Lucent Technologies
Bell Labs Innovations

Data Networking Products Synchronous/Asynchronous Multiplexer Reference

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Preface

The *Data Networking Products Synchronous/Asynchronous Multiplexer Reference* provides a physical description of the individual products in Lucent Technologies' Synchronous/Asynchronous Multiplexer (SAM) product family. Procedures are presented to install, cable, administer, and troubleshoot these products. Commands related to the administration, operation, and maintenance of the various SAMs are described in full. System responses to these commands are also presented.

Important Notice

As of January 1997, Lucent Technologies merged *Datakit* II VCS and MPC15 into one BNS-2000 hardware platform. The new name for *Datakit* II VCS is BNS-2000 VCS; the new name for the MPC15 is BNS-2000 MPC. Ordering will be simplified through the use of one (1) "J" drawing for initial orders. There will be different software for the BNS-2000 and BNS-2000 VCS but one (1) BNS-2000 documentation set that will include the necessary information for the BNS-2000, BNS-2000 VCS, and BNS-2000 MPC. Existing Datakit II VCS and BNS-2000 customers will receive the new documentation set when they purchase upgrades.

The BNS-2000 hardware platform will consist of the following options:

- BNS-2000. This is the BNS-2000 M1/M2 cabinet configuration supporting both low-speed (M1) and high-speed (M2) modules. This configuration will require BNS-2000 software.

- BNS-2000 VCS. This is the BNS-2000 VCS M1-only cabinet configuration supporting low-speed (M1) modules. The M1 cabinet will contain clock/repeater modules as opposed to CIM/CTRM modules contained in BNS-2000 M1 cabinets. M2 cabinets are not required. This configuration requires BNS-2000 VCS/Datakit II VCS R6.0 software.

- BNS-2000 MPC. This is the BNS-2000 MPC M1 Multipurpose Concentrator cabinet configuration.

All BNS-2000 offerings described above are managed by *StarKeeper* II Network Management System (NMS). (When configuring BNS-2000 VCS, customers select "Datakit II VCS" as the node option.)

BNS-2000 training courses will be updated to include information on the BNS-2000 VCS and BNS-2000 MPC offerings.

Document Organization

The *Data Networking Products Synchronous/Asynchronous Multiplexer Reference* consists of the following chapters:

SAM Overview includes a physical description of the SAMs and a discussion of their common features. Diagrams are included with the description of the hardware components for each SAM type.

SAM Installation describes the installation requirements of each SAM, including floor space required, power and grounding specifications, tools needed to complete the installation, and step-by-step instructions for each installation procedure.

SAM Cabling describes the cabling requirements for the various SAMs including the cabling requirements for asynchronous and synchronous connections. Ordering information for cables and adapters is also presented.

SAM Administration provides procedures for administration of the SAMs including how to enter, change, move, and copy SAM database information.   Available reports, used to assist with analysis of SAM/Network performance, system expansion, troubleshooting, and other routine tasks, are listed.

SAM Troubleshooting provides the information and procedures needed to troubleshoot the various SAMs.

SAM Commands provides a detailed reference of the commands needed to administer, control, and maintain the various SAMs.   Included are command syntax sections, explanations of parameter options, input/output examples, report field definitions, and system responses.

In addition, two appendixes are included. One explains the implications of EIA RS-232-C lead states when SAM service types are administered as *console, host, terminal, modem, dialer,* or *2way* and flow control is administered as *eia*. The other presents the SAM database entry forms. Tables of contents and an index help to locate information quickly.

Related Documentation

BNS-2000 Publications describes the complete documentation sets available. (See the inside front cover for ordering information.) The following companion documents provide related information:

- *BNS-2000 Node Reference*

- *BNS-2000 System Description*

- *Data Networking Products Commands Reference*

- *Data Networking Products Messages Reference*

- *Data Networking Products Ordering Guide*

- *Data Networking Products Planning Guide*

SAM Overview

SAM Overview

This chapter provides a physical description of the individual products in the Lucent Technologies Synchronous/Asynchronous Multiplexer (SAM) product family and a discussion of their common features. Subsequent chapters explain how to install, cable, administer and troubleshoot the products.

The SAM product family consists of the following Synchronous/Asynchronous Multiplexers:

- Synchronous/Asynchronous Multiplexer 16-port (SAM16)

- Synchronous/Asynchronous Multiplexer 64-port (SAM64)

- Synchronous/Asynchronous Multiplexer 504-port (SAM504)

- VDM Synchronous/Asynchronous Multiplexer 504-port (VDM-SAM504)

Various SAMs are supported by BNS-2000 and BNS-2000 VCS nodes; refer to the *BNS-2000 System Description*.

SAM Common Features

All of the SAM products support the following features on a per-port basis:

- predefined destination (PDD) protocol support for bisync, high level data link control (HDLC), synchronous data link control (SDLC), digital data communications message protocol (DDCMP), Burroughs Poll/Select, Uniscope, and asynchronous protocols.

- 75 bps to 19.2 Kbps full-duplex ASCII and other configured asynchronous data transmission speeds

- 110 bps to 9.6 Kbps full-duplex synchronous data transmission for SAM64 and SAM504; up to 19.2 Kbps for SAM16

- break signal handling

- odd, even, and no parity options for asynchronous ports and ASCII bisynchronous ports

- XON/XOFF and Electronics Industry Association (EIA) flow control in both directions

- autobaud detection for asynchronous ports

- variable service types, including console, terminal, host, two-way and modem,

- voice/data multiplexer (VDM) diagnostics

- permanently active port (PAP) option, which permits SAM synchronous ports to be "active" as soon as they are put into service; calls between ports can remain up regardless of EIA lead state changes in network endpoints

- attention session and attention action for asynchronous modem, two-way, and terminal service

- connect time billing for asynchronous modem, two-way, and terminal service

- non-return to zero (NRZ) and non-return to zero inverted (NRZI) support to handle encoding and decoding of serial data communications

- internal and external message pipelining

- user connections administrable in software as configurable port options

- end-to-end network diagnostics and management

- average and peak utilization measurements for SAM links

- database configurations commenting for SAM ports

- real-time EIA status for SAM ports

- DTE or DCE emulation for synchronous ports

SAM16 Physical Description

The Synchronous/Asynchronous Multiplexer 16-port (SAM16) provides 16 ports that can be configured individually to work with any supported synchronous or asynchronous service. It can combine 16 data channels onto a single or dual line for transmission through a trunk to a data switch.

SAM16 services are fully compatible with synchronous and asynchronous ports of the Lucent Technologies family of fast packet switches, which include the BNS-2000 and BNS-2000 VCS. The SAM16 connects to a node over a single or dual communication facility using either an EIA RS-232-D or V.35 interface. Each trunk is equipped with a redundant connection that provides backup should the main trunk link fail. An external modem or data service unit (DSU) is required to connect to the node.

All SAM 16 components are housed in a desktop cabinet 17-inches wide by 13-inches deep and 4.4-inches high. The SAM16 is shown in the following two figures.
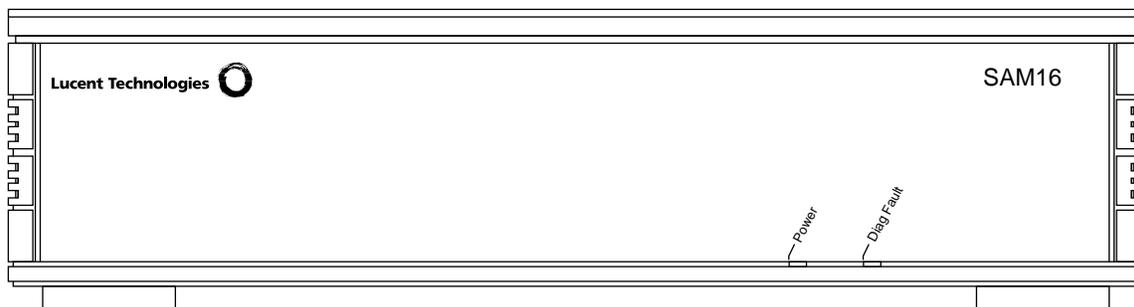
FIGURE 1-1. SAM16 Front View
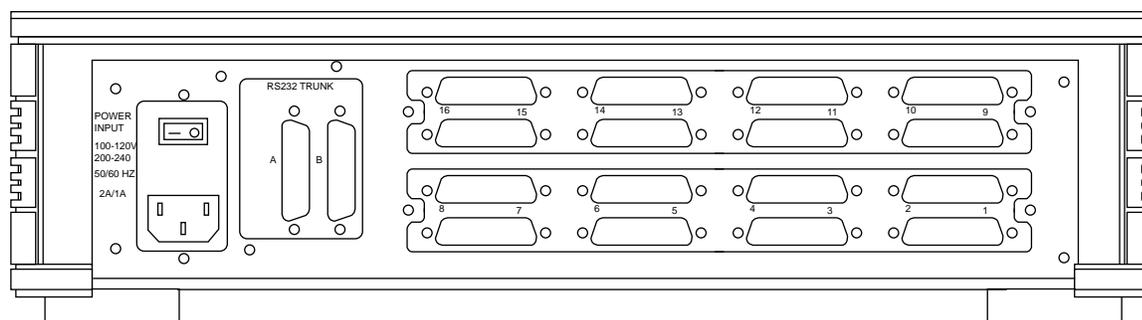
(Equipped with dual RS-232-D Trunk Option)

FIGURE 1-2. SAM16 Rear View

SAM16 Hardware Components

The SAM16 consists of modules, an AC or DC power supply, and fans.

SAM16 Modules

Four modules are used with the SAM16. The CPW1 main module is the main processor board. The CPY1 interface module is the customer interface board. Each board contains eight ports, so two boards are required. Each port is DCE and can run at speeds of up to 19.2 Kbps for asynchronous and synchronous transmission. The CRA1 V.35 Trunk Module (1 or 2) and the CRA2 RS-232-D Trunk Module are the trunk interface boards. Either one can be used with the SAM16.

SAM16 Power

The SAM16 can be equipped with one of two power supplies: an AC or DC power supply, which must be specified by customer upon purchase.

The AC power supply used with the SAM16 is a 50-watt auto-ranging (90–250 VAC, 50/60 Hz) supply with a +5 VDC main output rated at 6.8A and two auxiliary 12 VDC outputs rated for 0.5A each.   The supply provides overload and short-circuit protection for all outputs and overvoltage protection for the main output.   The maximum ambient operating temperature for the power supply is 40° C.

The DC power supply used with the SAM16 is a 50-watt auto-ranging (-42 to -60 VDC) supply with +5 VDC main output rated at 6A and two auxiliary 12 VDC outputs rated for 0.5A each. The supply provides overload and short-circuit protection for all outputs and overvoltage protection for the main output. The maximum ambient operating temperature for the power supply is 40° C.

SAM16 Fans

Two fans are provided with the SAM16.   Each fan is rated for 9 cubic feet per minute (CFM) of cooling and requires +12 VDC, .06A.

SAM16 Hardware Controls and Indicators

The front and rear panels contain the following controls and indicators:

- The front panel of the SAM16 is equipped with two LEDs, one red and the other green.   The red LED, labeled Diag Fault, lights during power-on initialization and then again if a diagnostic fault occurs on the CPW1 circuit board.   The green LED lights when the SAM16 is powered on and indicates whether the SAM16 is powered on or not.

- The rear panel contains 16 user interface connectors, two trunk interface connectors, the on/off switch, and the power input connection.   The on/off switch is the main power control for the SAM16, and also serves as the reset switch should the SAM16 need to be restarted. The in-line fuse for AC power applications is found within the power input connection.

SAM64 Physical Description

The Synchronous/Asynchronous Multiplexer 64-port (SAM64) multiplexers from 1 to 64 ports onto a single trunk line for transmission to the node.

The system can be configured for AC (input voltage range 90–264 VAC, 50–60 Hz) or DC (input voltage range −42 to −60 VDC) operation. The basic system is equipped with one controller board (TN1394B or TN1394C) and one TERM32 board to provide 32 synchronous/asynchronous ports. Available options include a second TERM32 and any one of the following trunks (only one trunk per system): T1-TRUNK, HS-TRUNK, SAMSL V.35, SAMSL RS-232, or SAMDL RS-232.

The SAM64 is shown in the following figure.
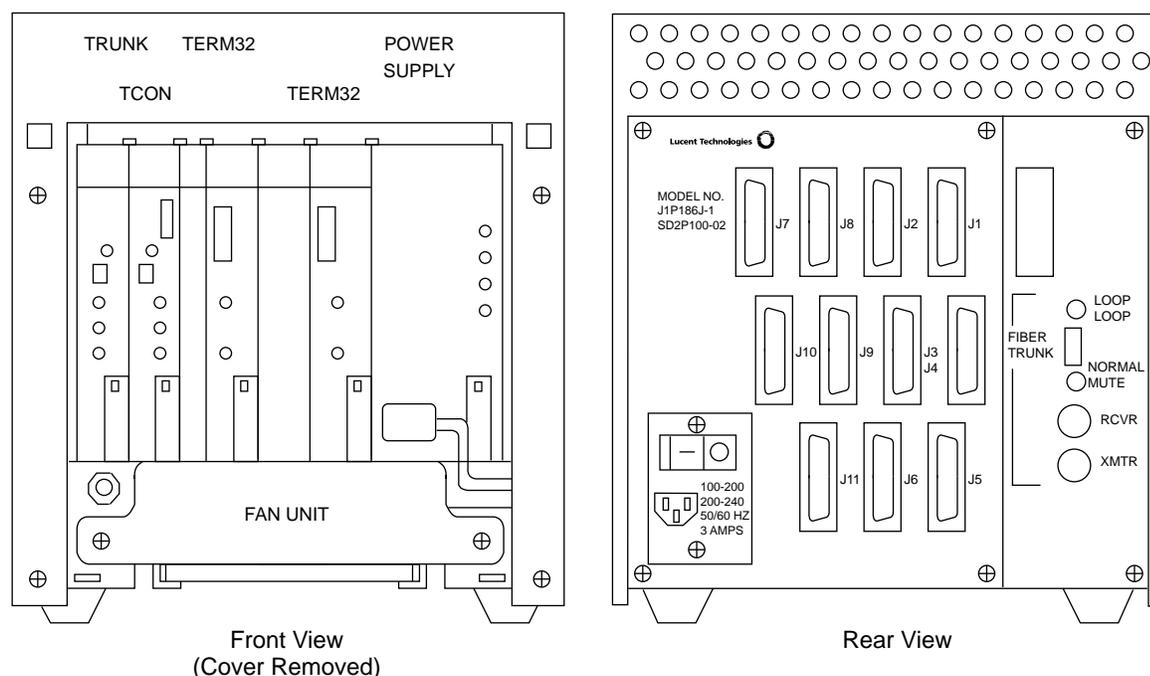
FIGURE 1-3. **SAM64 Front and Rear Views**

SAM64 Hardware Components

SAM64 hardware components include modules, an AC or DC power supply (must be specified by customer upon purchase), and a fan tray assembly.

SAM64 Modules

Modules used with the SAM64 include the TCON, TERM32, T1-Trunk, HS-Trunk, SAMSL, and SAMDL. Each module is discussed in the sections that follow.

TCON in the SAM64.   The TCON module (TN1394B/TN1394C) is the controller for the SAM64. Its functions include the following:

- translating data between the trunk module and the TERM32 modules

- controlling the node, Time Division Multiplexer (TDM), and download buses

- initializing the trunk module

- downloading and controlling up to 16 processor stations located on the TERM32 modules

- receiving the primary download from the node for subsequent downloading to the TERM32 modules

- accumulating and reporting status data for the SAM64

- emulating the node Clock, Switch, and integral Control Computer functions for the SAM64

Since the TCON module communicates only with the integral Control Computer and the stations that control the user ports, all of the functions listed above are transparent to the user.

NOTE: The TCON module does not use an input/output (I/O) distribution board.

TERM32 in the SAM64.   The TERM32 module (UN315) can interface with terminals, host computers, personal computers, or modems.   It can provide up to 32 serial, asynchronous, full-duplex ports that run at speeds up to 19.2 Kbps, or 32 serial, synchronous, full-duplex ports that run at speeds up to 9.6 Kbps.   Autobaud detection is supported in asynchronous mode.   In addition, the TERM32 module optionally supports XON/XOFF flow control and Clear To Send/Request To Send (CTS/RTS) flow control.   Odd, even, and no parity features are supported. In synchronous Data Carrier Equipment (DCE) mode, the module generates the transmit and receive clocks, and in synchronous data terminal equipment (DTE) mode, it accepts synchronized transmit and receive clocks.

Five types of diagnostics are provided for the SAM64 module, including on-line, off-line, module, board-level, and port-level.

Module diagnostics test the trunk in both the SAM64 and the node, and the TCON. Board-level diagnostics test the integrity of a particular TERM32 circuit board in both on-line and off-line states (in and out of service, respectively).   Port-level diagnostics test the integrity of a specific TERM32 port and any interface cabling connected to the port (for off-line diagnostics only).

I/O connections to the TERM32 modules are made through eleven 50-pin receptacle connections on the rear panel (Figure 1-3).   The relationship between the TERM32 modules and I/O connections is shown in the following table.

NOTE: J6 has only four circuits.

_____

TABLE 1-1. TERM32 I/O Connectors

Ports	TERM32 Modules	I/O Connector
1–6	1	J1
7–12	1	J2
13–18	1	J3
19–24	1	J4
25–30	1	J5
31–32	1	J6
33–38	2	J7
39–44	2	J8
45–50	2	J9
51–56	2	J10
57–62	2	J11
63–64	2	J6

Pin-out information for I/O connectors J1 through J11 is shown in the following figure.

```
                    J ( )
         1  │ RLSD 1        NC │  50
         2  │ CTS 1      GRD 6 │  49
         3  │ DTR 1       RD 6 │  48
         4  │ RTS 1      GRD 6 │  47
         5  │ RLSD 2      TD 6 │  46
         6  │ CTS 2      GRD 5 │  45
         7  │ DTR 2       RD 5 │  44
         8  │ RTS 2      GRD 5 │  43
         9  │ RLSD 3      TD 5 │  42
        10  │ CTS 3      GRD 4 │  41
        11  │ DTR 3       RD 4 │  40
        12  │ RTS 3      GRD 4 │  39
        13  │ RLSD 4      TD 4 │  38
        14  │ CTS 4      GRD 3 │  37
        15  │ DTR 4       RD 3 │  36
        16  │ RTS 4      GRD 3 │  35
        17  │ RLSD 5      TD 3 │  34
        18  │ CTS 5      GRD 2 │  33
        19  │ DTR 5       RD 2 │  32
        20  │ RTS 5      GRD 2 │  31
        21  │ RLSD 6      TD 2 │  30
        22  │ CTS 6      GRD 1 │  29
        23  │ DTR 6       RD 1 │  28
        24  │ RTS 6      GRD 1 │  27
        25  │ NC          TD 1 │  26
```

Lead designations are for asynchronous connections where SAM64 is a DTE device.
For synchronous connections where SAM64 is a DTE device, all CTS leads are CLOCK IN.

Typical I/O Connector (J1 – J11) Pin-out

FIGURE 1-4. Pin-out Information for TERM32 I/O Connectors

T1-Trunk in the SAM64.   The T1-Trunk module (TN1392) provides long-distance high- or medium-speed, point-to-point communication from the SAM64 over common carrier facilities to the supporting node.   The supporting node uses the complementary Trunk-T1 module (TN1015).

The T1-Trunk supports a maximum of 512 virtual circuits, with 504 available for end-user traffic.   Actual virtual circuit capacity is a function of user traffic characteristics and speed of the SAM64-to-node connecting link.

The SAM64 T1-Trunk module does not have a corresponding I/O distribution board but comes equipped with a module-to-DSU connecting cable that provides a 37-pin RS-449-type receptacle connector labeled J12.   RS-422 data and clocking signals are used along with RS-232-D control lead signals for this trunk connection.

NOTE: Operation below 56 Kbps is not recommended.

For T1 (1.544 Mbps) operation, the *D/I MUX*™ Multiplexer, the *Phoenix 1536*™ single-channel multiplexer, the *Saturn D4/ESF*™ Modem, or equivalent T1 multiplexer is the recommended equipment to perform the DSU function.   Most applications will require the use of a channel service unit (CSU) to provide network protection, automatic loop equalization, and maintenance loopback testing between the DSU and the T1 network. The *T-Serv*™ T1 CSU, or equivalent, is the recommended equipment to provide the CSU function.

NOTE: For 56 Kbps operation, the Lucent Technologies 2556 DSU or 2656 DSU, or equivalent unit, is recommended.

The SAM64 T1-Trunk module is always used in conjunction with a Trunk-T1 module in the supporting node, regardless of the link speed chosen (1.544/2.048 Mbps or 48/56/64 Kbps).

HS-Trunk in the SAM64.   The HS-Trunk module (TN1391) is installed in the SAM64 to provide limited distance, high-speed, point-to-point communication over a fiber-optic link to the supporting node.   The node uses the complementary Trunk-HS module.

This module supports a maximum of 512 virtual circuits, up to 504 of which are available for end-user traffic.   The high-speed link is capable of running at 8 Mbps on optical fibers up to a maximum distance of 3 km.

The HS-Trunk module is a simple-state machine, not programmable.   There is a cyclic redundancy check (CRC) to detect bad frames, which are discarded.   Error correction and retransmission are the responsibility of either the interface modules (e.g., TERM32) or the higher-level protocols involved.   The recommended fiber cable is a multimode fiber (62.5/125μm) cable terminated with Straight-Tip (ST)®-style connectors.

I/O connections are made via the rear panel access to the CEY1 I/O distribution board.

SAMSL in the SAM64.   The SAMSL module (MC1D090A1B) is the wire interface at each end of a digital data system (DDS) or analog transmission facility connecting a node and a SAM.   It supports EIA RS-232-D connections at 9.6 or 19.2 Kbps and V.35 connections up to 56 Kbps. It also provides software for boot-up diagnostics, loop diagnostics, and channel selection. The SAMSL I/O connections are:

- *V.35 Connections -* The CEY2 I/O distribution board provides one 34-pin, Winchester-type, V.35 DTE receptacle connector accessed from the rear panel.   DSUs, such as the Lucent Technologies Model 2556 or 2656, are required for this connection.

- *RS-232-D Connections -* The CEY3 I/O distribution board provides one 25-pin subminiature RS-232-D DTE receptacle connector accessed from the rear panel. Lucent Technologies Model 2596 or 2696 DSUs are used in this configuration.

SAMDL in the SAM64.   The SAMDL module (MC1D106A1) is the wire interface at the SAM64 end of a DDS or analog transmission facility. It connects to a SAMML in the node.   It supports two EIA RS-232-D port connections.

The SAMDL I/O connection is RS-232-D. The CEY4 I/O distribution board provides one 25-pin subminiature receptacle connector.   The cable, ED5P055-31, G219, converts from a single 25-pin RS-232-D plug subminiature to two, 25-pin, RS-232-D plug subminiature connectors.

SAM64 Power

The SAM64 can be equipped with an AC or DC power supply.

The AC power supply (TN2166) used in the SAM64 is a 140 watt (170 watt peak) auto-ranging (90–132/180–264 VAC, 50–60 Hz) supply with a main +5 VDC output rated at 20A and two auxiliary 12 VDC outputs rated for 5A (+) and 3A (−).   This supply provides overload and short-circuit protection for all outputs and overvoltage protection for the main output.   The supply requires 25 CFM of forced air cooling at full rated load, which is provided by the internal fan unit.

The DC power supply (TN2167) used in the SAM64 is a 125 watt, −42 to −60 VDC input supply with a main +5VDC output rated at 20A and two auxiliary 12 VDC outputs rated at 5A each. This supply provides overload and short-circuit protection for all outputs and overvoltage protection for the main output.   The power supply requires 25 CFM of forced air cooling at the full rated load, which is provided by the internal fan unit.

SAM64 Fan Tray Assembly

The fan tray assembly (405753187) consists of the following:

- two fans

- a fan power filter circuit board (BCM1)

- a fan particle filter

This unit is accessed from the front of the SAM64 and slides out for service. The following figure shows the fan tray assembly.
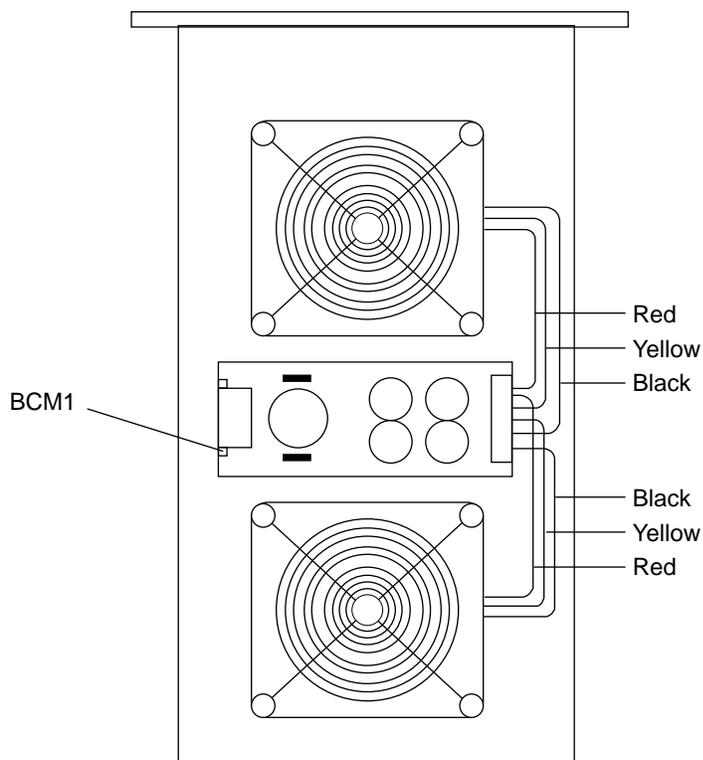
FIGURE 1-5. SAM64 Fan Tray Assembly

SAM64 Hardware Controls and Indicators

Faceplate controls and indicators are used to monitor and control the SAM64 modules.

are equipped with test points to verify the output voltages.

The TERM32 module contains two indicator lights and a trace channel connection, as shown in Figure 1-6 and described in Table 1-2.

_____

TABLE 1-2. TERM32 Faceplate LEDs

Item	Label	Function
Red LED	FAULT	Internal TERM32 fault or reset mode
Green LED	POWER	+12 VDC, -12 VDC, +5 VDC are present when lit

Faceplate label marks are presented in Table 1-3.

_____

TABLE 1-3. Label Marking

HS-Trunk	T1-Trunk	SAMSL	SAMDL
TN	TN	MC	MC1D
1391	1392	1D090 A1B	106A1
HS TRK	T1 TRK	SAMSL	SAMDL
CNST200AAC	CNST330AXX	CNPQ200AAC	CNTI9D0BAC

The controls and indicators for the TCON module are shown in Figure 1-6 and described in Table 1-4.
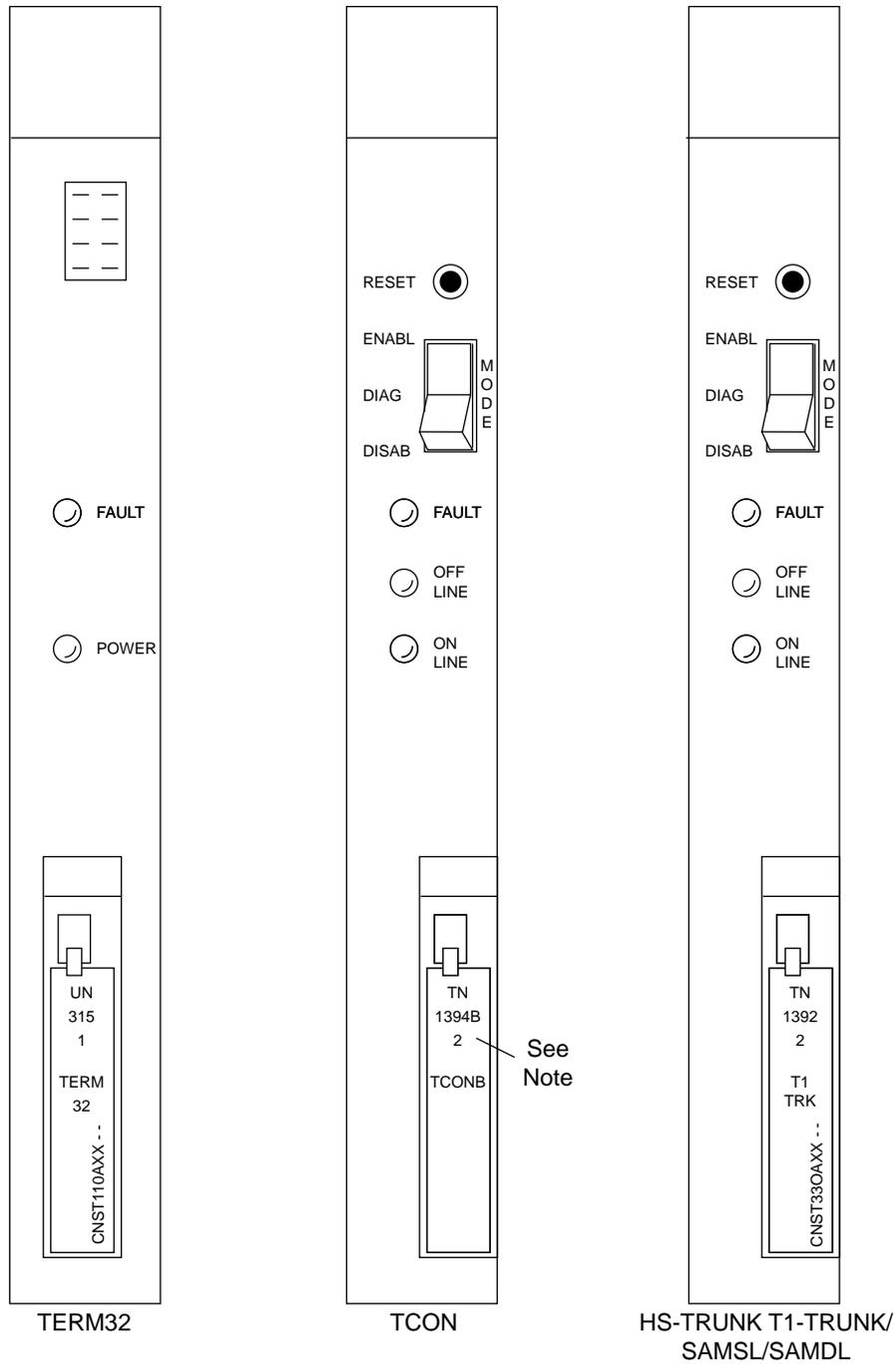
Note: The TCON module will be marked either 1394B or 1394C

FIGURE 1-6. SAM64 Module Faceplates

TABLE 1-4. TCON Faceplate

Item	Label	Function
Push button	RESET	Performs a hardware reset of the TCON.
Three-position rocker switch	MODE	
	ENABLE	Enables SAM in a normal mode.
	LOCAL	Puts the trunk module into a local loopback mode for local testing.
	REMOTE	Puts the trunk into a remote loopback mode for test by a remote node.
Red LED	DIAG FAULT	Controlled by firmware; denotes TCON is in diagnostic state or diagnostic fault.
Amber LED	MEM FAULT	Controlled by firmware; denotes memory fault.
Green LED	POWER	When lit, indicates presence of +5 VDC power on the TCON.

SAM504 Physical Description

The Synchronous/Asynchronous Multiplexer 504-port (SAM504) provides up to 504 individually configurable ports. Configuration consists of 15 TERM32 boards with 32 ports each and one TERM32 board with 24 ports.   (If the SAM504 connects to a SAMML in the node, only 19 ports on the sixteenth TERM32 module can be configured.)

The SAM504 was designed for use in a central office (CO) environment, and it conforms to CO standards with a -48 VDC power supply and CO framework.

The SAM504 dimensions (26" wide x 84" high x 24" deep) are those of the ESS® switch single-bay frame (ED5A001-70) in which the SAM504 is housed. It weighs about 100 pounds, depending on the number and type of installed modules. Figure 1-7 shows a SAM504.

Fuse/Alarm
Panel

Multiplexer
Shelf

Fan Unit

Patch Panel

ED-5A001-70, G4
Frame

Cover, Base
(With Outlets)

Rear   Front
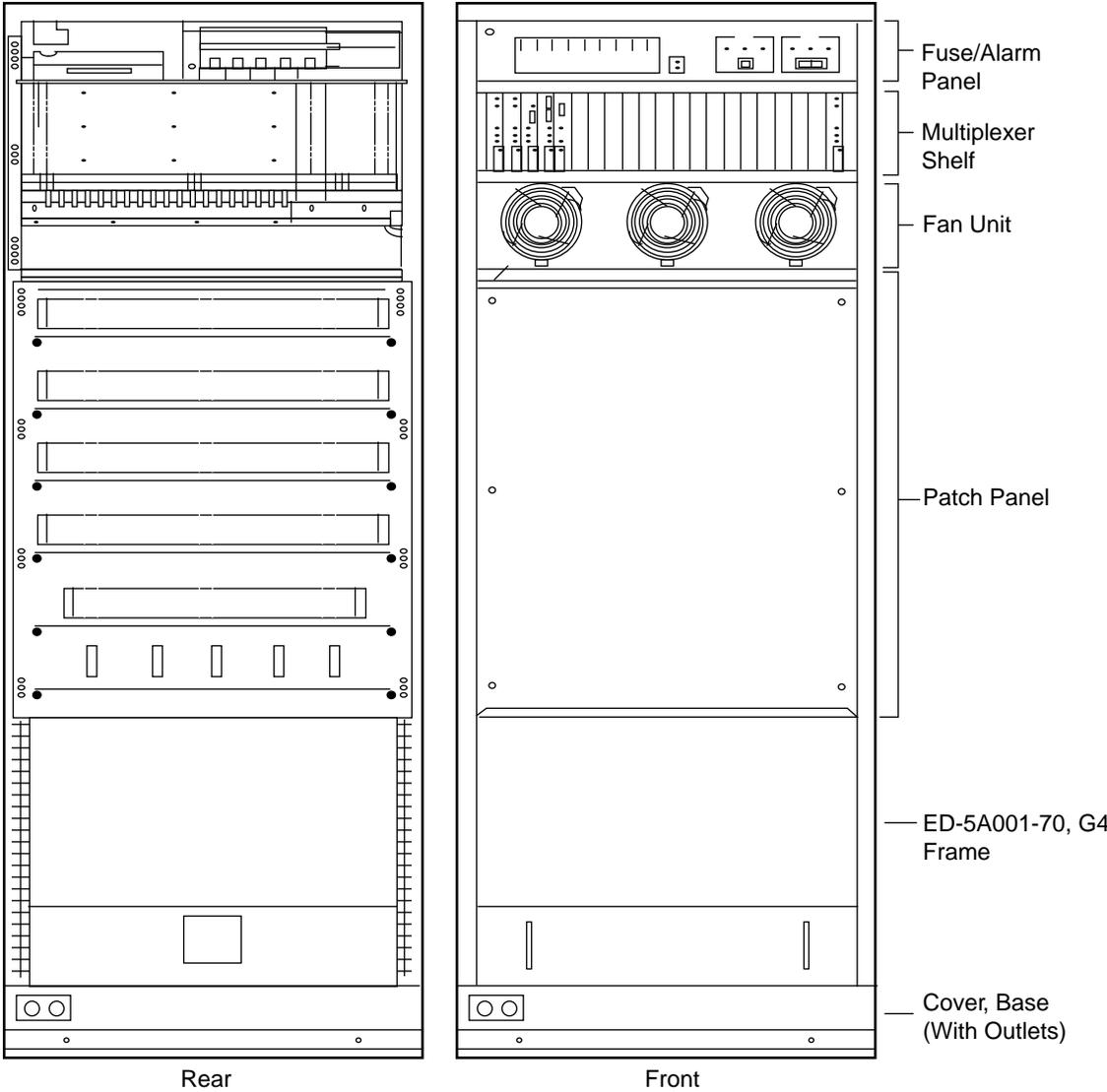
FIGURE 1-7. SAM504 Front and Rear Views

SAM504 Hardware Components

The SAM504 consists of modules, a fuse and alarm panel, a multiplexer shelf, a fan unit, and a patch panel.

SAM504 Modules

Modules used with the SAM504 include the TCON, TERM32, T1-Trunk, HS-Trunk, and SAMSL. Each module is discussed in the sections that follow.

TCON in the SAM504.   The TCON module (TN1394C), shown in Figure 1-8, is the controller for the SAM504. Its functions include the following:

- translation of data between the trunk module and the TERM32 modules

- control of the node, Time Division Multiplexer (TDM), and node bus

- initialization of the trunk module

- downloading and controlling up to 126 processor stations located on the TERM32 modules

- receiving the primary download from the node for subsequent downloading to the TERM32 modules

- accumulation and reporting of status data for the SAM504

- emulation of the node Clock, Switch, and integral Control Computer functions for the SAM504

Since the TCON module communicates only with the integral control computer and the stations that control the user ports, all of the functions listed are transparent to the user.

NOTE: The TCON module does not use an I/O distribution board.

TERM32 in the SAM504.   The TERM32 module (UN315) can interface with terminals, host computers, personal computers, or modems.   It can provide up to 32 serial, asynchronous, full-duplex ports that run at speeds up to 19.2 Kbps, or 32 serial, synchronous, full-duplex ports that run at speeds up to 9.6 Kbps.   The TERM32 supports baud rates of 75, 110, 150, 300, 1200, 2400, 4800, 9600 and 19,200.   It also can support autobaud detection in asynchronous mode.

In asynchronous mode, the TERM32 module optionally supports XON/XOFF flow control and Clear To Send/Request To Send (CTS/RTS) flow control.   Odd, even, and no parity features are supported.   In synchronous DCE mode, the module generates the transmit and receive clocks, and in synchronous DTE mode it accepts synchronized transmit and receive clocks.

Five types of diagnostics are provided for the SAM504 module, including on-line, off-line, module, board-level, and port-level.

Module diagnostics test the trunk in both the SAM504 and the node, and the TCON. Board-level diagnostics test the integrity of a particular TERM32 circuit board in both on-line and off-line states (in and out of service, respectively).   Port-level diagnostics test the integrity of a specific TERM32 port and any interface cabling connected to the port (for off-line diagnostics only).

T1-Trunk in the SAM504.   The T1-Trunk module (TN1392) provides long-distance high- or medium-speed, point-to-point communication from the SAM504 over common carrier facilities to the supporting node.   The node uses the complementary Trunk-T1 module.

This module supports a maximum of 512 virtual circuits, up to 504 of which are available for end-user traffic.   Actual virtual circuit capacity is a function of user traffic characteristics and speed of the SAM504-to-node connecting link.

For the SAM504, the recommended connecting facility is T1 carrier, with a total throughput of 1.544 Mbps domestically and 2.048 Mbps internationally.   The net data rate available to the SAM and the supporting node will be less than the rates above.   In the U.S., the net will be 1.344 Mbps with the DSUs recommended.

The SAM T1-Trunk module may be ordered with a module-to-DSU connecting cable with the choice of two connectors.   One option provides a 34-pin V.35-type connector and the second option provides a 37-pin RS-449-type connector.   In both cases, RS-422 data and clocking signals are used along with RS-232-D control lead signals.   Operation below 56 Kbps is not recommended.

For T1 (1.544 Mbps) operation, the *D/I MUX* multiplexer, the Phoenix 1536 single-channel multiplexer, the *Saturn D4/ESF* Modem, or equivalent T1 multiplexer, is the recommended equipment to perform the DSU function.   Most applications will require the use of a channel service unit (CSU) to provide network protection, automatic loop equalization, and maintenance loopback testing between the DSU and the T1 network.   The *T-Serv* T1 CSU, or equivalent, is the recommended equipment to provide the CSU function.

