELAY CARD

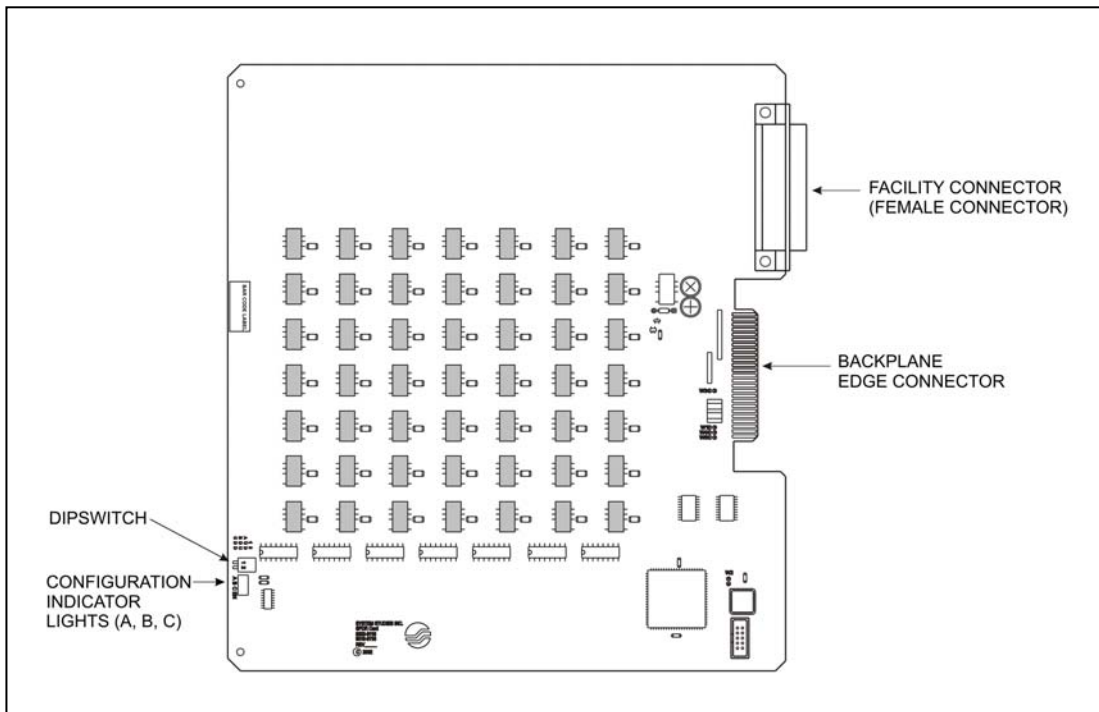


FIGURE 1-8: SPARTON DEDICATED REPLACEMENT CARD (SPDR)

