

# Section 1

## **INTRODUCTION**

This manual provides procedures for installing and operating the 289H-M Loop Surveillance System (LSS)<sup>™</sup> monitor. It addresses both new installations and conversions from existing systems.

The manual is divided into the following five sections and six appendices:

1. **Overview** — defines the capabilities of the 289H-M monitor and explains how it works with the PressureMAP<sup>™</sup> software. This section also identifies 289H-M model variations and describes their respective components and capabilities.
2. **Site Planning** — lists the prerequisites and physical requirements for installing the 289H-M LSS monitor.
3. **Installation** — describes how to install the 289H-M LSS and make the necessary power connections.
4. **Connector Block Wiring** — illustrates and explains how to wire device pairs to the 289H-M connector block and make the proper cable connections from the block to the 289H-M relay card.
5. **Start Up and Test Procedures** — explains how to power on the monitor, run the Card Calibration Test, the Ping Relay Test, and any additional tests needed to ensure the correct setup of the 289H-M. Other procedures in this section include testing and replacing blown fuses, and setting up network communication for the LAN Controller Card.

Appendix 1 — **Troubleshooting** — describes both corrective and preventive 289H-M LSS maintenance methods. It also explains how the options in PressureMAP's 289H Diagnostics functions can be used in a number of 289H-M—related applications.

Appendix 2 — **289H-M Reading Messages** — contains examples of possible output readings from the 289H-M monitor.

Appendix 3 — **Technical Notes** — includes documents that pertain to the setup, operation and use of the 289H-M LSS. These were originally published as Release Notes or excerpts from other System Studies documents and newsletter articles.

Appendix 4 — **289H-M Alert Modem Status Code** — explains the possible status codes that PressureMAP can receive from the 289H-M alert modem.

Appendix 5 — **289H-M Diagnostics** — describes each test in PressureMAP's 289H Diagnostics Utility.

Appendix 6 — **Equipment Ordering Information** — includes a listing of available 289H LSS components and their System Studies product numbers.

With the exception of the PressureMAP data entry requirements for the 289H-M, which is described in the *PressureMAP System Data Entry Manual*, this manual provides the general information you will need to place the 289H-M LSS monitor in operation. The sections have been structured to convey only the information required to perform a particular task or procedure. Whenever possible, procedures are numbered sequentially, and illustrations or tables are used to supplement the information provided in the text.

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](mailto: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](http://www.airtalk.com).

## **289H-M LSS OVERVIEW**

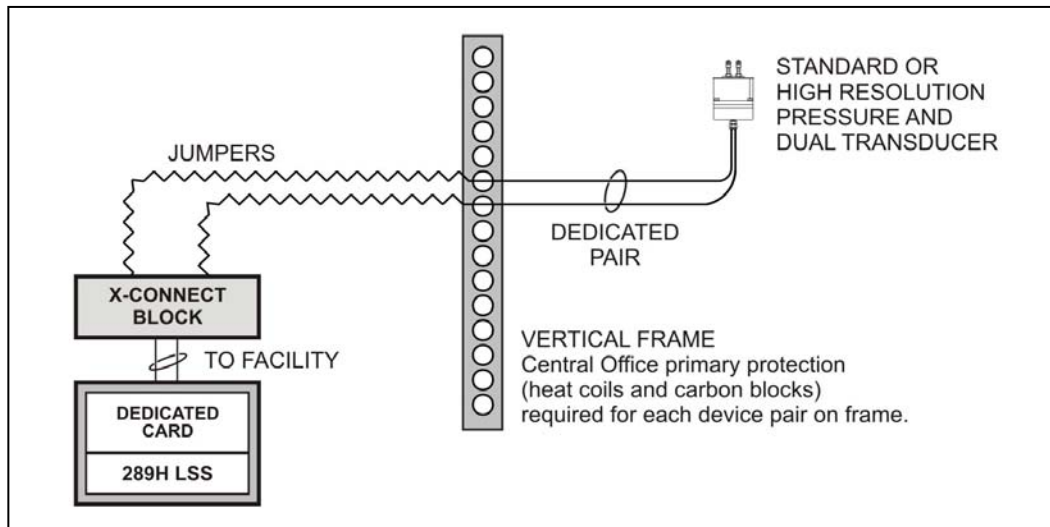
The 289H-M Loop Surveillance System is a simple, multi-application monitor designed for offices with small to moderate monitoring requirements. This “mini” version of the full-size 289H LSS contains a Controller Card (either a modem version or a LAN version), a Utility Card (tone or no tone capability) and one of the following relay cards: 50-pair standard dedicated, 36-pair Sparton Dedicated Replacement (SPDR), or a 25-pair subscriber.

Unlike old-style cable pressurization system monitors, both the 289H and 289H-M LSS are able to obtain readings from System Studies’ solid-state, High Resolution pressure and flow transducers. These transducers, which measure loop current in the range of 4 to 20 milliamperes (mA), are more accurate and versatile than conventional resistive transducers. The 289H-M monitor provides the technology needed to read these transducers on dedicated telephone pairs.

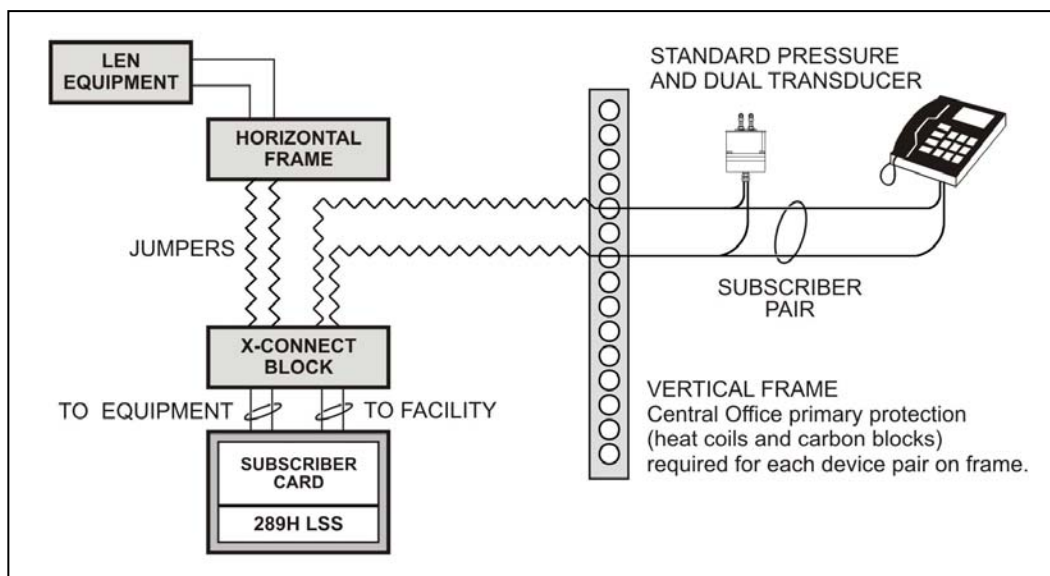
Like the larger 289H LSS, the 289H-M obtains electrical resistance, electrical current, and binary data from remote monitoring devices installed throughout the cable system. The data received from these monitoring devices is converted into air pressure, air flow, and contact alarm information by the PressureMAP monitoring software.