For 56 Kbps operation, the Lucent Technologies 2556 DSU or 2656 DSU, or equivalent unit, is recommended.

The SAM T1-Trunk module is always used in conjunction with a Trunk-T1 module in the supporting node, regardless of the link speed chosen (1.544/2.048 Mbps or 48/56/64 Kbps).

HS-Trunk in the SAM504.   The HS-Trunk module (TN1391) is installed in the SAM504 to provide limited-distance, high-speed, point-to-point communication over a fiber-optic link to the supporting node.   The node uses the complementary Trunk-HS module.

This module supports a maximum of 512 virtual circuits, up to 504 of which are available for end-user traffic.   The high-speed link is capable of running at 8 Mbps on optical fibers up to a maximum of 3 km.

The HS-Trunk module is a simple-state machine, not programmable.   There is a CRC to detect bad frames, which are then discarded. Error correction and retransmission are the responsibility of either the interface modules (i.e., TERM32) or the higher-level protocols involved.

The recommended fiber cable (LB2P-P cable assembly equipped with Lucent Technologies 1801B fiber) is a 62.5-micron diameter cable terminated with Lucent Technologies 1005B biconic style connectors.   In addition, 50-micron cable is also supported.

SAMSL in the SAM504.   The SAMSL module (MC1D090A1) is the wire interface at each end of a DDS or analog transmission facility connecting a node and a SAM.   It supports EIA RS-232-D connections at 9.6 or 19.2 Kbps and V.35 connections up to 56 Kbps.   It also provides software for boot-up diagnostics, loop diagnostics, and channel selection.

The SAMSL connections are the following:

- **V.35 Connections -** In the node the AWJ9 I/O distribution board provides two V.35 DTE ports.   The SAM504 uses an EAA2 single-port DTE V.35 I/O distribution board connection.   DSUs, such as the Lucent Technologies Model 2556 or 2656, are required for this connection.

- **RS-232-D Connections -** The AWJ11 board, which provides two RS-232-D DTE ports, is used in the node. Lucent Technologies Model 2596 or 2696 DSUs are used in this configuration.

+5.0A   +12.0   TRUNK TCONC ——————————————————— TERM 32 ——————————————————— −12.0   +5.0B

Power Units   *TN1392   TN1394C   UN315   Power Units
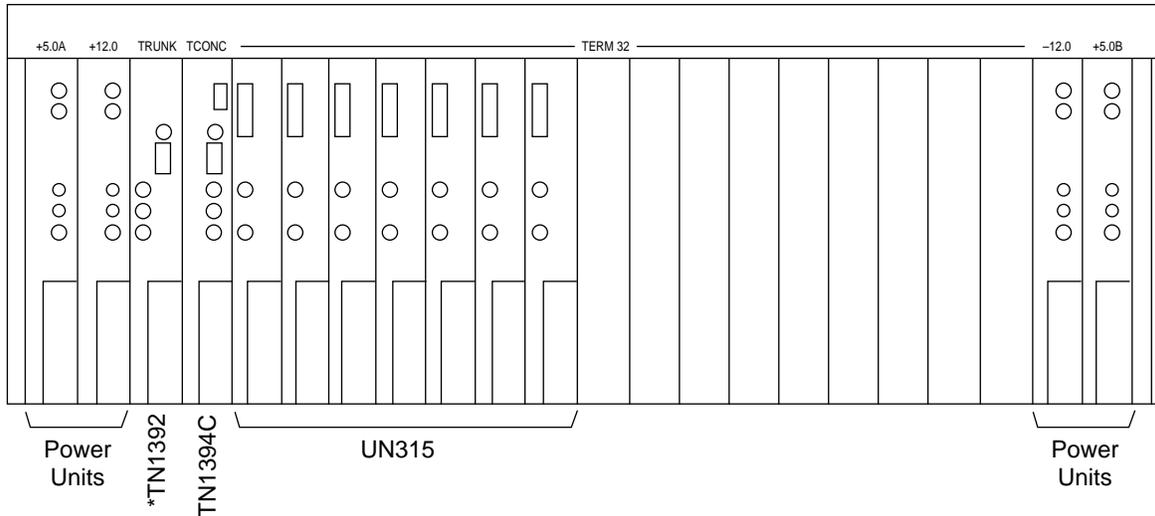
FIGURE 1-8. SAM504 Board Layout

* or TN1391 or MC1D090A1

SAM504 Fuse and Alarm Panel

The fuse and alarm panel distributes -48VDC power to the fans and the multiplexer shelf power supplies.   An interface to the CO alarm grid is also provided.   Eight fuses protect the power supplies in the multiplexer shelf, fans, and the alarm circuitry in the fuse and alarm panel.

An electrostatic discharge (ESD) jack provides maintenance personnel with a ground for wrist straps worn during circuit pack maintenance and installation.   Indicators light if a fault condition is detected in any of the three cooling fans. A push-button reset switch below the fan alarm indicators resets a fan alarm once it has been corrected. The system alarm status section of the front panel displays the status of SAM major alarms and is used to connect and disconnect the SAM from the CO alarm grid. The fault indicator is lit when a major alarm occurs within the SAM.

Failure of a fuse, two cooling fans, or a multiplexer shelf power supply are all causes of major alarms.   When the alarm circuit cut-off switch is in the ENABLE position, the SAM is connected to the CO alarm grid. Placing this switch in the DISABLE position disconnects the SAM from the CO alarm grid and lights the off-line indicator. The DISABLE position allows maintenance without CO alarm grid involvement.

SAM504 Multiplexer Shelf

The multiplexer shelf consists of front and rear card slots that support a maximum of 22 circuit packs.   The shelf slots are numbered beginning with slot 010 and continuing in multiples of eight to slot 034.   After slot 034, the device interface slots begin at slot 040 and continue in multiples of eight to slot 178.   The multiplexer shelf contains the following:

■   a Time Division Multiplexed (TDM) Bus Controller (TCON) module

■   a trunk/link module

■   up to 16 TERM32 interface modules

■   power supplies

The front card slots hold the TCON, a trunk module, the TERM32 modules, and the multiplexer shelf power supplies. The rear of the shelf contains I/O distribution boards for connections to endpoint devices and link facilities. A printed circuit backplane separates the front and rear of the multiplexer shelf.

SAM504 Power.   The SAM504 power supplies are housed in the SAM504 multiplexer shelf. Shelf slots 1 and 22 house the two +5 VDC supplies, designated +5.0A and +5.0B.   The supplies are Model 410AA *Fastech* Power Unit DC/DC converters operating from −48 VDC.   Each supply employs remote voltage sensing, voltage programming and current programming.   Each circuit card used in the SAM504, with the exception of the trunk circuit cards, has an integral current programming resistor that monitors current output. See Figure 1-8.

Shelf slots 2 and 21 house the +12 VDC and −12 VDC supplies, which are Model 494MA *Fastech* Power Unit DC/DC converters.   These power supplies also employ remote voltage sensing.   The three basic power supplies are interlocked, that is, the +5.0A VDC, +12 VDC, and −12 VDC supplies must all be plugged into the backplane and their latches must be in the locked (up) position.   The start button, "ST," on any of the three supplies must be pushed to start all three supplies.   The fourth power supply (5.0B) must be started separately.

The +5 volt supply in slot 010 provides power for multiplexer shelf slots 026 through 080. If TERM32s are installed in slot 088 or higher, then an additional +5 volt power supply card must be installed in slot 178 when the seventh TERM32 is installed.

SAM504 Fan Unit

The SAM504 fan unit contains three cooling fans, positioned vertically on the shelf and located below the multiplexer shelf.   The fans run on -48 VDC and are fused for 3 amps each. Their operation is monitored by the fuse and alarm panel's alarm circuit. See Figure 1-7.

SAM504 Patch Panel

The patch panel, which is below the cooling fan unit, provides connections for endpoint devices. It consists of six rows, labeled J1 through J6, of 50-pin connectors. Each connector provides six EIA RS-23-C connections with eight leads. Ribbon cables connect the TERM32 I/O boards (ED2P466-30,G1) to the 50-pin connectors in the SAM patch panel.

VDM-SAM504 Physical Description

The VDM-SAM504 system consists of Voice Data Multiplexer (VDM) equipment combined with Synchronous/Asynchronous Multiplexer 504-port (SAM504) equipment. This combination of technologies enables the VDM-SAM504 to provide simultaneous voice/data service to as many as 504 users per system.

The VDMs permit synchronous/asynchronous service over existing telephone lines at data rates up to 19.2 Kbps. The SAM504 concentrates this data (from as many as 504 ports) onto a single trunk line for transmission to the node.

The system can be purchased in either a one- or a two-bay configuration, or the second bay may be added later as an option. See Figure 1-9. It is equipped with all of the following:

- up to 9 VDM modular power supplies (installed three per shelf)

- as many as 21 VDM shelves (with each shelf providing up to 24 ports)

- a fuse and alarm panel

- the SAM504

- a SAM504 fan unit

- one VDM fan tray per bay

This equipment is mounted in either a one- or two-bay ED5A001-70,G4 Central Office (CO) equipment framework, similar to that used for *ESS* Switching Equipment. The system is designed to operate on −48 VDC power fused for 70A.
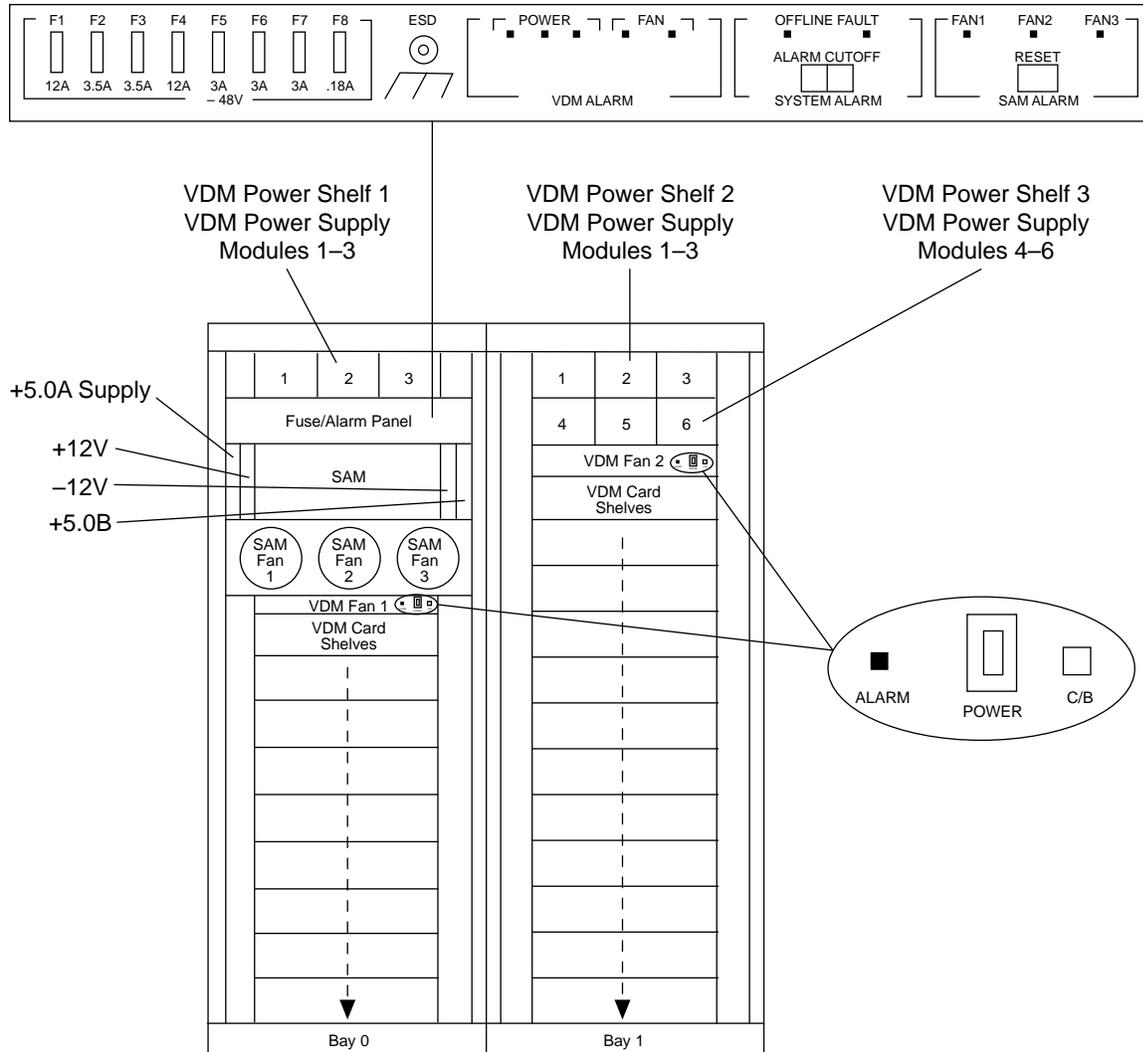
FIGURE 1-9. **VDM-SAM504 Two-Bay Configuration**

VDM-SAM504 Hardware Components

The VDM-SAM504 consists of modules, a VDM modular power supply, a SAM504 Fastech power unit, a VDM fan unit, a SAM504 fan unit, a fuse and alarm panel, card shelves (model 10B), and a circuit card (Model 045C Series 2).

VDM-SAM504 Modules

Modules used with the VDM-SAM504 include the TCON, TERM32, T1-Trunk, HS-Trunk, and SAMSL. Each module is discussed in the sections that follow.

TCON in the VDM-SAM504.   The TCON module (TN1394B) is the controller for the VDM-SAM504.   Its functions include the following"

- translation of data between the trunk module and the TERM32 modules

- control of the node, Time Division Multiplexer (TDM), and node bus

- initialization of the trunk module

- downloading and controlling up to 126 processor stations located on the TERM32 modules

- receiving the primary download from the node for subsequent downloading to the TERM32 modules

- accumulation and reporting of status data for the SAM504

- emulation of the node Clock, Switch, and integral Control Computer functions for the SAM504

Since the TCON module communicates only with the integral control computer and the stations that control the user ports, all of the functions listed are transparent to the user.

NOTE: The TCON module does not use an I/O distribution board.

TERM32 in the VDM-SAM504.   The TERM32 module (UN315) shown in Figure 1-12, can interface with terminals, host computers, personal computers, or modems.   It can provide up to 32 serial, asynchronous, full-duplex ports that run at speeds up to 19.2 Kbps, or 32 serial, synchronous, full-duplex ports that run at speeds up to 9.6 Kbps.   The TERM32 supports baud rates of 75, 110, 150, 300, 1200, 2400, 4800, 9600 and 19,200.   It also can support autobaud detection in asynchronous mode.

In asynchronous mode, the TERM32 module optionally supports XON/XOFF flow control and Clear To Send/Request To Send (CTS/RTS) flow control.   Odd, even, and no parity features are supported.   In synchronous DCE mode, the module generates the transmit and receive clocks, and in synchronous DTE mode it accepts synchronized transmit and receive clocks.

NOTE: When TERM32 modules are being used with VDMs in the asynchronous mode, an ED-5P055-31 G(201) adapter must be inserted between the data interface cable(s) and the VDM shelf.   This adapter is not required when using Model 045C Series 2 VDMs.   When operating in the asynchronous mode without the adapter, failure to have Model 045C Series 2 VDM switches S2.6 and S2.7 in the OFF position can cause a fuse to open on the SAM TERM32 board.

T1-Trunk in the VDM-SAM504.   The T1-Trunk module (TN1392), shown in Figure 1-12, provides long-distance high- or medium-speed, point-to-point communication from the VDM-SAM504 over common carrier facilities to the supporting node.   The node uses the complementary Trunk-T1 module.

This module supports a maximum of 512 virtual circuits, up to 504 of which are available for end-user traffic.   Actual virtual circuit capacity is a function of user traffic characteristics and speed of the VDM-SAM504-to-node connecting link.

For the VDM-SAM504, the recommended connecting facility is T1 carrier, with a total throughput of 1.544 Mbps domestically and 2.048 Mbps internationally.   The net data rate available to the SAM and the supporting node will be less than the rates above.   In the U.S., the net will be 1.344 Mbps with the DSUs recommended.

The SAM T1-Trunk module may be ordered with a module-to-DSU connecting cable with the choice of two connectors.   One option provides a 34-pin V.35-type connector and the second option provides a 37-pin RS-449-type connector.   In both cases, RS-422 data and clocking signals are used along with RS-232-D control lead signals.   Operation below 56 Kbps is not recommended.

For T1 (1.544 Mbps) operation, the *D/I MUX* Multiplexer, the Phoenix 1536 single channel multiplexer, the *Saturn D4/ESF* Modem, or equivalent T1 multiplexer, is the recommended equipment to perform the DSU function.   Most applications will require the use of a channel service unit (CSU) to provide network protection, automatic loop equalization, and maintenance loopback testing between the DSU and the T1 network.   The *T-Serv* T1 CSU, or equivalent, is the recommended equipment to provide the CSU function.

For 56 Kbps operation, the Lucent Technologies 2556 DSU or 2656 DSU, or equivalent unit, is recommended.

The SAM T1-Trunk module is always used in conjunction with a Trunk-T1 module in the supporting node, regardless of the link speed chosen (1.544/2.048 Mbps or 48/56/64 Kbps).

HS-Trunk in the VDM-SAM504.   The HS-Trunk module (TN1391) is installed in the VDM-SAM504 to provide limited-distance, high-speed, point-to-point communication over a fiber-optic link to the supporting node.   The node uses the complementary Trunk-HS module.

This module supports a maximum of 512 virtual circuits, up to 504 of which are available for end-user traffic.   The high-speed link is capable of running at 8 Mbps on optical fibers up to a maximum of 3 km.

The Trunk-HS module is a simple-state machine, not programmable.   There is a CRC to detect bad frames, which are then discarded. Error correction and retransmission are the responsibility of either the interface modules (i.e., TERM32) or the higher-level protocols involved.

The recommended fiber cable (FL2P-P-XX where XX=length in feet) cable assembly is a 62.5-micron diameter cable terminated with ST style connectors.   In addition, 50-micron cable is also supported.

SAMSL in the VDM-SAM504.   The SAMSL module (MC1D090A1) is the wire interface at each end of a DDS or analog transmission facility connecting a node and a SAM.   It supports EIA RS-232-D connections at 9.6 or 19.2 Kbps and V.35 connections up to 56 Kbps.   It also provides software for boot-up diagnostics, loop diagnostics, and channel selection.

The SAMSL connections are the following:

- **V.35 Connections -** In the node, the AWJ9 I/O distribution board provides two V.35 DTE ports.   The VDM-SAM504 uses an EAA2 single-port DTE V.35 I/O distribution board connection.   DSUs, such as the Lucent Technologies Model 2556 or 2656, are required for this connection.

- **RS-232-D Connections -** The AWJ11 board, which provides two RS-232-D DTE ports, is used in the node.   Lucent Technologies Model 2596 or 2696 DSUs are used in this configuration.

VDM-SAM504 Power

Power for the VDM-SAM504 comes from power supplies for both the VDM and the SAM504. The VDM is equipped with a VDM Modular Power Supply and the SAM-504 is equipped with a SAM504 Fastech power unit. Both are described in the following sections.

VDM Modular Power Supply. The VDM modular power supply occupies the top shelf in Bay 0 and the top two shelves in Bay 1. See Figures 1-10 and 1-11. A power supply shelf can accommodate a maximum of three modular power supplies, each of which operates on −48 VDC input power and provides DC output voltages of +5.25, +12, and −12. The number of modular power supplies needed is dependent on the number of circuit cards in use. Refer to the following tble to determine how many power supply modules are needed.

_____

TABLE 1-5. Circuit Cards/Modular Power Supply Relationship

Bay 0		Bay 0 and Bay 1	
Circuit Cards in Service	No. of Modular Power Supplies Required	Circuit Cards in Service	No. of Modular Power Supplies Required
1–72	2	1–72	2
73–144	3	73–144	3
145–216	3	145–216	5
		217–288	6
		289–360	7
		361–432	8
		433–504	9

NOTE: Bay 0 configurations with 145 to 216 circuits in operation and three power supplies will **not** have power supply redundancy capability.

Each plug-in module can support up to 72 VDM circuit cards or three VDM circuit card shelves. If Bay 0 contains a full complement of 216 circuit cards, power supply redundancy can only be provided by adding another power supply module in the second bay.
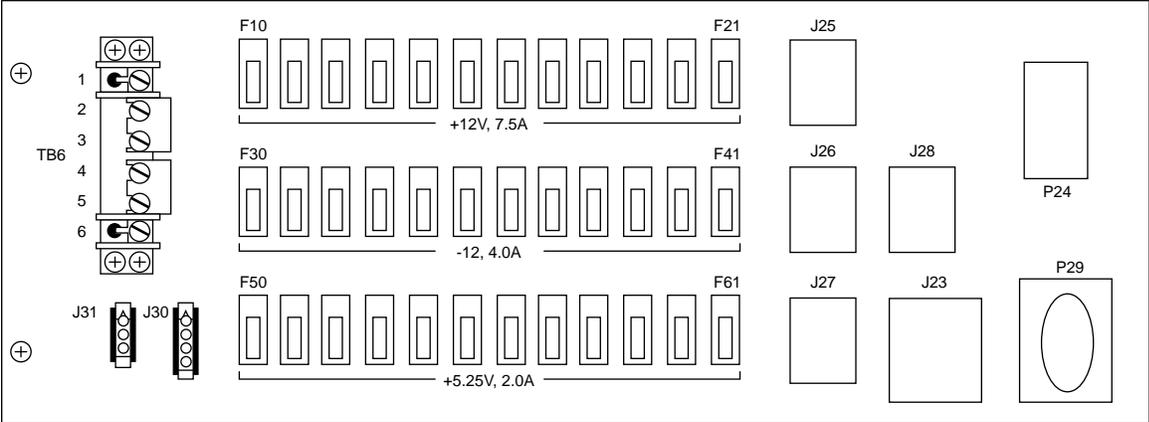
FIGURE 1-10. VDM Power Supply Shelf

DC Fuse 10A
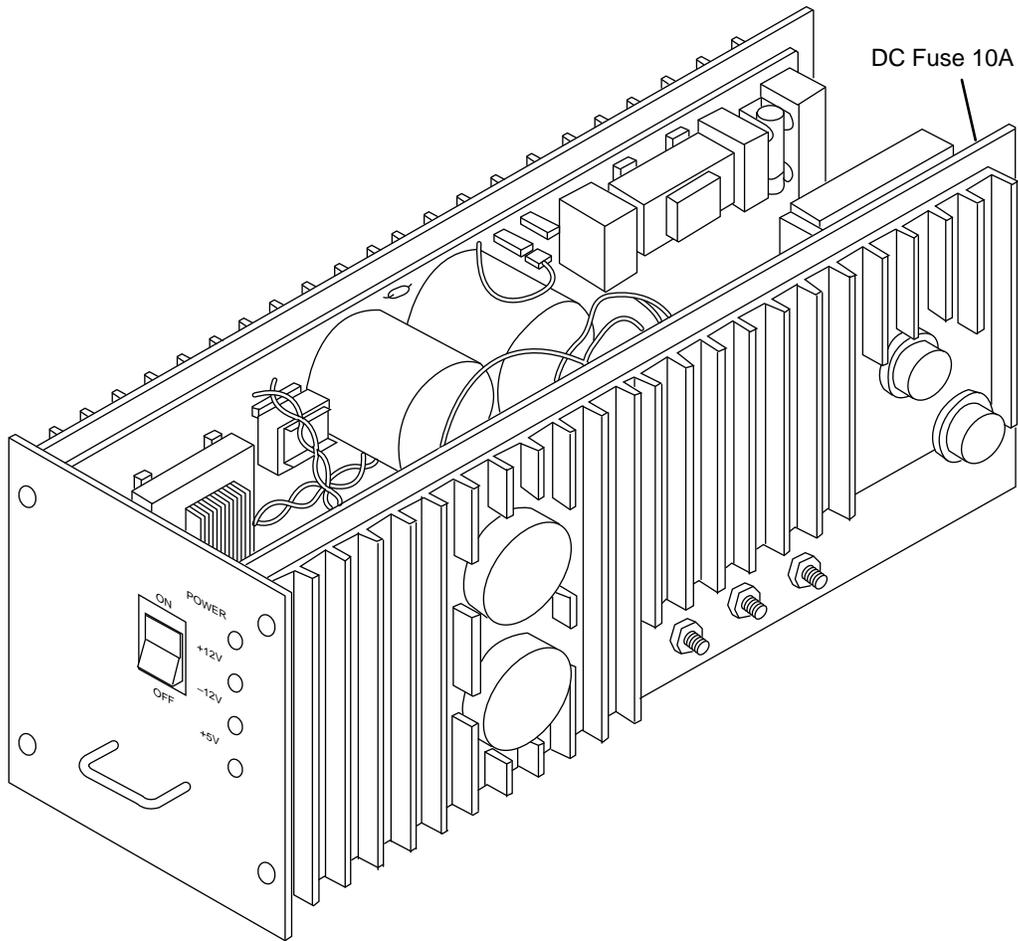
FIGURE 1-11. VDM Power Supply Module

SAM504 Power Supplies.   The SAM504 power supplies are housed in the SAM504. Shelf slots 1 and 22 house the two +5 VDC supplies, designated +5.0A and +5.0B.   The supplies are Model 410AA *Fastech* Power Unit DC/DC converters operating from −48 VDC.   Each supply employs remote voltage sensing, voltage programming, and current programming.   Each circuit card used in the SAM504, with the exception of the trunk circuit cards, has an integral current programming resistor that monitors current output. See Figure 1-12.

Shelf slots 2 and 21 house the +12 VDC and −12 VDC supplies, which are Model 494MA *Fastech* Power Unit DC/DC converters.   These power supplies also employ remote voltage sensing.   The three basic power supplies are interlocked, that is, the +5.0A VDC, +12 VDC, and −12 VDC supplies must all be plugged into the backplane and their latches must be in the locked (up) position.   The start button, "ST," on any of the three supplies must be pushed to start all three supplies.   The fourth power supply (5.0B) must be started separately.
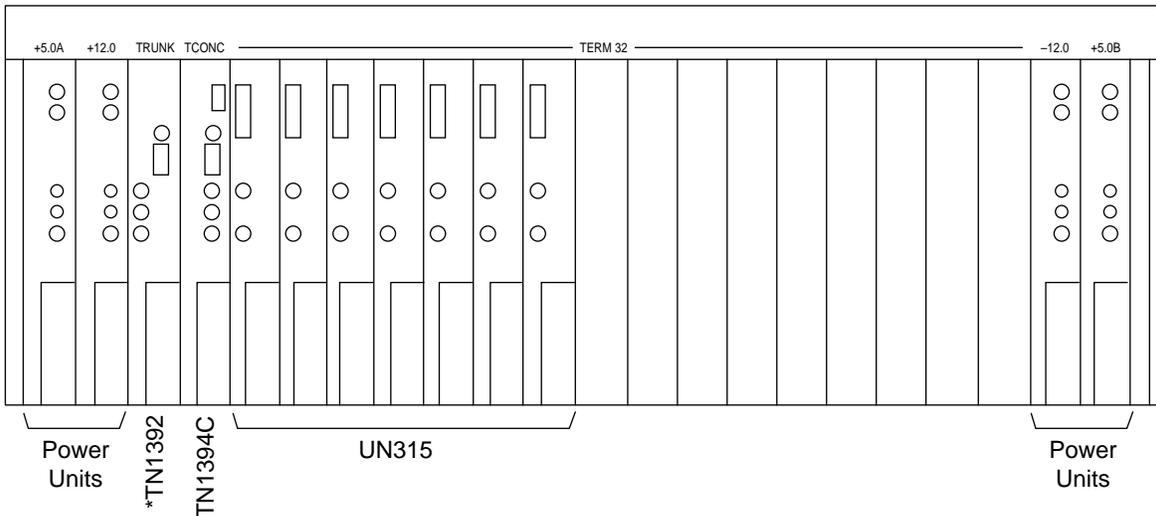
 * or TN1391 or MC1D090A1

FIGURE 1-12. SAM504 Board Layout

VDM-SAM504 Fan Units

The fan units for the VDM-SAM504 consist of fan units for both the VDM and the SAM504.

The SAM504 fan unit contains three fans, positioned vertically on the shelf and located below the multiplexer shelf.   The fans run on −48 VDC and are fused for 3 amps each.   Their operation is monitored by the fuse and alarm panel's alarm circuit. See Figure 1-9.

The VDM fan unit is located on the fifth shelf from the top of Bay 0 and the third shelf from the top of Bay 1 of the VDM-SAM504.   It contains six fans powered by −48 VDC that cool the VDM shelves below it.   An ON/OFF switch on the front panel of the fan unit can be used to reset the internal sensing circuitry after an alarm condition or to power down the fan unit when the VDM-SAM504 is not in use.

VDM-SAM504 Fuse and Alarm Panel

The fuse and alarm panel, located directly below the VDM power supply shelf in Bay 0, serves as a central point for system alarm output indicators and for system power input for both the VDM and SAM504 components.   It provides local fusing and distribution of −48 VDC CO battery to the VDM-SAM504 circuits and serves as a CO alarm grid interface.

The front panel displays:

- eight −48 VDC telecommunications fuses (labeled F1 through F8)

- an electrostatic discharge (ESD) jack

- three red SAM504 fan alarm LEDs, a SAM ALARM RESET switch and system alarm status indicators, including OFF LINE (yellow LED) and FAULT (red LED)

- an alarm cutoff switch

- VDM alarm indicators, including three red LEDs for the VDM power supply shelves and two red LEDs for the VDM fan units

Fuses F1 and F4 (12A) protect the +5.0A and +5.0B power supplies; F2 and F3 (3.5A) protect the +12 VDC and −12 VDC power supplies; F5 and F6 (3A) protect SAM fans 1, 2, and 3; and F8 (0.18A) protects the alarm circuit.

The alarm cutoff switch enables the user to disable alarms to perform routine VDM-SAM504 maintenance.   Placing the switch in the disable position:

- disconnects the alarm circuit from the CO grid

- illuminates the yellow OFF LINE LED

- notifies the TCON controller that the VDM-SAM504 is disconnected

VDM Card Shelves

The VDM-SAM504 can accommodate up to 9 VDM card shelves in a one-bay configuration, and up to 21 VDM card shelves in a two-bay configuration. The Model 10B circuit card shelf is equipped with mass-terminated interface connectors. Each of the four 50-pin data interface (RS-232) receptacles with bail lock fasteners supports six data circuits; each of the two 50-pin voice interface (RJ21) plugs with screw fasteners supports 12 voice circuits. All electrical connections from the circuit card to the backplane are made through a card-edge connector. When a circuit card is not in place, voice continuity is maintained by Normally Closed (NC) contacts. The following figure shows the Model 10B Circuit Card Shelf and its backplane.
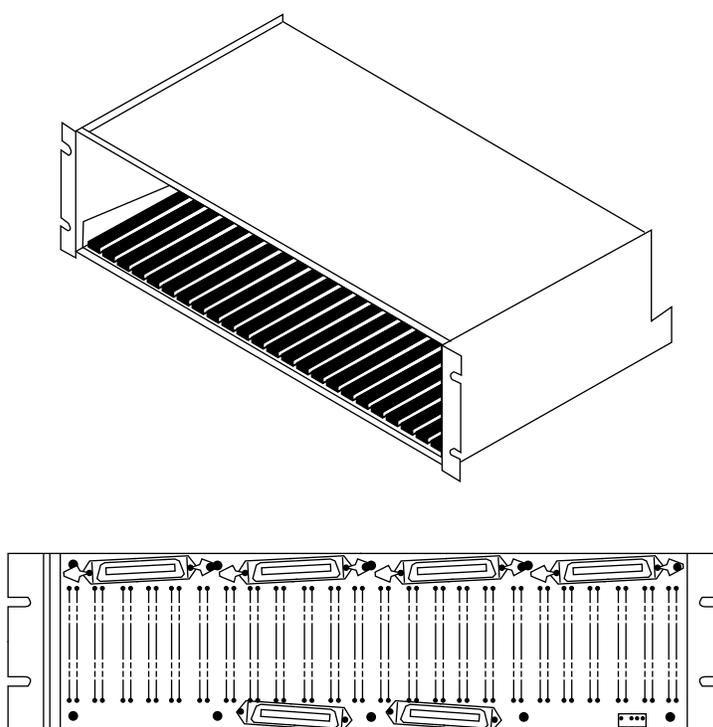
FIGURE 1-13. **Model 10B Circuit Card Shelf**

Model 045C Series 2 VDM Circuit Card

Each Model 045C Series 2 VDM circuit card (Figure 1-14) provides for multiplexing and demultiplexing of one full-duplex voice/data circuit. For each card shelf installed at the customer's premises, one complementary Model 045C Series 2 circuit card is required. All electrical connections from the circuit card to the backplane are through a card-edge connector.

Voice continuity is maintained through the backplane when a circuit card is not in place, by NC contacts. Tip/Ring (T/R) fusing is included.

The Model 045C Series 2 circuit card provides the standard feature set and is required for both asynchronous (no hardware flow control) and synchronous point-to-point configurations. In addition, a synchronous clock disconnect feature is provided as well as T/R fusing.
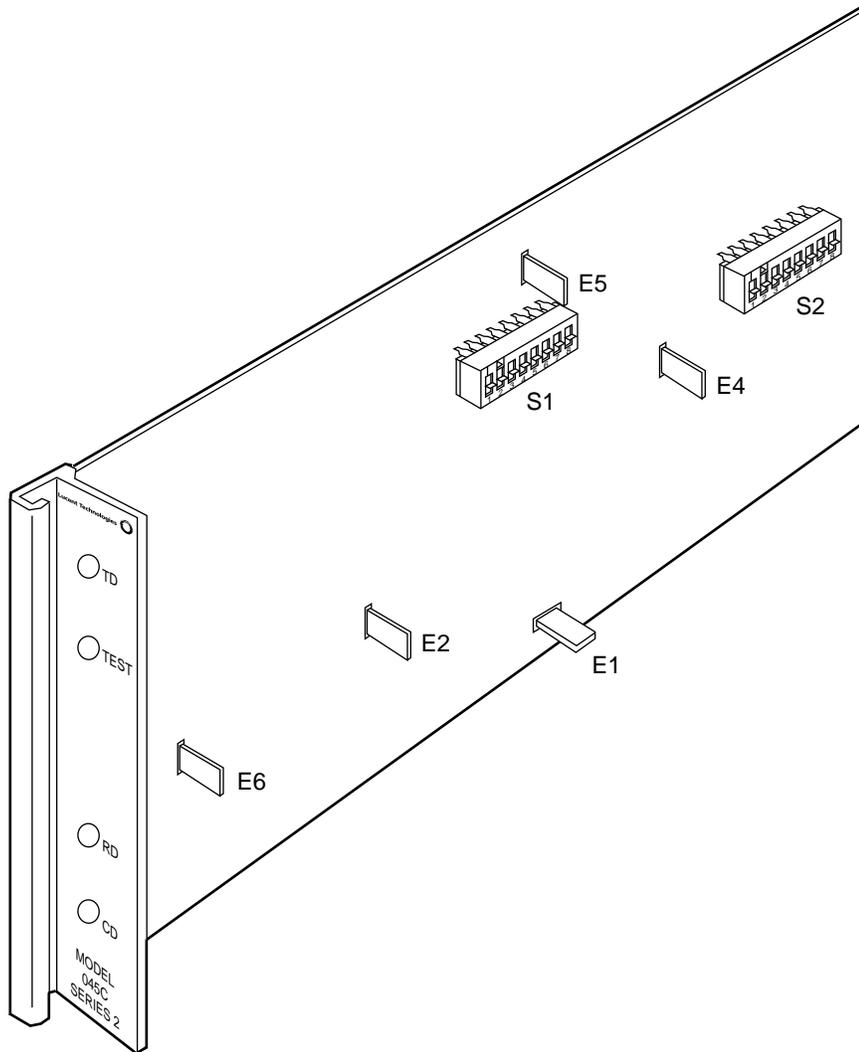
FIGURE 1-14. Model 045C Series 2 Circuit Card

VDM-SAM504 Controls and Indicators

Once the VDM-SAM504 has been installed and powered up, it requires no maintenance during normal operation. Fuse and alarm panel status indicators and switches, and faceplate controls and indicators are used to monitor and control the cabinet power supplies and modules, as well as the alarm and fan units.

Fuse and Alarm Panel Indicators

The fuse and alarm panel, shown at the top of Figure 1-9, is located directly below the VDM power supply shelf. It serves as a central point for system alarm output indicators, as well as for system power input.   The front panel contains fuses and alarm LEDs for all major components of the system (i.e., SAM504 fans, power, and bus controller; the VDM fan units and modular power supply shelves; switches controlling alarm disable and fan alarm reset functions; the ESD jack; and fuses for −48 VDC input to the VDM-SAM504 components).

VDM-SAM504 Alarm.   The two red LEDs labeled FAN (1 and 2) monitor the two VDM fan units (Fan 1 in Bay 0 and Fan 2 in Bay 1). If any one of the six fans in a unit either stops completely or if a fan's speed falls below the minimum number of rotations per minute, the red LED will light to signal the failure.

A two-bay configuration of the VDM-SAM504 contains three VDM power supply shelves.   The three red LEDs labeled POWER (1, 2 and 3) monitor the VDM power supply shelves (shelf 1 in Bay 0 and shelves 2 and 3 in Bay 1).   Each shelf, in turn, contains three modular power supplies.   The fuse and alarm panel contains one red LED for each of the VDM power shelves. If any of the three VDM modular power supplies on a shelf fail, the corresponding LED for that shelf will light on the fuse and alarm panel.   At that point the three VDM modular power supplies on the shelf indicated should be checked to determine which has failed.

VDM-SAM504 System Alarm.   One red LED labeled FAULT lights when a failure occurs in any of the following: a VDM power supply shelf, a VDM fan unit, the SAM504 fan unit, the SAM 504 power supplies, a SAM fuse or the TCON module. In any of these instances, a warning light will also be illuminated on the equipment that failed.

An amber LED labeled OFFLINE lights when the ALARM CUTOFF switch is toggled to disable the system alarm circuit board.

VDM-SAM504 SAM Alarm.   The three red LEDs at the right of the fuse and alarm panel, labeled FAN1, FAN2, and FAN3, monitor the three SAM504 fans. They light if the fan they are monitoring stops completely, or if the fan's speed falls below the minimum number of rotations per minute.   The RESET switch, located below the SAM fan LEDs, resets the SAM fan alarm latch after a fan failure has occurred.

TERM32 Circuit Card

The following figure and table give more information on the TERM32 circuit card.