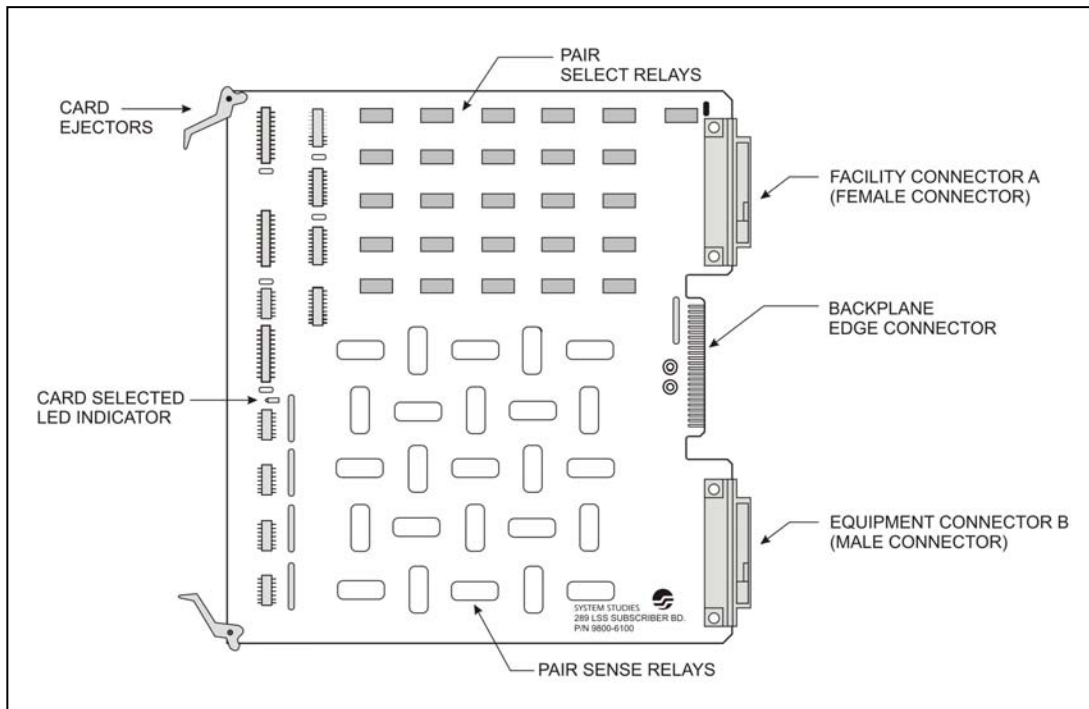


FIGURE 1-9: SUBSCRIBER RELAY CARD

CARD CONNECTIONS

Amphenol cable connectors are located on the back edge of each card. The dedicated cards have two female connectors (FIGURES 1-7), SPDR cards have a single female connector (FIGURE 1-8), and subscriber cards have both a male and female connector (FIGURE 1-9).

Device pairs are wired to the 289H relay cards via 25-pair connector cables and one or more connector blocks. Although some conventional blocks may be modified for use with the 289H, the two standard types of connector blocks, explained below, are supplied by System Studies Incorporated.

Note: It is possible to wire dedicated circuits to subscriber relay cards. However, the opposite is not true. Subscriber circuits CANNOT be used with dedicated cards because the dedicated cards do not have busy detection circuitry installed.

Connector Blocks

In addition to the equipment that is installed in the 289H chassis, there are a number of other important components that are required for the successful operation of the 289H. These items are described in the following pages.

Monitoring device circuits from the field and the central office switching equipment are terminated at a connector block before they are routed to the 289H chassis. Although there are a variety of connector blocks in use with other monitor types and monitoring applications, two standard types of connector blocks are designed for the 289H. One is used for dedicated circuits and the other for subscriber circuits. What distinguishes one block from another is the arrangement of wire wrap pins

on the face of the block and the number of pre-wired Amphenol cable connectors on the bottom of each block.

Regardless of which block is being used, two wire wrap pins are supplied for each incoming device pair. For subscriber circuits, two additional pins are provided for each device to complete the connection between the field and the central office switching equipment (see EXAMPLE 1-2).

DEDICATED CONNECTOR BLOCK

The dedicated connector block (P/N 9800-6055) provides the means of physically connecting a maximum of 100 monitoring devices on dedicated pairs. Wire wrap termination pins are arranged in two equal groups on the front (face) of the block (FIGURE 1-10). Each group of pins serves 50 devices on dedicated circuits.

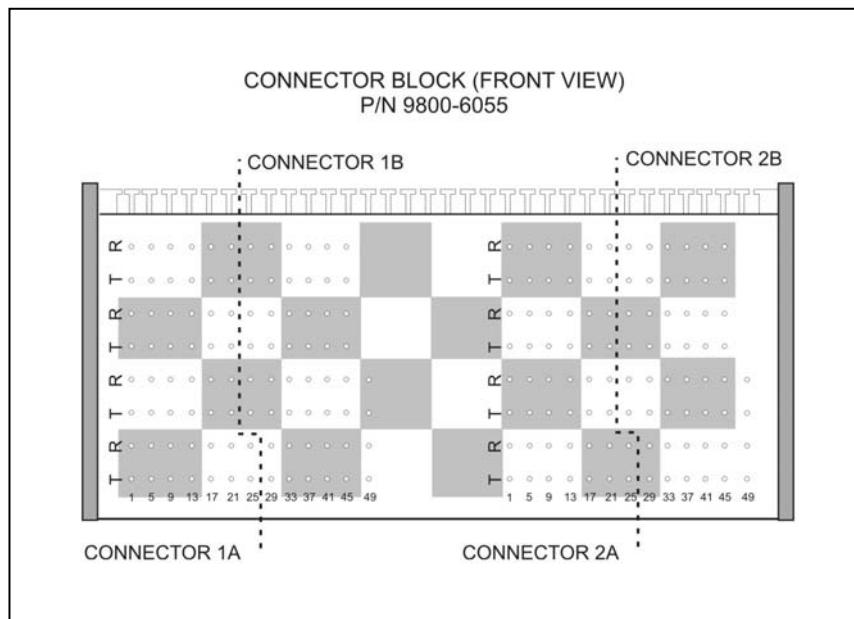


FIGURE 1-10: DEDICATED CONNECTOR BLOCK

The arrangement of pins in two groups makes it easy to associate device circuits with a specific relay card. For example, all of the circuits wired to the left side of connector block 9800-6055 will be connected to one dedicated relay card in the 289H chassis. All of the circuits in the right group are cabled to a second relay card.

The pins in each of these sections are internally wired to two female Amphenol cable connectors on the bottom of the block. Each connector provides wiring for 25 device pairs. In all, a total of four cable connectors are provided on the dedicated connector block (FIGURE 1-11).