Either dedicated or 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-M chassis are accomplished by means of one or two 25 pair, pre-wired connector/cable assemblies. EXAMPLE 1 represents a typical transducer installation on a dedicated conductor pair, and EXAMPLE 2 illustrates the same type of installation on a subscriber pair.



EXAMPLE 1-1: DEDICATED INSTALLATION



EXAMPLE 1-2: SUBSCRIBER INSTALLATION

### Scanning & Alerting Functions

The 289H-M scans each of the monitoring points wired to its relay card, placing the incoming raw data into memory. This function is performed continually throughout the day and night to provide up-to-date information for determining device readings. PressureMAP calls the 289H-M approximately 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-M monitor's hardware configuration. The data is then converted into meaningful pressure, flow, contact alarm or other information by the PressureMAP software.

If, at any time during its continual scanning of devices, the 289H-M detects a possible alarm condition, it will notify PressureMAP by sending out an alert via its on-board modem or over the

LAN. The criteria for this alerting capability is defined by the user in PressureMAP by setting desired sensitivity levels for the various types of devices wired to the 289H-M.

Unlike conventional monitoring systems that contain expensive memory, computing power, and report generation capabilities, the 289H-M is designed for functional simplicity. It contains only the minimum equipment necessary to provide device data for PressureMAP. It does not attempt to convert data 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, alert evaluation, task dispatching and indexing functions, are performed automatically by the PressureMAP software.

### ***Communication Options***

The 289H-M 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.

### ***Pair Diagnostic Functions***

In addition to collecting device data, the 289H-M significantly reduces the burden of having to manually test conductor pairs. When addressed through PressureMAP, the 289H-M provides access to dedicated and subscriber pairs in order to perform functions similar to mechanized line testing (MLT). Circuits on the 289H-M LSS Controller Card 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 these user-initiated functions, if the 289H-M 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 truly is a short (resistance lower than 100k ohms) or if the flow transducer is pegged.

Another 289H Diagnostics function enables the 289H-M to detect open circuits on device pairs (open IN or open OUT). If, during its scanning of monitoring points, the 289H-M 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.

The 289H-M 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-M, via PressureMAP, can be set up to provide voltage readings (either AC or DC) from tip to ground and from ring to ground.

### ***Tone Generation***

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-M can be equipped with a Tone Utility Card. This card has a tone generator which 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 “locator” tone to specified pairs or place “pair-saver” tone on all dedicated monitoring devices.

**Note:** The full tone capability is available only on dedicated pairs and only for 289H-M monitors equipped with a tone-capable Controller Card (EPROM version B05 or greater), a Tone

Utility Card, and a Dedicated Tone Relay Card (all cards manufactured since December, 1998). To utilize the pair-saver tone capability, the dedicated relay card must be equipped with tone capacitors. However, the user-directed locator tone can be used with older “non-tone” dedicated relay cards, as well as with the current model relay cards. In addition, effective with PressureMAP Version 24, locator tone can be routed to subscriber pairs.

## 289H-M MONITOR DESCRIPTION

The 289H-M consists of a main chassis (15 x 12 x 3 1/2 inches) that has been designed to fit in either a standard 23 or 19 inch equipment rack, using the mounting brackets that are supplied with the monitor (FIGURE 1-1). These brackets allow you to mount the chassis flush with the front of the rack, or slightly forward. The chassis contains a backplane, a controller card, a utility card, and one relay card.

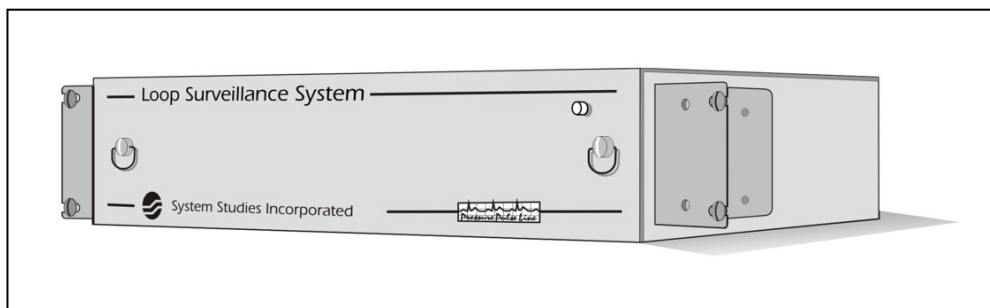


FIGURE 1-1: 289H-M LSS MONITOR

There are several versions of the 289H-M: one for 25 subscriber points (P/N 9800-6302MS-25), one for 36 Sparton dedicated points (P/N 9800-6302MD-36), and one for 50 dedicated points (P/N 9800-6302MD-50). Additionally, each of these variations can be purchased with LAN, tone or both LAN and tone capabilities. (Please refer to Appendix 6 for model explanations and part numbers.)

Device pairs are wired to the 289H-M LSS relay card via a connector block and either one or two 25-pair connector cables. Although several types of blocks may be modified for use with the 289H-M, two standard types of connector blocks are supplied by System Studies Incorporated. Please refer to the “Connector Blocks” information below for more detailed information.

### Controller Card

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

The latest version of the modem Controller Card, shown in FIGURE 1-2, features some advances in the board’s layout design. The modem indicator lights have been moved toward the front of the card, so that they are visible from the front of the chassis when troubleshooting. A visual key, identifying each modem light, is silkscreened on the front edge of the card.