_____

TABLE 1-6. TERM32 Faceplate

Item	Label	Function
10-pin connector	TRACE	One-way RS-232 trace channel
Red LED	FAULT	Internal TERM32 fault or reset mode
Green LED	POWER	+12 VDC, -12 VDC, +5 VDC are present when lit

TERM32   TCON   HS-TRUNK T1-TRUNK/
                                              SAMSL/SAMDL
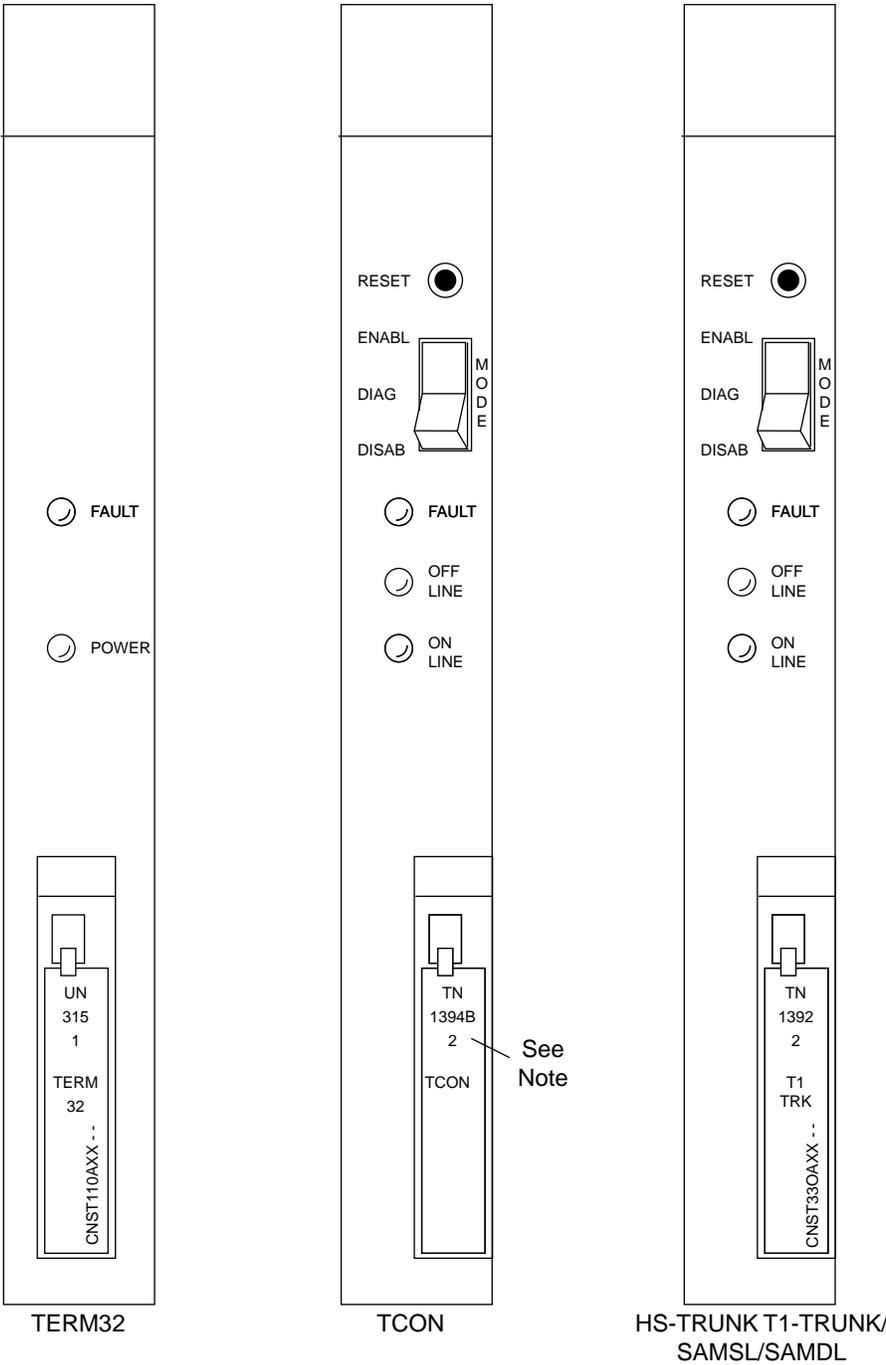
Note: The TCON module will be marked either 1394B or 1394C

FIGURE 1-15. VDM-SAM504 Faceplates

TCON Circuit Card

The previous figure and the following table give more information about the TCON circuit card.

_____

TABLE 1-7. TCON Faceplate

Item	Label	Function
Push button	RESET	Performs a hardware reset of the TCONC
Three-position switch	MODE	
	ENABLE	Enables SAM in a normal mode
	LOCAL	Puts the trunk module into a local loopback mode for local testing
	REMOTE	Puts the trunk into a remote loopback mode for test by a remote node
Red LED	DIAG FAULT	Controlled by firmware; denotes diagnostic fault
Amber LED	MEM FAULT	Controlled by firmware; denotes memory fault
Green LED	POWER	When lit, indicates presence of +5V power on the TCONC

T1-Trunk Circuit Card

The previous figure and the following table give more information about the T1-Trunk circuit card controls.

_____

TABLE 1-8. T1-Trunk and HS-Trunk Faceplate

Item	Label	Function
Push button	Reset	Performs hardware reset of trunk circuit
Three-position switch	MODE	
	ENABL	Normal operating mode
	DIAG	Places the trunk in diagnostic mode
	DISAB	Disables the trunk
Red LED	FAULT	Light indicates an internal trunk fault
Yellow LED	OFFLINE	Trunk is offline. Indicates MODE SWITCH is in DIAG position. A lighted LED is associated with diagnostic functions.
Green LED	ONLINE	Trunk is online. Mode switch is in either ENABL or DIAG position.

HS-Trunk Circuit Card

The HS-Trunk circuit card controls and indicators are identical to those for the T1-Trunk circuit card, described in **T1-Trunk Circuit Card**.

SAMSL Circuit Card

The SAMSL circuit card controls and indicators are identical to those for the T1-Trunk circuit card, described in **T1-Trunk Circuit Card**.

Model 045C Series 2 Circuit Card

The Model 045C Series 2 circuit card contains four indicators, shown in Figure 1-14, which function as shown in Table 1–9.   There are no external switches on the Model 045C Series 2 VDM circuit card.

_____

TABLE 1-9. Model 045C Series 2 Circuit Card Faceplate

Indicator	Color	Function
TEST	Red	Lights during loopback operation and power up
CD	Green	Lights when carrier is detected
TD	Amber	Lights while space data signal is being sent on Pin 2 of data interface
RD	Red	Lights while space data signal is being received on Pin 3 of data interface

VDM-SAM504 Power Supply Indicators

The VDM-SAM504 has two sets of power supplies: one for the VDM, which is the VDM modular power supply, the other for the SAM504, which is Model 410AA Fastech power supply.

VDM Modular Power Supply.   The following table and figure supply more information about the VDM Modular Power Supply.

_____

TABLE 1-10. VDM Power Supply Module Faceplate

Indicator	Color	Function
POWER	Green	Lights when power is ON
+12V	Green	Lights when +12V power supplies are ON
−12V	Green	Lights when −12V power supplies are ON
+5V	Green	Lights when +5.5V power supplies are ON

DC Fuse 10A

POWER
ON
+12V
OFF
-12V
+5V
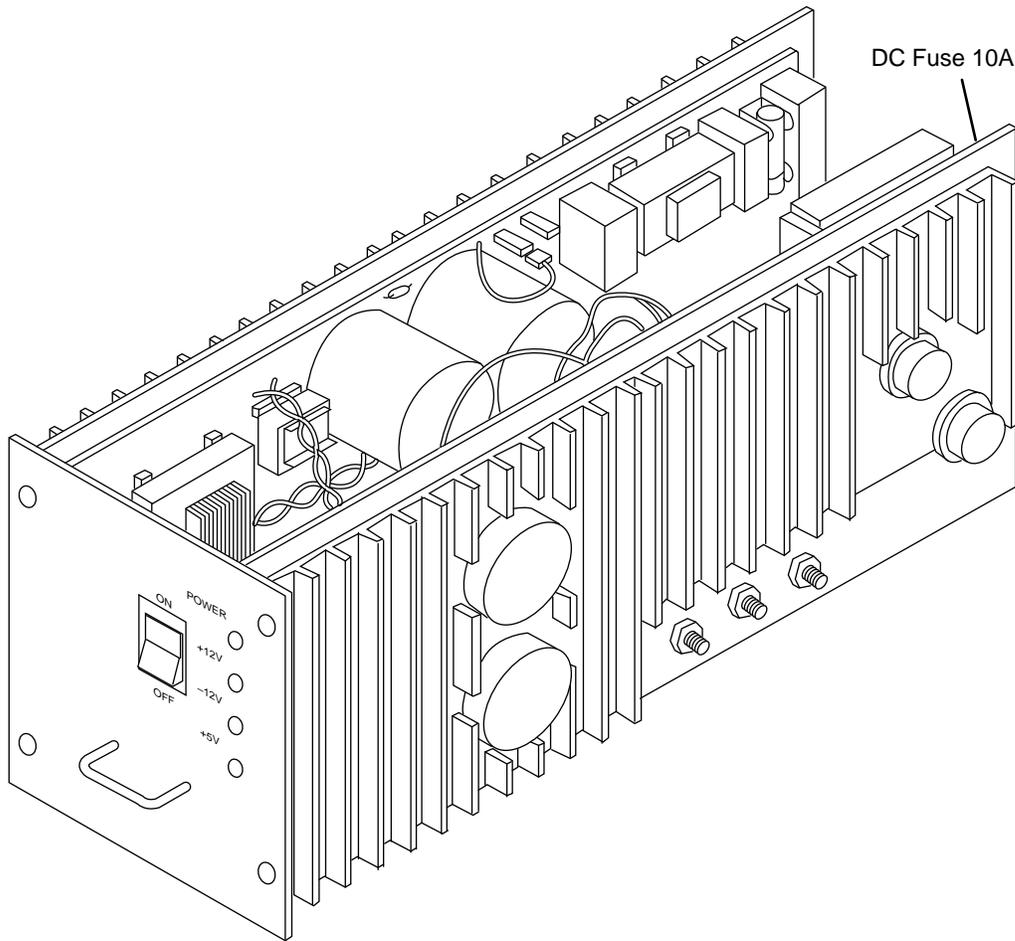
FIGURE 1-16. **VDM Power Supply Module**

SAM504 Power Supply. The controls and indicators for the SAM504 power supply are described in the following table and figure.

_____

TABLE 1-11. Faceplate for SAM504 Power Supply

Item	Label	Faceplate
Jacks	5V/12V	Voltage test jacks
Red LED	OFF	Low voltage or overcurrent shutdown alarm
Amber LED	OOS	Out-of-service indicator
Push button	ST	Start button or hardware reset of power supply
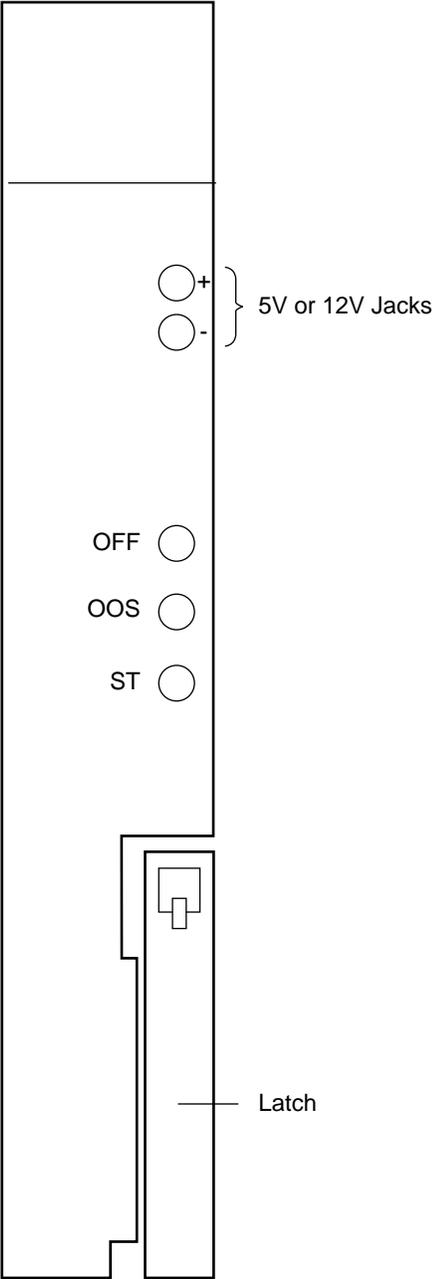
FIGURE 1-17. SAM504 Power Supply Faceplate

SAM Installation

SAM Installation

This chapter describes the installation requirements of each SAM, including floor space required, power and grounding specifications, tools needed to complete the installation, and step-by-step instructions for each installation procedure.

Multiplexer to Node Connections

The following table shows the modules that are used to connect multiplexers to nodes.

TABLE 2-1. Multiplexer to Node Connections

SAM Multiplexer	SAM Trunk Module	I/O Board	Node Trunk Module	I/O I/O Board
SAM16	integrated	integrated	SAMSL	AWJ9, AWJ11
			SAMML	AWJ17, AWJ32
SAM64	T1-Trunk	none (cable assembly)	Trunk-T1	AWJ4
	HS-Trunk	CEY1	Trunk-HS	AWJ2
	SAMSL	CEY2, CEY3	SAMSL	AWJ9, AWJ11
			SAMML	AWJ17, AWJ32
	SAMDL	CEY4	SAMML	AWJ17, AWJ32
SAM504	T1-Trunk	ED2P465-30, G1	Trunk-T1	AWJ4
	HS-Trunk	ED2P471-30, G1	Trunk-HS	AWJ2
		ED2P472-30, G1	Trunk-HS	AWJ2
	SAMSL	EAA2	SAMSL	AWJ9, AWJ11
			SAMML	AWJ17, AWJ32

SAM16

The following sections supply installation information on, along with the appropriate procedures for, the SAM16.

Important Safety Instructions

When using this product, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:

1. Follow all instructions provided with this product.

2. Service of the SAM16 requires the experience of qualified service personnel.

3. Do not block or cover the ventilation openings. This product should not be installed in a cabinet or closet unless proper ventilation is provided.

4. The SAM16 should only be opened when replacing or adding circuit packs. There are no user-serviceable parts inside and the product should be returned to your place of purchase for repair.

5. Do not use a 3-to-2 prong adapter at the receptacle; use of this type of adapter may result in risk of electrical shock and/or damage to the SAM16.

6. The detachable power cord supplied with this product is rated for 120 VAC service only. If this product is intended to be connected to commercial power services other than 120 VAC, a power cord suitable for the application and having appropriate electrical ratings and safety approvals must be obtained.

7. Do not allow anything to rest on the power cord. Do not staple the power cord to building surfaces. Do not locate this product where the power cord will be abused by persons walking on it.

Power and Grounding

Following are power and grounding requirements for the SAM16.

Caution: The AC SAM16 comes equipped with 2A fuses installed for 110 VAC operation. Both these fuses should be replaced with the 1A fuses supplied with the product for 220 VAC operation.

110 VAC (Nominal)

The 110 VAC (50 - 60 Hz) connection to the SAM16 requires a grounded circuit with a 2A capacity. Connection is through the power cord supplied with the SAM16. This power cord must be connected to a grounded (3-prong) AC outlet.

220 VAC (Nominal)

The 220 VAC (50 - 60 Hz) connection to the SAM16 requires a grounded circuit with a 1A capacity. Connection is through the power cord supplied with the SAM16. This power cord must be connected to a grounded (3-prong) AC outlet.

DC Power and Ground Requirements

The −48 to −60 VDC feed to the SAM16 should be taken from a CO signal-designated supply and fused for 5A service. One #14 AWG stranded wire should be used to connect to the rear panel terminal block marked −48V.   In addition, one #14 AWG stranded wire should be used to connect the +48 terminal block on the rear panel.   Internal fusing is provided through the ON/OFF circuit breaker.

The SAM16 must be grounded to a solid, stable, "single-point ground" via an "external chassis ground conductor." This conductor is to be free from all other connections to minimize foreign, unstable ground current. When the SAM16 is being installed, a #14 AWG stranded external grounding conductor or larger (smaller AWG number) must be connected to the stud provided on the rear of the unit using a Ring Terminal.
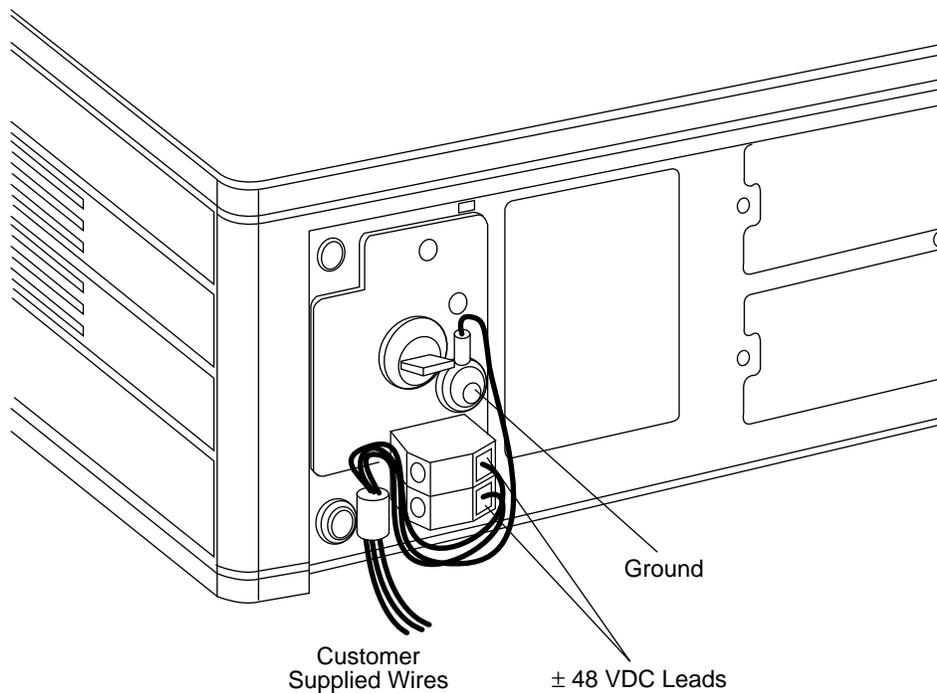
Note: All wires 14 AWG or larger (smaller AWG)

FIGURE 2-1. SAM16 DC Power and Ground Connections

Preparation for Installation

The SAM16 cabinet is placed on a desk, table, or shelf, and requires about 21" by 20" for ventilation (about 2" on each side) and access to the front and rear. Basic cabling requirements are:

■ Access to building power (110/220 VAC, 50/60 Hz)

■ Access to a trunk connection via an external modem for communications with the node

■ Access to cables from endpoints

Replacing the Circuit Packs

The SAM16 is normally shipped in assembled form, with two circuit boards (the CPY1 board and the CRA1 or CRA2 board) installed.   The following procedures explain how to remove and re-install each board.

Warning: Disconnect the input power cord before opening the SAM16. Failure to do this will expose dangerous voltages inside the enclosure.

Customer Interface Board (CPY1)

To remove and re-install the CPY1 board, you will need the following tools:

■ medium Phillips head screwdriver

■ medium slot head screwdriver

■ 3/16 nut driver.

NOTE: The SAM16 must be completely turned over during this procedure and it is recommended that all cables be disconnected from the rear panel.

To remove the CPY1 board, follow Procedure 2-1.

_____

PROCEDURE 2-1. Removing the CPY1 Board

1. Disconnect the power cord from the rear panel.

2. Remove four screws from the rear panel and set them aside for reassembly.

3. Turn the SAM16 completely over so the bottom is facing up.

4. Remove eight screws from the bottom and set them aside for reassembly.

5. Turn the SAM16 completely over so it is facing right side up.

6. Carefully remove the enclosure cover and rest it next to the SAM16 base.

7. Remove the 16 hex nuts and washers from the rear panel and the two connecting ribbon cables from the CPY1

8. Remove the CPY1 board from the SAM16.

To install the CPY1 board, follow Procedure 2-2.

_____

PROCEDURE 2-2. Installing the CPY1 Board

1. Using 16 hex nuts and washers, mount the board, component side down, to the rear panel.

2. Connect the two ribbon cables between the CPY1 and main circuit boards.

3. Carefully place the enclosure cover over the base of the SAM16.

4. Replace the four screws in the rear panel.

5. Completely turn the SAM16 over so it is resting on its top.

6. Replace the eight screws in the base of the SAM16 and turn the enclosure over so it is now facing right-side up.

7. Replace all cables and the power cord on the rear panel.

CRA1 (V.35) or CRA2 (RS-232-D)

To remove and re-install the CRA1 or CRA2 board, you will need the following tools:

- medium Phillips head screwdriver

- medium slot head screwdriver

NOTE: The SAM16 must be completely turned over during this procedure and it is recommended that all cables be disconnected from the rear panel.

To remove the CRA1 or CRA2 board, follow Procedure 2-3.

_____

PROCEDURE 2-3. Removing the CRA1 or CRA2 Board

1. Perform steps 1–6 of Procedure 2-1 (Removing the CPY1 Board).

2. Remove two screws from the rear panel securing the trunk interface board.

3. Carefully remove the trunk board assembly.

NOTE: The trunk board assembly must be slowly rocked out of its connector (on the main circuit board); take care not to bend the pins in the connector.

To reinstall the CRA1 or CRA2 board, follow Procedure 2-4.

_____

PROCEDURE 2-4. Re-installing the CRA1 or CRA2 Board

NOTE: The trunk board assembly does not install straight into the main board connector. The trunk interface connector must be partially placed through the rear panel while simultaneously seating the trunk board connector in the main board.

1. Secure the trunk board to the rear panel by replacing the two mounting screws.

2. Carefully place the enclosure cover over the base of the SAM16.

3. Replace the four screws in the rear panel.

4. Completely turn the SAM16 over so it is resting on its top.

5. Replace the eight screws in the base of the SAM16 and turn the enclosure over so it is now facing right-side up.

6. Replace all cables and the power cord on the rear panel.

Replacing the Power Supply

To remove and re-install the power supply, you will need the following tools:

- medium Phillips head screwdriver

- medium slot head screwdriver

- 5/16 nut driver

NOTE: The SAM16 must be completely turned over during this procedure and it is recommended that all cables be disconnected from the rear panel.

To remove the power supply, follow Procedure 2-5.

_____

PROCEDURE 2-5. Removing the Power Supply

1. Perform steps 1–6 in the section for the CPY1.

2. Remove the chassis ground wire from the inside of the rear panel using the 5/16 nut driver.

3. Mark and disconnect the black and white wires from the power entry module to the power supply.

4. Unscrew the cable clamps used to route the input power to the supply.

5. Disconnect the power connector from the main circuit board.

6. Remove the three mounting screws from the power supply and remove the supply.

To re-install the power supply, follow Procedure 2-6.

_____

PROCEDURE 2-6. Re-installing the Power Supply

1. Place the new power supply on the mounting posts and secure it with the three screws.

2. Connect the power connector to the main circuit board.

3. Route the wiring harness through the cable clamps and secure the clamps.

4. Secure the chassis ground terminal to the rear panel by placing the ring terminal on the mounting post followed by the lock washer and nut.

    NOTE: This connection must be secure but not over tightened.

5. Reconnect the black and white wires to the power entry module.

6. Carefully place the enclosure cover over the base of the SAM16.

7. Replace the four screws in the rear panel.

8. Completely turn the SAM16 over so it is resting on its top.

9. Replace the eight screws in the base of the SAM16 and turn the enclosure over so it is now facing right-side up.

10. Replace all cables and the power cord on the rear panel.

Replacing the Fan

To remove and re-install the fan, you will need the following tools:

- medium Phillips head screwdriver

- medium slot head screwdriver

NOTE: The SAM16 must be completely turned over during this procedure and it is recommended that all cables be disconnected from the rear panel.

To remove the fan, follow Procedure 2-7.

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PROCEDURE 2-7. Removing the Fan

1. Note which fan has failed by looking through the cooling slots before disassembling the SAM16.

2. Perform steps 1–6 in the section for the CPY1.

3. Remove the two mounting screws securing the fan to the enclosure and slide the fan off the mounting posts.

4. Unscrew the fan power wires, noting which terminal is red and which is black.

To re-install the fan, follow Procedure 2-8.

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PROCEDURE 2-8. Re-installing the Fan

1. Place the new fan, with the power wires facing down and towards the other fan and with the label on the fan facing the inside of the enclosure on the mounting posts, and secure it with the two screws.

2. Connect the fan power wires.

3. Carefully place the enclosure cover over the base of the SAM16.

4. Replace the four screws in the rear panel.

5. Completely turn the SAM16 over so it is resting on its top.

6. Replace the eight screws in the base of the SAM16 and turn the enclosure over so it is now facing right-side up.

7. Replace all cables and the power cord on the rear panel.

Replacing the Air Filter

The air filter provided with the SAM16 requires cleaning and should be checked periodically depending on the environment in which the enclosure is placed.

The filter is accessed through the bottom of the SAM16 and is located on the left side (front-view) of the base.   The left side of the enclosure must be lifted off the table about 7 inches to gain access to the filter.

To clean the filter, follow Procedure 2-9.

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PROCEDURE 2-9. Cleaning the Air Filter

1. Lift the left side of the SAM16 off the table until the filter door on the base can be reached.

2. Unscrew the filter door.

3. Remove the filter.

4. The filter can be cleaned in water but should not be placed inside the SAM16 until it is *absolutely* dry.

5. Once the filter is dry, place it in the SAM16 and close the filter door.

Starting the SAM16

To power-up the SAM 16, follow Procedure 2-10.

_____

PROCEDURE 2-10. Powering-Up and Powering-Down the SAM16

1. Set the power switch on the rear panel to O (off).   Make sure the line cord is fully seated in the appliance receptacle.

2. Plug the line cord into a 110 or 220 VAC outlet.   In the case of a DC powered SAM16, connect the -48VDC source to the field wireable terminal located in the back of the unit. Correct polarity must be made in the connection. Incorrect polarity will not cause any harm, however, the unit will not work.

3. Set the power switch to | (on).

To power down the SAM16, turn the power switch on the rear panel to the off position.

Replacing the Power Fuse

The main power fuses are found in the power entry module at the back of the SAM16. If the LEDs do not light when the unit is powered on, a fuse may be blown. To remove and re-install the power fuse, follow Procedure 2-11.

NOTE: Fuses for both 110 VAC and 220 VAC are provided in the power entry module. The appropriate fuse should be selected before applying power to the SAM16 (110/2A, 220/1A). The unused fuses should not be placed in the power entry module.

_____

PROCEDURE 2-11. Replacing the Power Fuse

1. Remove the power line cord.

2. Insert a flat-blade screwdriver in the slot at the top and twist to snap the front of the receptacle open (see the following figure).

3. Use the screwdriver to pry the fuse drawer open from the right. Replace the blown fuse with the spare and close the drawer.

4. Close the fuse receptacle cover, making sure it snaps closed.
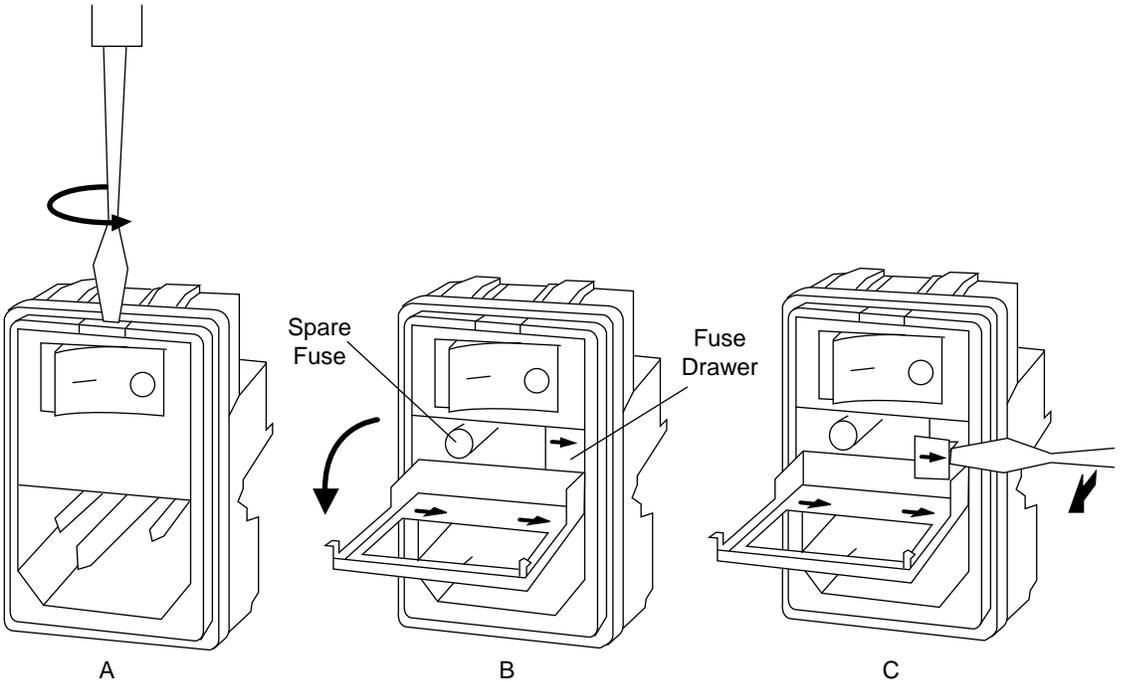
FIGURE 2-2. Replace Power Fuse

SAM64

The following sections supply installation information on, along with the appropriate procedures for, the SAM64.

Installation Options

The basic SAM64 comes equipped with one TERM32 module that provides 32 user ports. You can add a second TERM32 module to increase the user capacity to 64 ports. The first TERM32 is installed in the third slot of the SAM64. If a second TERM32 module is installed, it is located in the fourth slot.

The basic SAM64 also comes equipped with a TCON controller module. The TCON module occupies the second slot.

The basic SAM64 **does not** come equipped with a trunk board. Both the trunk module and trunk I/O circuit must be added as options. The trunk module is installed in the third (leftmost) slot. Any of the following trunk options and/or connections standards can be added to the basic SAM64:

- T1-Trunk

- fiber optic link

- RS-232-C connections

- V.35 connections

The SAM64 can operate on either AC or DC input voltages (universal AC or DC input supply must be specified by the customer upon purchase). For AC to DC or DC to AC power conversion, see Procedures 2-16 and 2-17 respectively. The power supply is placed in the rightmost slot of the SAM64.

Installation Requirements

The SAM64 is designed for operation in either a customer premises or Central Office (CO) environment.   At the customer premises location, the SAM64 can be placed on the floor, on a table, on a rack, or on other equipment, provided forced air from that equipment is not directed at the SAM64.   The front and rear of the SAM64 should be unobstructed. Each side should have a minimum clearance of 3 inches.

The same front, rear, and side clearance requirements apply to a SAM64 that is situated in a CO environment.   In the CO, the equipment may be placed on an available rack.   Figure 2-2 illustrates the dimensions and space requirements for both AC- and DC-powered SAM64s.
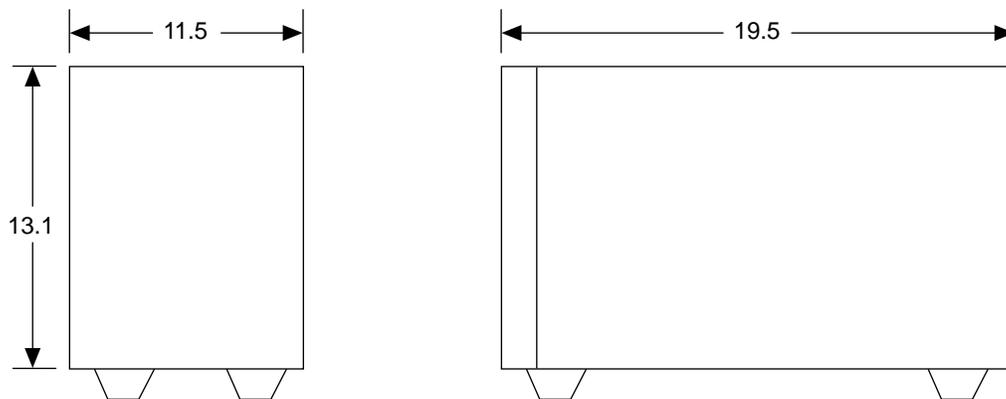
FIGURE 2-3. SAM64 Dimensions

Installing the Trunk

The SAM64 supports the T1-Trunk module, the HS-Trunk module, the SAMSL trunk module, and the SAMDL trunk module. These trunk modules are usually installed at the factory.   If your SAM64 has a trunk module installed, the following instructions can be used for service or to make final connections to the node.

NOTE: For continued protection against electrostatic discharge (ESD) damage, a grounding wrist-strap must be used when handling all circuit packs and I/O distribution boards. A receptacle is located on the front left surface of the unit.

T1-Trunk Module

The following tools and equipment are required to install the T1-Trunk module:

- Phillips head screwdriver
- slotted screwdriver
- #4 nut driver
- cable assembly, ED2P491-30, G14
- T1-Trunk module, TN1392 (104377320)
- small cover plate (marked "J12 RS449 TRUNK")

To install the T1-Trunk module, refer to Figures 2-3 through 2-5 and follow Procedure 2-12.
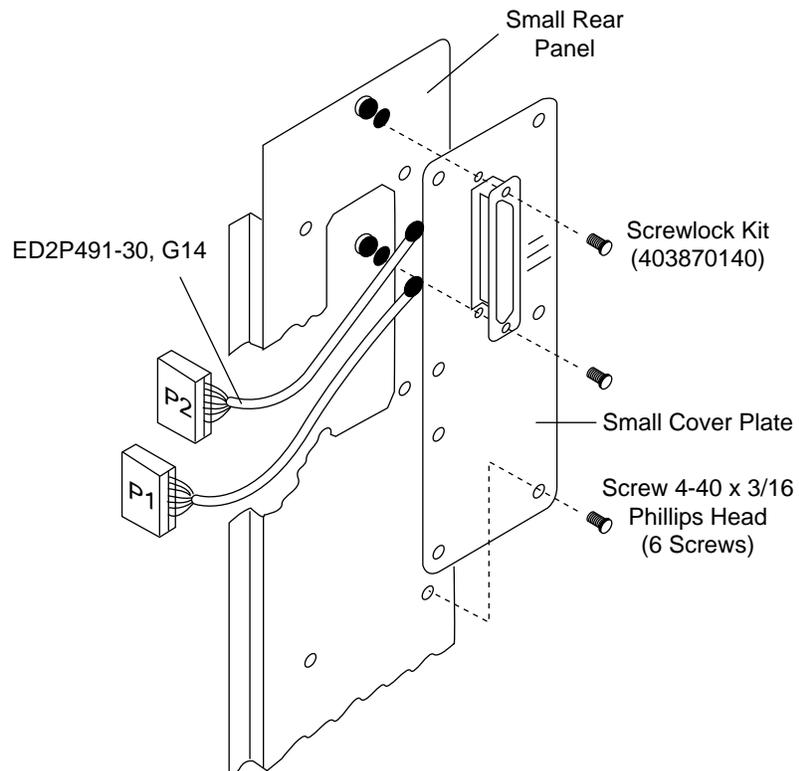
FIGURE 2-4. Installation Details – T1-Trunk I/O Module (Rear View)

NOTE: Each SAM64 is shipped with five small cover plates used with the five trunk options. The four unused cover plates should be stored for later use.

PROCEDURE 2-12. **Installing the T1-Trunk Module**

1. Remove the small rear panel.

2. Remove the small cover plate and set the six #4-40 x 3/16 Phillips head screws aside.

3. Mount the ED2P491-30, G14 cable assembly to the small cover plate using the screwlock kit (Comcode 403870140) as shown in Figure 2-3.

4. Mount the cover plate (now equipped with the cable assembly) to the rear panel using six #4-40 x 3/16 Phillips head screws as shown in Figure 2-3.

5. Connect the P1 and P2 connectors from cable assembly ED2P491-30, G14 to the backplane as shown in Figure 2-4.
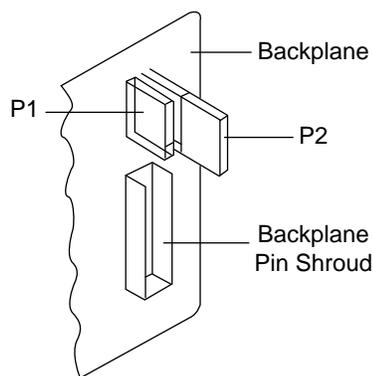
FIGURE 2-5. **Backplane Details**

6. Replace the small rear panel.

7. Route the external trunk cable, ED5P055-31, G128, (GN) to the DSU/CSU and connect it to the SAM64 J12 RS449 Trunk receptacle.

> **NOTE:** The recommended cable to connect the DSU to CSU is ED5P055-31,G128, G(AN).

8. Install the T1-Trunk module as shown in Figure 1-3 and set the MODE switch to ENABLE.

HS-Trunk Module

The following tools and equipment are required to install the HS-Trunk module:

- Phillips head screwdriver
- slotted screwdriver
- HS-Trunk module, TN1391 (104377312)
- HS I/O distribution board, CEY1 (105367791)
- small cover plate

The SAM64 high-speed fiber trunk (HS-Trunk) I/O distribution board is equipped with two ST-type connectors. The distance between the SAM64 and node should not exceed 3 km. A multimode (62.5/125μm) fiber cable is required.

To install the HS-Trunk module and I/O Board, follow Procedure 2-13.

_____

PROCEDURE 2-13. Installing the HS-Trunk Module

1. Remove the small rear panel and the two #4-40 x 3/16 screws from the I/O distribution board mounting tabs.

2. Carefully insert the CEY1 I/O distribution board (105367791) into the backplane pin shroud as shown in Figure 2-5.

3. Secure the I/O distribution board to the mounting tabs using the two #4-40 x 3/16 screws.

4. Replace the rear panel.

5. Secure the small cover to the rear panel using four #4-40 x 3/16 Phillips head screws.

6. Connect the two fiber-optic cables to the SAM64. If the cables are connected to a node, the MUTE light should go out. If the cables are connected to a node and the MUTE light does not go out, switch the cables on the SAM64.

7. Install the HS-Trunk as shown in Figure 2-5 and set the MODE switch to ENABLE.
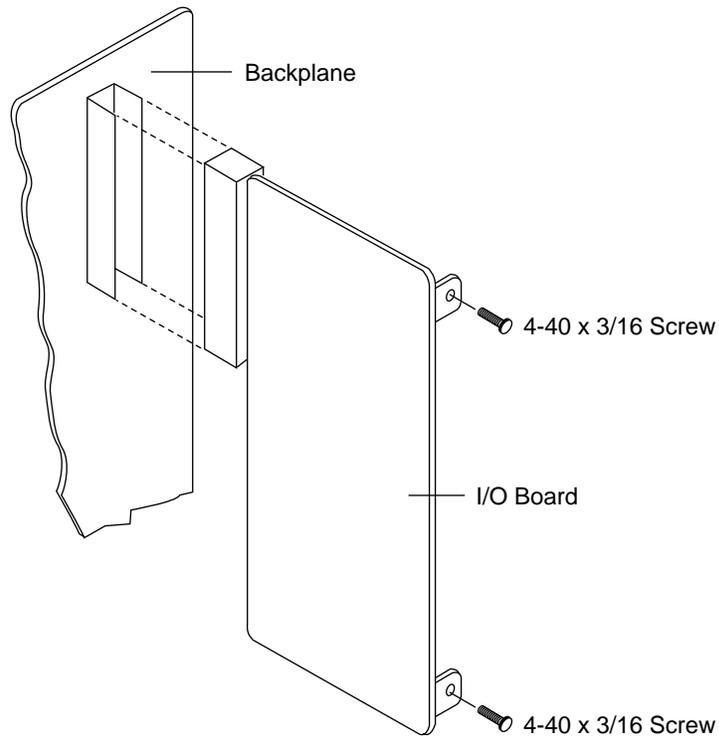
FIGURE 2-6. Installation of HS-Trunk, SAMSL, and SAMDL I/O Modules

SAMSL Trunk Module

The following tools and equipment are required to install the SAMSL trunk module:

- Phillips head screwdriver

- slotted screwdriver

- SAMSL trunk module, MC1D090A1B (106060932)

- V.35 I/O distribution Board, CEY2 (105531321) or RS-232-D I/O distribution board, CEY3 (105531339)

- Cable assembly, ED5P055-31, G170 G(T) (CEY2) or ED5P055-31, G108 G(P) (CEY3)

- Small cover plate (marked "J12 V35 TRUNK" (CEY2) or "J12 RS232 TRUNK" (CEY3)).