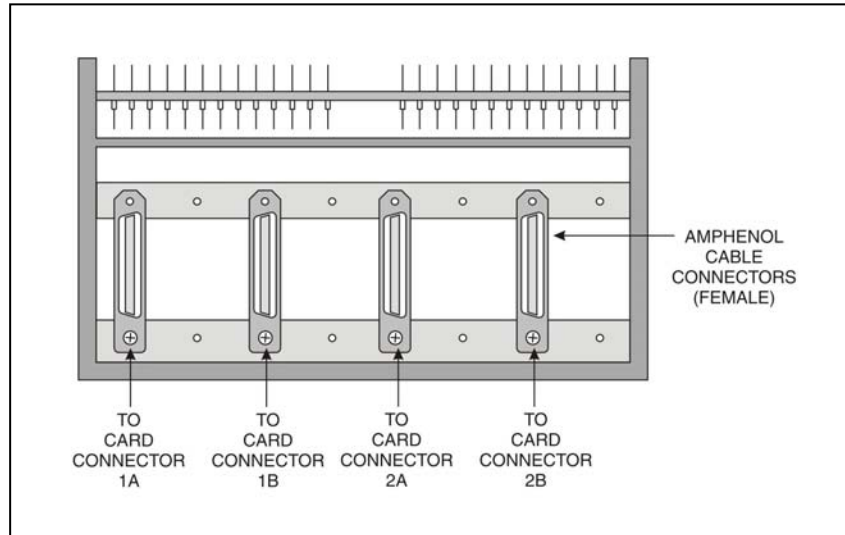


FIGURE 1-11: DEDICATED CONNECTOR BLOCK (CABLE CONNECTORS)

SUBSCRIBER CONNECTOR BLOCK

The second type of standardized connector block (P/N 9800-6056) is a variation of the dedicated connector block. Designed for subscriber pair monitoring, it differs from the dedicated block in that it has eight (8) pre-wired cable connectors and a slightly different pin arrangement.

Block 9800-6056 has 100 pairs of wire wrap pins to accommodate a total of 50 devices on subscriber circuits (FIGURE 1-12). Like the dedicated connector block, the pins on this block are also arranged in two main groups.

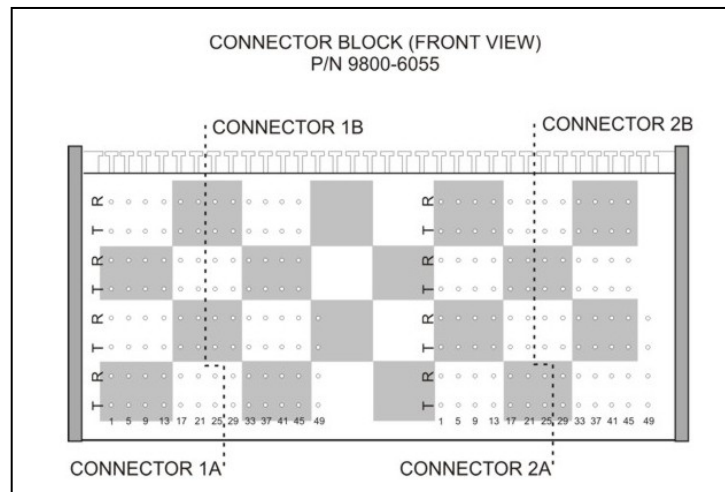


FIGURE 1-12: SUBSCRIBER CONNECTOR BLOCK (PIN ARRANGEMENT)

The bottom section of each group of pins is used to terminate device pairs from the central office (designated “equipment” on the block face). The top group is used to connect the corresponding device pairs to the field (designated “facility”). The pins in each group are internally wired to one of

the four primary female cable connectors—1A, 1B, 2A, 2B—located on the bottom of the block. (FIGURE 1-13).