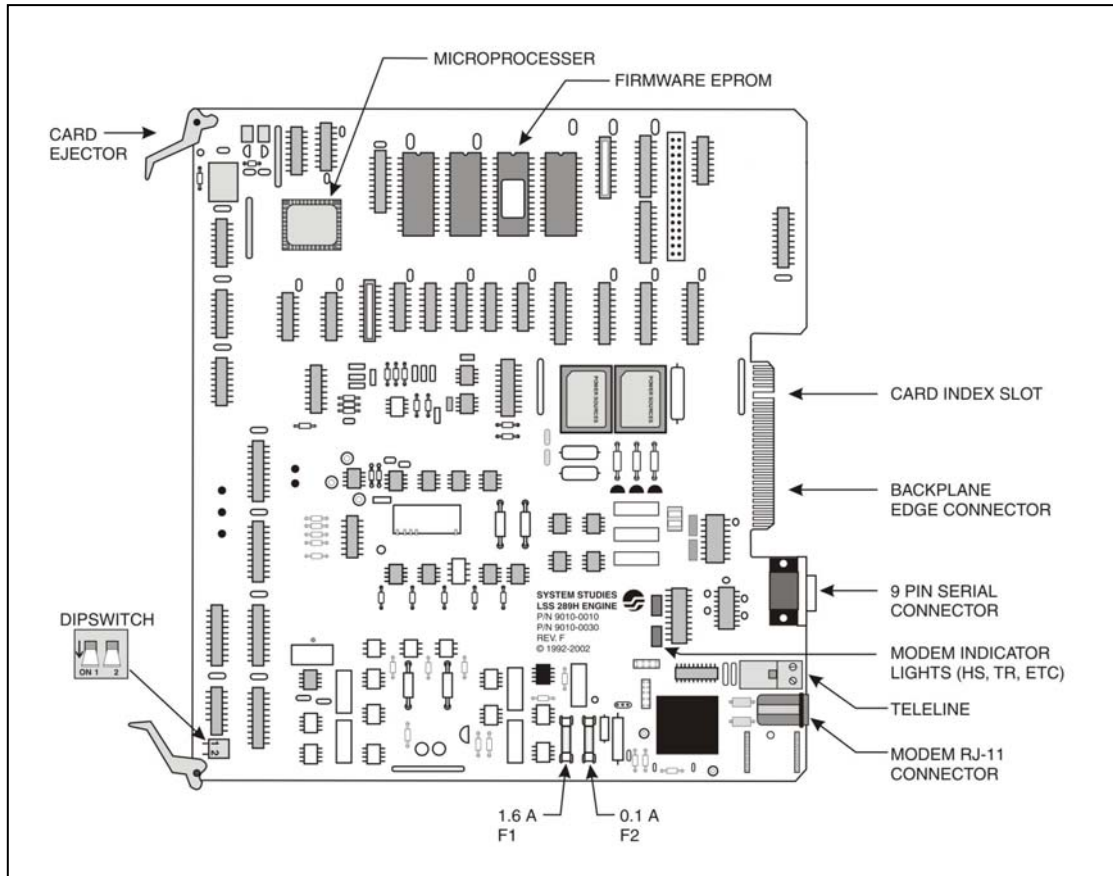


FIGURE 1-2: 289H LSS MODEM CONTROLLER CARD

The LAN Controller Card is shown in FIGURE 1-3. The LAN module is 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. The modem indicator lights, used in diagnostics for the LAN module, are visible from the front of the 289H chassis.

**Note:** As new capabilities were added to the 289H, new versions of the firmware EPROM chip on the Controller Card have been introduced. In addition, new versions have been necessary as suppliers upgrade their products and discontinue old parts. EPROM versions, compatibility requirements and capabilities are described in 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.

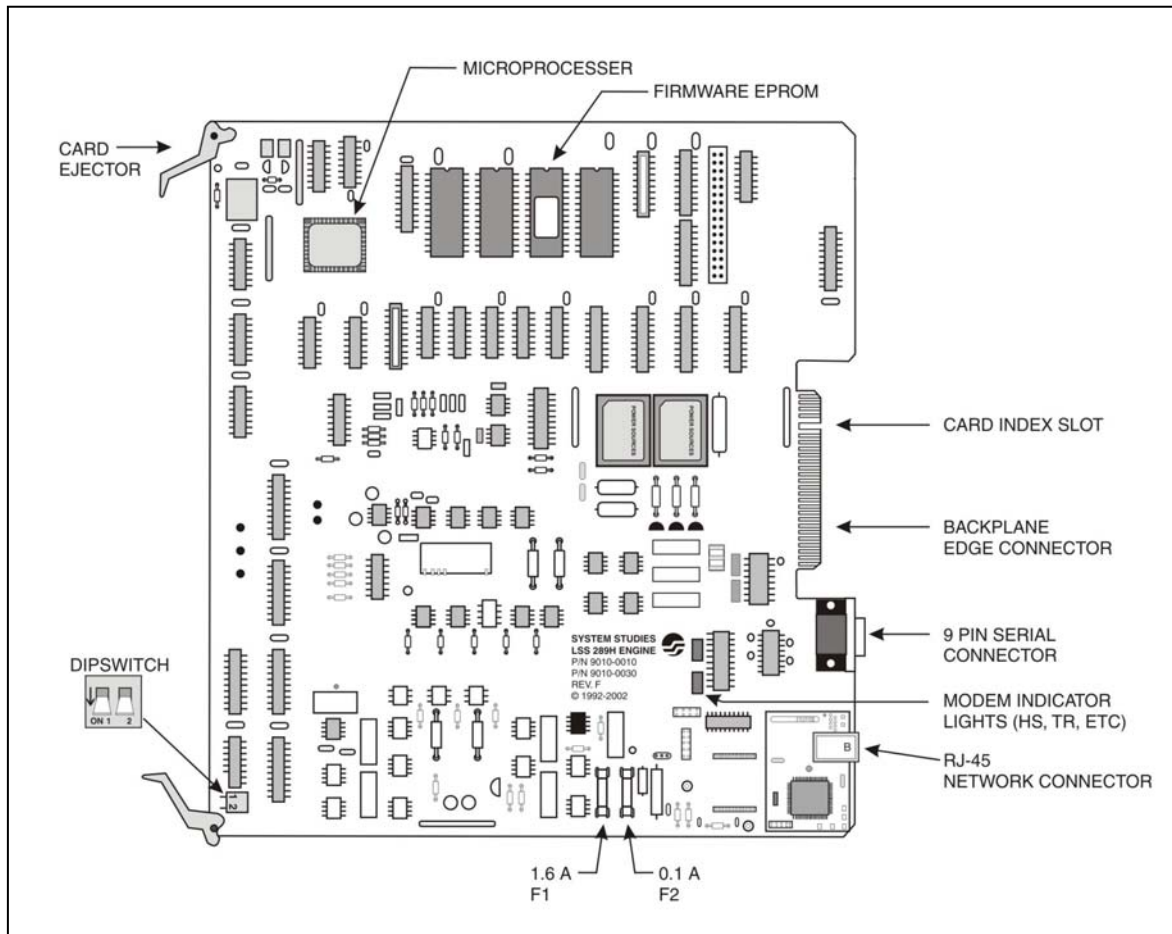


FIGURE 1-3: 289H LSS LAN CONTROLLER CARD



## Utility Card

The Utility Card contains a 48 volt DC power supply, a microprocessor which contains the I/O circuitry for the 289H-M chassis, a power switch, and an alarm enable/disable switch. The newer model, the Tone Utility Card (FIGURE 1-4) is also equipped with a tone generator.