To install the SAMSL module and either the CEY2 (V.35) (105531321) or the CEY3 (RS-232C) (105531339) I/O distribution board, follow Procedure 2-14.

_____

PROCEDURE 2-14. Installing the SAMSL Module and CEY2/CEY3 Board

1. Remove the rear panel and the two #4-40 x 3/16 screws from the I/O distribution mounting tabs.

2. Carefully insert the CEY2 or CEY3 I/O distribution board into the backplane pin shroud as shown in Figure 2-5.

3. Secure the I/O distribution board to the mounting tabs using the two #4-40 x 3/16 screws.

4. Replace the rear panel.

5. Secure the small cover using six #4-40 x 3/16 Phillips head screws.

6. Connect the trunk cable from the DSU to the SAM64.   The cable used with the CEY2 I/O distribution board is ED5P055-31, G170, G(T).   The cable used with the CEY3 I/O distribution board is ED5P055-31, G108, G(P).

7. Install the SAMSL module in the front of the SAM64 as shown in Figure 1-3.   Once the module is installed, set the MODE switch to ENABLE.

SAMDL Trunk Module Installation

The following tools and equipment are required to install the SAMDL trunk module:

- Phillips head screwdriver

- slotted screwdriver

- SAMDL Trunk module, MC1D106A1 (106259591)

- RS-232C I/O distribution board, CEY4 (106210404)

- cable assembly, 601325426 and ED5P055-31, G107 G(P)

- small cover plate (marked "J12 DUAL TRUNK").

Complete the following steps to install the SAMDL To install the SAMDL module and the CEY4 I/O distribution board, follow Procedure 2-15.

PROCEDURE 2-15. Installing the SAMDL Module and CEY4 I/O Distribution Board

1. Remove the rear panel and the two #4-40 x 3/16 screws from the I/O distribution board mounting tabs.

2. Carefully insert the CEY4 (106210404) I/O distribution board into the backplane pin shroud as shown in Figure 2-5.

3. Secure the I/O distribution board to the mounting tabs using the two #4-40 x 3/16 screws.

4. Replace the rear panel.

5. Secure the small cover using six 4-40 x 3/16 Phillips head screws.

6. Connect the trunk cable from the DSU to the SAM64. The recommended cable used with the CEY4 I/O distribution board is Comcode 601325426. This "Y" cable can be connected to one or two DSUs using a ED5P055-31, G107, G(P) cable for each DSU.

7. Install the SAMDL Module and set the MODE switch to ENABLE.

TERM32 Module Installation

The SAM64 comes equipped with a TERM32 module, which is connected to the rear panel receptacles J1-J11.   Table 2-2 shows the relationship between the connectors and the user ports.

If a second TERM32 module is added to the basic SAM64 to provide an additional 32 ports, it should be connected as shown in Figure 1-3.

TABLE 2-2. **Connector – Port Relationship**

Connector	Ports
J1	1-6
J2	7-12
J3	13-18
J4	19-24
J5	25-30
J6	31,32,63,64
J7	33-38
J8	39-44
J9	45-50
J10	51-56
J11	57-62

Changing Power Modules

WARNINGS: The following procedures should only be performed by a qualified service or repair person.

Disconnect the input AC or DC voltage from the rear panel before attempting this service.

AC to DC Conversion

The following tools and equipment are required to change the SAM64 from AC input power to DC input power:

- screwdriver, slotted head (small)
- screwdriver, Phillips head
- crimp tool for 14 AWG ring terminal
- nut driver, #8 equipped with a 10" extension
- power module, TN2167 (106411408)
- DC Power Entry Assembly (846626968)

To change the AC power supply to DC, follow Procedure 2-16.

_____

PROCEDURE 2-16. Changing the AC Power Supply to DC

1. Remove the AC input line cord.

2. Remove the front door by turning the fasteners ¼ turn each.

3. Unplug the power supply input cord on the front of the power supply and remove the TN2166 power supply.

4. Remove the outer cover by removing three screws on each side and four screws from the front surface.   Place these screws aside for re-assembly.

5. Remove two Phillips head screws and lockwashers from the AC power entry assembly and place aside for re-assembly.

6. Carefully pull out the power entry assembly until the white plug is visible.

7. Unplug this connection.

8. Using the nut driver and extension remove the top nut and washer from the right (rear view) frame ground stud.

9. Remove the green frame ground wire from the stud and pull out the power entry assembly.

10. Place the green frame ground wire from the DC Power Entry Assembly (ED2P491-30, G22) on the frame ground stud.

PROCEDURE 2-16. **Changing the AC Power Supply to DC** (continued)

11. Replace the washer and nut and secure with the nut driver.

   CAUTION: A solid connection is essential for safe operation.

12. Plug the white connectors together and carefully insert the DC power entry assembly.

13. Secure the power entry assembly with the two Phillips-head screws and lockwashers.

14. Replace the top outer cover and screws.

15. Insert the DC power supply (TN2167) in the same location from which the AC supply was removed.

16. Plug the input power cord into the front of the power supply.

17. Connect the external frame ground stud located on the DC power entry assembly to a solid ground point using the ring terminal provided.

   CAUTION: A solid connection is essential for safe operation.

18. Connect the −48 VDC input to the terminal blocks on the rear panel.

   CAUTION: Take care to make the −48 VDC connections to the proper terminals. Take notice of the +/− polarity.

19. Apply power to the system and verify that the SAM64 is functional.

20. Replace the front door.

DC to AC Conversion

The following tools and equipment are required to change the SAM64 from DC input power to AC input power:

- slotted screwdriver
- Phillips head screwdriver
- #8 nut driver equipped with a 10" extension
- power module, TN2166 (106411390)
- AC Power Entry Assembly (846626950)
- line Cord (403271117).

To change the DC power supply to AC power supply, follow Procedure 2-17.

PROCEDURE 2-17. Changing DC Power Supply to AC Power Supply

WARNING: Turn off DC input power before attempting to complete the following steps.

1. Disconnect the power input + and − wires.   The exposed ends of the wires should each be covered with an insulating material.

2. Remove the frame ground wire using the #8 nut driver and replace the nut and lockwasher.

3. Remove the front door by turning the fasteners 1/4 turn each.

4. Unplug the power supply input cord on the front of the power supply and remove the TN2167 power supply.

5. Remove the outer cover by removing three screws on each side and four screws from the front surface.   Place these screws aside for reassembly.

6. Remove two Phillips head screws and lockwashers from the DC power entry assembly and place aside for reassembly.

7. Carefully pull out the power entry assembly until the white plug is visible.

8. Unplug this connection.

9. Using the nut driver and extension remove the top nut and washer from the right (rear view) frame ground stud.

10. Remove the green frame ground wire from the stud and pull out the power entry assembly.

11. Place the green frame ground wire from the AC Power Entry Assembly on the frame ground stud.

12. Replace the washer and nut and secure with the nut driver.

    WARNING: A solid connection is essential for safe operation.

13. Plug the white connectors together and carefully insert the AC power entry assembly.

14. Secure the power entry assembly with the two Phillips head screws and lockwashers.

15. Replace the top outer cover and screws.

16. Insert the AC power supply in the same location from which the DC supply was removed.

17. Plug the input power cord into the front of the power supply.

18. Plug the external line cord into the receptacle on the rear of the unit and then into a 110/220 VAC wall outlet.

19. Replace the front door.

SAM504

The following sections supply installation information on, along with the appropriate procedures for, the SAM504.

Installation Preparation

Before the SAM504 can be installed, the site must be prepared.   Ensure that there is sufficient floor space to position and anchor the unit, as well as appropriate power and ground capacity. The following sections elaborate on these requirements.

Floor Space	Figure 2-6 illustrates the dimensions and space requirements for the SAM504.
Power and Ground	Take the –48 VDC power feed to the SAM504 from a CO signal designated supply fused for 30 amp service. The bay requires a single-point connection to Central Office ground.

Table 2-3 lists the tools and miscellaneous hardware required for installation.

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TABLE 2-3. Required Hardware for SAM504 Installation

Quantity	Description	Comcode, Part Number, or Equivalent
	screw, slotted, hex with washer HO, #10-32x1/2 inch*	900964798
5	washer, #10-32*	802486810
5	nut, #10-32, hex*	80383458
2	terminal connector*	T&B 78-6210-54204
1	terminal, ring tongue*	AMP 2-31771-1
1 set	frame mounting. hardware (ED1A210-20)	H511-049
1	nylon tie fastener tool	R4827
	nylon ties	R4265
	#10 AWG stranded conductor	

* Supplied with unit

TOP VIEW   SIDE VIEW
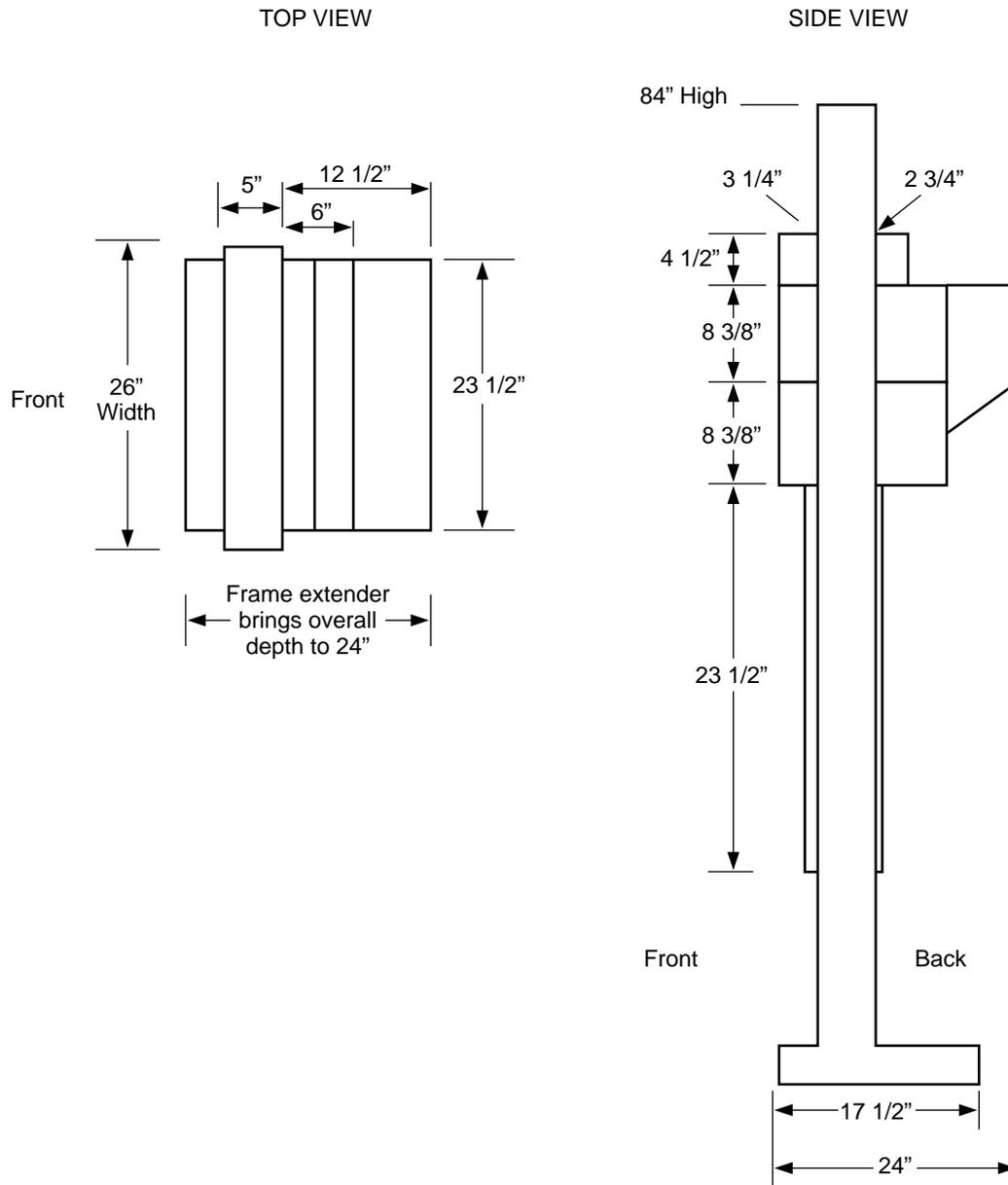
FIGURE 2-7. **SAM504 Dimensions**

Unpacking the Frame

The SAM504 is shipped as an assembly on a skid.   Carefully cut the strapping and remove the protective wrapping.

Bay Installation

The frame comes equipped with a base cover set that includes front and rear appliance outlets. Brackets are included as part of the assembly to extend the rear base cover to a depth of two feet. The brackets must be used to protect the I/O card cage assembly.   Refer to Figure 1-7 for a view of the SAM504 bay assembly with frame and cabinetry.

Frame Anchoring

The SAM504 is designed for base-mounted attachment to the floor.   Overhead earthquake bracing may be used to meet earthquake requirements.   Locate the floor mounting holes to fit the slot patterns for the bay, as shown in Figure 2-7.

Cable Racking

The SAM504 is lined up under existing ceiling-supported cable racks or new ones that are provided.   This alignment facilitates running the cables from the Cable Distribution System to the rear of the SAM504 bay.

Grounding

The SAM504 must be grounded to a stable single point ground via a ground conductor.   This conductor should be free from all other connections to minimize foreign, unstable ground current.   When installing the SAM504, a #10 AWG stranded external grounding conductor must be connected to the contact (stud) provided at the fuse and alarm panel.   To ground the SAM504, follow Procedure 2-18.

_____

PROCEDURE 2-18. Grounding the SAM504

1. Clean the area around the grounding contact (located at the rear of the fuse and alarm panel) to remove any paint or oxidation.

2. Terminate the CO ground conductor with the ring tongue terminal, AMP 2-3177-1.

3. Attach the ring tongue terminal to the grounding contact using the #10-32 hex nut and washer specified in Table 2-4.

4. Use cable ties where needed to secure the ground conductor inside the SAM504.
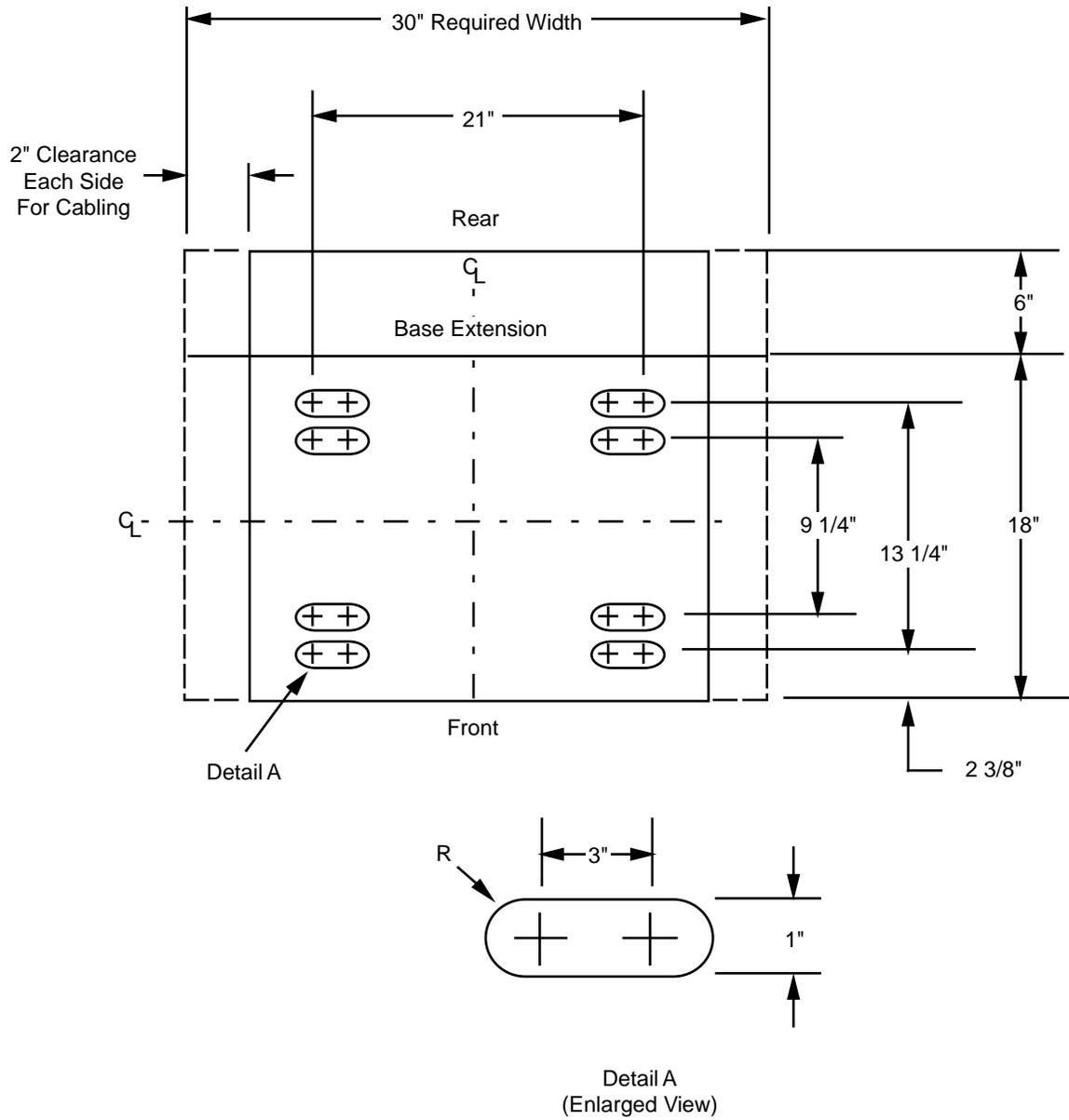
FIGURE 2-8. **SAM504 Base Floor Anchoring Hole Pattern**

Central Office Power (−48 VDC)

The SAM504 requires a −48 VDC power source and an external ground.   To provide CO power connections, follow Procedure 2-19.

_____

PROCEDURE 2-19. Providing CO Power Connections

1. Thread power cables through the strain relief connector located at the rear of the top cover, as shown in Figure 2-8.   Pull the cables through until the leads are long enough to reach from the strain relief connector to the power terminal with the top cover back far enough so that you can reach the power terminals.

2. Route the −48 VDC RTN conductor (black) into the fuse and alarm panel at the top of the SAM504 cabinet.

3. Connect the −48 VDC RTN conductor to the ground bus bar located just below the fuse board in the fuse and alarm.   Line up the two holes on the terminal with the two holes on the bus bar, as shown in Figure 2-8.   Then place the #10-32 screws through the holes and tighten the nut and washer on the other side.

4. Connect the −48 VDC conductor (red) to the battery bus bar, which is located on the fuse board just above the ground bus bar.   Line up the two holes on the terminal with the two holes on the bus bar.   Place the screws through the holes and tighten the nut and washer.

5. Use cable ties where needed to secure the power cable located inside the SAM504.

6. Once the connections have been made, slide the cover forward and tuck the excess wire length into the fuse and alarm panel. Make sure the wire will not interfere with circuit pack installation.   Secure the top cover to the fuse and alarm panel.

Thomas & Betts (T&B)
78-6210-54204
Terminal Lug

Ground

Power Cable

-48 VDC

-48 VDC RTN

90° Strain Relief

Power Cable

Top Cover, Perforated

Power Cable

Rear Cover

Flexible Grommet
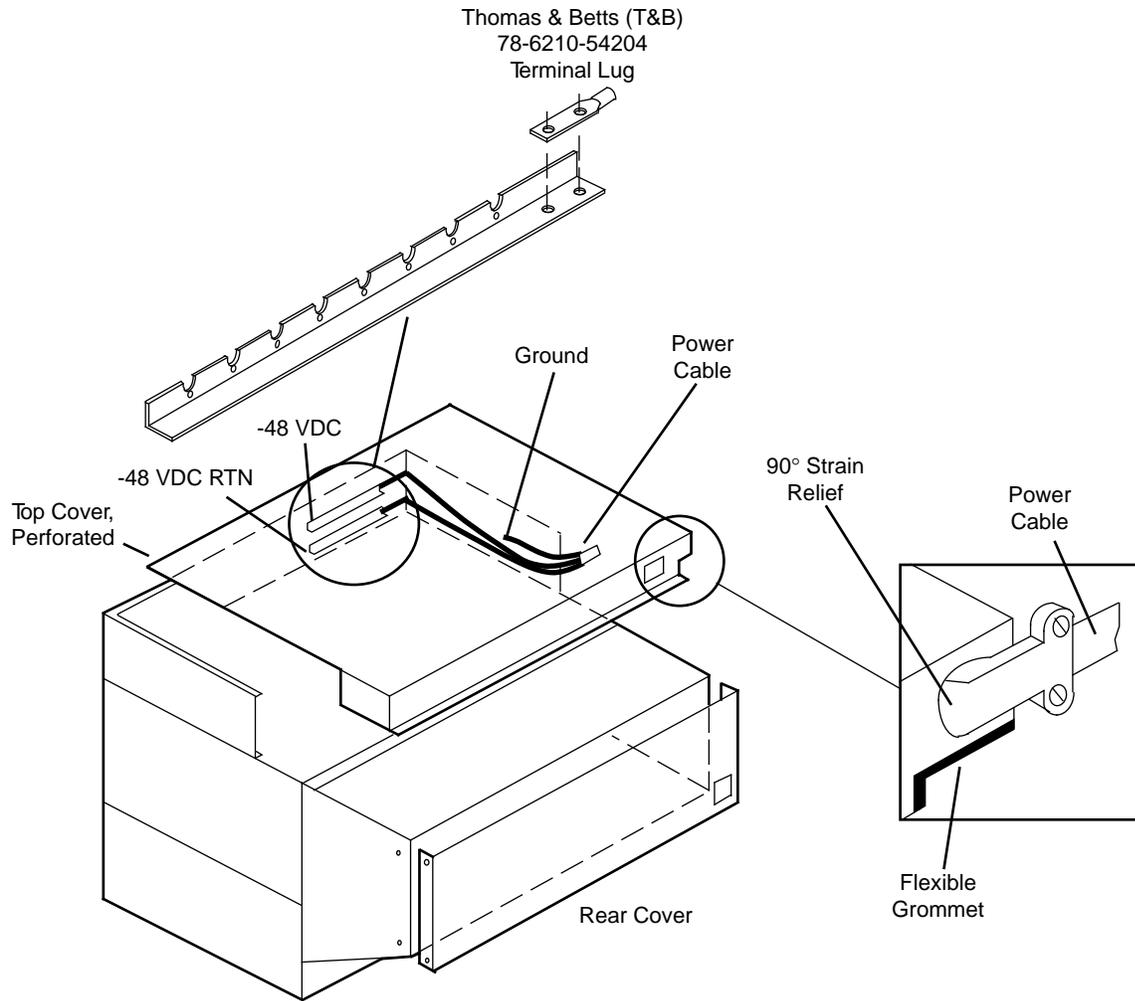
FIGURE 2-9. **Power Connection**

Central Office Alarm Connections

A terminal block at the rear of the fuse and alarm panel provides a connection to two sets of normally open relay contacts:

- MJ   MJR

- MJV   MJVR

The contacts are rated for 100 mA at 50 VDC.   Both sets close simultaneously on system failure.   Connect the CO alarm grid to the screw terminals on the terminal block using the appropriate wire and terminals.

Central Office Cabling

Cabling to the patch panel is organized and supported by six cable brackets located along the uprights of the equipment frame and the towel bars mounted on the patch panel; see Figure 2-9. Cables are routed down the left or right side of the frame (when viewed from the rear), depending on the connector location; see Table 2-4.

_____

TABLE 2-4. SAM504 Cable Routing

Left Side of Frame	Right Side of Frame
J1-9 to J1-16	J1-1 to J1-8
J2-9 to J2-16	J2-1 to J2-8
J3-9 to J3-16	J3-1 to J3-8
J4-9 to J4-16	J4-1 to J4-8
J5-9 to J5-15	J5-1 to J5-8
J6-10/11/12 to J6-13/14/15	J6-1/2/3 to J6-7/8/9

The cables are located in the three slots of the supporting cable brackets to allow for orderly cable additions and to permit easy cable removal without disturbing working circuits; see Figure 2-10. Secure the cables to the cabling brackets and towel bars using cable ties placed as shown in Figure 2-11.

To Overhead
Cable Racks

Secure Cables with
Cable Ties

Bracket

B25F Type Cable

Towel Bar

Cable Bracket
(6 Required) Mounts
to Existing Slotted
Hex Washer Head
Screw Locations

ED-2P469-30,
G1 Patch Panel

ED-1A157-73, G53 Cover,
Base (with Outlets)

ED-5A001-70,
G4 Frame
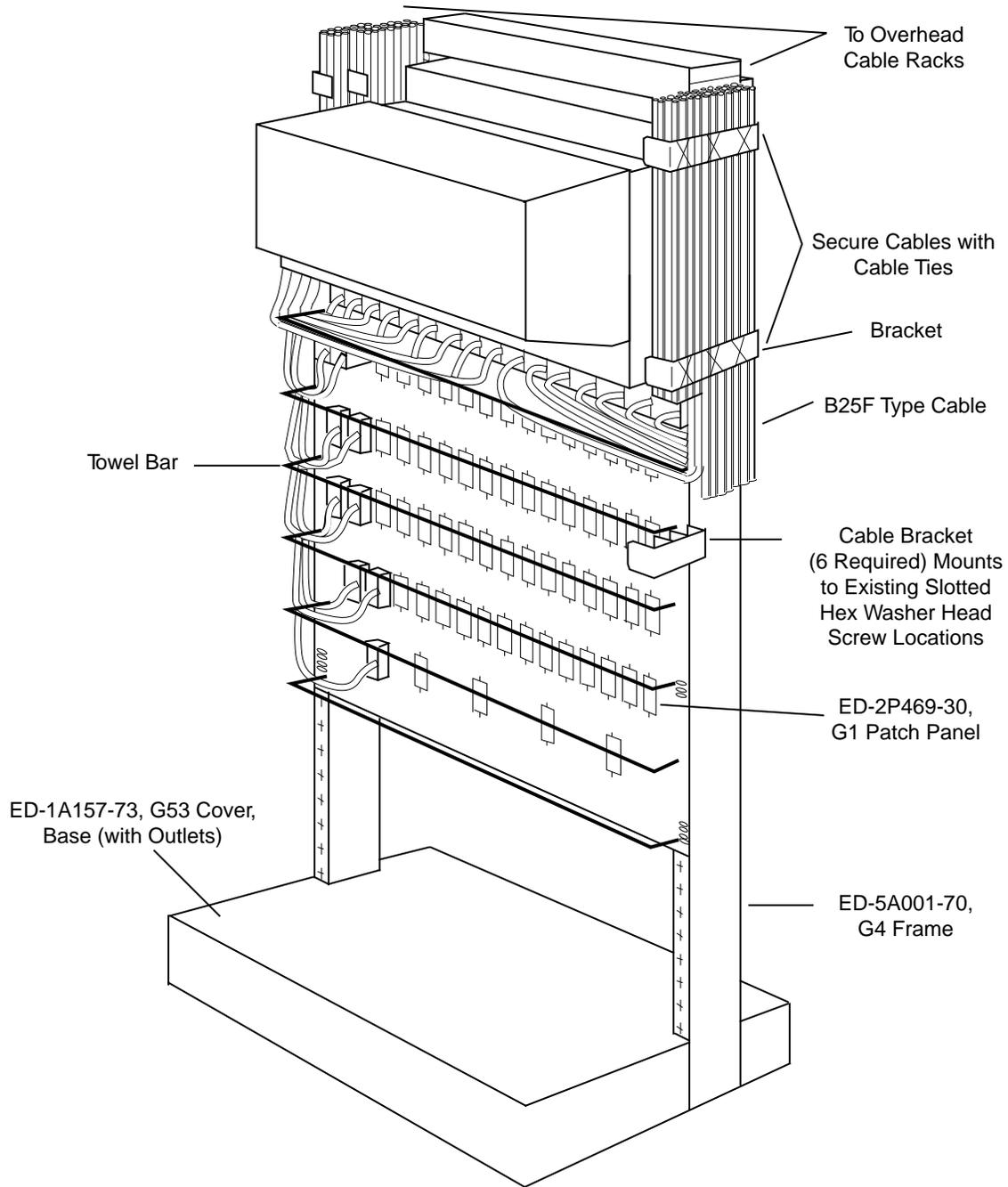
FIGURE 2-10. **Cabling Method**
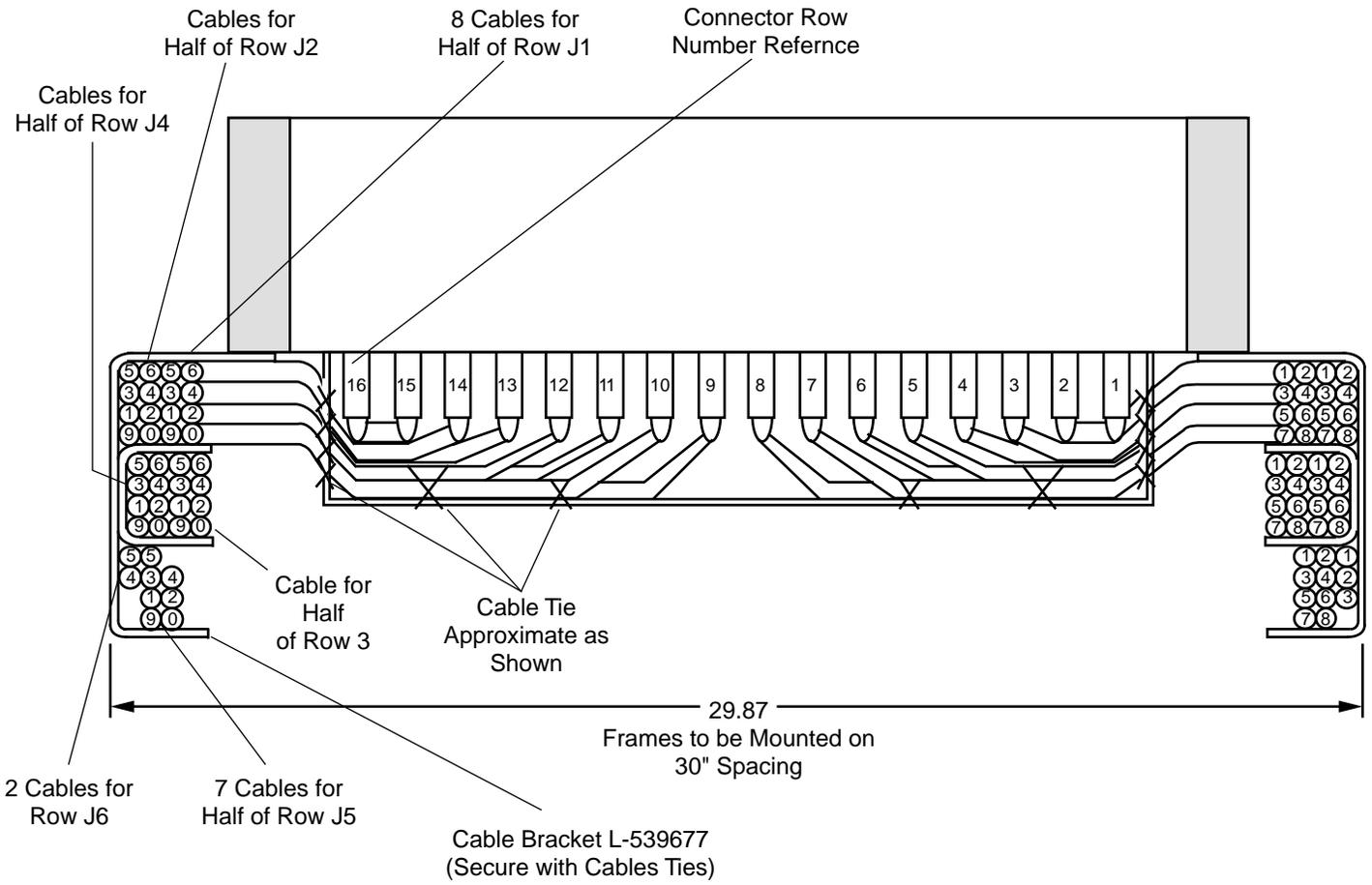
FIGURE 2-11. Cable Routing, Top View

Cables for
Half of Row J2

8 Cables for
Half of Row J1

Connector Row
Number Refernce

Cables for
Half of Row J4

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Cable for
Half
of Row 3

Cable Tie
Approximate as
Shown

29.87
Frames to be Mounted on
30" Spacing

2 Cables for
Row J6

7 Cables for
Half of Row J5

Cable Bracket L-539677
(Secure with Cables Ties)
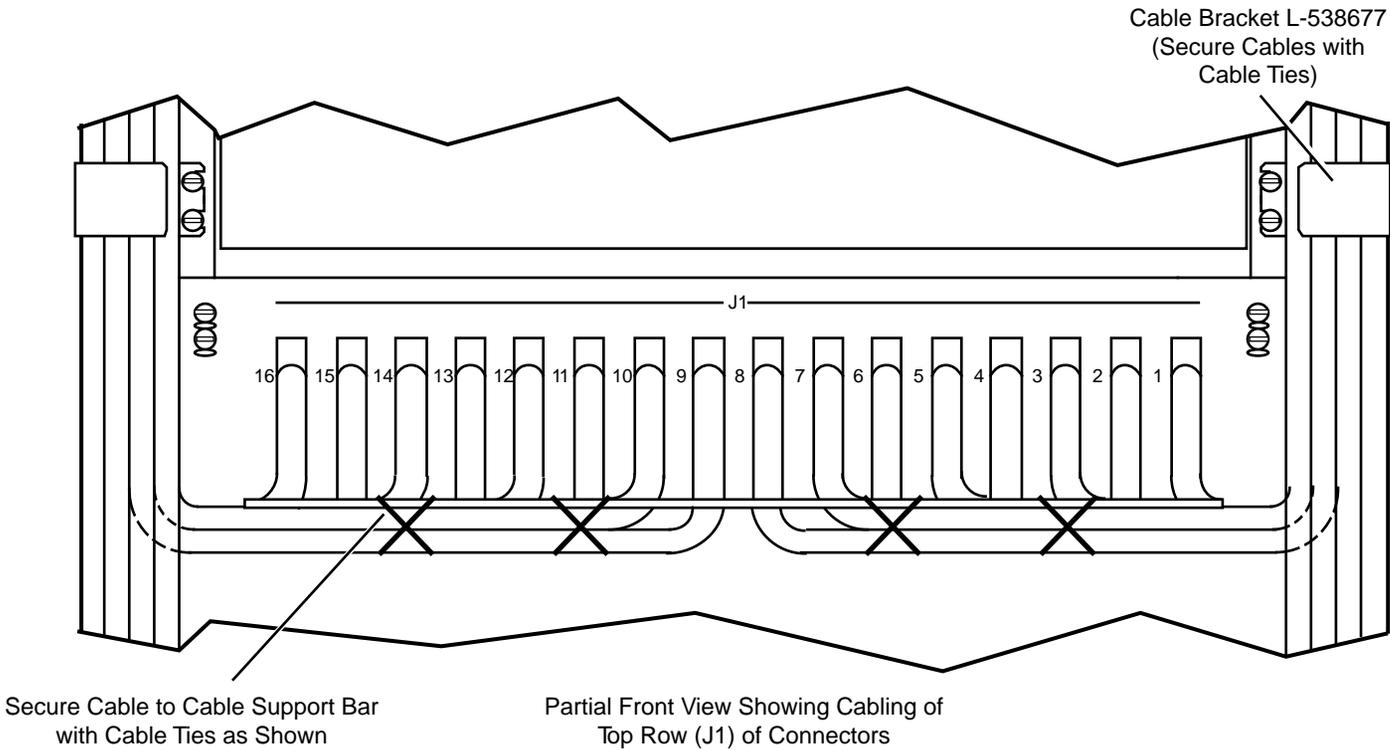
FIGURE 2-12. Cable Routing, Rear View

Cable Bracket L-538677
(Secure Cables with
Cable Ties)

J1

16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Secure Cable to Cable Support Bar
with Cable Ties as Shown

Partial Front View Showing Cabling of
Top Row (J1) of Connectors

Link Connections

There are four kinds of link connections for the SAM504 concentrator; see Table 2-5.

_____

TABLE 2-5. SAM504 Link Connections

Node Module Type	SAM504 Module Type			
Trunk-HS	HS-Trunk	TN1391	ED2P471-30, G1 ED2P472-30, G1	Up to 1 km Up to 2.9 km*
SAMSL, and SAMML	SAMSL	MC1D090A1	EAA2	1 V.35 56 kbps
Trunk-T1	T1-Trunk	TN1392	ED2P465-30, G1	

* ST®-biconic adapter cable FL2P-B-04 (Comcode 104244959) and coupling 1007A (Comcode 103877577) are required when ED-2P471-31, G1 replaces boards in existing installations.

Module and I/O Board Installation

Link modules occupy the slot marked **Trunk**.

To install a module in the front of the SAM504, open the latch on the faceplate, line up the board in the slot, and slide it all the way in. The board should seat easily on the pins. Resistance may indicate a bent pin or other obstruction. Close the latch to complete the installation.

NOTE: When a VDM is used with a SAM504 and the TERM32 module is operating in asynchronous mode, an adapter (ED5P055-31, G201, Comcode 405890617) must be inserted in the data interface cabling between the SAM and the VDM. Without this adapter, the TERM32 fuse will fail prematurely. No adapter is required with the Model 045C Series 2 VDM.

TERM32 Module and I/O Distribution Board Installation

To install additional TERM32 modules with ED2P466-30, G1 I/O distribution boards, follow
Procedure 2-20 and Procedure 2-21.

CAUTION: Always wear an ESD wrist strap when handling circuit packs. Ground the strap to
the ESD jack located on the front of the Fuse and Alarm panel.

_____

PROCEDURE 2-20. Assembling the TERM32 I/O Board

1. Lay out all six cables in order. Take up the first three (**J1**, **J2**, and **J3**) with the connectors
   facing up, so that **J1** is on top, **J2** is next, and **J3** is on the bottom.   (The connectors and
   headers are numbered.)

2. Hold the I/O board with the headers facing up, and fit the three cables through the slot at the
   bottom of the board.   The cables should enter the slot from the front, slide around the back,
   and return to the front of the board through the slot in the middle; see Figure 2-12.

3. Insert the connectors into the headers: **J3** first, then **J2**, and **J1** last.   Make sure that the
   latches snap closed.   Fold the ribbon cable flat against the headers and pull up any slack.

   NOTE: The connectors are keyed and can only be inserted in one direction.

4. Take connector **J6** (16-conductor cable) and lace the cable underneath the rightmost tab at
   the bottom slot on the board.   Insert **J6** into **P6**.