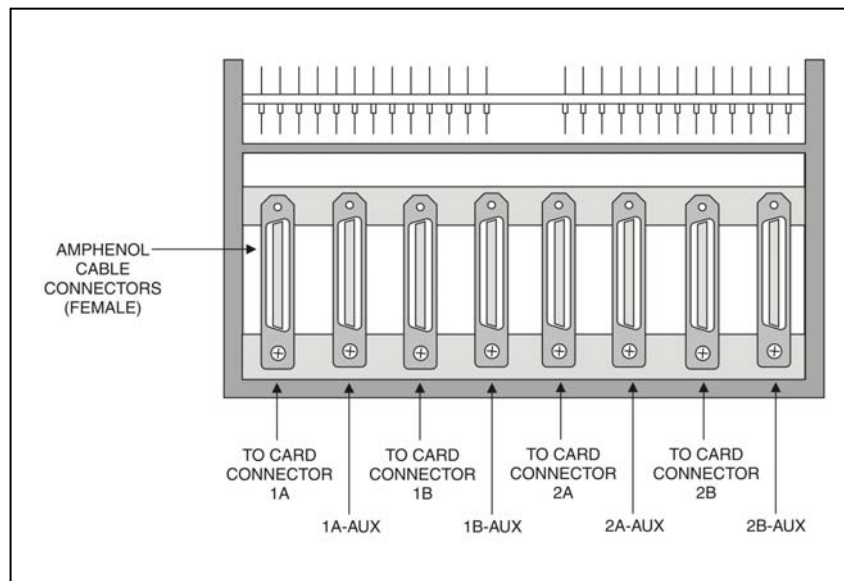


FIGURE 1-13: SUBSCRIBER CONNECTOR BLOCK (CABLE CONNECTORS)

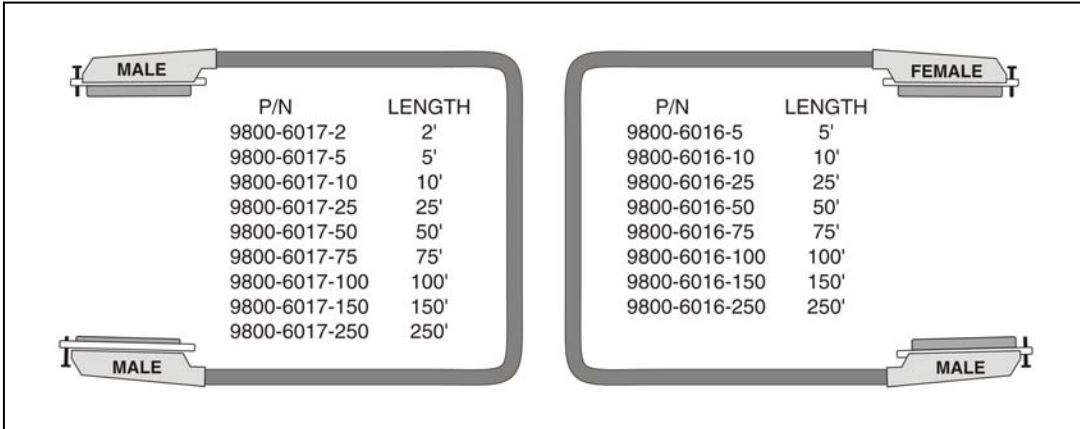
AUXILIARY CONNECTORS

The additional four female auxiliary connectors permit the insertion of “jumper” cables which bypass the 289H if you need to change subscriber cards or perform maintenance on the 289H monitor. By placing a cable between designated auxiliary connectors on the block, it is possible to route incoming pairs from the CO switch at the block directly to the outgoing subscriber pairs. This makes it possible to bypass the 289H monitor without interrupting service to the subscriber.

Note: All of the female Amphenol cable connectors on the 289H blocks, with the exception of the auxiliary connectors on the 9800-6056, are equipped with a locking barb to prevent removal of the cable. Once a cable connection is made, it is permanent. However, because cables may need to be connected and disconnected to the auxiliary cable connectors, the auxiliary Amphenol connectors are not equipped with locking mechanisms. Specific information on how to properly wire and connect the System Studies connector blocks to the 289H monitor is provided in Section 4 of this manual.

289H Cables

The electrical connections between the 289H and the connector blocks are accomplished by the use of standard 50-pin, 25-pair cable assemblies. Cables are supplied in six lengths ranging from 5 feet to 250 feet (FIGURE 1-14). Depending upon the type of relay card being used, the cables will be equipped with either two male connectors (for dedicated and subscriber “facility” connections) or one male and one female connector (for subscriber “equipment” connections). A similar, shorter connector cable is used to “jumper” the auxiliary connectors on the 8-connector block. This cable is supplied in one standard length: 24 inches.



The diagram illustrates two cable configurations for connecting a connector block to relay card cables. The left configuration features a cable with a MALE connector at the top and another MALE connector at the bottom. The right configuration features a cable with a FEMALE connector at the top and a MALE connector at the bottom. Each configuration includes a table of part numbers (P/N) and lengths.

P/N	LENGTH
9800-6017-2	2'
9800-6017-5	5'
9800-6017-10	10'
9800-6017-25	25'
9800-6017-50	50'
9800-6017-75	75'
9800-6017-100	100'
9800-6017-150	150'
9800-6017-250	250'

P/N	LENGTH
9800-6016-5	5'
9800-6016-10	10'
9800-6016-25	25'
9800-6016-50	50'
9800-6016-75	75'
9800-6016-100	100'
9800-6016-150	150'
9800-6016-250	250'

FIGURE 1-14: CONNECTOR BLOCK TO RELAY CARD CABLES