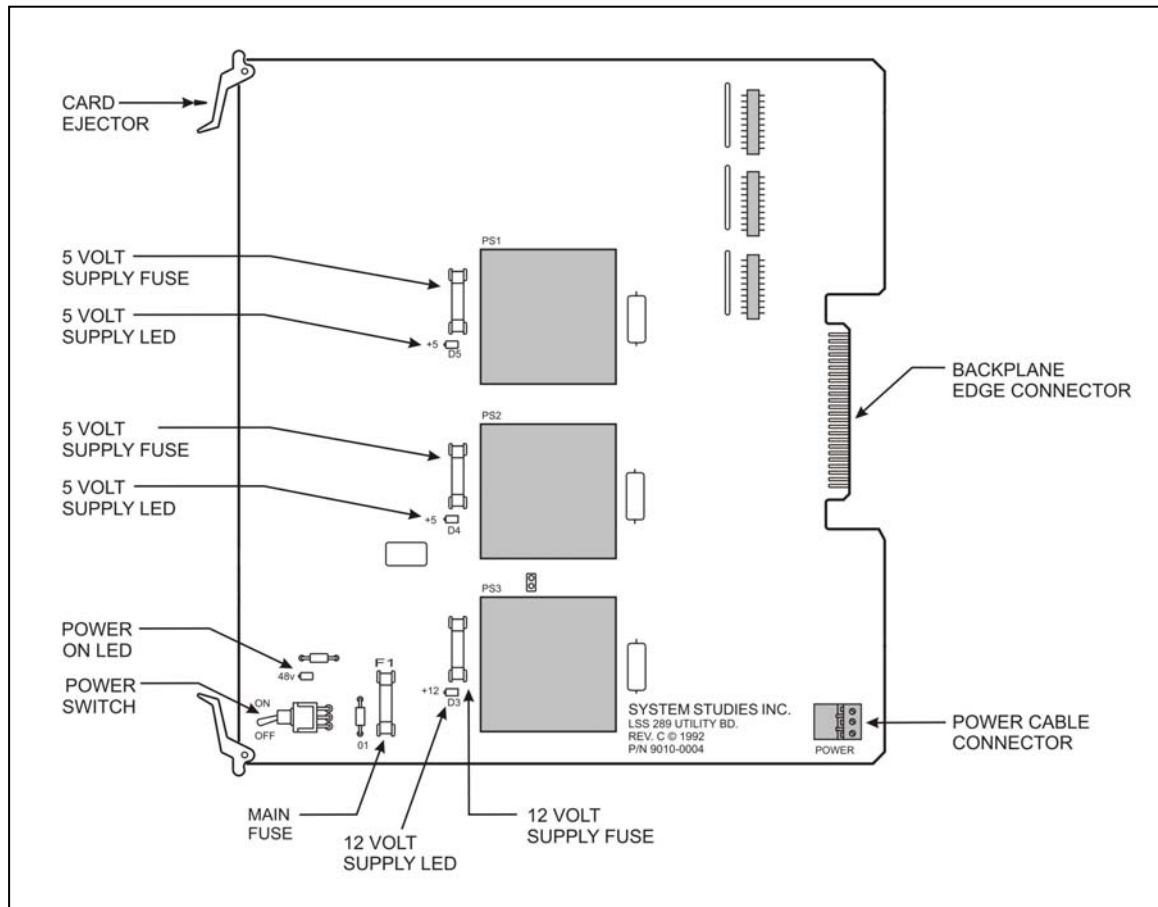


FIGURE 1-4: 289H LSS STANDARD UTILITY CARD

For 289H-M LSS monitors equipped with an earlier version of the Utility Card (FIGURE 1-5), 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 and a Dedicated Tone Relay Card (all cards supplied after December, 1998).



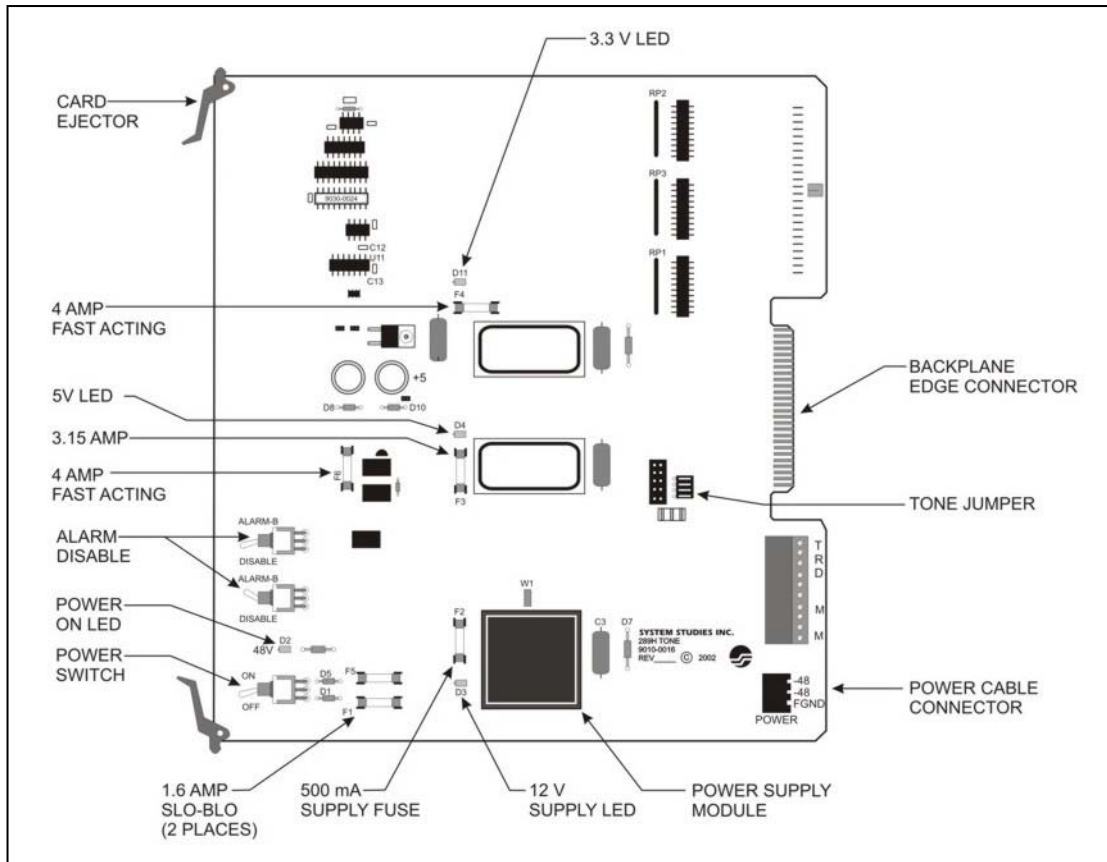


FIGURE 1-5: 289H LSS TONE UTILITY CARD

### Relay Card

There are three types of relay cards that can be used with the 289H-M LSS: 50-pair Dedicated Relay Card (FIGURE 1-6), 25-pair Subscriber Relay Card (FIGURE 1-7), and 36-pair Sparton Dedicated Replacement Card (FIGURE 1-8).