5. Lace **J5**, and then **J4**, under both tabs at the bottom slot and insert them into their respective
   headers.

6. Press the cable flat against the headers.   Draw up any slack so that the cables lie flat against
   the board.

To Patch
Panel
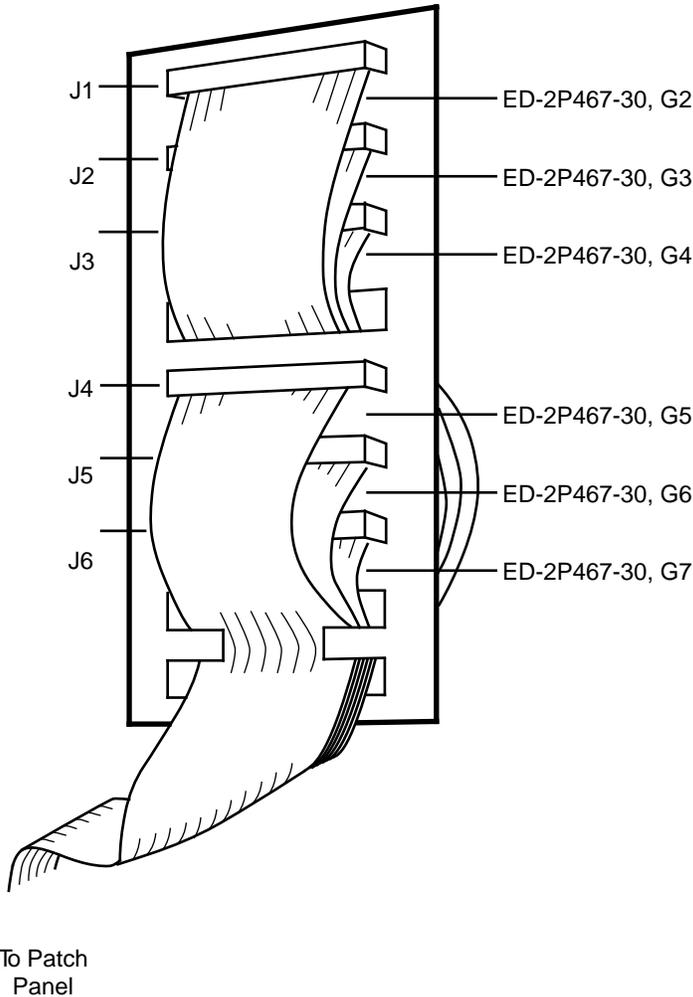
FIGURE 2-13. Cabling the ED2P466-30,G1 I/O Distribution Board

PROCEDURE 2-21. Installing the I/O Distribution Board with Cable Assembly

1. Open both latches.   Carefully insert the I/O distribution board into the rear card cage guiding the cables into the slot provided and close the latches.   Make sure that the adjacent cables are not damaged when inserting boards.

2. Remove the front cover of the patch panel by loosening the screws and lifting it up and out.

3. The cables should hang straight down in a neat bundle at the rear of the SAM504.   Fold the bundle once in a right angle, as shown in Figure 2-12, so you can pass it through the space provided between the Fan Shelf and the patch panel.   Then let the bundle hang down inside the panel at the front of the SAM504.

4. Fold the cable bundle again and slide it into its respective slot at the top of the patch panel.

5. Starting with the shortest cable, bend the ribbon flat against the connector.   This will allow the connector to slide through the cutout in the patch panel.

6. Slide the connector through the top slot of the patch panel being careful not to damage the cable on the edge of the cutout.   Be sure that the orientation of Pin 1 matches the marking on the front of the patch panel.

7. After the connector is completely through, pull back gently on the cable until the connector is snug in the cutout.

8. Line up the connector holes with the threaded holes in the patch panel and fasten the connector down with the two screws and baling wires included with it.

9. Repeat Steps 5 through 8 for connectors **J2** through **J5**.

10. The **J6** connector is connected in groups of three to a special cable (ED2P467-30, G8) at the bottom of the patch panel.   This cable is a 50-conductor ribbon cable that breaks out into three 16-pin connectors. The patch panel is marked to indicate which 16-pin connector of the ED2P467-30, G8 cable is connected to which I/O board.   Repeat Steps 5 through 8 to install the ED2P467-30, G8 cable.

    NOTE: Every fourth I/O board installed requires an additional special cable inside the patch panel.   The sixteenth board has no **J5** or **J6** cable.

11. After the last I/O cable assemblies are installed in the SAM504, replace the front cover of the patch panel and tighten the screws.

Inserting TERM32 Circuit Packs

To install additional TERM32 circuit packs when expanding the system, gently slide the circuit pack into the desired slot and secure the latch.   Do not install a TERM32 circuit pack until its corresponding I/O distribution board has been installed.

When seven or more TERM32 circuit packs are installed, the fourth multiplexer shelf power supply (410AA) must be installed in the slot labeled **+5.0B** at the right side.

Power-up

To power-up the SAM504, follow Procedure 2-22.
_____

PROCEDURE 2-22. Powering Up the SAM504

1. Verify that the fuse and alarm panel is properly fused.

2. Set the rocker switch on the fuse and alarm panel to the ENABLE position.

3. Verify that all the circuit packs are installed properly.

   CAUTION: Before applying power, check for proper polarity of −48 VDC power connections.

4. Turn on the −48 VDC power.   The three cooling fans should start immediately; if they do not, see **Troubleshooting**.   The red LEDs on each power supply and the red LED on the fuse and alarm panel marked **FAULT** will light up.

5. Set the fuse and alarm panel switch to DISABLE.   The amber LED on the fuse and alarm panel will light up.   Return the rocker switch to ENABLE.

6. Press the start (ST) button on any one of the three power supplies on the multiplexer shelf. The red LEDs on the power supplies and the **FAULT** LED will go out.   The LEDs on the TERM32 and on the TCON will now light.

   NOTE: If a fourth power supply has been installed, its start button must be pressed separately.

7. Set the mode switch on the link module to ENABLE.

8. The SAM504 is now ready to communicate with the node.

VDM-SAM504

The following sections supply installation information on, along with the appropriate procedures for, the VDM-SAM504.

Installation Preparation

Before the VDM-SAM504 can be installed, the site must be prepared.   Ensure that there is sufficient floor space to position and anchor the unit, as well as appropriate power and ground capacity.   The following sections elaborate on these requirements.

Floor Space	Figures 2-13 and 2-14 illustrate the minimum front and rear aisle space required to install a one-bay or two-bay configuration of the VDM-SAM504.
Power and Ground	Take the –48 VDC power feed to the VDM-SAM504 from a CO signal designated supply fused for 34 amp service for Bay 0 or 58 amp service for Bay 0 and Bay 1. Each bay requires a single-bond connection to CO ground.

The following table lists the tools and miscellaneous hardware required for installation.

_____

TABLE 2-6. Tools and Hardware — VDM-SAM504

Quantity	Description	Comcode Part Number or Equivalent
1	Screw slotted hex washer HO 10-32 x 5/8 LG	900821216
5	Lockwasher, #10 ext. tooth LK	802486810
2	Terminal, ring tongue supplied with unit	AMP 324082
	Nylon ties	R4265
1 set per frame	Frame MTG. hardware (per ED1A210-20)	H511-049
6	#10 AWG stranded conductor	
1 per frame	#8 AWG stranded conductor	

The following drawings contain further explanation of the VDM-SAM504 equipment:

SD-2P099-02	VDM-SAM504 Schematic Diagram
J-1P070W-01	VDM-SAM504 Bay 0 Drawing
J-1P070X-01	VDM-SAM504 Bay 1 Drawing
ED5A001-70	Equipment Frame
ED2P506-30	Internal Cabling
ED1A210-20	*ESS* Switch Common Method of Installing Framework

Floor Plan Requirements

The ED5A001-70, G4 frame comes equipped with a base cover set (includes front and rear appliance outlets).   Brackets are included as part of the base assembly to extend the rear base cover to a depth of 24 inches and **must be used** to protect the I/O card cage assembly.   As will be discussed later, the VDM-SAM504 can be configured with one or two bays.   Figure 2-13 shows the footprint for a one-bay configuration, and Figure 2-14 shows a two-bay configuration.
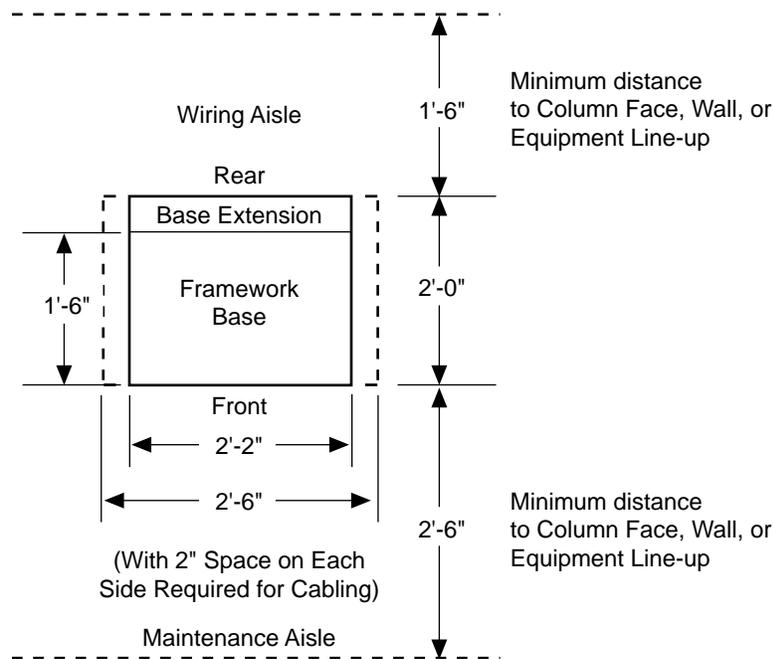
FIGURE 2-14. VDM-SAM504 Footprint for a One-Bay Configuration
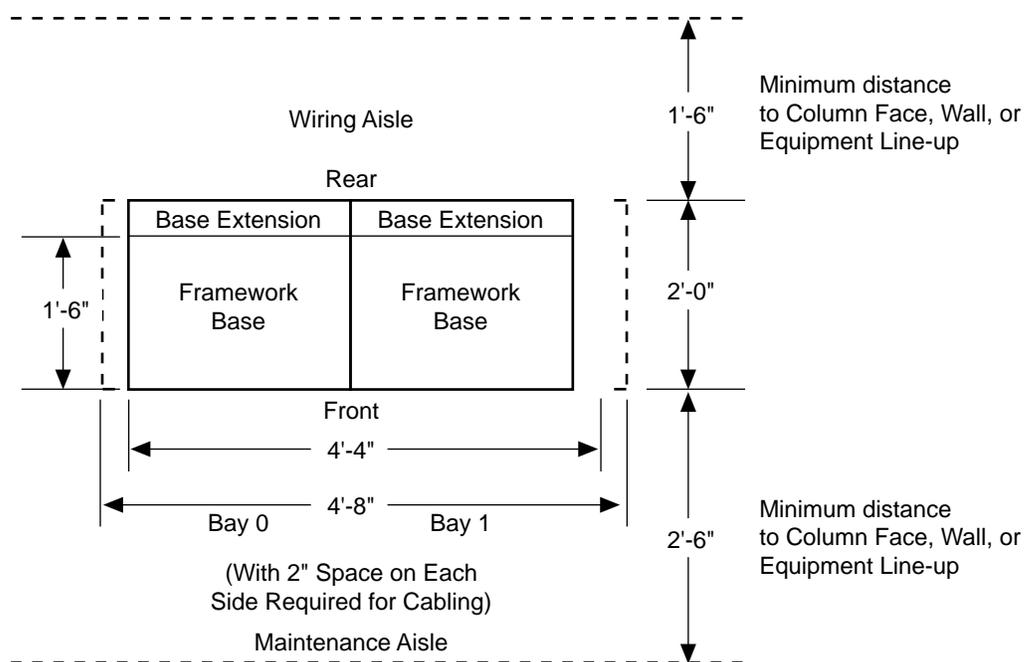
FIGURE 2-15. VDM-SAM504 Footprint for a Two-Bay Configuration

Frame Anchoring Requirements

The VDM-SAM504 is designed for base-mounted attachment to the floor.

NOTE: Overhead earthquake bracing must be used in Zone 4 locations to meet earthquake
requirements.   Refer to ED97877-01 for details.

Figure 2-15 shows how to locate the mounting holes to fit the slot patterns of a one-bay
configuration, and Figure 2-16 shows the same information for a two-bay configuration.   Refer to
ED1A210-20 for details regarding anchoring the framework(s) to a concrete floor.
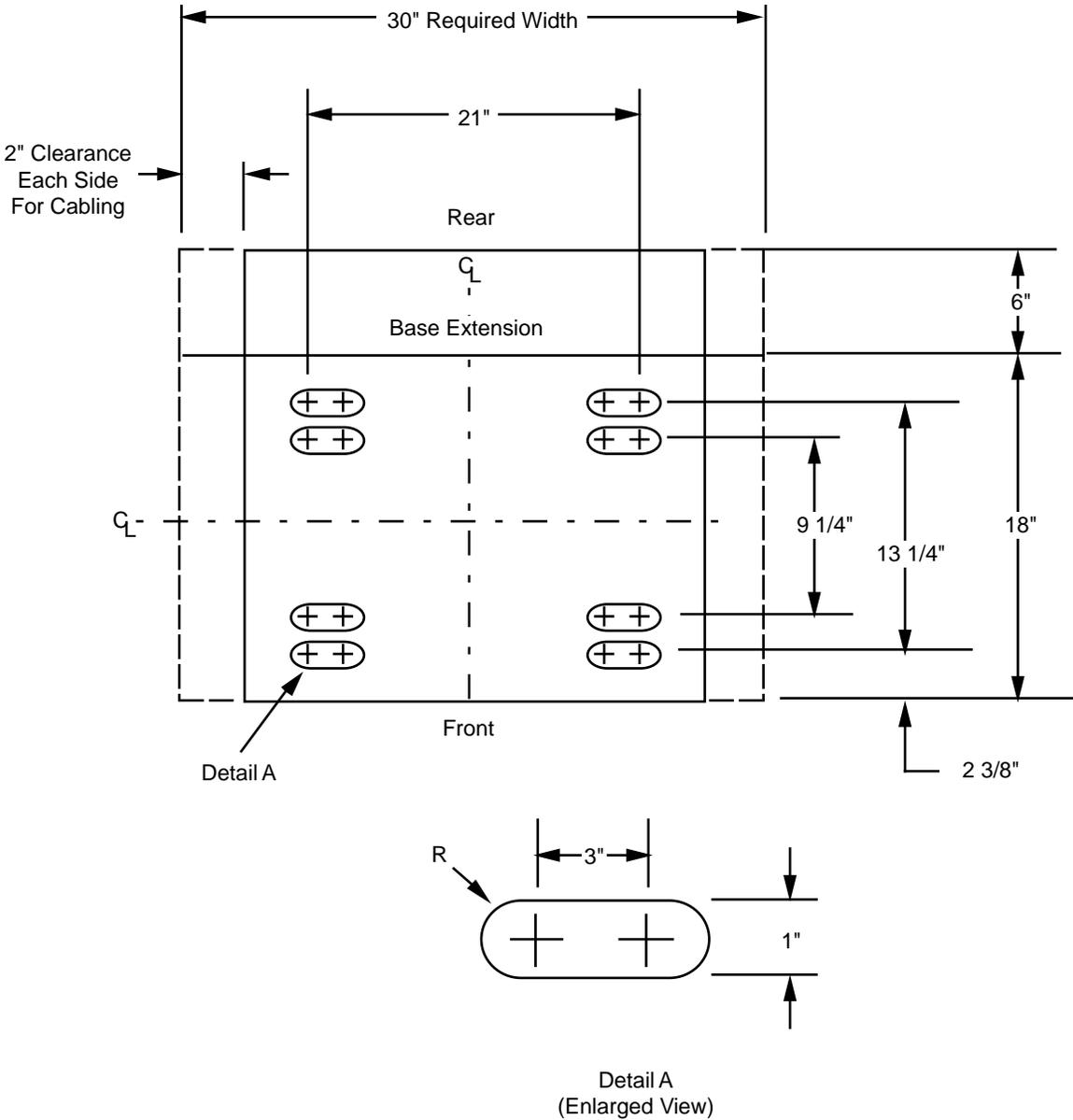
FIGURE 2-16. VDM-SAM504 Anchoring for a One-Bay Configuration
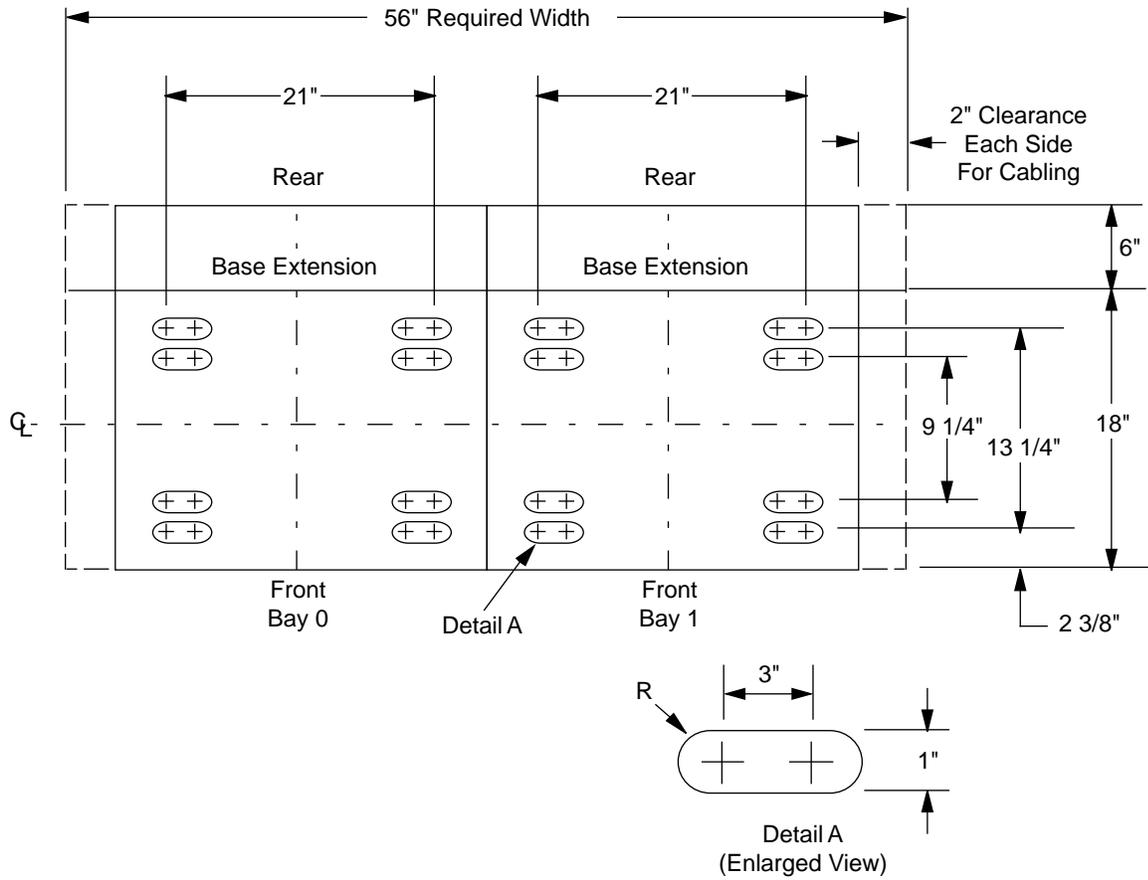
FIGURE 2-17. VDM-SAM504 Anchoring for a Two-Bay Configuration

Power and Grounding Requirements

Take the −48 VDC power feed to the VDM-SAM504 from a CO signal-designated supply and fused for 34 amp service for Bay 0 or 58 amp service for Bay 0 and Bay 1. Each bay requires a single-bond connection to the CO ground.

Installation Options

There are three possible ways to configure a VDM-SAM504. Depending on the number of ports you need and your budgetary constraints, you can order the equipment in the following configurations:

- one-bay configuration (Bay 0 only – up to 216 circuits)

- two-bay configuration (Bays 0 and 1 – up to 504 circuits)

- one-bay added later (Bay 1 – an additional 288 circuits)

One-Bay Configuration

To install Bay 0 only, follow Procedure 2-23.

_____

PROCEDURE 2-23. Installing Bay 0 Only

1. Secure the framework to the floor following the guidelines described in ED1A210-20. Anchor the framework as shown in Figure 2-15.

2. Connect the voice interface cables to P101 and P102 connectors on the VDM backplanes. Route the cables to the overhead rack, as illustrated in Figure 2-17.

3. Loosen TB7 upper terminals 1, 3 and 6 (see Figure 2-18).

4. Insert one #10 AWG −48 V CO feed into each terminal and tighten the screw.

5. Loosen TB7 upper terminals 7, 9 and 12 (see Figure 2-18).

6. Insert one #10 AWG −48 VDC RTN CO feed into each terminal and tighten the screw.

7. Connect the CO alarm grid wires to the appropriate terminals on TB11 (see Figure 2-19).

8. Verify that SW3 settings are as shown in Table 2-7.

9. Verify that the TB7 fuse ratings are set as shown in Figure 2-18.

PROCEDURE 2-23. Installing Bay 0 Only (continued)

10. Cover all empty VDM circuit card shelves with filler panels and any individual circuit card slots with filler cards.

11. Connect the trunk cable and route it to the overhead cable rack.

12. Remove the top 12–24 hex head mounting screw from the right side (rear view) of the framework and clean the area of paint.

13. Connect the CO ground (#8 AWG with ring terminal), shown in Figure 2-17, to the 12–24 screw.
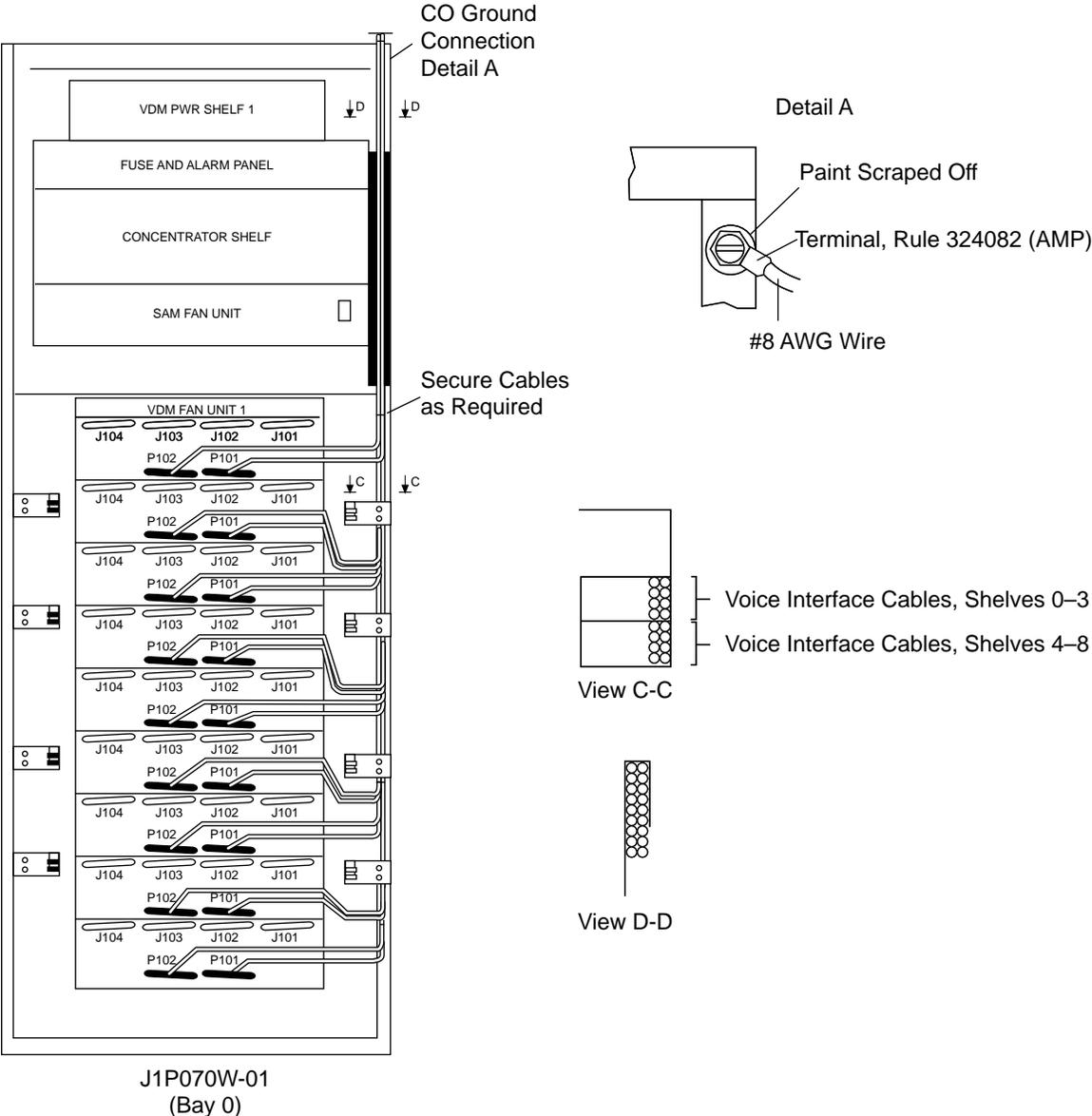
FIGURE 2-18. **Cabinet Cabling for Bay 0 Only**
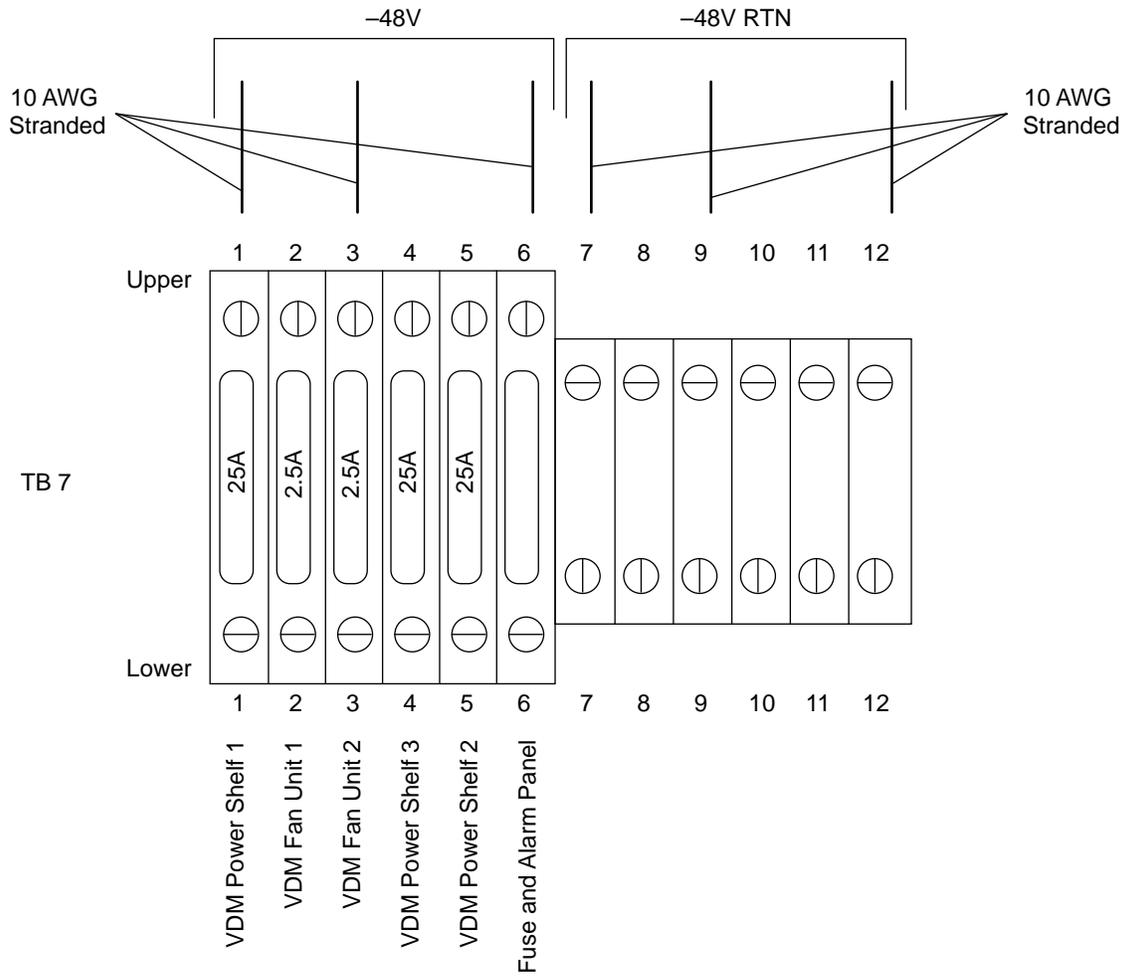
FIGURE 2-19. TB7 Connections

```
          TB 12                        TB 12
   ┌─────────────────┐        ┌──────────────────────┐
   1      2     3     4       1      2      3      4
```

| VDM Power Shelf 1 | VDM Power Shelf 2 | VDM Power Shelf 3 | VDM Fan Unit 1 | VDM Fan Unit 2 | VDM Power Shelf 1 | VDM Power Shelf 2 | VDM Power Shelf 3 |

VDM Fan Unit 1   VDM Fan Unit 2

Alarm Board Inputs

```
   1      2     3     4
```

TB 11

| MJV | MJ | MJVR | MJR |

Alarm Board Outputs
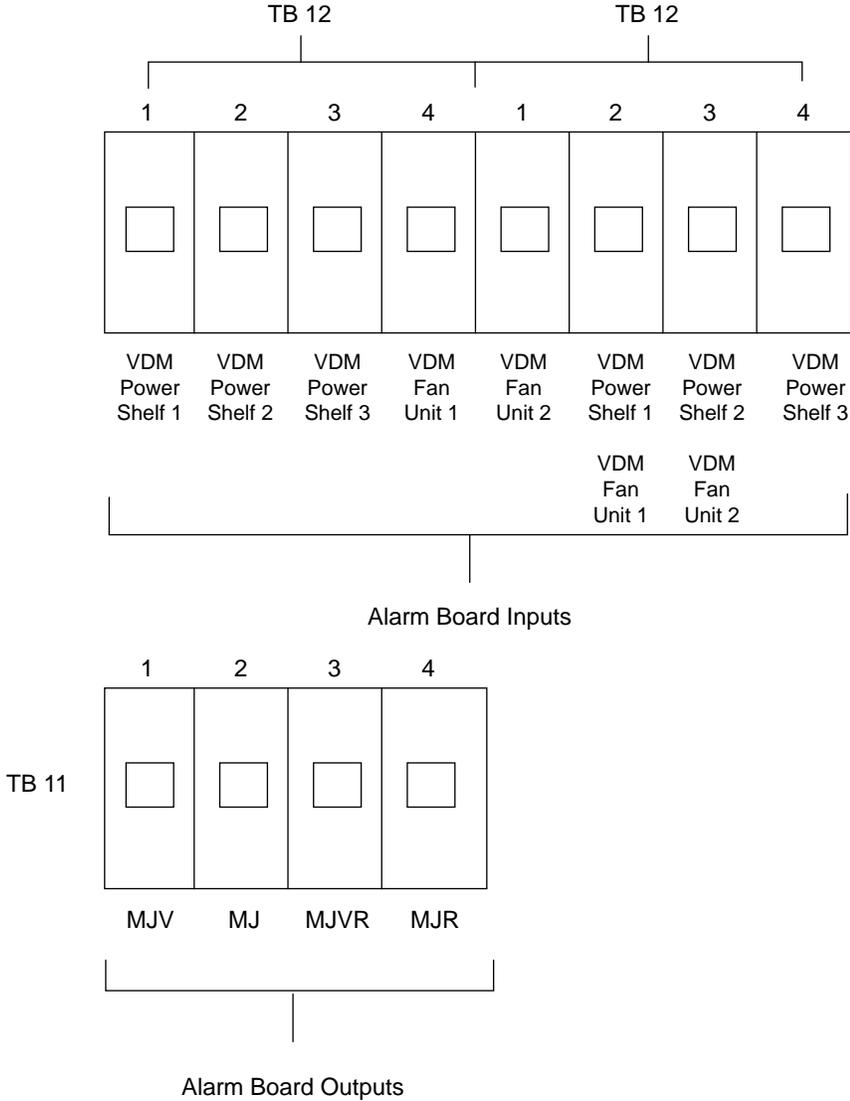
FIGURE 2-20. **TB11, TB12, and TB13 Connections**

Two-Bay Configuration

To install Bays 0 and 1, follow Procedure 2-24.

_____

PROCEDURE 2-24. Installing Bays 0 and 1

1. Follow Steps 1–11 for installing a one-bay configuration (see preceding section) with one exception — refer to Figure 2-16 for base anchoring information.

2. Remove the top 12–24 hex head screw from the left side (rear view) of Bay 1 and clean the area of paint.

3. Connect the CO ground (#8 AWG with ring terminal), shown in Figure 2-20, using the 12–24 hex head screw. Refer to Figure 2-17 for Detail A.

Voice Interface Cables, Shelves 9–14

Voice Interface Cables, Shelves 15–20

View E-E

View D-D

Voice Interface Cables, Shelves 0–3

Voice Interface Cables, Shelves 4–8

View C-C

CO Ground Connection

CO Ground Connection Detail A

VDM PWR SHELF 2

VDM PWR SHELF 3

VDM FAN UNIT 2

VDM PWR SHELF 1

FUSE AND ALARM PANEL

CONCENTRATOR SHELF

SAM FAN UNIT

Secure Cables as Required

VDM FAN UNIT 1

Secure Cables as Required

J1P070X-01
(Bay 1)

J1P070W-01
(Bay 0)

FIGURE 2-21. Cabinet Cabling for Bays 0 and 1

One Bay Added Later

When Bay 1 is installed after Bay 0, follow Procedure 2-25.

_____

PROCEDURE 2-25. Installing Bay 1 after Bay 0

1. Mount Bay 1 on the right-hand side (front view) of Bay 0, following the guidelines described in ED1A210-20.

2. Unpack the TERM32 I/O distribution boards and their connected ribbon cables.

3. Remove the leftmost (rear view) TERM32 I/O distribution board from Bay 0 and connect the two loose ribbon cables from Bay 1.   The 50-conductor cable connects to J5 and the 16-conductor cable to J6.

   NOTE: Be careful when inserting and extracting TERM32 I/O distribution boards or routing ribbon cables, to avoid the damage caused by pinching the cables between the circuit cards.

4. Insert the TERM32 I/O distribution boards into the successive I/O card cage assembly locations.

   CAUTION: Do not force I/O circuit cards in place, since the backplane pins on the SAM concentrator may be damaged in the process.

5. After all TERM32 I/O distribution boards have been inserted in the I/O card cage assembly, secure the ribbon cables to the cable support bracket mounted on the SAM concentrator.

6. Remove the P21.W connector from Bay 0 and replace it with the P21 connector from Bay 1.

7. Insert the P22 connector from Bay 1 into J22 on Bay 0.

8. Verify the SW3 settings using Table 2-7.

9. Verify the TB7 fuse ratings, as shown in Figure 2-18.

10. Cover all empty VDM circuit card shelves with filler panels and all empty circuit card slots with filler cards.

TABLE 2-7. Asynchronous/Synchronous Baud Rate

Baud	S1.1	S1.2	S1.3	S1.4
ASYNC	off	off	off	off
300	on	on	on	on
600	off	on	on	on
1200	on	off	on	on
2400	off	off	on	on
4800	on	on	off	on
7200	off	on	off	on
9600	on	off	on	off
14400	off	on	off	off
19200	on	off	off	off

Installing the Power and Grounding

Connecting the Power

The −48 VDC feed to the VDM-SAM504 should be taken from a CO signal-designated supply and fused for 34A service for Bay 0 or 58A service for Bay 0 and Bay 1.   Three parallel #10 AWG stranded wires should be used to connect to TB7 terminals 1, 3 and 6. In addition, three parallel #10 AWG stranded wires should be used to connect the −48 VDC RTN signal to TB7 terminals 7, 9 and 12.

Connecting the Grounding

The VDM-SAM504 must be grounded to a solid, stable, "single-point ground" via an "external chassis ground conductor." This conductor is to be free from all other connections to minimize foreign, unstable ground current. When the VDM-SAM504 is being installed, a #8 AWG stranded external grounding conductor must be connected to the screw provided on the rear of the framework. Proper cleaning of the screw area is required. For a detailed description of power and ground connections, refer to the section **One-Bay Configuration**.

Connecting the Remote Alarm Interface

A terminal block at the rear of the fuse and alarm panel (TB11) provides a connection to two sets of Normally Open (NO) relay contacts: MJ – MJR and MJV – MJVR.   The contacts are rated for 100 mA at 50 VDC, and both sets close simultaneously on system failure.   Connect the CO alarm grid to the screw terminals on the terminal block using appropriate wire and terminals.

Model 10B C-VDM Card Shelves Power and Grounding

Power (+12 VDC, −12 VDC, +5 VDC) and ground are supplied to the card shelves by integral cabinet wiring harnesses. These harnesses have a five-position locking connector, which connects to the rear of each card shelf (P103), as shown in Figure 2-21.
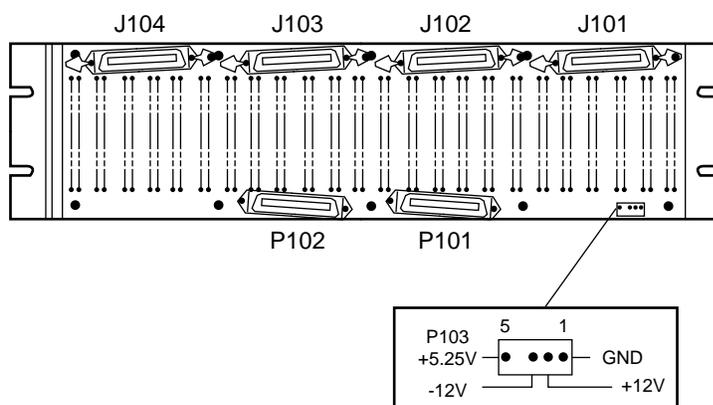
FIGURE 2-22. Backplane of Model 10B Shelf

Model 10B C-VDM Card Shelves Data Interface

Table 2-8 lists the relationships between card shelf backplane connectors and VDM circuit cards.

_____

TABLE 2-8. Data Connector/Circuit Card Relationship

Data Connector	Circuit Card/Slot
J101	1–6
J102	7–12
J103	13–18
J104	19–24

Model 10B C-VDM Card Shelves Tip and Ring Interface

The cabling between the card shelf and the MDF is connectorized at the VDM end and butt-ended at the MDF end.

To dress the cables into a two-bay configuration, follow the details shown in Figure 2-20; for a one-bay configuration, see Figure 2-17.   Attach the 50-pin connectors to the voice interface connectors, P101 or P102, using the two captivated screws of the connector. Then, drop the butt end of the cable at the assigned MDF location and dress the cable into the MDF. Cut off any excess cable and butt and strip the cable. Wire wrap the individual leads to the terminals of an MDF connecting block (e.g., Lucent Technologies 89 type).

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TABLE 2-9. Voice Connector/Circuit Card Relationship

Voice Connector	Circuit Card/Slot
P101	1 – 12
P102	13 – 24

25-Pair Cable to MDF
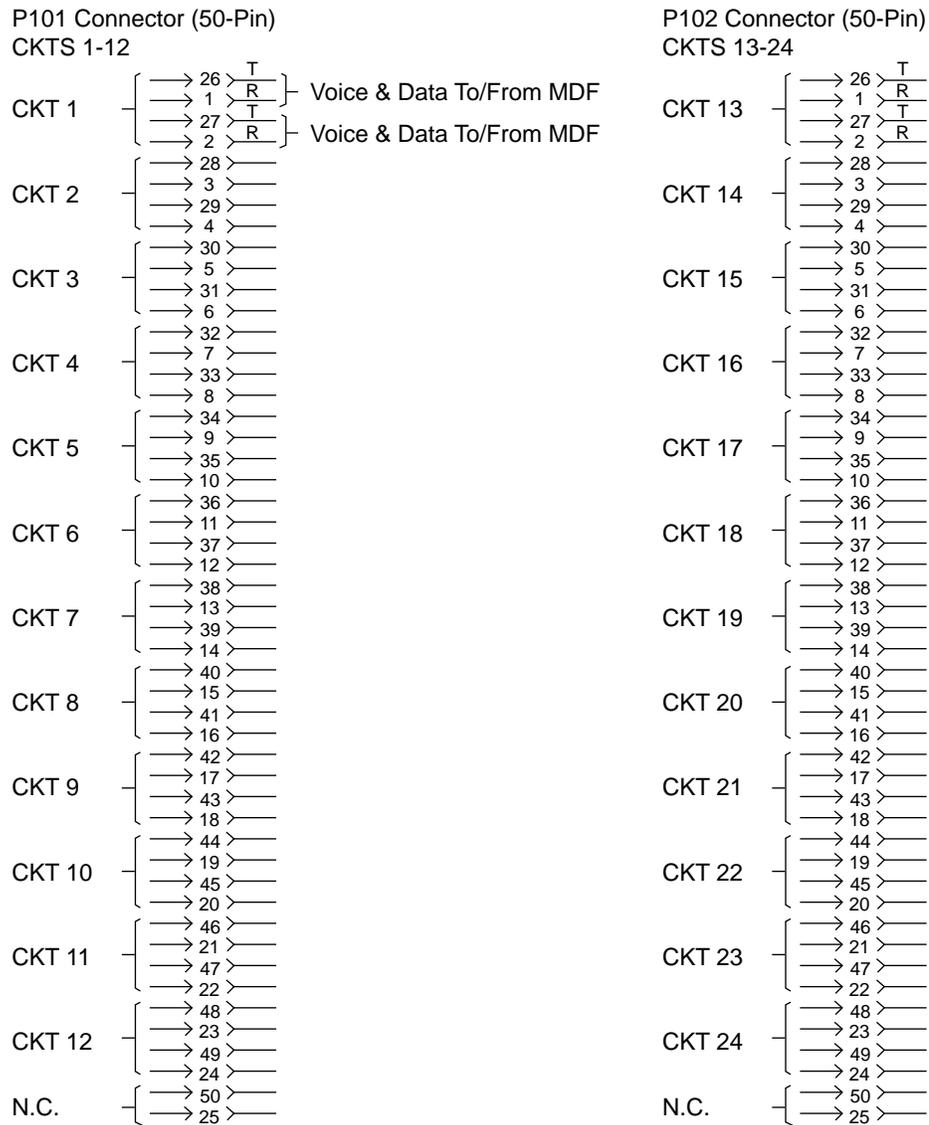
FIGURE 2-23. T/R Interface to MDF

Model 045C Series 2 VDM Circuit Cards

Once a VDM card shelf has been energized, VDM circuit cards can be inserted and removed from a card shelf without damaging either the card or shelf. Removing power from a shelf and/or a VDM circuit card will not interrupt voice circuit continuity.

There are no external VDM circuit card controls. Once the jumpers and switches have been set to the desired options and the card has been inserted into a slot, it is ready for service.

Filler Cards

A VDM filler card (Comcode 846349496) should be used in card shelves that contain fewer than 24 VDM circuit cards. The presence of these filler cards ensures that the VDM fan unit(s) will be able to provide maximum cooling to the VDM circuit cards in operation. Figure 2-23 illustrates how to insert a filler card into a VDM circuit card shelf.
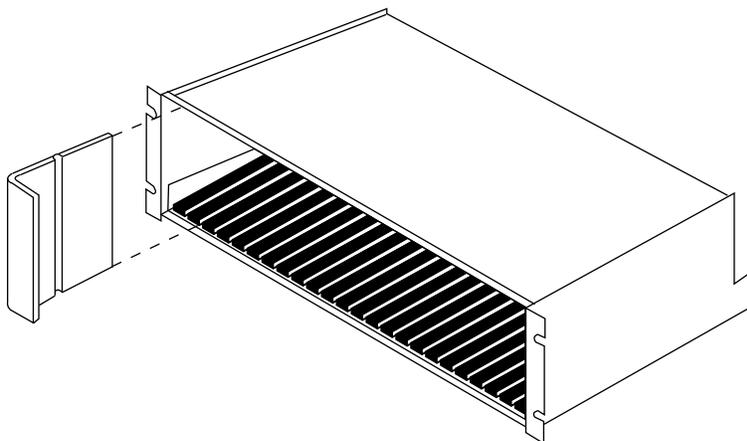
FIGURE 2-24. Inserting a Filler Card into a VDM Circuit Card Shelf

Filler Panels

A VDM filler panel (Comcode 846362184) should be used in empty VDM circuit card shelves. The presence of these filler panels ensures that the VDM fan unit(s) will be able to provide maximum cooling to the VDM circuit cards in operation. The filler panel should be inserted so that the handles are oriented in the same direction as the VDM circuit cards.

Trunk Connections

T1-Trunk Module

For the T1 facility (if applicable), a DS-1 circuit must be made available (if a T1-Trunk module is being used) to connect the VDM-SAM504 to the host or BNS-2000 VCS. Separate mounting space must be provided for the DSU, and, if applicable, the CSU. Owing to cable limitations on the VDM-SAM504, this space must be within 50 feet of the VDM-SAM504 bay. A *Dataphone* Data Communication Service cabinet (or equivalent) located in the same lineup as the VDM-SAM/BNS-2000 VCS/BNS-2000 is typically used for miscellaneous equipment (for example, modems, CSU, DSU, etc).

A DSU (multiplexer or modem) is needed to convert the T1-Trunk module signals to properly framed and timed data for transmission over DS-1 facilities. Lucent Technologies recommends using the *SATD4/ESF* Modem, the *D/I MUX* Multiplexer, or the Phoenix Model 1536 Data-T Modem as the DSU for a T1-Trunk to the VDM-SAM504/BNS-2000 VCS/BNS-2000.

To install the T1-Trunk module, follow Procedure 2-26.

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PROCEDURE 2-26. Installing the T1-Trunk Module

1. Insert the T1-Trunk I/O distribution board in the SAM concentrator.

2. Route the cable to the DSU using the cable troughs and overhead cable racks.

3. Connect the cable from the DSU to the I/O distribution board.

4. Install the T1-Trunk module and set the mode switch to ENABLE. The VDM-SAM504 is now ready for initialization.

Trunk-HS Module

To connect the Trunk-HS module, follow Procedure 2-27.

_____

PROCEDURE 2-27. Connecting the Trunk-HS Module

1. Connect the two fiber-optic cables to the I/O distribution board (for the VDM-SAM504). The designations are silk-screened on the rear panel. The receiver on the VDM-SAM504 end is connected to the transmitter at the BNS-2000 VCS end, and the transmitter on the VDM-SAM504 end is connected to the receiver at the BNS-2000 VCS end. The *ODL* 50 Lightwave Data Link series of devices uses an ST type connector while the previous fiber optic interfaces use biconic Data Link connectors. In cases where connectivity to a biconic type connector is required, an adapter cable must be used. This cable is coded as an FL2P-B-04 (comcode 104244959) and provides an ST to biconic conversion. Additionally, two biconic couplings (1007A, comcode 103877577) are required to mate the two biconic ends. These products are available through the Atlanta Works.

2. Install the Trunk-HS and set the mode switch to ENABLE. The VDM-SAM504 is now ready for initialization.

SAMSL Trunk Module

Install the SAMSL trunk module as described in the earlier **T1-Trunk Module** section.

TERM32 Module

TERM32 modules are prewired to the VDM circuit card shelves.

An adapter (ED5P055-31, G (201), Comcode 405890617) is required for asynchronous applications and is installed on the VDM circuit card shelf backplane connectors (J101 to J104). When TERM32 modules are being used with VDMs in the asynchronous mode, an ED5P055-31 G(201), 405890617 adapter must be inserted between the data interface cables and the VDM shelf.   This adapter is not required when using Model 045C Series 2 VDMs.   When operating in the asynchronous mode without the adapter, failure to have Model 045C Series 2 VDM switches S2.6 and S2.7 in the OFF position can cause a fuse to open on the SAM TERM32 board.

VDM Power Supplies

The VDM power supplies require a −48 VDC signal power source and an external ground. The power supplies are prewired at the factory (to the P24 connector).

SAM Cabling

SAM Cabling

This chapter provides a description of the cabling requirements for the various SAMs. The cabling requirements for asynchronous connections are presented, followed by a description of the cabling requirements for synchronous connections. The chapter concludes with a description of SAM16 node cabling and cable ordering information.

The first 25 feet of data cabling connected to a SAM16, SAM64, SAM504, and VDM-SAM504 must be shielded to meet Federal Communications Commission (FCC) electromagnetic interference (EMI) requirements. If longer cable runs are needed for a given configuration, unshielded cables can be used after the first 25 feet.

Asynchronous Connections

Cabling from SAM16 (TERM8) Directly to Terminal or Host

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) to terminals or hosts can be configured as follows:

- The cabling for the SAM16 begins at the rear panel. The SAM16 CPY1 I/O board is equipped with eight, female DB25 connectors (one per port) with data communications equipment (DCE) interfaces.

- The connection for each port can be made in one of the following ways:

  — using RS-232-D cables

    - Use an M25A cable if the terminal or host has a male connector.

    - Use an M25B cable if the terminal or host has a female connector.

  — using modular cables

    - Connect a D8AH cable to a port at the rear of the SAM16.

    - An optional method is to use a D8AH-M adapter and a D8W cable.

- Plug the other end of the D8W cord into the modular socket of either a D8AH-F or D8AH-M adapter, depending on the gender of the terminal or host connector.   Use D8AH-F if the terminal or host connector is male and use D8AH-M if the terminal or host connector is female.

- Plug the D8AH adapter into the terminal or host connector.

Ordering information is presented in Table 3-1.

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TABLE 3-1. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
M25B	25-pin-M 25-pin-M	G-108, G-P
D8AH	25-pin-M mod plug	G-131, G-G
D8AH-M adapter	25-pin-M mod socket	G-139
D8AH-F adapter	25-pin-F mod socket	G-147
D8W	mod plug mod plug, straight through	G-137, G-G

For plenum cables, see **Table 3-30** *at the end of this section.*

Cabling from SAM16 (TERM8) to Terminal or Host via Modem or FOM

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) to terminals or host via a modem or FOM can be configured as follows:

- The cabling for the SAM16 begins at the rear panel.   The SAM16 CPY1 I/O board is equipped with eight female DB25 connectors (one per port).

- The connection for each port can be made in one of the following ways:

    — using RS-232-D cables

        - An M25A cable connects to the port at the rear of the SAM16.

        - The other end of the M25A cable connects to the DCE to DCE adapter.

        - The DCE to DCE adapter connects to the modem or FOM.

    — using modular cables

        - Connect a D8AH cable to the port at the rear of the SAM16.

        - An alternate method is to connect a D8W modular cord to the modular socket of a D8AH-M adapter.

        - Plug the other end of the D8W modular cord into the modular socket of a D8AH-F adapter.

        - The DCE to DCE adapter connects to the modem or FOM.

Ordering information is provided in Table 3-2.

TABLE 3-2. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
D8AH	25-pin-M mod plug	G-131, G-G
D8W	mod plug mod plug, straight through	G-137, G-G
D8AH-M adapter	25-pin-M mod socket	G-139
D8AH-F adapter	25-pin-F mod socket	G-147
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
M25B	25-pin-M 25-pin-M	G-108, G-P

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM16 (TERM8) to R-VDM
via VDM Cabinet

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) to an R-VDM via a VDM cabinet can be configured as follows:

- A VDM cabinet can have up to 12 shelves.   For this application, an ED2P497, G-7 (Model 10F) shelf is required.   It provides twenty-four DB25 female connectors, one per data channel.

- The SAM16 provides 16 circuits via eight female DB25 connectors located on the two TERM8 CPY1 I/O boards on the rear of the unit.

- A DCE to DCE adapter is required to connect the SAM16 to a device with a DCE interface.

    NOTE: When connecting a SAM16 to a VDM cabinet, an ED2P497, G-7 (Model 10F) shelf is required in the VDM cabinet.

- An M25A cable connects to a port at the rear of the SAM16.

- The other end of the M25A cable connects to the DCE to DCE adapter.

- The DCE to DCE adapter connects to the VDM cabinet.

    NOTE: The DCE to DCE adapter can be attached at the SAM16 or at the VDM cabinet end of the configuration.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

    — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable.   Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

    — The end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

— Voice channels are wired from the MDF to the CO voice switch.

— Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-3.

Data Connectors

Voice Connectors

FIGURE 3-1. VDM Cabinet Shelf Backplane

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TABLE 3-3. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM16 (TERM8) to R-VDM
via VDM Stand-Alone Shelf

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account
Representative for more information.

The cabling from a SAM16 (TERM8) to an R-VDM via a VDM Stand-Alone Shelf can be
configured as follows:

- The VDM Stand-Alone Shelf supports 18 circuits. Female DB25 RS-232-D connectors are
  provided for each circuit, requiring 18 data cables per shelf.

- The SAM16 provides 16 circuits via eight DB25 RS-232-D connectors located on two
  TERM8s on the rear of the units.

- An M25A cable connects to the port at the rear of the SAM16.

- The other end of the M25A cable connects to the DCE to DCE adapter.

- The DCE to DCE adapter connects to the Stand-Alone Shelf.

  NOTE: The DCE to DCE adapter can be attached at the SAM16, or at the Stand-Alone
  Shelf end of the configuration.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the
  customer or end user equipment location. The connection between the VDM Stand-Alone
  Shelf in the CO and the R-VDM at the customer or end user equipment location is provided as
  follows:

  — The VDM Stand-Alone Shelf voice and voice/data circuits are connected to the CO Main
    Distribution Frame (MDF) with an A25RXM cable. Each of the 50-pin A25RXM cables
    provides voice and voice/data connections for 12 circuits.

  — The end of the A25RXM cable connects to one of the 50-pin plugs on the VDM
    backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop
    (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Data Connectors

Voice and
Voice/Data
Connectors

FIGURE 3-2. **VDM Stand-Alone Shelf Backplane**

Ordering information is presented in Table 3-4.

TABLE 3-4. **Ordering Information**

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** at the end of this section..

Cabling from SAM16 (TERM8) to R-VDM
via Model 045CS VDM

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8)'s CPY1 I/O board to an R-VDM via a Model 045CS VDM can be configured as follows:

- The Model 045CS VDM is equipped with one DB25 data connector.

- The SAM16 provides 8 circuits via eight female DB25 connectors located on two TERM8s on the rear of the unit.

- An M25A cable connects to the port at the rear of the SAM16.

- The other end of the M25A cable connects to the DCE to DCE adapter.

- The DCE to DCE adapter connects to the Model 045CS VDM.

    NOTE: The DCE to DCE adapter can be attached at the SAM16, or at the Model 045CS VDM end of the configuration.
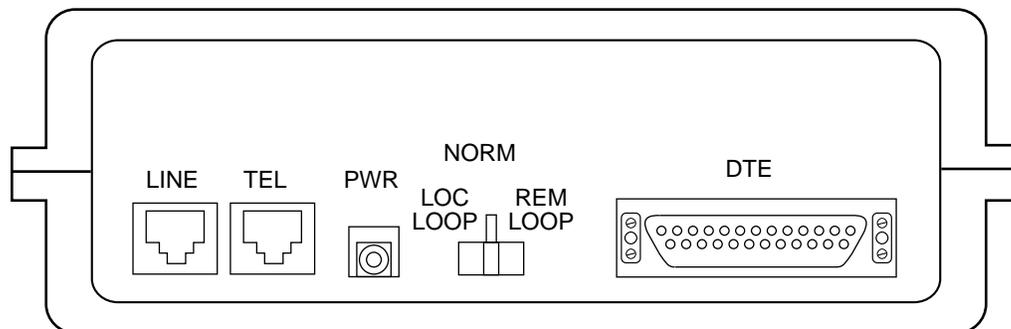
FIGURE 3-3. **Model 045CS VDM Rear Panel**

■ For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the Model 045CS VDM in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

— The Model 045CS VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) via D6AM modular cables and 635B connecting blocks. Each pair of the D6AM modular cables provides one voice and one voice/data connection.

— One end of each of the D6AM modular cables connects to the TEL and LINE receptacles on the Model 045CS VDM.   The other end of these cables connects to receptacles on a 635B connecting block that, in turn, is connected to the CO MDF.

— Voice channels (from the TEL receptacle) are wired from the MDF to the CO voice switch.

— Voice/data channels (from the LINE receptacle) are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

FIGURE 3-4. R-VDM Rear Panel

Ordering information is presented in Table 3-5.

TABLE 3-5. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
D6AM	6-pin mod 6-pin mod	G-144, G-H

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) Directly to Terminal or Host

The cabling from a SAM64 or SAM504 TERM32 module directly to terminal or host can be configured as follows:

■ Cabling originates at the distribution panel of the SAM64 and SAM504. TERM32 modules reside in the SAM64 and SAM504. An I/O distribution panel equipped with 50-pin connectors provides cable connections.

■ The TERM32 requires B25FS-1MOD shielded cable for the first 25 feet.

■ Each B25FS-1MOD 25-pair cable supports six 8-wire interface ports.

■ There are eleven 50-pin connectors on the SAM64 I/O distribution panel that link TERM32 modules to the 25-pair cables.

■ There are eighty-four 50-pin connectors on the SAM504 I/O distribution panel that link TERM32 modules to the 25-pair cables.

■ Although B25FS-1MOD shielded cable is required for the initial 25 feet from the TERM32 module, a B25A unshielded cable can be used at the customer's option after the first 25 feet.

■ A B25FS-1MOD 25-pair cable is connected to one of the 50-pin connectors associated with the TERM32 module.

■ One of three methods may be used to make direct connections to terminals or hosts:

— An M48EX cable can be connected to the B25FS-1MOD cable providing six 25-pin connections.

NOTE: The M48EX cable does not provide for the DSR lead. Use the 258AF, 258BF, or 258CF adapter when the connecting terminal or host requires the DSR signal.

— A 258AF or 258BF adapter can be connected to the B25FS-1MOD cable to provide six 8-wire modular jacks.

— A 258CF adapter can be connected to a B25FS-1MOD cable to provide six 8-wire modular jacks.

NOTE: When connecting a 3B2 EPORTS, use only the 258CF adapter. The TERM32 board may blow a fuse if a 258AF or 258BF adapter is used in this configuration.

■ The connection from the 258CF adapter to the 3B2 EPORTS is made with a D8AA cable.

■ The connection from the 258BF adapter to the terminal depends on the gender of the terminal or host connector.

— Use D8AG cables for terminals or hosts with male connectors.

— Use D8AN cables for terminals or hosts with female connectors.

■ As an alternative cabling method, use D8W modular cable from the 258BF adapter to a D8AG-F adapter for a terminal or host with a male connector or a D8AN-M adapter for a terminal or host with a female connector.

Ordering information is presented in Table 3-6.

TABLE 3-6. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258AF adapter	50-pin-F 6 mod sockets, side entry	G-152
258BF adapter	50-pin-F 6 mod sockets	G-155
258CF adapter	50-pin-F 6 mod sockets	G-210
D8AG	25-pin-F mod plug, null modem wiring	G-130, G-G
D8AN	25-pin-M mod plug, null modem wiring	G-132, G-G
D8W	mod plug mod plug, straight through	G-137, G-G
D8AA	8-pin-M (rev wiring)	G-134, G-G
D8AG-F adapter	25-pin-F mod socket, null modem wiring	G-138
D8AN-M adapter	25-pin-M mod socket, null modem wiring	G-140
M48EX	50-pin 90°-F 6 25-pin-F, null modem wiring	G-168, G-E

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to Terminal or Host via 110 Patch Panel

With use of the indicated cables, asynchronous connections from the SAM64 and SAM504 are compatible with standard SYSTIMAX PDS 110 patch panels.

The cabling from a SAM64 or SAM504 TERM32 module to terminals or hosts via a 110 patch panel can be configured as follows:

■ The TERM32 modules are accessed via 50-pin connectors located on the rear panel of the SAM64 and on the distribution panel of the SAM504. Each 50-pin connector supports six 8-wire ports.

■ A 110 patch panel can accept up to thirty-six 25-pair cables. Each 25-pair cable supports six 8-wire interface ports.

■ The TERM32 module requires M42P or M30P shielded cable for the first 25 feet.

— The M42P cable provides flow control signaling and is not compatible with SYSTIMAX PDS.

— The M42P or M30P cables may be terminated directly to the 110 patch panel, or they may be extended with B25A or A25U cables as required.

■ For 110 patch panels that require field termination of cables, use B25FS-1MOD cable from the SAM64 or SAM504 connected to an A25R-SE single-ended cable.

■ Depending on the type of 110 patch panel used and the specific distribution method required, connections from the patch panel to the terminating equipment may be made with 4-pair "D" wire to 103A connecting blocks, or they may be made with a B25A cable to a 258A or a 258B adapter.

In either case, the final connection to the terminating equipment will be made with modular cables.

— Use the D8AG cable for equipment with male connectors.

— Use the D8AN cable for equipment with female connectors.

■ As an alternative to using the D8AG and D8AN cables, a D8W cable may be connected to D8AG-F or D8AN-M adapters to provide the same respective connections.

Ordering information is presented in Table 3-7.

TABLE 3-7. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
A25R-SE	50-pin 90°-F single-ended	G-103, G-A
M42P	50-pin 180°-M 50-pin 90°-F	G-177, G-AR
M30P	50-pin 180°-M 50-pin 90°-F	G-176, G-AR
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
A25U	50-pin 90°-M 50-pin 90°-M	G-114, G-F
258A adapter	50-pin-M 6 mod sockets, side entry	G-153
258B adapter	50-pin-M 6 mod sockets, rear entry	G-154
D8AG	25-pin-F mod plug, null modem wiring	G-130, G-G
D8AN	25-pin-M mod plug, null modem wiring	G-132, G-G
D8W	mod plug mod plug, straight through	G-137, G-G
D8AG-F adapter	25-pin-F mod socket, null modem wiring	G-138
D8AN-M adapter	25-pin-M mod socket, null modem wiring	G-140

For plenum cables, see **Table 3-30** *at the end of this section.*

Cabling from SAM64 or SAM504 (TERM32) to Terminal or Host via Modem or FOM

The cabling from a SAM64 or SAM504 TERM32 module to terminals or hosts via a modem or FOM can be configured as follows:

- The TERM32 modules are accessed via 50-pin connectors located on the rear panel of the SAM64 and on the distribution panel of the SAM504. Each 50-pin connector supports six 8-wire ports.

- The TERM32 requires B25FS-1MOD shielded cable for the first 25 feet.

- Each B25FS-1MOD 25-pair cable supports six 8-wire interface ports.

- There are eleven 50-pin connectors on the SAM64 I/O distribution panel that link TERM32 modules to the 25-pair cables.

- There are eighty-four 50-pin connectors on the SAM504 I/O distribution panel that link TERM32 modules to the 25-pair cables.

- Although B25FS-1MOD shielded cable is required for the initial 25 feet, a B25A unshielded cable can be used at the customer's option after the first 25 feet.

- The terminating end of the B25FS-1MOD cable may be connected to an M48D cable assembly that provides six male ends that connect directly to modems or multiplexers, or it may be connected to a 258AF or 258BF adapter that provides six 8-pin modular jacks.

- If the 258AF or 258BF adapter is used, the connection from the adapter to the modem or multiplexer should be made with a D8AH cable.

- As an alternative to the D8AH cable, a D8W modular cable may be used with an adapter to provide the same connection.

  — Use a D8AH-F adapter for a modem or multiplexer with a male connector.

  — Use a D8AH-M adapter for a modem or multiplexer with a female connector.

- Terminal and host connections are made at the terminating modems and multiplexers using M25A and M25B cables as required.   The cable selected depends on the gender of the modem or multiplexer.

Ordering information is presented in Table 3-8.

Direct Connection

Another option is to use an B25FS-1MOD cable (B25F for a SAM504) from the SAM64 or SAM504 cabinet plugged directly into a 50-pin connector on a FOM at the other end.   *Canoga Data Systems* Model CDS372 and Optical Data Systems Model ODS310 are two FOM vendors that provide 50-pin connectors.

TABLE 3-8. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258AF adapter	50-pin-F 6 mod sockets, side entry	G-152
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8AH	25-pin-M mod plug	G-131, G-G
D8W	mod plug mod plug, straight through	G-137, G-G
D8AH-F adapter	25-pin-F mod socket	G-147
D8AH-M adapter	25-pin-M mod socket	G-139
M48D	50-pin 90°-F 6 x 25-pin-M	G-109, G-E
M25A	25-pin-M 25-pin-F	G-107, G-P
M25B	25-pin-M 25-pin-M	G-108, G-P

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM via VDM Cabinet

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a VDM cabinet can be configured as follows:

- The TERM32 provides 32 data circuits.   On the SAM64, the data circuits are accessed via eleven 50-pin connectors on the rear panel.   On the SAM504, the data circuits are accessed via eighty-four 50-pin connectors on the distribution panel.   Each of these connectors provides for 6 data circuits.

- A VDM cabinet can have up to 12 shelves.   Each shelf provides four 50-pin connectors that support 6 circuits each.   A fully populated VDM cabinet with 12 shelves and 288 circuits requires 48 data interface cables.   For an illustration of the VDM cabinet shelf, see Figure 3-1.

- Connect a SAM-VDM adapter to the connector at the rear of the SAM64 or SAM504.

    CAUTION: The SAM-VDM adapter must be used or premature TERM32 fuse failure may result.   The adapter must be removed for synchronous operation.   Adapters are not required when using Model 045C Series 2 VDMs.

- Connect a B25FSX-1MOD cable to the 50-pin connector on the adapter.

- The other end of this cable connects to a 50-pin connector on the VDM shelf backplane.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

    — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RX cable.   Each of the 50-pin A25RX cables provides voice and voice/data connections for 12 circuits.

    — The end of the A25RX cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

    — Voice channels are wired from the MDF to the CO voice switch.

    — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-9.

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TABLE 3-9. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
SAM-VDM adapter	50-pin-M 50-pin-F	G-201
B25FSX-1MOD	50-pin 180°-M 50-pin 180°-M	G-204, G-C
A25RX	50-pin 180°-F single-ended	G-115, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM
via VDM Stand-Alone Shelf

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a VDM Stand-Alone Shelf is configured as follows:

■ The TERM32 provides 32 data circuits.   On the SAM64, the data circuits are accessed via eleven 50-pin connectors on the rear panel.   On the SAM504, the data circuits are accessed via eighty-four 50-pin connectors on the distribution panel.   Each of these connectors provides for 6 data circuits.

■ The VDM Stand-Alone Shelf supports 18 circuits.   Female DB25 RS-232-D connectors are provided for each circuit, requiring 18 data cables per shelf.   For an illustration of the VDM Stand-Alone Shelf, see Figure 3-2.

■ A B25FS-1MOD cable connects the SAM64 to a 258BF adapter or M48D cable.

■ Connect a 258BF adapter to the B25FS-1MOD cable.   It provides six 8-pin modular jacks for RS-232-D connections.   Use D8AH cords to complete the connections from the 258BF adapter to the VDM Stand-Alone Shelf.

■ Alternatively, an M48D cable can connect to the B25FS-1MOD cable that splits the 25-pair cable into six RS-232-D cables with DB25 male connectors.   Each leg of the M48D cable can connect directly to one of the DB25 connectors on the VDM Stand-Alone Shelf backplane.

   NOTE: A SAM-VDM adapter is not required when connecting SAM64 or SAM504 to a VDM Stand-Alone Shelf or a Model 045CS VDM.

■ For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM Stand-Alone Shelf in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

   — The VDM Stand-Alone Shelf voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable.   Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

   — The end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

   — Voice channels are wired from the MDF to the CO voice switch.

   — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-10.

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TABLE 3-10. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
M48D	50-pin 90°-M 6 25-pin-M	G-109, G-E
D8AH	25-pin-M mod plug	G-131, G-G
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM via Model 045CS VDM

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a Model 045CS VDM can be configured as follows:

■ The TERM32 provides 32 data circuits. On the SAM64, the data circuits are accessed via eleven 50-pin connectors on the rear panel. On the SAM504, the data circuits are accessed via eighty-four 50-pin connectors on the distribution panel. Each of these connectors provides for 6 data circuits.

■ The Model 045CS VDM is equipped with one DB25 data connector. For an illustration of the Model 045CS VDM rear panel, see Figure 3-3.

■ A B25FS-1MOD cable connects the SAM64 or SAM504 50-pin connector to a 258BF adapter or M48D cable.

■ A 258BF adapter provides six 8-pin modular jacks for RS-232-D connections. Use one D8AH cord to complete each connection from the 258BF adapter to one Model 045CS VDM.

■ Alternatively, an M48D cable splits the 25-pair cable into six RS-232-D cables with DB25 male connectors. Each leg of an M48D cable can connect directly to the DB25 connector at the back of a Model 045CS VDM.

> **NOTE:** A SAM-VDM adapter is not required when connecting SAM64 or SAM504 to a VDM Stand-Alone Shelf or Model 045CS VDM.

■ For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the Model 045CS VDM in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

— The Model 045CS VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) via D6AM modular cables and 635B connecting blocks. Each pair of the D6AM modular cables provides one voice and one voice/data connection.

— One end of each of the D6AM modular cables connects to the TEL and LINE receptacles on the Model 045CS VDM. The other end of these cables connects to receptacles on a 635B connecting block that, in turn, is connected to the CO MDF.

— Voice channels (from the TEL receptacle) are wired from the MDF to the CO voice switch.

— Voice/data channels (from the LINE receptacle) are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-11.

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TABLE 3-11. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8AH	25-pin-M mod plug	G(131), G-G
M48D	50-pin 90°-F 6 25-pin-M	G-109, G-E
D6AM	6-pin mod 6-pin mod	G-144, G-H

For plenum cables, see **Table 3-30** *at the end of this section.*

Cabling from SAM64 or SAM504 (TERM32) to R-VDM
via D4 Channel Bank and VDM Cabinet

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a D4 RS-232-D DSU-II data port and a VDM cabinet can be configured as follows:

- A VDM cabinet can have up to 12 shelves. Each shelf provides four 50-pin connectors that support 6 circuits each. A fully populated VDM cabinet with 12 shelves and 288 circuits requires 48 data interface cables. For an illustration of the VDM cabinet shelf, see Figure 3-1.

- The TERM32 provides 32 data circuits. On the SAM64, the data circuits are accessed via eleven 50-pin connectors on the rear panel. On the SAM504, the data circuits are accessed via eighty-four 50-pin connectors on the distribution panel. Each of these connectors provides for 6 data circuits.

- Connections to the D4 RS-232-D DSU-II data port, used for CO-LAN Foreign Serving Office (FSO) arrangements of the VDM and the BNS-2000 and BNS-2000 VCS, may be made via a DB25 connection on the faceplate of the DSU-II data port plug-in unit or via direct connections to the backplane of the D4 channel bank.

- A D4 DSU-II data port plug-in supports one circuit with a female DB25 RS-232-D connector.

- The B25FS-1MOD cable from the SAM64 or SAM504 plugs into a 258BF adapter. This adapter provides six 8-pin modular jacks for RS-232-D connections.

- Use D8AHX cords to make the connection from the adapter to the D4 DSU-II data port.

- At the remote end, use D8ANX cords to make the connection from a D4 DSU-II data port to a jack in a 258BF adapter.

- Use a B25F 25-pair cable to connect the 258BF adapter to the VDM cabinet.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the VDM cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RX cable. Each of the 50-pin A25RX cables provides voice and voice/data connections for 12 circuits.

  — The end of the A25RX cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-12.

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TABLE 3-12. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8AHX	25-pin-M mod plug	G-193, G-G
D8ANX	25-pin-M mod plug	G-194, G-G
B25F	50-pin 180°-M 50-pin 90°-M	G-100, G-F
A25RX	50-pin 180°-F single-ended	G-115, G-A

For plenum cables, see **Table 3-30** *at the end of this section.*

Cabling from SAM64 or SAM504 (TERM32) to R-VDM via D4 Channel Bank and VDM Stand-Alone Shelf

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via D4 RS-232-D DSU-II data port and VDM Stand-Alone Shelf can be configured as follows:

- The VDM Stand-Alone Shelf supports 18 circuits. Female DB25 RS-232-D connectors are provided for each circuit, requiring 18 data cables per shelf.   For an illustration of the VDM Stand-Alone Shelf, see Figure 3-2.

- The TERM32 provides 32 data circuits.   On the SAM64, the data circuits are accessed via eleven 50-pin connectors on the rear panel. On the SAM504, the data circuits are accessed via eighty-four 50-pin connectors on the distribution panel. Each of these connectors provides for 6 data circuits.

- Connections to the D4 RS-232-D DSU-II data port, used for CO-LAN Foreign Serving Office (FSO) arrangements of the VDM and the BNS-2000 or BNS-2000 VCS, may be made via a DB25 connection on the faceplate of the DSU-II data port plug-in unit or via direct connections to the backplane of the D4 channel bank.

- A D4 DSU-II data port plug-in supports one circuit with a female DB25 RS-232-D connector.

- The B25FS-1MOD cable from the SAM64 or SAM504 plugs into a 258BF adapter.   This adapter provides six 8-pin modular jacks for RS-232-D connections.

- Use D8AHX cords to make the connection from the adapter to the D4 DSU-II data port.

- At the remote end, an M25B-DSU cable connects the D4 DSU-II data port to one DB25 connector on the VDM Stand-Alone Shelf.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM Stand-Alone Shelf in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM Stand-Alone Shelf voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable.   Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

  — The end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

— Voice channels are wired from the MDF to the CO voice switch.

— Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-13.

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TABLE 3-13. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8AHX	25-pin-M mod plug	G-193, G-G
M25B-DSU	25-pin-M 25-pin-M	G-166, G-AM
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** *at the end of this section*.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM
via D4 Channel Bank and Model 045CS VDM

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a D4 RS-232-D DSU-II data port and a Model 045CS VDM can be configured as follows:

- The Model 045CS VDM is equipped with one DB25 data connector. For an illustration of the Model 045CS VDM rear panel, see Figure 3-3.

- The TERM32 provides 32 data circuits. On the SAM64, the data circuits are accessed via eleven 50-pin connectors on the rear panel. On the SAM504, the data circuits are accessed via eighty-four 50-pin connectors on the distribution panel. Each of these connectors provides for 6 data circuits.

- Connections to the D4 RS-232-D DSU-II data port, used for CO-LAN Foreign Serving Office (FSO) arrangements of the VDM and the BNS-2000 or BNS-2000 VCS, may be made via a DB25 connection on the faceplate of the DSU-II data port plug-in unit or via direct connections to the backplane of the D4 channel bank.

- A D4 DSU-II data port plug-in supports one circuit with a female DB25 RS-232-D connector.

- The B25FS-1MOD cable from the SAM64 or SAM504 plugs into a 258BF adapter. This adapter provides six 8-pin modular jacks for RS-232-D connections.

- Use D8AHX cords to make the connection from the adapter to the D4 DSU-II data port.

- At the remote end, an M25B-DSU cable connects the D4 DSU-II data port to the Model 045CS VDM.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the Model 045CS VDM in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The Model 045CS VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) via D6AM modular cables and 635B connecting blocks. Each pair of the D6AM modular cables provides one voice and one voice/data connection.

  — One end of each of the D6AM modular cables connects to the TEL and LINE receptacles on the Model 045CS VDM. The other end of these cables connects to receptacles on a 635B connecting block that, in turn, is connected to the CO MDF.

— Voice channels (from the TEL receptacle) are wired from the MDF to the CO voice switch.

— Voice/data channels (from the LINE receptacle) are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-14.

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TABLE 3-14. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8AHX	25-pin-M mod plug	G-193, G-G
M25B-DSU	25-pin-M 25-pin-M	G-166, G-AM
D6AM	6-pin mod 6-pin mod	G-144, G-H

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from VDM-SAM504 (TERM32) to R-VDM

The cabling from a VDM-SAM504 TERM32 module to an R-VDM can be configured as follows:

- A VDM-SAM504 cabinet combines the functions of the SAM504 and a VDM cabinet.   The cabling between the SAM504 TERM32 module and the VDM in the VDM cabinet is internal to the VDM-SAM504 cabinet.   For an illustration of the VDM-SAM504, see **Appendix D.**

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM-SAM504 cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RX cable.   Each of the 50-pin A25RX cables provides voice and voice/data connections for 12 circuits.

  — The end of the A25RX cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-15.

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TABLE 3-15. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
A25RX	50-pin 180°-F single-ended	G-115, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Synchronous Connections

Cabling from SAM16 (TERM8) Directly to Terminal, Host, or Cluster Controller

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) to terminals, hosts, or cluster controllers can be configured as follows:

- The cabling for the SAM16 begins at its rear panel. The SAM16 (TERM8)'s CPY1 I/O board is equipped with eight DB25, RS-232-D connectors (one per port) with a DCE interface.

- An M25A or M25B cable connects to a DB25 connector at the rear of the SAM16. Use an M25A if the connector on the terminating end is male and an M25B if the connector is female.

- The other end of the cable connects to a synchronous terminal, host port, or cluster controller.

Ordering information is presented in Table 3-16.

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TABLE 3-16. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
M25B	25-pin-M 25-pin-M	G-108, G-P

For plenum cables, see **Table 3-30** _at the end of this section._

Cabling from SAM16 (TERM8) to Terminal, Host, or Cluster Controller via Modem or FOM

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) to terminals, hosts, or cluster controllers via modems or FOMs can be configured as follows:

■ The cabling for the SAM16 begins at its rear panel. The SAM16 (TERM8)'s CPY1 I/O board is equipped with eight DB25, RS-232-D connectors (one per port) with a DCE interface.

■ An M25A cable connects to the 25-pin connector at the rear of the SAM16.

■ A DCE to DCE adapter is required to connect the AMDA or TERM8 to a device with a DCE interface. The DCE to DCE adapter can be plugged into either the AMDA or TERM8, or the modem or FOM.

■ At the remote end modem or multiplexer, an M25A or M25B cable connects to terminals, hosts, or cluster controllers. Cable selection will depend on the gender of the connectors used on the terminating equipment.

Ordering information is presented in Table 3-17.

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TABLE 3-17. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	
M25B	25-pin-M 25-pin-M	G-108, G-P

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM16 (TERM8) to R-VDM
via VDM Cabinet

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) module to an R-VDM via a VDM cabinet can be configured as follows:

- Each VDM cabinet shelf used for synchronous service in this application must be configured with an ED2P497-30, G-7 (Model 10F) shelf with 24 RS-232-D DB25 connectors. Each shelf also has two 50-pin connectors for voice and voice/data connections to the Main Distribution Frame (MDF). For an illustration of the VDM cabinet shelf backplane, see Figure 3-1.

- The cabling for the SAM16 begins at its rear panel. Each of the two TERM8's CPY1 I/O boards are equipped with eight DB-25 RS-232-D connectors. These connectors (one per port) are DCE interfaces.

- An M25A cable connects to one of the ports of the SAM16.

- A DCE to DCE adapter is then connected to the M25A cable and is plugged into the VDM back panel.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the VDM cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable. Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

  — The connectorized end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-18.

TABLE 3-18. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM16 (TERM8) to R-VDM
via VDM Stand-Alone Shelf

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account Representative for more information.