Please note that part numbering information for these relay card options, as well as the corresponding utility and controller card possibilities, are available in Appendix 6 of this manual. Similar information is also available in the *Product Catalog* section of System Studies' Airtalk.com website. Visit [http://www.airtalk.com/z\\_ref-2.htm](http://www.airtalk.com/z_ref-2.htm).

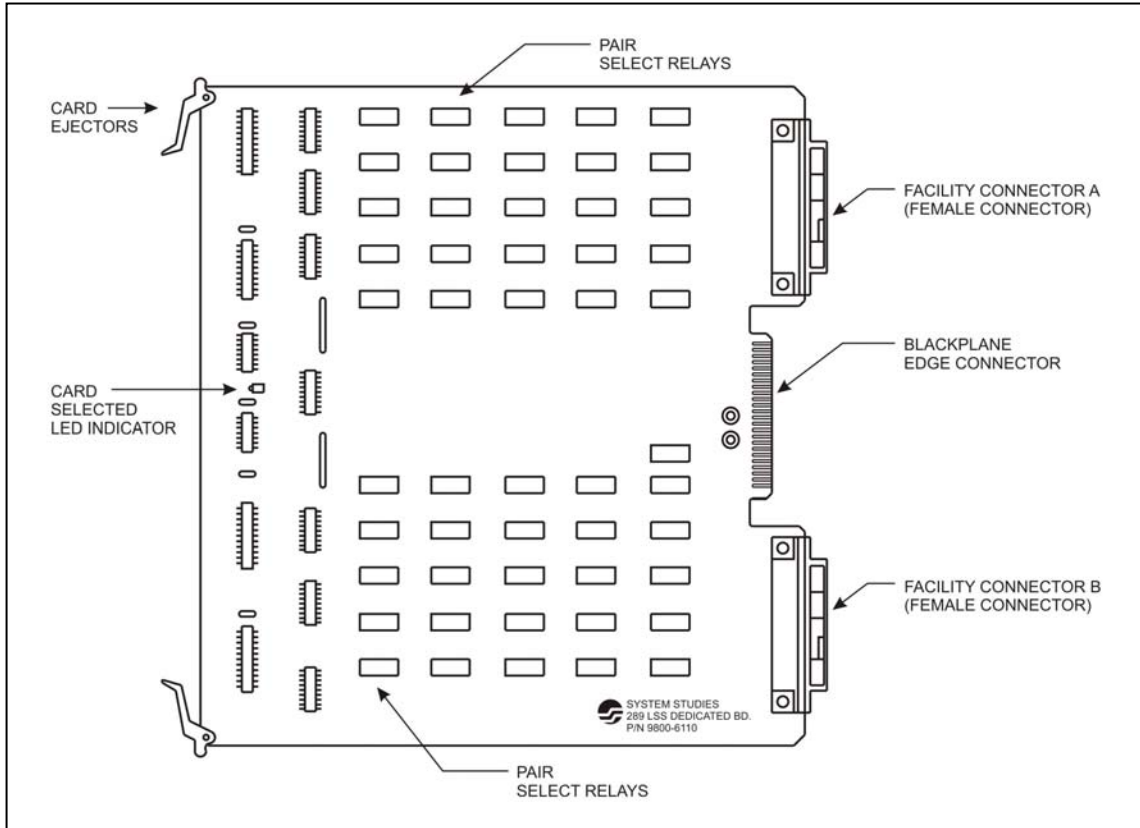


FIGURE 1-6: 289H LSS DEDICATED RELAY CARD

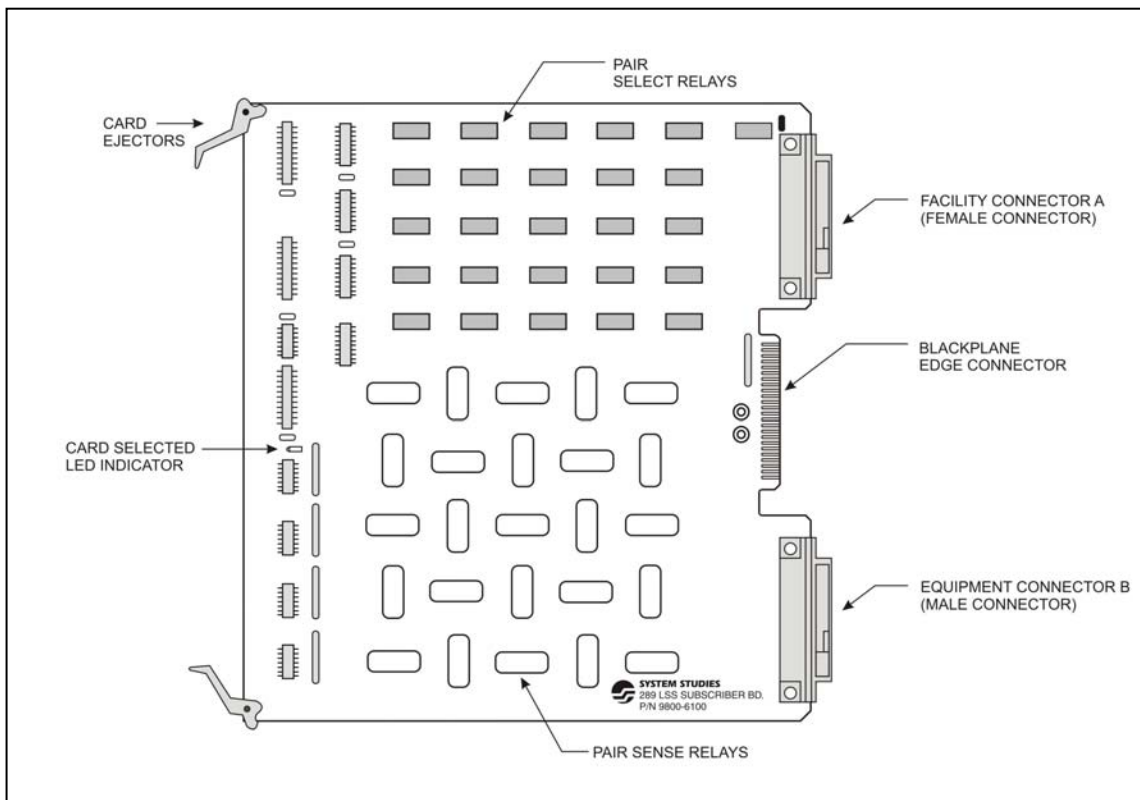
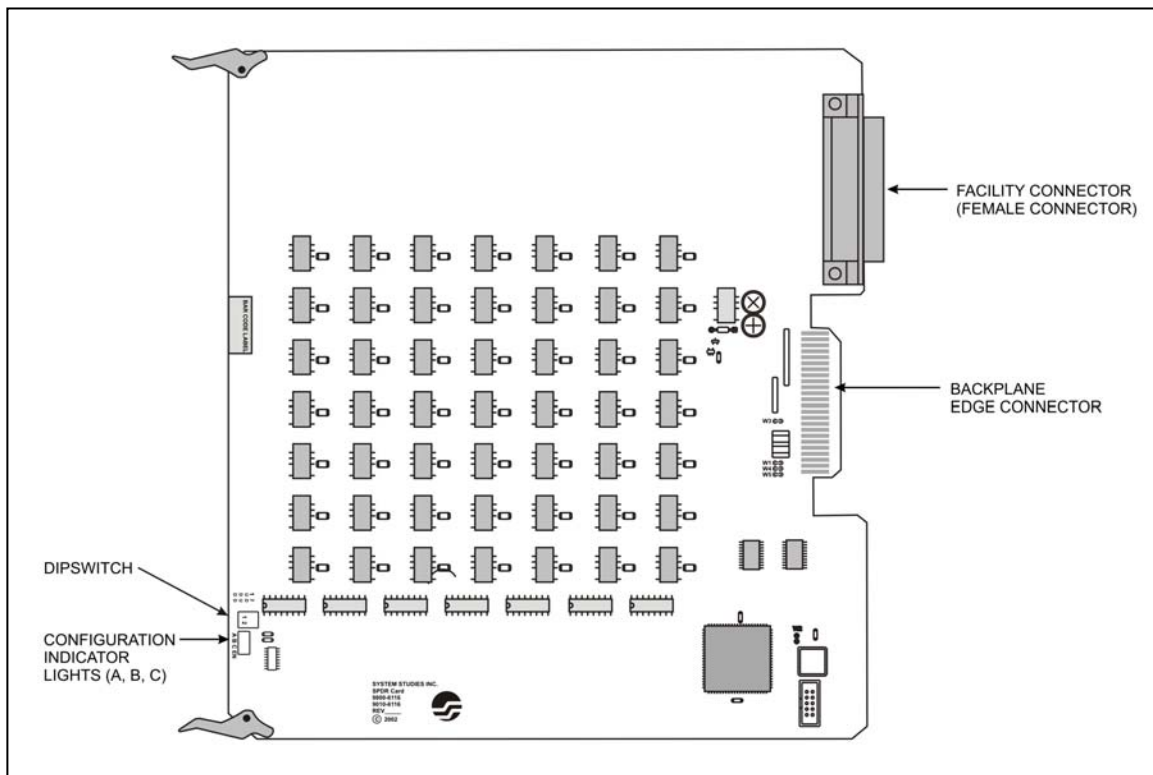


FIGURE 1-7: 289H LSS SUBSCRIBER RELAY CARD



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

The Sparton Dedicated Replacement card (SPDR) is a special-application relay card that streamlines the process of cutting over from a Sparton monitor to the 289H LSS by eliminating time-consuming rewiring and data conversion. The SPDR card contains relays for up to 36 dedicated Sparton pairs, and it connects directly to the existing Sparton dedicated block's A, B or C cables. The on-card dipswitch can be set for A, B or C configuration (as appropriate), to translate the Sparton cable's pinout for 289H monitoring. Labeled LED indicator lights at the front edge of the SPDR identify the installed card's current setting. 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.

Please note that the newer relay card models require that the Controller Card's EPROM version supports that relay card model. For the Sparton Dedicated Replacement Card (SPDR), the EPROM must be Rev. C07, D04, E04, F03, G03 or higher.