The cabling from a SAM16 (TERM8) module to an R-VDM via a VDM Stand-Alone Shelf can be configured as follows:

- The VDM Stand-Alone Shelf supports up to 18 VDM circuit packs. The backplane for the Stand-Alone Shelf is equipped with 18 DB25 connectors for RS-232-D data connections and two 50-pin connectors for voice and voice/data connections. For an illustration of the VDM Stand-Alone Shelf, see Figure 3-2.

- The cabling for the SAM16 begins at its rear panel. Each of the two TERM8's CPY1 I/O boards are equipped with eight DB-25 RS-232-D connectors. These connectors (one per port) are DCE interfaces.

- An M25A cable connects to one of the ports of the SAM16.

- A DCE to DCE adapter is then connected to the M25A cable and is plugged into the VDM Stand-Alone Shelf rear panel.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the VDM Stand-Alone Shelf in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM Stand-Alone Shelf voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable. Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

  — The connectorized end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-19.

TABLE 3-19. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
A25RX	50-pin 180°-F single-ended	G-115, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM16 (TERM8) to R-VDM
via Model 045CS VDM

NOTE: Cables for the SAM16 may differ; contact your Lucent Technologies Account
Representative for more information.

The cabling from a SAM16 (TERM8) module to an R-VDM via a Model 045CS VDM can be
configured as follows:

- The Model 045CS VDM supports one circuit.   A female DB25 RS-232-D connector is
  provided, requiring one data cable per VDM.   For an illustration of the Model 045CS VDM
  rear panel, see Figure 3-3.

- The cabling for the SAM16 begins at its rear panel. Each of the two TERM8's CPY1 I/O
  boards are equipped with eight DB-25 RS-232-D connectors. These connectors (one per port)
  are DCE interfaces.

- An M25A cable connects to one of the ports of the SAM16.

- A DCE to DCE adapter is then connected to the M25A cable and is plugged into the Model
  045CS VDM 25-pin receptacle.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the
  customer or end user equipment location.   The connection between the Model 045CS VDM
  in the CO and the R-VDM at the customer or end user equipment location is provided as
  follows:

  — The Model 045CS VDM voice and voice/data circuits are connected to the CO Main
     Distribution Frame (MDF) via D6AM modular cables and 635B connecting blocks.
     Each pair of the D6AM modular cables provides one voice and one voice/data connection.

  — One end of each of the D6AM modular cables connects to the TEL and LINE receptacles
     on the Model 045CS VDM.   The other end of these cables connects to receptacles on a
     635B connecting block that, in turn, is connected to the CO MDF.

  — Voice channels (from the TEL receptacle) are wired from the MDF to the CO voice
     switch.

  — Voice/data channels (from the LINE receptacle) are wired from the MDF to the R-VDM
     over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop
     Carrier (SLC 96) system.

Ordering information is presented in Table 3-20.

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TABLE 3-20. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
M25A	25-pin-M 25-pin-F	G-107, G-P
DCE to DCE adapter	25-pin-M 25-pin-M	G-208
D6AM	6-pin mod 6-pin mod	G-144, G-H

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) Directly to Terminal, Host, or Cluster Controller

The cabling from a SAM64 or SAM504 TERM32 module to terminals, hosts, or cluster controllers can be configured as follows:

- The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

- A B25FS-1MOD cable connects to each 50-pin connector at the rear of a SAM64 or SAM504.

  NOTE: SAM64s that are running pre-release R2.1 software will require a controller interface adapter (ED5P055-31, G-215) when connecting to Lucent Technologies 6500 or IBM® 3174 cluster controllers.

- The other end of the cable connects to a 258AF or 258BF adapter which provides six 8-pin, modular connections.

- One D8W modular cable is used for each connection from the 258AF or 258BF adapter to a terminal.

- The D8W cable connects to the terminal via an 8-pin modular to 25-pin DB RS-232-D synchronous adapter.   If the gender of the connector on the terminal is female, use a SYNC DCE-M adapter. If the gender of the connector on the terminal is male, use a SYNC DCE-F adapter.   This adapter is designed for synchronous communications only, and one adapter is required per port.

Ordering information is presented in Table 3-21.

TABLE 3-21. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
258AF adapter	50-pin-F 6 mod sockets, side entry	G-152
D8W	mod plug mod plug, straight through	G-137, G-G
SYNC DCE-M adapter	25-pin-M mod socket	G-148
SYNC DCE-F adapter	25-pin-F mod socket	G-150

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to Terminal, Host, or Cluster Controller via Modem or FOM

The cabling from a SAM64 or SAM504 TERM32 module to terminals, hosts, or cluster controllers via modems or FOMs can be configured as follows:

- The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

- A B25FS-1MOD cable connects to each 50-pin connector at the rear of a SAM64 or SAM504.

  NOTE: SAM64s that are running pre-release R2.1 software will require a controller interface adapter (ED5P055-31, G-215) when connecting to Lucent Technologies 6500 or IBM 3174 cluster controllers.

- The other end of each cable connects to a 258AF or 258BF adapter which provides six 8-pin modular connections.

- One D8W modular cable is used for each connection from the 258AF or 258BF adapter to the modem or FOM.

- The D8W modular cable connects to the modem or FOM via an 8-pin modular to 25-pin D RS-232-D synchronous adapter. If the gender of the connector on the terminal is female, use a SYNC DTE-M adapter. If the gender of the connector on the terminal is male, use a SYNC DTE-F adapter. This adapter is designed for synchronous communications only, and one adapter is required per port.

- At the remote end modem or multiplexer, an M25A or M25B cable connects to terminals, hosts, or cluster controllers. Cable selection will depend on the gender of the connectors used on the terminating equipment.

Ordering information is presented in Table 3-22.

TABLE 3-22. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258AF adapter	50-pin-F 6 mod sockets, side entry	G-152
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8W	mod plug mod plug, straight through	G-137, G-G
SYNC DTE-M adapter	25-pin-M mod socket	G-149
SYNC DTE-F adapter	25-pin-F mod socket	G-151
M25A	25-pin-M 25-pin-F	G-107, G-P
M25B	25-pin-M 25-pin-M	G-108, G-P

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM via VDM Cabinet

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a VDM cabinet can be configured as follows:

- A VDM cabinet backplane provides four 50-pin connectors per shelf for data circuits; each connector supports six circuits.   A fully populated VDM cabinet with 12 shelves and 288 circuits requires 48 data cables.   For an illustration of the VDM cabinet shelf backplane, see Figure 3-1.

- A B25FSX-1MOD cable is required to connect the SAM64 or SAM504 to the VDM cabinet.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

    — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RX cable.   Each of the 50-pin A25RX cables provides voice and voice/data connections for 12 circuits.

    — The connectorized end of the A25RX cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

    — Voice channels are wired from the MDF to the CO voice switch.

    — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-23.

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TABLE 3-23. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25FSX-1MOD	50-pin 180°-M 50-pin 180°-M	G-204, G-C
A25RX	50-pin 180°-F single-ended	G-115, G-A

For plenum cables, see **Table 3-30** *at the end of this section.*

Cabling from SAM64 or SAM504 (TERM32) to R-VDM via VDM Stand-Alone Shelf

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a VDM Stand-Alone Shelf can be configured as follows:

- The VDM Stand-Alone Shelf supports up to 18 VDM circuit packs. The backplane for the Stand-Alone Shelf is equipped with 18 DB25 connectors for RS-232-D connections.   Three 25-pair cables are required from the SAM64 or SAM504 end to support a VDM Stand-Alone Shelf with 18 circuit packs installed.   For an illustration of the VDM Stand-Alone Shelf, see Figure 3-2.

- The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

- A B25FS-1MOD cable connects to each 50-pin connector at the rear of a SAM64 or SAM504.

- The other end of the 25-pair cable connects to a 258BF adapter.

- A D8W cable connects each modular connection on the 258BF adapter to a SYNC DTE-M adapter.

- This adapter plugs into one of the ports at the rear of the VDM Stand-Alone Shelf.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location.   The connection between the VDM Stand-Alone Shelf in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM Stand-Alone Shelf voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable. Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

  — The connectorized end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-24.

TABLE 3-24. **Ordering Information**

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8W	mod plug mod plug, straight through	G-137, G-G
SYNC DTE-M adapter	25-pin-M mod socket	G-149
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM
via Model 045CS VDM

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via a Model 045CS VDM can be configured as follows:

■ The Model 045CS VDM is a single circuit assembly housed in a plastic enclosure with the modulating circuitry of the VDM cabinet circuit pack. The Model 045CS VDM is equipped with one DB25 connector for the data interface. For an illustration of the Model 045CS VDM rear panel, see Figure 3-3.

■ The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

■ A B25FS-1MOD cable connects to each 50-pin connector at the rear of a SAM64 or SAM504.

■ The other end of the 25-pair cable connects to a 258BF adapter.

■ Use a D8W cable to connect the 258BF adapter to a SYNC DTE-M adapter.

■ This adapter plugs into the DB25 connector on the rear of the Model 045CS VDM.

■ For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the Model 045CS VDM in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

— The Model 045CS VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) via D6AM modular cables and 635B connecting blocks. Each pair of the D6AM modular cables provides one voice and one voice/data connection.

— One end of each of the D6AM modular cables connects to the TEL and LINE receptacles on the Model 045CS VDM. The other end of these cables connects to receptacles on a 635B connecting block that, in turn, is connected to the CO MDF.

— Voice channels (from the TEL receptacle) are wired from the MDF to the CO voice switch.

— Voice/data channels (from the LINE receptacle) are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-25.

TABLE 3-25. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8W	mod plug mod plug, straight through	G-137, G-G
SYNC DTE-M adapter	25-pin-M mod socket	G-149
D6AM	6-pin mod 6-pin mod	G-144, G-H

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM via D4 Channel Bank and VDM Cabinet

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via D4 channel bank and the VDM cabinet in a Foreign Serving Office (FSO) can be configured as follows:

■ Each VDM cabinet shelf used for synchronous service in this configuration must be configured with an ED2P497-30, G-7 (Model 10F) shelf with 24 RS-232-D DB25 connectors. This configuration supports up to 24 circuits (one circuit per data connector) per shelf, and requires up to 24 data cables to the D4 DSU-II dataport. For an illustration of the VDM cabinet shelf backplane, see Figure 3-1.

■ Connections to the D4 RS-232-D DSU-II dataport, used for CO-LAN Foreign Serving Office (FSO) arrangements of the VDM and the BNS-2000 or BNS-2000 VCS, may be made via a DB25 connection on the faceplate of the DSU-II dataport plug-in unit or via direct connections to the backplane of the D4 channel bank.

■ The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

■ A B25FS-1MOD cable connects to a 50-pin connector at the rear of a SAM64 or SAM504.

■ The other end of the 25-pair cable connects to a 258BF adapter.

■ D8W cables connect the 258BF adapter to a SAM/DSU-M adapter, which then connects to a D4 DSU-II dataport.

■ The D4 DSU-II dataport plug-in supports one circuit with a female DB25 RS-232-D connector.

■ At the remote end, a M25B-DSU cable is connected from each D4 DSU-II dataport to a port in the VDM cabinet.

■ For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the VDM cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

— The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable. Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

— The connectorized end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

— Voice channels are wired from the MDF to the CO voice switch.

— Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-26.

TABLE 3-26. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8W	mod plug mod plug, straight through	G-137, G-G
SAM/DSU-M adapter	mod socket 25-pin-M	
D8ANX	25-pin-M 8-pin-M	G-194, G-G
A25RXM	50-pin 180°-F single-ended	G-115, G-A
M25B-DSU	25-pin-M 25-pin-M	G-166, G-AM

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM
via D4 Channel Bank and VDM Stand-Alone Shelf

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via D4 channel bank and the VDM Stand-Alone Shelf in a Foreign Serving Office (FSO) can be configured as follows:

■ The VDM Stand-Alone Shelf supports up to 18 circuits. Female DB25 RS-232-D connectors are provided for each circuit, requiring 18 data cables per shelf. For an illustration of the VDM Stand-Alone Shelf, see Figure 3-2.

■ Connections to the D4 RS-232-D DSU-II dataport, used for CO-LAN Foreign Serving Office (FSO) arrangements of the VDM and the BNS-2000 or BNS-2000 VCS, may be made via a DB25 connection on the faceplate of the DSU-II dataport plug-in unit or via direct connections to the backplane of the D4 channel bank.

■ The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

■ A B25FS-1MOD cable connects to a 50-pin connector at the rear of a SAM64 or SAM504.

■ The other end of the B25FS-1MOD cable connects to a 258BF adapter.

■ D8W cables connect the 258BF adapter to a SAM/DSU-M adapter, which then connects to a D4 DSU-II dataport.

■ The D4 DSU-II dataport plug-in supports one circuit with a female DB25 RS-232-D connector.

■ At the remote end, a M25B-DSU cable is connected from each D4 DSU-II dataport to the VDM Stand-Alone Shelf.

■ For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the VDM Stand-Alone Shelf in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

— The VDM Stand-Alone Shelf voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RXM cable. Each of the 50-pin A25RXM cables provides voice and voice/data connections for 12 circuits.

— The connectorized end of the A25RXM cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

— Voice channels are wired from the MDF to the CO voice switch.

— Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-27.

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TABLE 3-27. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8W	mod plug mod plug, straight through	G-137, G-G
SAM/DSU-M adapter	mod socket 25-pin-M	G-158
M25B-DSU	25-pin-M 25-pin-M	G-166, G-AM
A25RXM	50-pin 180°-M single-ended	G-167, G-A

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from SAM64 or SAM504 (TERM32) to R-VDM
via D4 Channel Bank and Model 045CS VDM

The cabling from a SAM64 or SAM504 TERM32 module to an R-VDM via D4 channel bank and the Model 045CS VDM in a Foreign Serving Office (FSO) can be configured as follows:

- The Model 045CS VDM supports one circuit. A female DB25 RS-232-D connector is provided, requiring one data cable per VDM. For an illustration of the Model 045CS VDM rear panel, see Figure 3-3.

- Connections to the D4 RS-232-D DSU-II dataport, used for CO-LAN Foreign Serving Office (FSO) arrangements of the VDM and the BNS-2000 or BNS-2000 VCS, may be made via a DB25 connection on the faceplate of the DSU-II dataport plug-in unit or via direct connections to the backplane of the D4 channel bank.

- The cabling for the SAM64 or SAM504 begins at the rear panel of the SAM64 or the I/O distribution panel of the SAM504.

- A B25FS-1MOD cable connects to a 50-pin connector at the rear of a SAM64 or SAM504.

- The other end of the 25-pair cable connects to a 258BF adapter.

- D8W cables connect the 258BF adapter to a SAM/DSU-M adapter, which then connects to a D4 DSU-II dataport.

- The D4 DSU-II dataport plug-in supports one circuit with a female DB25 RS-232-D connector.

- At the remote end, a M25B-DSU cable is connected from each D4 DSU-II dataport to the Model 045CS VDM.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the Model 045CS VDM in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The Model 045CS VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) via D6AM modular cables and 635B connecting blocks. Each pair of the D6AM modular cables provides one voice and one voice/data connection.

  — One end of each of the D6AM modular cables connects to the TEL and LINE receptacles on the Model 045CS VDM. The other end of these cables connects to receptacles on a 635B connecting block that, in turn, is connected to the CO MDF.

— Voice channels (from the TEL receptacle) are wired from the MDF to the CO voice switch.

— Voice/data channels (from the LINE receptacle) are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-28.

TABLE 3-28. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
B25A	50-pin 90°-M 50-pin 90°-F	G-106, G-F
B25FS-1MOD	50-pin 180°-M 50-pin 90°-M	G-200, G-C
258BF adapter	50-pin-F 6 mod sockets, rear entry	G-155
D8W	mod plug mod plug, straight through	G-137, G-G
SAM/DSU-M adapter	mod socket 25-pin-M	G-158
M25B-DSU	25-pin-M 25-pin-M	G-166, G-AM
D6AM	6-pin mod 6-pin mod	G-144, G-H

For plenum cables, see **Table 3-30** at the end of this section.

Cabling from VDM-SAM504 (TERM32) to R-VDM

The cabling from a VDM-SAM504 TERM32 module to an R-VDM can be configured as follows:

- A VDM-SAM504 cabinet combines the functions of the SAM504 and a VDM cabinet. The cabling between the SAM504 TERM32 module and the VDM in the VDM cabinet is internal to the VDM-SAM504 cabinet. For an illustration of the VDM Cabinet Shelf, see Figure 3-1.

- For each VDM circuit in a central office (CO), a corresponding R-VDM is required at the customer or end user equipment location. The connection between the VDM-SAM504 cabinet in the CO and the R-VDM at the customer or end user equipment location is provided as follows:

  — The VDM voice and voice/data circuits are connected to the CO Main Distribution Frame (MDF) with an A25RX cable. Each of the 50-pin A25RX cables provides voice and voice/data connections for 12 circuits.

  — The connectorized end of the A25RX cable connects to one of the 50-pin plugs on the VDM backplane. The butt end is then connected to the MDF.

  — Voice channels are wired from the MDF to the CO voice switch.

  — Voice/data channels are wired from the MDF to the R-VDM over 2-wire unloaded loop (maximum length is 18,000 feet) or via a Subscriber Loop Carrier (SLC 96) system.

Ordering information is presented in Table 3-29.

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TABLE 3-29. Ordering Information

Cable or Adapter	Description	ED5P055-31 Group Number
A25RX	50-pin 180°-F single-ended	G-115, G-A

For plenum cables, see **Table 3-30** *at the end of this section.*

SAM16 Node Cabling

The following sections explain how to cable the SAM16 to the node.

Trunk Cabling

Cabling from the other end of the trunk to a SAMML in the node is shown in the *Data Networking Products Cabling Guide*.

Select one of the cables described below to provide the link to a DSU or synchronous modem.

- RS-232—For a low-speed trunk (19.2 Kbps or lower), use the RS-232 connectors on the rear of the SAM16. Connect an M25A cable from the SAM16 to the RS-232 connector on the sync modem or DSU. Port A is the primary connection and Port B is the backup.

- V.35—For a medium-speed trunk (up to 56 Kbps), use the V.35 connectors on the rear of the SAM16. Connect a V.35 cable from the SAM16 to the V.35 connector on the sync modem or DSU. Port A is the primary connection and Port B is the backup.

Endpoint Cabling

Some cable configurations can be used for both synchronous and asynchronous connections; others only for asynchronous. The cabling for the SAM16 begins at the rear panel, which is equipped with up to sixteen DB25 RS-232 receptacle connectors (one per port) with DCE interfaces.

The SAM16 can be connected to a modem, multiplexer, or voice/data multiplexer (such as the Model 045CS VDM). Because the SAM16 is DCE, a DCE-to-DCE adapter is required to connect the SAM16 to a device with a DCE interface.

Cable Ordering Information with ED Codes

Table 3-30 contains cable ordering information. It lists descriptions for each cable, cable names according to cable types (i.e., standard, shielded, plenum, and shielded/plenum), and the associated ED codes.

Table 3-30. Cable Ordering Information with ED Codes

Description	Standard Name	Standard ED5P055-31	Shielded Name	Shielded ED5P055-31	Plenum Name	Plenum ED5P055-31	Shielded-Plenum Name	Shielded-Plenum ED5P055-31
50-pin,90°-F / 50-pin,90°-F	A25R-DE	G-102, G-A† / G-102, G-F*			A25BP-DE	G-104, G-B		
50-pin,90°-F butt	A25R-SE	G-103, G-A† / G-103, G-F*			A25BP-SE	G-105, G-B		
50-pin,180°-F butt	A25RX	G-115, G-A† / G-115, G-F*			A25RXP	G-115, G-B		
50-pin,180°-M butt	A25RXM	G-167, G-A† / G-167, G-F*			A25RXMP	G-167, G-B		
50-pin,90°-M / 50-pin,90°-M	A25U	G-114, G-A† / G-114, G-F*	A25US	G-124, G-C	A25UP	G-114, G-B	A25USP	G-124, G-Y
50-pin,90°-M butt	A25W	G-126, G-A† / G-126, G-F*						
50-pin,90°-M / 50-pin,90°-F	B25A	G-106, G-A† / G-106, G-F*	B25AS	G-123, G-C	B25AP	G-113, G-B	B25ASP	G-123, G-Y
50-pin,180°-M / 50-pin,180°-F	B25AX	G-122, G-A† / G-122, G-F*			B25AXP	G-122, G-B		
50-pin,90°-M / 50-pin,180°-M (bail slot)	B25F	G-100, G-A† / G-100, G-F*	B25FS / B25FS-1 / B25FS-1MOD	G-117, G-K / G-101, G-C / G-200, G-C	B25FP	G-100, G-B	B25FSP / B25FSP-1 / B25FSP-1MOD	G-117, G-Y / G-101, G-Y / G-200, G-Y
50-pin,180°-M / 50-pin,180°-M			B25FS-LS	G-218, G-K			B25FS-LSP	G-218, G-Y
50-pin,180°-M / 50-pin,180°-M	B25FX	G-116, G-A† / G-116, G-F*	B25FSX / B25FSX-1 / B25FSX-1MOD	G-129, G-K / G-162, G-E / G-204, G-C	B25FXP	G-116, G-B	B25FSXP / B25FSXP-1 / B25FSXP-1MOD	G-129, G-Y / G-162, G-Y / G-204, G-Y

†(A) denotes tinned cable
*(F) denotes untinned cable

Table 3-30. Cable Ordering Information with ED Codes (continued)

Description	Standard		Shielded		Plenum		Shielded-Plenum	
	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31
50-pin,90°-M 50-pin,90°-M (special wiring)	CPM-422B	G-165, G-AK						
50-pin,180°-M 50-pin,90°-F	M30P	G-176, G-AR						
50-pin,180°-M 50-pin,90°-F	M42P	G-177, G-AR						
50-pin,180°-M V.35-M			C25AS C25AS-MOD	G-120, G-C G-202, G-C			C25ASP C25ASP-MOD	G-120, G-Y G-202, G-Y
50-pin,180°-M RS-449-M			C25ASX C25ASX-MOD	G-125, G-C G-203, G-C			C25ASXP C25ASXP-MOD	G-125, G-Y G-203, G-Y
50-pin,180°-M RS-449-M (narrow hood)			C25ASX-NH	G-192, G-C			C25ASXP-NH	G-192, G-Y
50-pin,90°-F 6 25-pin-M	M48D	G-109, G-E						
50-pin,90°-M 6 25-pin-F	M48DX	G-111, G-E						
50-pin,90°-M 6 25-pin-M	M48E	G-110, G-E						
50-pin,90°-F 6 25-pin-F	M48EX	G-168, G-E						
50-pin,90°-F 4 25-pin-F	SYNC4-F	G-161, G-R			SYNC4-F(P)	G-161, G-AH		
50-pin,90°-F 4 25-pin-M	SYNC4-M SYNC4-MX	G-160, G-R G-217, G-R			SYNC4-M(P) SYNC4-MX(P)	G-160, G-AH G-217, G-AH		
50-pin,180°-F 6 25-pin-F	SYNC6-F	G-112, G-E	SYNC6-FS	G-163, G-S			SYNC6-FSP	G-163, G-AJ

Table 3-30. Cable Ordering Information with ED Codes (continued)

Description	Standard		Shielded		Plenum		Shielded-Plenum	
	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31
50-pin,180°-F 6 25-pin-F (narrow hood)			SYNC6-FS-NH	G-188, G-S				
50-pin,180°-F 6 25-pin-M	SYNC6-FX	G-195, G-E						
50-pin,180°-M 6 25-pin-F	SYNC6-M	G-164, G-E						
50-pin,180°-M 25-pin-M			T1-DSU	G-185, G-Q			T1-DSU(P)	G-185, G-AA
50-pin,180°-M 6 8-pin modular plug			ASYNC	G-189, G-S				
25-pin-F 6-pin modular plug 6-wire	D6AWX	G-145, G-H						
25-pin-M 6-pin modular plug 6-wire	D6AYX	G-146, G-H						
25-pin-M 6-pin modular plug 6-wire	D6AUX	G-133, G-H						
25-pin-F 8-pin modular plug (null modem wiring)	D8AG	G-130, G-G			D8AGP	G-130, G-AC		
25-pin-F 8-pin modular plug (special wiring)	D8AG-SP	G-216, G-G			D8AG-SP-P	G-216, G-AC		
25-pin-M 8-pin modular plug	D8AH	G-131, G-G			D8AHP	G-131, G-AC		
25-pin-M 8-pin modular plug (special wiring)	D8AHX	G-193, G-G			D8AHXP	G-193, G-AC		

Table 3-30. Cable Ordering Information with ED Codes **(continued)**

Description	Standard		Shielded		Plenum		Shielded-Plenum	
	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31
25-pin-M 8-pin modular plug (null modem wiring)	D8AN	G-132, G-G			D8ANP	G-132, G-AC		
25-pin-M 8-pin modular plug (special wiring)	D8ANX	G-194, G-G			D8ANXP	G-194, G-AC		
25-pin-M 25-pin-F 6-wire	M6BD	G-136, G-J	M6BDS	G-186, G-AE	M6BDP	G-136, G-AC		
25-pin-M 8-pin modular plug	M8AC	G-135, G-G			M8ACP	G-135, G-AC		
25-pin-F 8-pin modular plug	M8AF	G-142, G-G			M8AFP	G-142, G-AC		
25-pin-M 25-pin-F	M25A	G-107, G-P	M25AS M25AS-MOD	G-118, G-L G-178, G-L	M25AP	G-107, G-AB	M25ASP M25ASP-MOD	G-118, G-Z G-178, G-Z
25-pin-F (narrow hood)			M25AS-NH	G-190, G-L			M25ASP-NH	G-190, G-Z
25-pin-F 25-pin-M (special wiring)			M25AS-DSU	G-169, G-AL				
25-pin-M 25-pin-M	M25B	G-108, G-P	M25BS M25BS-MOD	G-119, G-L G-179, G-L	M25BP	G-108, G-AB	M25BSP M25BSP-MOD	G-119, G-Z G-179, G-Z
25-pin-M 25-pin-M (special wiring)	M25B-DSU	G-166, G-AM						
25-pin-M 25-pin-M (narrow hood)			M25BS-NH	G-191, G-L			M25BSP-NH	G-191, G-Z

Table 3-30. Cable Ordering Information with ED Codes (continued)

Description	Standard		Shielded		Plenum		Shielded-Plenum	
	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31
25-pin-M 2 25-pin-M			SAM64-CEY4	G-219, G-AL				
25-pin-M RS-449-M			T1-SAM64/DSU	G-187, G-Q			T1-SAM64/DSU(P	G-187, G-AA
RS-449-F 25-pin-M			50-450X	G-207, G-T				
25-pin-M V.35-F			V.35-DSU	G-184, G-Q			V.35-DSU(P	G-184, G-AA
25-pin-M V.35-M			V.35-INT	G-206, G-Q				
25-pin-F 25-pin-M (special wiring)			RS-232-C	G-175, G-Q				
RS-449-M RS-449-F			RS-449	G-171, G-T				
RS-449-M RS-449-M			SAM449	G-128, G-N			SAM449(SP)	G-128, G-AA
RS-449-M V.35-M			SAM35	G-127, G-N			SAM35(SP)	G-127, G-AA
V.35-M V.35-F			CCITT V.35	G-121, G-Q			CCITT V.35(SP)	G-121, G-AA
V.35-M V.35-M			V.35-MM	G-220, G-T				
V.35-M V.35-F			V.35	G-170, G-T				
15-pin-M 8-pin modular plug (15-pin NI)			T1-CSU/NI-3	G-181, G-AE			T1-CSU/NI-3P	G-181, G-AP
15-pin-M 15-pin-M			T1-DSU/CSU	G-183, G-AN			T1-DSU/CSU-P	G-183, G-AQ

Table 3-30. Cable Ordering Information with ED Codes (continued)

Description	Standard		Shielded		Plenum		Shielded-Plenum	
	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31
6-pin modular plug 6-pin modular plug	D6AM	G-144, G-H						
8-pin modular plug 8-pin modular plug (reverse wiring)	D8AA	G-134, G-G			D8AAP	G-134, G-AC		
8-pin modular plug 8-pin modular plug (straight through)	D8W	G-137, G-G			DW8AP	G-137, G-AC		
8-pin modular plug 8-pin modular plug AT&T (NI)			T1-CSU/NI-1	G-182, G-AE			T1-CSU/NI-1P	G-182, G-AP
8-pin modular plug 8-pin modular plug (FCC-NI)			T1-CSU/NI-2	G-180, G-AE			T1-CSU/NI-2P	G-180, G-AP
8-pin modular plug 2 8-pin modular plug	Y-Cable	G-143, G-G			Y-Cable(P)	G-143, G-AC		
RS-449-F 25-pin-M			RS-449-F	G-221, G-7				
50-pin-M 2 V.35-M			HD-2V.35M	G-222, G-AS				
15-pin-M 15-pin-M			AU1.5-CSU	G-227, G-AN			AU1.5-CSU	G-227, G-AQ
9-pin-M RS45			DB-9RS45	G-229, G-AE				
15-pin-M butt			AU1.5-PD	G-230, G-AN				
15-pin-M 15-pin-M			CHIO-CROSS	G-246, G-AN				
15-pin-M RJ45			CHIO-MOD	G-247, G-AN				
15-pin-M RJ45			CHIO-MOD-S	G-250, G-AN				

Table 3-30. Cable Ordering Information with ED Codes (continued)

Description	Standard		Shielded		Plenum		Shielded-Plenum	
	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31	Name	ED5P055-31
50-pin 180°-M 50-pin 90°-M			CPM-MOD	G-231, G-AT			CPM-MOD-SP	G-231, G-AN
25-pin-M V.35-F			FRM-GDC	G-232, G-Q			FRM-GDC	G-232, G-AA
BNC coax BNC coax			728B	G-233, G-AV				
25-pin-M 25-pin-M (null modem wiring)			M25AS-NM	G-234, G-AL			M25AS-NM	G-234, G-AM
25-pin-M 25-pin-F (null modem wiring)			M25AS-NM-MF	G-235, G-AL			M25AS-NM-MF	G-235, G-AM
50-pin-M 2 25-pin-M (special wiring)			HD-2DB25M-SPEC	G-236, G-AS				
25-pin-M 25-pin-M (special wiring)			SPEC-GDC	G-237, G-Q			SPEC-GDC	G-237, G-AA
4 25-pin-M butt			AI-T1/4	G-238, G-AW				
8-pin mod plug 8-pin mod plug (special wiring)	D8W-MOD	G-239, G-G						
4 50-pin-M 3 50-pin-F			TY-AIM	G-240, G-AX				
25-pin-M 25-pin-M (special wiring)			SPEC-UDS	G-244, G-Q			SPEC-UDS	G-244, G-AA

SAM Administration

SAM Administration

The groundwork for SAM administration is completed by consulting the *Planning Guide* or the *Node Reference* for data and procedures required to fill out the database entry forms provided in **Appendix A**. The SAM administration described in this chapter is more easily accomplished by working from these completed database entry forms. Data entry can be completed before or after the physical installation of the SAM hardware. Upon completion of both tasks, the SAM is restored to service.

SAM Components

SAM components, which consist of the module, its boards, and ports vary according to SAM type:

- The **SAM16** module has one logical board with 16 ports, even though there are two physical boards (CPY1).

- The **SAM64** module has up to two physical boards (TERM32s) with 32 ports each for a total of 64 ports.

- The **SAM504** module has up to 16 physcial boards (TERM32s) with 32 ports each for a total of 504 ports.*

SAM components form a hierarchy: modules hold the highest level, followed by boards, then ports. The component level determines the order in which information can be added to and eliminated from the database and the order in which the component itself can be removed and restored to service. Some specific restrictions are:

- Module information must be entered into the database first, followed by board, then port information. If the module is in service when you are entering board information, the board is taken out of service. (You are not queried for the initial service state.)

- If the board is in service when you are entering port information, the port is taken out of service. However, if a board is out of service or ready for service (meaning its module is out of service), you must specify the initial service state of the port.

The hierarchy of SAM components affects the input of the **sam** commands (see SAM Commands section).

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* Eight ports are lost for overhead on the sixteenth TERM32.

SAM Trunks

SAMs are physically connected to the node through two trunk modules, one residing in the node, and one residing in the SAM. As Table 5-1 indicates, their names differ according to their physical placement. The SAMs can also be linked to the node via a SAMSL or SAMML, but the administration of these trunk modules differs according to SAM type.

When a SAM is connected to the node by a *t1*, *hs*, or *samsl* trunk module, the connection is administered as an option of the `TRUNK TYPE` parameter of the **enter sam** command.

When a SAM is connected to the node via a *samml*, the connection is administered through the `MODULE ADDRESS` parameter of both the **enter samml** and **enter sam** commands. Unlike the SAM504, the SAM64 and SAM16 also support a dual-link connection for redundancy and load sharing via its SAMDL module. This module has two links: one, the primary link, is connected to an odd-numbered port on the SAMML; the other, the secondary link, is connected to a consecutive, even-numbered port on the SAMML. To address a SAM that is SAMML-connected with a dual link, the primary port on the SAMML must be specified. When a single link of a dual link must be specified, a separate prompt, with options *primary* or *secondary*, appears. (For all SAMML connections, **samml** must be entered into the database first.)

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TABLE 4-1. SAM Trunk Modules

SAM Type	SAM Trunk Module	Node Trunk Module	Administered As	Command Object for Administration
SAM16	SAMSL (integrated)	SAMSL *-or-*	*samsl*	**sam**
	SAMDL (integrated)	SAMML	*samml*	**samml**
SAM64	T1-TRUNK	TRUNK-T1	*t1*	**sam**
	HS-TRUNK	TRUNK-HS	*hs*	**sam**
	SAMSL	SAMSL *-or-*	*samsl*	**sam**
		SAMML	*samml*	**samml**
	SAMDL	SAMML	*samml*	**samml**
SAM504	T1-TRUNK	TRUNK-T1	*t1*	**sam**
	HS-TRUNK	TRUNK-HS	*hs*	**sam**
	SAMSL	SAMSL *-or-*	*samsl*	**sam**
		SAMML	*samml*	**samml**

Command Set

Information on the SAM and its associated link interface module is added to the database, and thereafter manipulated and checked, with the **enter**, **change**, **delete**, and **verify** commands. The parameter prompting sequence of the **enter** and **change** commands enable configurable options to be specified in the database. Once specified, these options can be checked with the **verify** command and removed from the database with the **delete** command.

The **restore** and **remove** commands control the service state of the SAM; these commands, which also affect call processing, are often used with administration and maintenance procedures. When modules are resident in the SAM, the execution of **remove sam** and **restore sam** automatically affects the service state of the resident module. Refer to the description of these commands in **SAM Commands**.

In addition, the **remove** and **restore** commands can be used with **verify oosmods**, which lists all out-of-service SAMs and modules.

The **diagnose** command is used for SAM maintenance and troubleshooting, along with other status and maintenance-related commands such as **dstat sam** and **dmeas sam**.

The following table shows the SAM command family along with related objects of other operations commands:

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TABLE 4-2. SAM Commands

Administration	Operation	Maintenance	Related Objects	
enter sam	remove sam	diagnose sam	address*	module
change sam	restore sam	dmeas sam	circuits	oosmods
verify sam	remove samml	dstat sam	comment	oosports
delete sam	restore samml	diagnose samml	connections	periodic_bill
enter samml**	remove samtrk	dmeas samml	eia	profile*
change samml	restore samtrk	dstat samml	epn	schedule
delete samml		diagnose samtrk	group*	
verify samml			held	
			measurements	

* These objects should be entered before configuring a SAM in the database.

** If the SAM is SAMML-connected, the SAMML should be configured in the database first.

NOTE: The prompted entry, one-line entry, and any subsequent output examples shown in the **sam** commands exemplify system output that would occur on an ECPU System or CPU System except where noted.

SAM Administrative Procedures

The initial administration of a concentrator is not hardware dependent—that is, the concentrator does not have to be physically installed before its information is entered in the database. However, for routine administration and operations procedures, such as removing and restoring the concentrator to service or displaying the status of the hardware, concentrator installation is required.

The *Node Reference* discusses the administration of groups, addresses, and profiles, which are associated with SAM ports. This section discusses the following SAM trunk, module, and port administration commands:

- **enter samml.** This command is relevant only to SAMs connected to a SAMML module in the node. In these cases, the SAMML must be identified to the node before the SAM can be identified.

- **enter sam.** This command is relevant to all SAMs, with some variations.

  — *for SAMs connected to any non-SAMML module in the node.* At the module level, this command identifies the link module in the node, and the SAM itself. At the port level, it individually configures the SAM ports.

  — *for SAM16s, SAM64s, and SAM504s connected to SAMMLs in the node.* At the module level, this command identifies the SAMML port(s) to which the SAM is connected, the SAM itself, and the SAMSL or SAMDL module in the SAM. At the board level, it identifies the TERM32 boards located in the SAM. At the port level, it individually configures SAM ports.

  In addition to the above information, for dual-link SAM64 and SAM16 modules, you must specify the CRC alarm threshold, failure declaration threshold, and recovery declaration threshold for both the primary and secondary links.

  — *for SAM64s and SAM504s connected to the node through non-SAMML modules.* At the module level, this command identifies the link modules at both the node and SAM end, and the SAM itself. At the board level, it identifies the TERM32 boards in the SAM. At the port level, it individually configures SAM ports.

  Each SAM port can be configured as either DCE or DTE with an option of external clocking for support of synchronous and asynchronous protocols.

To enter SAM information in the database, follow Procedure 4-1.

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PROCEDURE 4-1. Entering SAM Information in the Database

Applicability: Administering a SAM for the first time in the database.

1. Use **enter sam** to begin administration of the SAM. Have your completed database entry forms handy and remember that default values can be specified by pressing [Return] or [+] , as shown in the prompted entry examples in **SAM Commands**.

2. Use **verify sam** to check your entries.

3. If you made any errors or have to change parameter specifications, use **change sam.** If you need to start over, use **delete sam** to eliminate all entries made; then begin again with **enter sam.**

4. If the SAM is installed, use **restore sam** to bring the SAM into service.

To make minor changes in the database, follow Procedure 4-2.

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PROCEDURE 4-2. Making Minor SAM Database Changes

Applicability: A minor database change constitutes a change to a few parameter options. The SAM has already been administered in the database.

1. Remove the SAM from service with **remove sam.**

2. Make modifications with **change sam.**

   If you are specifying a **NEW MODULE ADDRESS** , all information on the SAM is transferred to the new module address automatically.

3. Check changes with **verify sam.**

4. Return the SAM to service with **restore sam.**

To move SAM information, follow Procedure 4-3.

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PROCEDURE 4-3. Moving SAM Information

Applicability: SAM information can be moved to another module address (slot) with the **move command** or with a combination of **delete** and **enter**.

Method 1:

1. Remove the SAM from service with **remove sam.**

2. Use **verify module** to ensure that a database entry has not been made for the new module address. (If a database address does exist for the specified module address, the command fails.)

3. Use **move module** to transfer database information from one module address to another.

4. Physically move the hardware.

5. Using the new module address, put the concentrator back into service with **restore sam.**

    All information on the SAM, including the interface modules residing in the SAM, is transferred to the new module address automatically.

   Method 2:

   1. If **move module** is not appropriate for the situation, use **verify sam** to get a report of the configuration data.

   2. Remove the SAM from service with **remove sam.**

   3. Delete the information on all modules residing in the SAM using the appropriate **delete <module>** commands.

   4. Use **delete sam** to eliminate all information at the existing module address.

   5. Use **enter sam** to add the information to the new address.

   6. Use **enter** <**module**> to add the new module addresses and the remaining information on all modules residing in the SAM.

   7. Check information entered at the new address with **verify sam.**

   8. Physically move the hardware.

   9. Return the SAM to service with **restore sam.**

To copy information to another module address, follow Procedure 4-4.