EPROM versions, compatibility requirements and capabilities are described in *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.

### **RELAY CARD CONNECTIONS**

On the back edge of each card are either one or two cable connectors. The dedicated card has two female connectors, the SPDR card has a single female connector, and the subscriber card has both a male and female connector. These components can be accessed from the rear of the chassis, making it possible to complete the cabling from a connector block to the 289H-M relay card (FIGURE 1-9).

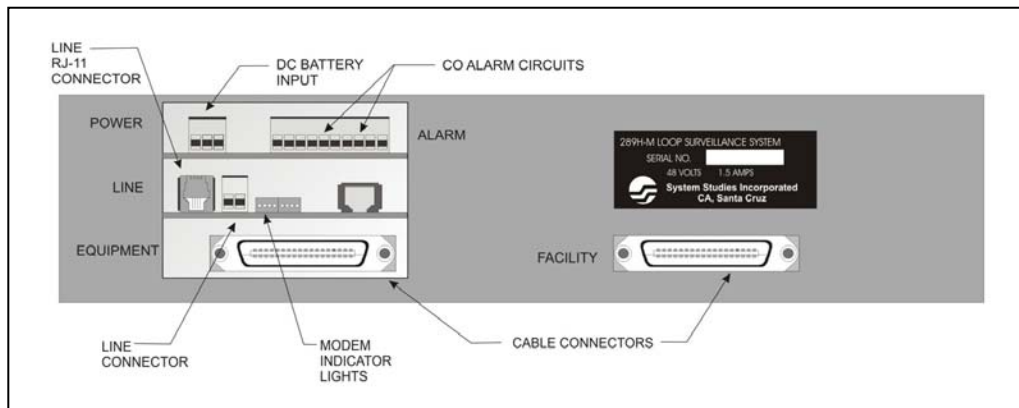


FIGURE 1-9: 289H-M LSS MONITOR (BACK VIEW)

**Note:** If you have an office that has a combination of subscriber and dedicated circuits, it is possible to wire both of these circuits to the subscriber relay card. However, subscriber circuits CANNOT be used with a dedicated card because it does not have busy detection circuitry installed.

## CONNECTOR BLOCKS

In addition to the equipment that is installed in the 289H-M chassis, there are other important components that are required for the successful operation of the 289H-M. 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-M chassis. Although there is 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-M LSS. What distinguishes these blocks from one another is the internal pre-wiring and the arrangement of cable connectors on the bottom of each block.

### Subscriber Block

Regardless of which block is being used, two wire wrap pins are supplied for each incoming device pair. For subscriber circuits, the block is equipped with two additional pins for each device to complete the wiring connection between the field and the central office switching equipment. The pins on this block are arranged in two main groups (left and right), only one of which is used with the 289H-M (FIGURE 1-10).

On the subscriber block the bottom section of the left 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”). These pins are internally wired to the first and third female cable connectors located on the bottom of the block (FIGURE 1-11).

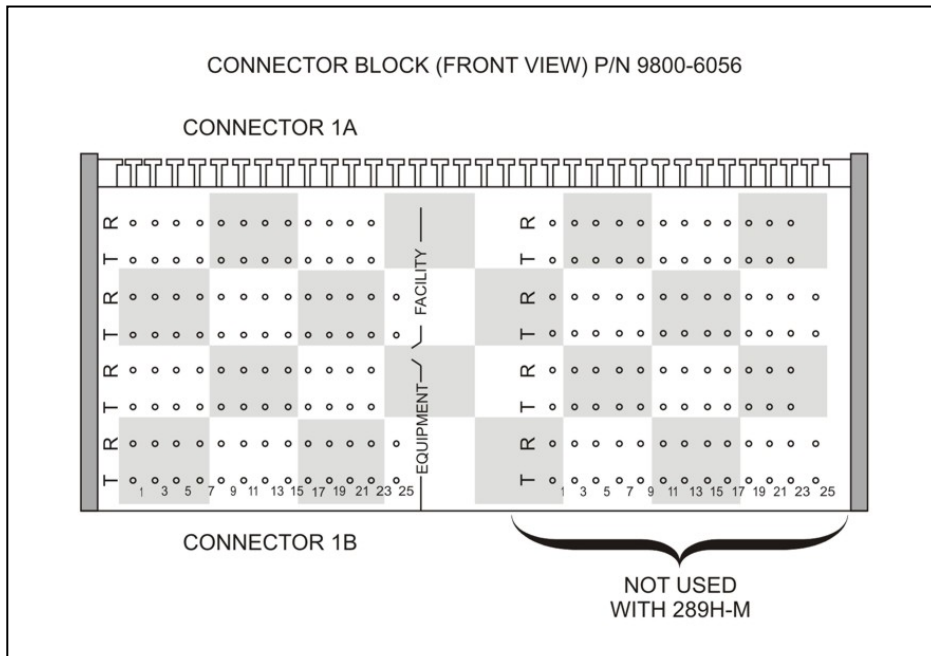


FIGURE 1-10: SUBSCRIBER CONNECTOR BLOCK (PIN ARRANGEMENT)

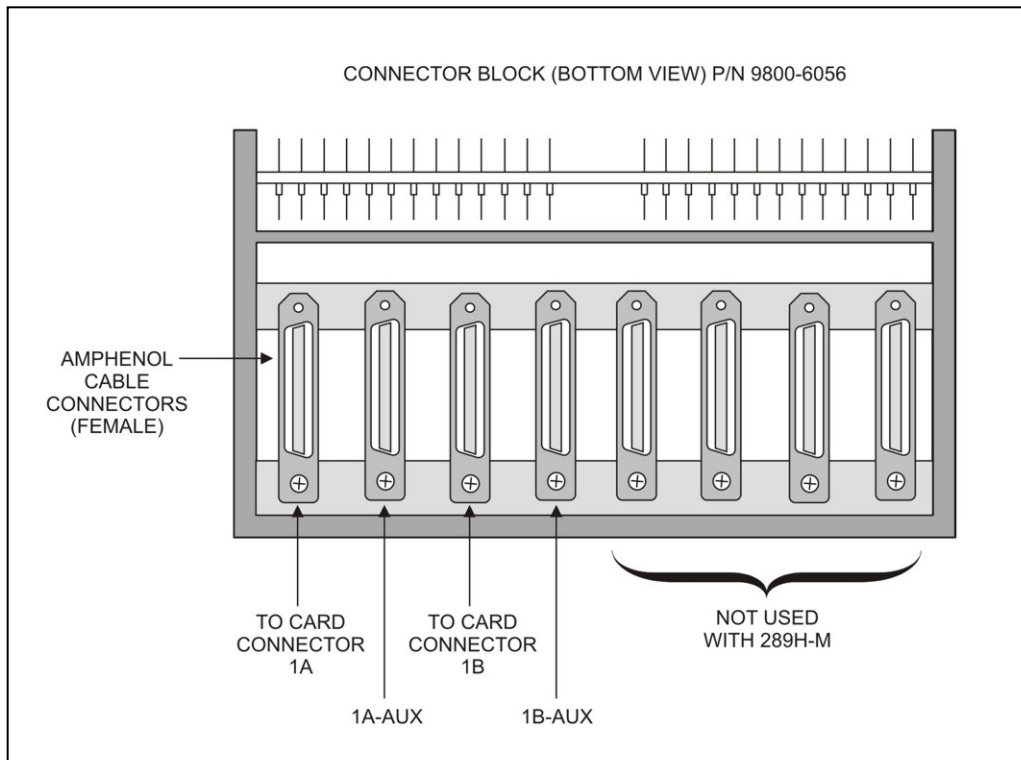


FIGURE 1-11: SUBSCRIBER CONNECTOR BLOCK (CABLE CONNECTORS)

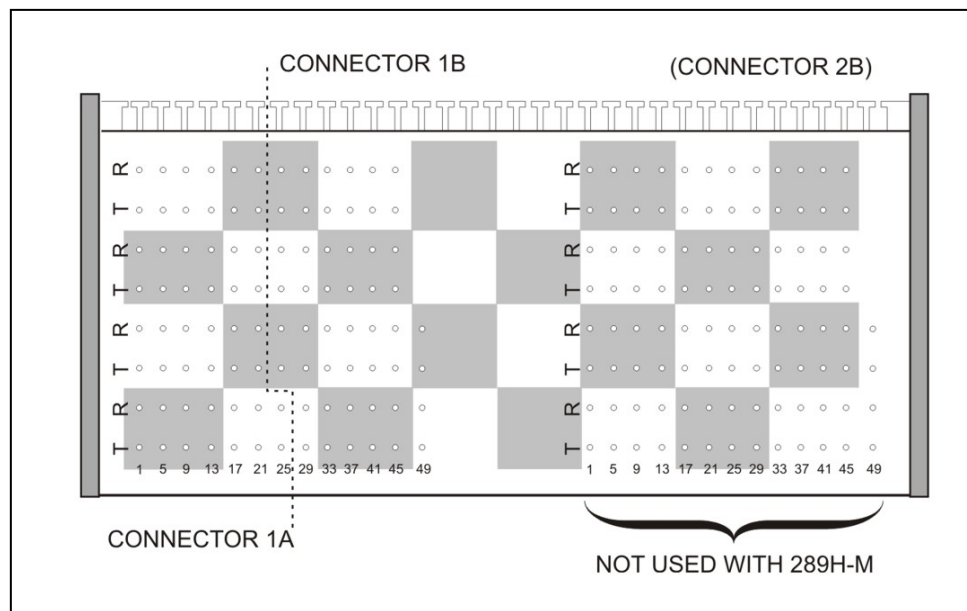
**SUBSCRIBER BLOCK AUXILIARY CONNECTORS**

The 1A-AUX and 1B-AUX connectors (FIGURE 1-11) permit the insertion of a jumper cable, which bypasses the 289H-M if you need to perform maintenance on the monitor. By placing a cable between these 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-M monitor without interrupting service to the subscriber.

**Note:** All of the female Amphenol cable connectors on the subscriber block, with the exception of the auxiliary connectors, are equipped with a locking barb to prevent removal of the cable. Once a cable connection is made, it is permanent. However, because the jumper cable may need to be connected and disconnected to the auxiliary cable connectors, the auxiliary Amphenol connectors are not equipped with locking bars.

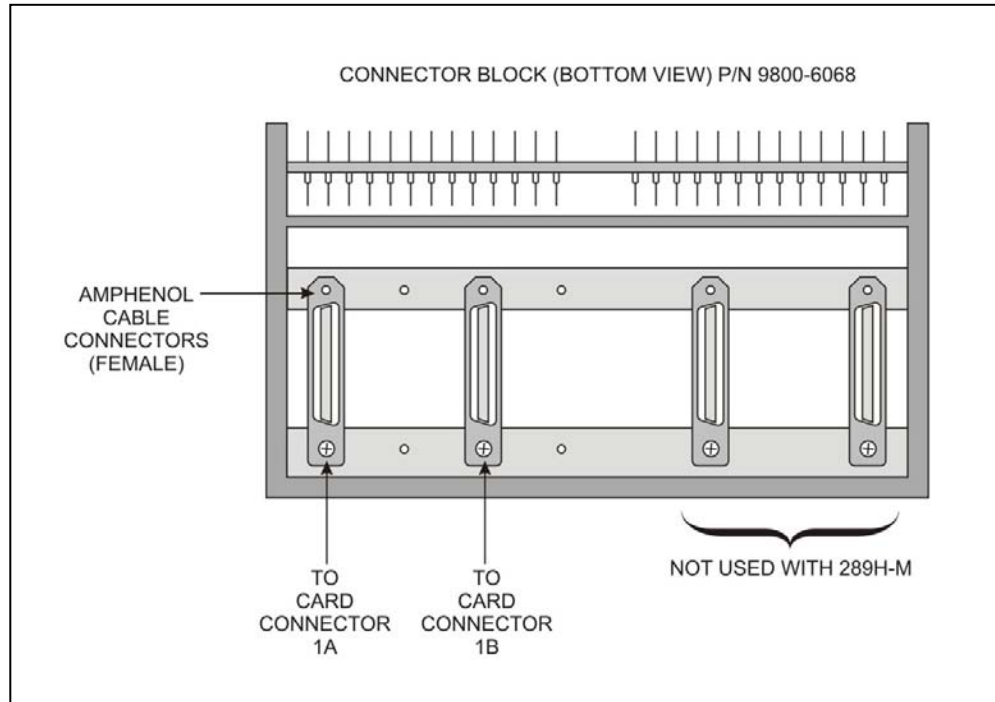
**Dedicated Block**

System Studies' standard dedicated connector block provides the means of physically terminating up to 100 monitoring devices on dedicated pairs. However, when used with the 289H-M LSS, only half of the pins on the block (maximum of 50 pairs) will be required. Therefore, either the left or right group of pins may be used to make the connection to the 289H-M (as in FIGURE 1-12).



**FIGURE 1-12: DEDICATED CONNECTOR BLOCK (PIN ARRANGEMENT)**

The pins on each side of the block are internally wired to two female Amphenol cable connectors located on the bottom of the block. Each connector provides wiring for 25 device pairs (FIGURE 1-12). When wiring the block for a 289H-M cutover or installation, it is important to make sure that the cable connectors used correspond to the group of pins in use.



**FIGURE 1-13: DEDICATED CONNECTOR BLOCK (CABLE CONNECTORS)**

Specific information on how to properly wire and connect the System Studies subscriber and dedicated connector blocks to the 289H-M monitor is provided in Section 4 of this manual.

### **289H-M CABLES**

The electrical connections between the 289H-M and the connector block are accomplished by the use of standard 50-pin, 25-pair cable assemblies. Cables are supplied in six lengths ranging from 5 feet to 100 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 connections) or one male and one female connector (for subscriber connections). 289H-M monitors equipped with a 50 pair dedicated relay card will require two of the cables listed in FIGURE 1-14.

A similar, shorter connector cable is used to “jumper” the auxiliary connectors on the 8-connector subscriber block. This cable is supplied in one standard length: 24 inches. The connectors on both ends of the cable are equipped with a mounting screw in order to make a secure connection to the 289H-M relay card. However, it is not necessary to use the fastening screw on the connection to the connector block, since the cable terminals on the block are equipped with locking barbs, which prevent the cable from becoming dislodged.



MALE	P/N	LENGTH	FEMALE	
	9800-6017-2	2'	9800-6016-5	5'
	9800-6017-5	5'	9800-6016-10	10'
	9800-6017-10	10'	9800-6016-25	25'
	9800-6017-25	25'	9800-6016-50	50'
	9800-6017-50	50'	9800-6016-75	75'
	9800-6017-75	75'	9800-6016-100	100'
	9800-6017-100	100'	9800-6016-150	150'
	9800-6017-150	150'	9800-6016-250	250'
	9800-6017-250	250'		
MALE			MALE	

FIGURE 1-14: RELAY CARD TO RELAY BLOCK CONNECTOR CABLES

In addition to the common connector cables described above, System Studies has designed a unique cable that simplifies the process of connecting a 289H-M LSS monitor equipped with a standard dedicated relay card to a pre-wired Sparton dedicated block (PHOTO 1-1). (This cabling option is an alternative to using the SPDR relay card, described previously in this chapter.)

The Sparton A Cable, P/N 9800-6020, has been modified to accept dedicated device pairs 1 through 36. It plugs into the Sparton end of the connector cable that previously ran from the Sparton dedicated Telzon block to the Sparton monitor. On the 289H-end of the Sparton A Cable are two male Amphenol connectors which are used to make the connection to the 289H dedicated card. Additional information regarding this special cabling is provided in Section 4 of this manual.



PHOTO 1-1: SPARTON A CABLE