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PROCEDURE 4-4. Copying SAM Information to Another Module Address

Applicability: If an additional SAM must be installed that requires the same or similar parameter specifications as a currently installed and administered SAM, database information can be duplicated from one module address to another module address with the **copy command** or with a combination of **verify** and **enter**. (Remember that the **copy module** command does not duplicate any endpoint numbers or ranges.)

Method 1:

1. Remove the SAM from service with **remove sam.**

2. Use **verify module** to ensure that a database entry has not been made for the new module address. (If a database entry does exist for the specified module address, the command fails.)

3. Use **copy module** to duplicate the database information from one module address to another.

4. Return the SAM to service with **restore sam.**

    All information on the SAM, its associated link interface module, and any resident interface modules are automatically duplicated in the new module address.

    Method 2:

    1. If **copy module** is not appropriate for the situation, use **verify sam** to get a report of the existing parameter options specified.   If you feel the need to, complete the database entry forms furnished in **Appendix A.**

    2. Re-enter the information with **enter sam.**

    3. Check information entered with **verify sam.**

SAM Reports

The following table explains the reports available to assist with analysis of SAM/network performance, system expansion, troubleshooting, and other routine tasks.   In addition, refer to the reports available for the SAM resident modules.

TABLE 4-3. Reports Available for SAMs

Report Topic	Command	Description
comment information	**verify comment**	Shows the comment information entered into the database for the SAM and resident modules.
connection/traffic data	**display connections**	Lists established connections for modules, groups, or hosts. Group names are included.
	display traffic	Lists established connections for modules, groups, or hosts. Segment counts are included. See the *Node Reference*.
database size	**dbaudit**	Shows where database space expenditures occur. If **dbresize** is used, the database tables are readjusted automatically. See the *Node Reference*.
measurements	**dmeas sam**	Provides information on the amount of data the link is carrying relative to its capacity, and the number of packets transported in both directions on the link. Overflow, parity, transmission, and synchronization errors are also reported for both sides of the link.
	verify schedule	Verifies the printing schedule for measurement data. Reports must be scheduled through *StarKeeper* II NMS; output goes to the node console and to *StarKeeper* II NMS.
module hardware status	**dstat sam**	Shows the hardware status of the SAM and the service state of its link interface module.

TABLE 4-3. **Reports Available for SAMs** (continued)

Report Topic	Command	Description
module/port data	**verify sam**	Lists hardware/software data as it currently appears in the configuration database. The SAM does not have to be installed.
out-of-service modules	**verify oosmods**	Lists all configured SAMs and modules that are currently out of service.

SAM Troubleshooting

SAM Troubleshooting

This chapter is organized to suggest a general approach to troubleshooting; help you take a first cut at a problem, as common indicators are observed, to identify the problem areas associated with certain indicators; and to further narrow the focus to a particular component. Some problems that arise during system operation can be quickly identified and solved. Other problems are more complex, perhaps involving the interrelationship of several elements. Whatever the problem, a good start toward a solution is to identify the severity of the problem, what capabilities are affected, the symptoms displayed by the problem, and who is affected.

For information about a general, systematic approach to troubleshooting, refer to the *Node Reference*. Using the method outlined there, you can diagnose problems affecting the entire node and isolate localized problems to a SAM or to one of its resident modules. Once the problem is isolated to a SAM, this chapter can help identify and further isolate the problem. It describes problems that are SAM-specific and corrective action and/or further references to remedy the problem.

This chapter does not explain problem indicators, such as module faceplate LEDs, that are common to all modules; these are explained in the *Node Reference*. In addition, this chapter does not provide isolation techniques or procedures for end users or their connected end devices, nor does it provide this information for the user services provided by resident interface modules. Refer to the *Node Reference* and/or to the appropriate module reference.

Problem Indicators

The faceplate indicators for the critical modules residing in the SAM and the link interface modules often indicate problems specific to the SAM. In addition, the output of certain alarms can indicate SAM problems.

Module Faceplate Indicators

The lights associated with the faceplate of the critical modules and the link interface modules are green, yellow, and red. They indicate on-line, off-line, and fault states. When the red light (fault light) is lit, the module circuitry and the database are inconsistent.

When pressed, the reset push button clears the module buffers and registers, and restarts the module application program. The SAM is taken out of service and connections are terminated.

Command Output

The output of operations commands, such as **diagnose sam**, and those listed in Table 5-1, can indicate an existing or potential problem.

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TABLE 5-1. Command Output

Command	Description	Further Reference
diagnose sam	Enables execution of several loopback tests. Test patterns can be looped from the Control Computer to the SAM and back.	See SAM diagnostic procedures in this chapter. See **diagnose sam** in **SAM Commands**.
display connections	Shows established connections for modules, groups, or hosts. Group names are included. Packet counts are included.	See the *Node Reference*.
dstat sam	Enables you to determine the hardware status of the sam and the service state of its link interface module. Report output can be compared to that of **dstat module**, **verify sam**, and faceplate indicators. The report output also provides serial numbers of the link interface module which can be useful in tracking intermittent hardware failures that occur when a module is moved from configuration to configuration.	See the **dstat sam** in **SAM Commands**.
dstat module	Lists hardware/software sam data.	See the *Node Reference*.
dmeas sam	Enables you to receive on-demand measurements for the node and the remote link interface module connected to the SAM. Reports can also be scheduled. The **dmeas** report provides information on the amount of data the link is carrying relative to its capacity, and the number of packets transported in both directions on the link. Overflow, parity, transmission, and synchronization errors are also reported for both sides of the link. This data relates primarily to link re-engineering, but also contains information relating to facilities status and hardware failures.	See **dmeas sam** in **SAM Commands**.

TABLE 5-1. **Command Output** (continued)

Command	Description	Further Reference
verify oosmods	Lists all configured sams and modules that are currently out of service.	See the *Node Reference.*
verify oosports	Lists out-of-service ports	See the *Node Reference*
verify sam	Shows all parameter options configured for the sam.	See **verify sam** in **SAM Commands**.

Alarms

Alarm output often indicates the nature of the problem and many times furnishes a recommended action. For a complete list of alarms and recommended actions, see the *Data Networking Products Messages Reference*.

Additional Problem Indicators

Additional indicators include problems observed

- **on the node administration console -** Problems like the inability to access the Control Computer (CCO> prompt), or automatic reboot and automatic recovery actions by the Control Computer, are observed at the node's console. This usually indicates a problem with system power or a critical module

- **by end users -** Network end users' observations help identify the severity, scope, and location of the problem. Identifying affected end users helps locate a problem with a line, interface module, shared module (trunk or host), or critical module

- **after installation or maintenance activity -** Recent installation or repair of modules or communication line connections may contribute to problems

Remote Service Problems

Remote service problems involve the SAM. To resolve SAM problems, look at the symptoms reported by end users and decide if the errors seem to be in the link or elsewhere:

- What have the end users reported? Loss of service? Loss of data?

- What is the network reporting? What is the status of the LEDs? What are the report alarm messages? What do the network reports reveal?

Once you have reviewed the symptoms, determine if the problem is with the link between the node and the SAM, with the SAM itself, or with the user interface. Reports can help you make this distinction. SAM-related problems appear in Table 5-2.

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TABLE 5-2. Remote Service—SAM Problems

Symptom	Indicator	Possible Cause	Actions
Active calls get dropped **Cannot place outgoing call**	Data loss or corruption reported by SAM users **DESTINATION:** prompt does not appear on terminal screen Terminal screen data appears to be out of order or incorrect Terminal appears to hang **DESTINATION:** prompt appears while call is in progress Alarm messages reveal a module malfunction Red LED is lit on SAM trunk module or other module residing in SAM **display connection** report indicates the call is in an unexpected state	Blown fuse (in node or SAM) Bad cabling connection Facility outage Facility interface failure (modem, DSU) Link at full capacity (indicated by **dmeas** report) Power problem Module hardware failure Noise or delay on trunk	See **Procedure 5-1. Correcting Link Problems on SAMs**. See **Procedure 5-2. Resolving Non-Link Related Problem**.

TABLE 5-2. **Remote Service—SAM Problems** (continued)

Symptom	Indicator	Possible Cause	Actions
Fault condition on one link of a SAM on a dual link after it has been restored to service	Alarm 8035 (link fault) and 8106 (trunk fade)	Cables for primary and secondary links may be connected incorrectly	See **Procedure 5-3. Handling SAM Dual Link Problem**.

PROCEDURE 5-1. Correcting Link Problems on SAMs

- If the **dmeas** report shows high `CRC Error` counts, you should diagnose the link first.

- If the **dstat** report shows a high `Hardware Error` count, the problem may be with an interface module.

See the report field descriptions in **SAM Commands**.

1. Check all cable connections between the SAM and the node.

2. Diagnose the trunk with the **diagnose samtrk** command.

3. If the **dmeas** command reports that the link is at full capacity

   a. restrict the usage and increase the speed of the link, if possible.

   b. add more channels, if possible

4. If there are power problems with the SAM and the node connection, check the fuse for the slot on the node and on the SAM.

5. Call the facilities provider if there is noise or delay on the link.

6. If there are communication problems in SAM64 units, remove the back of the unit and check the connectors on the backplane. Look for improper pin alignment and skewed connections. Check for interference between the baling clips on the external connection and the plastic connections.

PROCEDURE 5-2. Resolving Non-Link Related Problems

1. If a red LED is lit on the trunk module in the node, diagnose this module first. Otherwise, diagnose the SAM module.

2. If the diagnostics for a particular module fail, replace the module and run the test again. **SAM Commands** will explain each **diagnose** option. Using several diagnostic options will allow you to isolate a module failure.

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PROCEDURE 5-3. Handling SAM Dual Link Problems

The appearance of a fault condition on one link of a dual link SAM after the SAM has been restored to service and a subsequent trunk fade may have been caused by cables for primary and secondary links being incorrectly connected.

Verify that the odd-numbered link on the SAMML is connected to the primary link on the SAMDL.

SAM64 Troubleshooting

The following sections supply troubleshooting information and the appropriate procedures for the SAM64.

Hardware Problems

Table 5-3 outlines the types of hardware problems you may encounter and describes what corrective action is appropriate.

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TABLE 5-3. **SAM64 Troubleshooting**

Problem	Corrective Action
TCON and TERM32 power LEDs do not light	Make sure power is connected to the rear panel.
	Make sure correct power supply is used (AC=TN2166, DC=TN2167)
	Measure power supply output at test points on front of power supply. A DC voltmeter can be used to measure the output voltages using the test points on the power supply faceplate. Acceptable voltage levels for the three outputs are: **Output Limits** +5V 4.5V to 5.5V +12V 11.5V to 12.5V −12V −11.5V to −12.5V
	Make sure TCON and TERM32 circuit boards are fully inserted by making sure the circuit pack latch is properly engaged. When inserting the circuit pack, its latch should catch on the housing and force the circuit pack in place as the latch is closed.
Fans do not spin	Check fan connection on backplane. Check that J24 is properly and securely connected to the backplane (red wires on top; black wires on bottom). Refer to Figure 5-1.
	Remove fan tray and check power connection to the circuit board. Verify that connections to P20/J20 and TB26 are secure on the BCM1 circuit board. Refer to Figure 5-2.
	Measure the voltage on TB26, positions 1 and 2 (black wires) and 5 and 6 (red wires) with respect to ground. -12 V should be measured on positions 1 and 2. +12 V should be measured on positions 5 and 6.
	Check fuses (F1 & F2) on the circuit board with an ohmmeter. The fuses should read 0 ohms. If a fuse is blown (measures infinite resistance), the BCM1 circuit board should be replaced. Refer to Procedure 5-4.
	Replace fan filters and fans as needed. Refer to Procedures 5-5 and 5-6.

TABLE 5-3. **SAM64 Troubleshooting** (continued)

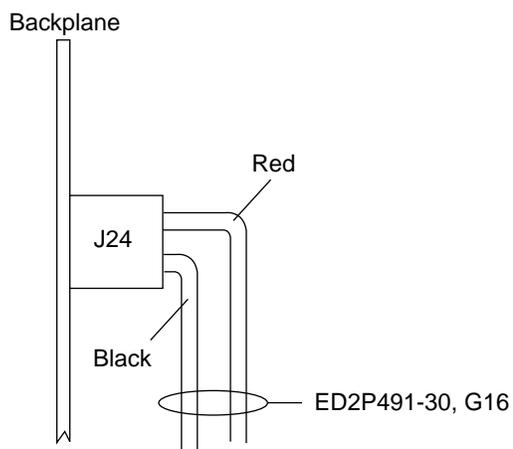| Problem	Corrective Action
TCON Red LED lit	TCON is in diagnostic state or diagnostics have found a fault. Check the node console for fault message. See the section **SAM64 Diagnostics** for more details.
TCON Amber LED lit	A memory fault exists on the TCON. See the section **SAM64 Diagnostics** for diagnostic tests.

FIGURE 5-1. **Backplane Connections**
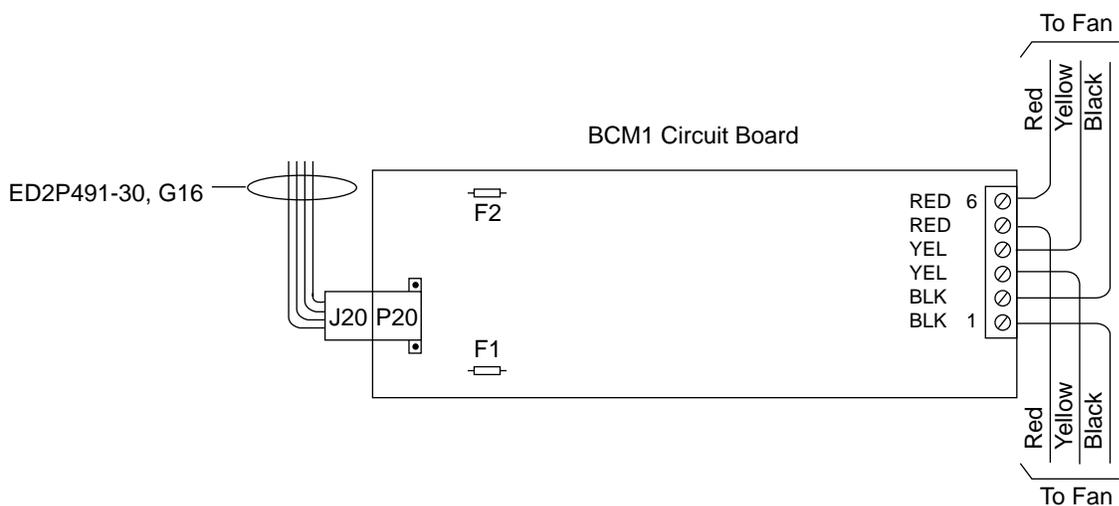
FIGURE 5-2. **BCM1 Circuit Board**

PROCEDURE 5-4. Replacing the Fan Power Filter (BCM1)

NOTE: Unplugging and plugging the fan power connector on either the backplane (J24) or the fan tray (J20) will cause unpredictable data corruption. All service to the fans must be performed with the SAM64 offline and the system powered down.

The following tools and equipment are required for this procedure:

- Fan, power filter, BCM1 (106411333)
- Phillips head screwdriver
- Slotted screwdriver.

1. Remove the front door.

2. Remove two Phillips-head screws from the front of the fan tray and set aside for reassembly.

3. Carefully slide out the fan tray until the fan filter circuit board is visible.

4. Unplug the white connector from the circuit board.

5. Slide out the fan tray completely.

6. Disconnect the red, black, and yellow wires from TB6.

7. Remove four screws and lockwashers from the top of the BCM1 circuit board and remove the board.

8. Place the new circuit board on the four stand-offs with TB26 facing the loose wires on the fans and secure with four screws and lockwashers.

9. Connect the red, black, and yellow wires using Figure 5-2 as a reference.

10. Slide the fan tray half way into the front of the SAM64.

11. Reconnect the white plug and slide the fan tray in completely.

12. Secure the fan tray with the two Phillips-head screws.

13. Apply power to the system and visually verify the fan's operation.

14. Replace the front door.

PROCEDURE 5-5. Cleaning and Replacing the SAM64 Fan Filter

To clean the filter:

1. Remove the front door.

2. Remove the filter from the front of the unit by pulling it out of the slot below the fans.

3. Clean the filter under running water and allow it to dry thoroughly before reinserting it in the fan shelf.

4. Reinsert the cleaned filter by sliding it into the slot below the fans.

To insert a new filter:

1. Remove the old filter from the front of the unit by pulling it out of the slot below the fans.

2. Insert the new filter by sliding it into the slot below the fans.

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PROCEDURE 5-6. Replacing a Fan

NOTE: Unplugging and plugging the fan power connector on either the backplane (J24) or the fan tray (J20) will cause unpredictable data corruption. All service to the fans must be performed with the SAM64 offline and the system powered down.

The following tools and equipment are required to replace a faulty fan:

■ Fan (405753187)

■ Phillips head screwdriver

■ Slotted screwdriver

■ Wire cutters

■ Wire strippers.

To replace a fan, follow Procedure 5-6 (refer to Figure 1-5):

1. Visually determine which fan has failed. Turn off the SAM64 power.

2. Remove the front door.

3. Remove two Phillips head screws from the front of the fan tray and set aside for reassembly.

4. Carefully slide out the fan tray until the fan filter circuit board is visible.

5. Unplug the white connector from the circuit board.

6. Slide out the fan tray completely.

7. Disconnect the red, black, and yellow wires for the faulty fan from TB26.

PROCEDURE 5-6. **Replacing a Fan** (continued)

8. Remove four screws and washers and the finger guard from the top of the fan and place aside for reassembly.

9. Lift the fan off the fan tray.

10. Place the new fan on the fan tray so the label can be read from the top.

11. Replace the finger guard, washer, and screws to secure the fan to the fan tray.

12. Trim the red, black, and yellow wires to reduce the slack when routed to TB26.

13. Connect these wires to the correct positions on TB26 (see Figure 5-2).

14. Slide the fan tray half way into the front of the SAM64.

15. Reconnect the white plug and slide the fan tray in completely.

16. Secure the fan tray with the two Phillips head screws.

17. Apply power to the system and visually verify the fan's operation.

18. Replace the front door.

SAM64 Diagnostics

The diagnostics can be classified as on-line or off-line and as module, board, or port-level diagnostics. Module diagnostics test the trunk in both the SAM64 and the node and the TCON. Board-level diagnostics test the integrity of a particular TERM32 circuit board in both on-line and off-line states (in and out of service, respectively). Port-level diagnostics test the integrity of a specific TERM32 port and any interface cabling connected to the port (for off-line diagnostics only).

When a module is being diagnosed at the module level, there are actually three circuit packs that are tested:

- the installed trunk module (T1-Trunk, HS-Trunk, SAMSL, or SAMML) in the local node

- the installed trunk module (T1-Trunk, HS-Trunk, SAMSL, or SAMDL) in the SAM

- the TCON module in the SAM64

When diagnosing is being done at the circuit card level, the circuit card tested is the TERM32. In the SAM64 there can be up to two 32-port TERM32 circuit cards.

To run diagnostics on the SAM64, the commands must be entered at the node and the slot number of the SAM64 trunk board must be known.

Off-line Diagnostics

To perform the SAM64 off-line diagnostics, enter the following information at the console.

MODULE (module must be out of service for these tests):

1. **diagnose sam off-line**
2. **module**

BOARD (module must be in service for these tests):

1. **diagnose sam off-line**
2. **board**

CABLING (module must be in service for these tests):

1. **diagnose sam off-line**
2. **cabling**

On-line Diagnostics

To perform the SAM64 on-line diagnostics, enter the following information at the console:

MODULE (module must be in service for these tests):

1. **diagnose sam on-line**
2. **module**

PORT (module and board must be in service and the port must be out of service for these tests):

1. **diagnose sam on-line**
2. **port**

SAM64 Trunk Diagnostics

The link between the node and the SAM64 can be tested using the **diagnose samtrk** command. This link can be either the HS-Trunk, T1-Trunk, SAMSL, or SAMDL module.   The five possible test types are:

- local_trk

- near_dsu

- remote_trk

- external_trk

- far_dsu

(The tests for **near_dsu** and **far_dsu** do not apply to the HS-Trunk module.)

NOTE: When performing the trk_remote test, put the TCON switch (in the SAM64) in the REMOTE position and press the RESET button. This will put the TCON module in the looparound mode. When you are finished, move the switch on the TCON module back into the ENABLE position and press RESET again to restore the TCON module to its normal operating state.

To perform the SAMTRK diagnostics, enter the following at the node console:

diagnose samtrk

SAM504/VDM-SAM504 Troubleshooting

This section describes troubleshooting and diagnostics for the various components of the SAM504/VDM-SAM504. It includes how to correct excessive noise, crosstalk, SAM504 and VDM hardware problems, fuse and alarm panel problems, and voice and data circuit problems. Table 5-5 at the end of this chapter provides TERM32-to-VDM connector references.

SAM504 Hardware Problems

Table 5-4 outlines the types of problems you may encounter on the SAM504, and describes what corrective action may be taken.

TABLE 5-4. SAM504 Troubleshooting

Problem	Corrective Action
Red LEDs on TCON and Trunk circuit pack faceplates do not go out after power is applied.	Make sure that TCON and Trunk module are inserted together. (The programming for the trunk module is on the TCON module.)
TERM32 red LED goes out after a download takes place.	Reset the alarm circuit. Replace power supplies as needed.
One or more fans do not start when −48 VDC power is applied.	Check that fuses are not blown.
	Check the fan connectors on the front of the fan shelf and the power connector at the rear of the fan shelf.
	Replace fans as needed.

SAM504 Diagnostics

Both on-line and off-line diagnostics are provided for SAM504 components (circuit cards and modules) and associated cabling.

Offline diagnostics test the integrity of SAM504 hardware when the corresponding SAM component is out of service. In addition, they can help diagnose the state of a module, all ports connected to a specified circuit card, or any cables connected to the I/O distribution board. To run SAM504 off-line diagnostics, refer to Procedure 5-7.

Online diagnostics test modules and ports. The ports to be diagnosed must be out of service, but the module must be in service. To run SAM504 on-line diagnostics, refer to Procedure 5-8.

When a module is being diagnosed at the module level, there are actually three circuit packs that are tested:

- the SAMSL module (or T1-Trunk or Trunk-HS) in the local node

- the SAMSL module (or T1-Trunk or Trunk-HS) in the remote SAM

- the TCON module in the remote SAM504.

When diagnosing is being done at the circuit card level, the circuit card tested is the TERM32. In the SAM504 there can be up to sixteen, 32-port TERM32 circuit cards. The sixteenth circuit card uses only 24 ports.

PROCEDURE 5-7. Running SAM504 Offline Diagnostics

1. Enter **diagnose sam off-line**

2. If the test passes, the problem is not in the SAM504 hardware tested.

3. If the test fails, replace the hardware and run the test again.

PROCEDURE 5-8. Running SAM504 On-line Diagnostics

1. Enter **diagnose sam on-line**

2. If the test passes, the problem is not in the SAM504 component tested.

3. If the test fails, replace the component and run the test again.

SAM504 Trunk Diagnostics

The link between the node and the SAM504 can be tested using the **diagnose samtrk** command. This link can be either the Trunk-HS, the T1-Trunk, or the SAMSL module.

The five possible test types are:

- local_trk

- external_trk

- near_dsu

- far_dsu

- remote_trk

(The tests for near_dsu and far_dsu do not apply to the Trunk-HS module.)

NOTE: When performing the trk_remote test, put the TCON switch on the remote end (in the VDM-SAM504) in the REMOTE position and press the RESET button. This will put the TCON module in the looparound mode. When you are finished, move the switch on the TCON module back into the ENABLE position and press RESET again to restore the TCON module to its normal operating state.

To run SAMTRK diagnostics, follow Procedure 5-9.

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PROCEDURE 5-9. **Running SAMTRK Diagnostics**

1. Enter **diagnose samtrk (module address) (loop type) ...** for each test you want to perform.

2. If the test passes, the problem is not in that portion of the path tested.

3. If the test fails, replace the failed component and run the test again.

VDM Hardware Problems

The following sections explain hardware problems that are particular to the VDM only.

Power Supply

If a power supply fails to energize when switched on during power-up (that is, the lamps do not light), or if a power supply failure is indicated by a red POWER LED on the front panel of the alarm unit, follow Procedure 5-10.

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PROCEDURE 5-10. **Troubleshooting Power Supply Problems**

1. Verify that the external power source to the power shelf and circuit fuses TB7 are in working condition.

2. Verify that the power connections between the VDM-SAM504 cabinet and the external power source are good.

3. For shelves with fewer than three power supplies, check the TB6 connections on the rear of the power supply shelf.

4. Check the connections to TB12 and TB13 (see Figure 2-19).

Fan Units

A fan failure is indicated by a red FAN LED on the front panel of the fuse and alarm panel and a flashing LED on the fan unit. If an alarm is present, follow Procedure 5-11.

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PROCEDURE 5-11. Troubleshooting Fan Failures

1. Check the fan unit front panel circuit breaker/fuse.

2. Make sure that the fan unit power switch is in the ON position.

3. Make sure that the power harness is connected with proper polarity (red to minus, black to plus) to the fan unit (on TB8).

   Caution: If power is applied to TB7 and the fan fuse is **not** blown, —48 VDC will be present at TB8.

4. Reset the fan unit circuitry by turning the unit OFF and then ON using the front panel switch.

5. Check the fan fuses in TB7 (see Figure 2-18).

Fuse and Alarm Panel Problems

If you suspect that the alarm board is malfunctioning, follow Procedure 5-12.

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PROCEDURE 5-12. Troubleshooting Alarm Boards

1. Locate the illuminated LED on the front of the fuse and alarm panel.

2. Disconnect and tag the alarm board input leads from TB12 and TB13 (see Figure 2-19) that correspond to the suspected alarm board channel (indicated by the illuminated LED).

3. If a VDM fan unit is suspected of malfunctioning but the alarm board input is functioning properly, the illuminated LED should go out when the alarm leads are disconnected.

4. If a VDM modular power supply is suspected of malfunctioning, insert a short wire between the corresponding TB12 and TB13 terminals. If the illuminated LED goes out, the alarm board input is working.

When the system alarm status LED is illuminated, the relays connected to TB11 positions 1-3 and 2-4 should be in the closed position. This can be verified using the continuity test on an ohmmeter.

Voice Circuit Problem

If a voice circuit is not operating properly, follow Procedure 5-13.

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PROCEDURE 5-13. Troubleshooting Voice Circuits

1. Test the VDM circuit card by replacing it with a known good one.

2. Verify that the main distribution frame (MDF) cross-connects to the VDM equipment have been made correctly.

Data Circuit Problem

If there is a data problem, use the following procedures to run diagnostics.

Caution: Running these diagnostics with the constant carrier control option will cause the VDM to stick in loopback. Local loopback is not supported when the VDM is operated in the synchronous mode while optioned for Receive Clock Mode.

If internal_port fails, follow Procedure 5-14.

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PROCEDURE 5-14. Troubleshooting Internal Port Failures

1. When all users on the SAM TERM32 module with the problem port are off the system, replace the module with a spare.

2. Restore all ports, except the problem port, on the module to service.

3. Run the **internal_port** diagnostic.

4. If the diagnostic passes, restore the problem port to service.

If local_modem fails, follow Procedure 5-15.

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PROCEDURE 5-15. Troubleshooting Local Modem Failures

1. Replace the VDM circuit card with a known good test card.

2. Run the **local_modem** diagnostic.

3. If the diagnostic passes, restore the port to service.

If remote modem fails, follow Procedure 5-16.

PROCEDURE 5-16. Troubleshooting Remote Modem Failures

1. Verify power on the R-VDM.

2. Verify all the modular connections on the R-VDM.

3. Run the R-VDM internal diagnostics (Self-Test and Digital Loopback Test).

4. Replace the R-VDM with a known good R-VDM. By replacing the R-VDM, you can determine if the R-VDM options have been set incorrectly or if the R-VDM is faulty.

5. Rerun the modem remote diagnostic.

6. If the diagnostic passes, restore the port to service.

   NOTE: If there is no carrier received by the R-VDM, or if the R-VDM is connected to a data device that sends out data (usually a welcome message and login prompt) upon detecting data carrier detect (DCD), the modem remote diagnostic will always fail.

If vdm_ckloop fails, follow Procedure 5-17.

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PROCEDURE 5-17. Troubleshooting VDM CKLOOP Failure

1. Verify that the VDM is not stuck in loopback mode (the TEST lamp will be on steady if in loopback).

2. Verify all MDF cross-connects.

3. Run the **vdm_ckloop** diagnostic.

4. If the diagnostic passes, restore the port to service.

If Diagnostics Still Fail

If diagnostics still fail, follow Procedure 5-18.

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PROCEDURE 5-18. Troubleshooting Diagnostics

1. Verify the connections to the VDM backplanes and TERM32 I/O distribution board.

2. Verify that the MDF cross-connects to the VDM have been made correctly.

3. Using a carrier detector, check for carrier (110 kHz) at the MDF.   Start at the first cross-connect (where the VDM is first connected to the MDF) and proceed to every cross-connect until you reach the last one before the cable pair exits the CO. This will determine whether there are any tip and ring reversals or incorrect cross-connects.

NOTE: The carrier detector must be able to detect frequencies from 0–120 kHz, have an impedance of 135 ohms, and indicate power level in dBm.

TABLE 5-5. TERM32 to VDM Connections

TERM32		VDM		TERM32		VDM	
Port	Connector	Shelf	Slot	Port	Connector	Shelf	Slot
0	J1-1	J101-0	1	59			10
1			2	60			11
2			3	61			12
3			4	62	J6-2	J104-3	21
4			5	63			22
5			6	64	J1-3	J103-2	13
6	J2-1	J102-0	7	65			14
7			8	66			15
8			9	67			16
9			10	68			17
10			11	69			18
11			12	70	J2-3	J104-2	19
12	J3-1	J103-0	13	71			20
13			14	72			21
14			15	73			22
15			16	74			23
16			17	75			24
17			18	76	J3-3	J101-3	1
18	J4-1	J104-0	19	77			2
19			20	78			3
20			21	79			4
21			22	80			5
22			23	81			6
23			24	82	J4-3	J102-3	7
24	J5-1	J101-1	1	83			8
25			2	84			9
26			3	85			10
27			4	86			11
28			5	87			12
29			6	88	J5-3	J103-3	13
30	J6-1	J104-3	19	89			14
31			20	90			15
32	J1-2	J102-1	7	91			16
33			8	92			17
34			9	93			18
35			10	94	J6-3	J104-3	23
36			11	95			24
37			12	96	J1-4	J101-4	1
38	J2-2	J103-1	13	97			2
39			14	98			3
40			15	99			3
41			16	100			5
42			17	101			6
43			18	102	J2-4	J102-4	7
44	J3-2	J104-1	19	103			8
45			20	104			9
46			21	105			10
47			22	106			11
48			23	107			12
49			24	108	J3-4	J103-4	13
50	J4-2	J101-2	1	109			14
51			2	110			15
52			3	111			16
53			4	112			17
54			5	113			18
55			6	114	J4-4	J104-4	19
56	J5-2	J102-2	7	115			20
57			8	116			21
58			9	117			22

TABLE 5-5. TERM32 to VDM Connections (Continued)

Port	Connector	Shelf	Slot	Port	Connector	Shelf	Slot
118			23	177			6
119			24	178	J4-6	J102-7	7
120	J5-4	J101-5	1	179			8
121			2	180			9
122			3	181			10
123			4	182			11
124			5	183			12
125			6	184	J5-6	J103-7	13
126	J6-4	J104-7	19	185			14
127			20	186			15
128	J1-5	J102-5	7	187			16
129			8	188			17
130			9	189			18
131			10	190	J6-6	J104-7	23
132			11	191			24
133			12	192	J1-7	J101-8	1
134	J2-5	J103-5	13	193			2
135			14	194			3
136			15	195			4
137			16	196			5
138			17	197			6
139			18	198	J2-7	J102-8	7
140	J3-5	J104-5	19	199			8
141			20	200			9
142			21	201			10
143			22	202			11
144			23	203			12
145			24	204	J3-7	J103-8	13
146	J4-5	J101-6	1	205			14
147			2	206			15
148			3	207			16
149			4	208			17
150			5	209			18
151			6	210	J4-7	J104-8	19
152	J5-5	J102-6	7	211			20
153			8	212			21
154			9	213			22
155			10	214			23
156			11	215			24
157			12	216	J5-7	J101-9	1
158	J6-5	J104-7	21	217			2
159			22	218			3
160	J1-6	J103-6	13	219			4
161			14	220			5
162			15	221			6
163			16	222	J6-7	J104-11	19
164			17	223			20
165			18	224	J1-8	J102-9	7
166	J2-6	J104-6	19	225			8
167			20	226			9
168			21	227			10
169			22	228			11
170			23	229			12
171			24	230	J2-8	J103-9	13
174			3	233			16
175			4	234			17
176			5	235			18

TABLE 5-5. **TERM32 to VDM Connections** (Continued)

TERM32		VDM		TERM32		VDM		TERM32		VDM	
Port	Connector	Shelf	Slot	Port	Connector	Shelf	Slot	Port	Connector	Shelf	Slot
236	J3-8	J104-9	19	295			8	354			15
237			20	296			9	355			16
238			21	297			10	356			17
239			22	298			11	357			18
240			23	299			12	358	J2-12	J104-14	19
241			24	300	J3-10	J103-12	13	359			20
242	J4-8	J101-10	1	301			14	360			21
243			2	302			15	361			22
244			3	303			16	362			23
245			4	304			17	363			24
246			5	305			18	364	J3-12	J101-15	1
247			6	306	J4-10	J104-12	19	365			2
248	J5-8	J102-10	7	307			20	366			3
249			8	308			21	367			4
250			9	309			22	368			5
251			10	310			23	369			6
252			11	311			24	370	J4-12	J102-15	7
253			12	312	J5-10	J101-13	1	371			8
254	J6-8	J104-11	21	313			2	372			9
255			22	314			3	373			10
256	J1-9	J103-10	13	315			4	374			11
257			14	316			5	375			12
258			15	317			6	376	J5-12	J103-15	13
259			16	318	J6-10	J104-15	19	377			14
260			17	319			20	378			15
261			18	320	J1-11	J102-13	7	379			16
262	J2-9	J104-10	19	321			8	380			17
263			20	322			9	381			18
264			21	323			10	382	J6-12	J104-15	23
265			22	324			11	383			24
266			23	325			12	384	J1-13	J101-16	1
267			24	326	J2-11	J103-13	13	385			2
268	J3-9	J101-11	1	327			14	386			3
269			2	328			15	387			4
270			3	329			16	388			5
271			4	330			17	389			6
272			5	331			18	390	J2-13	J102-16	7
273			6	332	J3-11	J104-13	19	391			8
274	J4-9	J102-11	7	333			20	392			9
275			8	334			21	393			10
276			9	335			22	394			11
277			10	336			23	395			12
278			11	337			24	396	J3-13	J103-16	13
279			12	338	J4-11	J101-14	1	397			14
280	J5-9	J103-11	13	339			2	398			15
281			14	340			3	399			16
282			15	341			4	400			17
283			16	342			5	401			18
284			17	343			6	402	J4-13	J104-16	19
285			18	344	J5-11	J102-14	7	403			20
286	J6-9	J104-11	23	345			8	404			21
287			24	346			9	405			22
290			3	349			12	408	J5-13	J101-17	1
291			4	350	J6-11	J104-15	21	409			2
292			5	351			22	410			3
293			6	352	J1-12	J103-14	13	411			4
294	J2-10	J102-12	7	353			14	412			5

TABLE 5-5. TERM32 to VDM Connections (Continued)

TERM32		VDM		TERM32		VDM	
Port	Connector	Shelf	Slot	Port	Connector	Shelf	Slot
413			6	472	J5-15	J103-19	13
414	J6-13	J104-19	19	473			14
415			20	474			15
416	J1-14	J102-17	7	475			16
417			8	476			17
418			9	477			18
419			10	478	J6-15	J104-19	23
420			11	479			24
421			12	480	J1-16	J101-20	1
422	J2-14	J103-17	13	481			2
423			14	482			3
424			15	483			4
425			16	484			5
426			17	485			6
427			18	486	J2-16	J102-20	7
428	J3-14	J104-17	19	487			8
429			20	488			9
430			21	489			10
431			22	490			11
432			23	491			12
433			24	492	J3-16	J103-20	13
434	J4-14	J101-18	1	493			14
435			2	494			15
436			3	495			16
437			4	496			17
438			5	497			18
439			6	498	J4-6	J104-20	19
440	J5-14	J102-18	7	499			20
441			8	500			21
442			9	501			22
443			10	502			23
444			11	503			24
445			12				
446	J6-14	J104-19	21				
447			22				
448	J1-15	J103-18	13				
449			14				
450			15				
451			16				
452			17				
453			18				
454	J2-15	J104-18	19				
455			20				
456			21				
457			22				
458			23				
459			24				
460	J3-15	J101-19	1				
461			2				
462			3				
463			4				
465			5				
466	J4-15	J102-19	7				
467			8				
468			9				
469			10				
470			11				
471			12				

SAM Commands

SAM Commands

This chapter describes the commands related to the administration operation, and maintenance of the various Synchronous/Asynchronous Multiplexers (SAMs). Commands that include the objects **sam**, **samml**, **samtrk**, and **eia** appear in alphabetical order by verb. System responses for these commands conclude this chapter.

The **enter sam** command presents the prompting sequence and a complete list of parameter definitions. The remaining SAM commands contain the prompting sequence and any parameter definitions that are not included in **enter sam**.

Additional information on the parameters used in the prompting sequence of **enter sam**, **change sam**, **verify sam**, and **delete sam** is presented in **SAM Administration**. For additional information on **remove SAM** and **restore SAM**, refer to **SAM Operations**, and for **diagnose sam**, **dmeas sam**, and **dstat sam**, refer to **SAM Troubleshooting**.

change sam

The **change sam** command enables you to modify most of the initial configuration entries made for SAM modules and ports in the database.   Those entries that cannot be changed include the component type and the port service type.   Since boards do not have any modifiable parameters, board parameters cannot be changed.   The particular component must be out of service or ready for service before any changes can be made.   For a SAM that is SAMML-connected with a dual link, only threshold parameters can be changed while the SAM is in service.

Syntax

You can input **change sam** in prompted entry only.   The command syntax for **enter sam** and **change sam** are similar. You cannot change the `COMPONENT` or `SERVICE TYPE` parameters or any board designations.

When changing to a wire trunk, the default for the `SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE` parameter prompt is not a current database value; it is the initial value that is specified in **enter sam**.   In addition, if the value specified in the `SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE` prompt changes, the default for the `PRIMARY FAILURE DECLARATION THRESHOLD` and the `SECONDARY FAILURE DECLARATION THRESHOLD` prompts are the current database value or the number of seconds minus 10, whichever value is lower.

The defaults for all remaining parameter prompts are those values, conditions, or states that currently exist in the database.   They are displayed within parentheses in the parameter prompt. The `BUILDOUT VALUE` parameter default is 254. If data transport performance is affected, a lower value may be set using the following guidelines:

- If the remote endpoint is a SAM, the SAM buildout should be a multiple of 29.

- If the remote endpoint is a TSM8, the SAM buildout should be a multiple of 59.

Should transmitter underrun problems occur with a non-default buildout value configured, raise the buildout value to 254 and adjust downward.

Parameters

Refer to the parameter definitions supplied in **enter sam**.

Prompted Entry: Changing SAM64 Module Information (SAMML-Connected)

```
CC0> change
OBJECTS [...sam... ]: sam
COMPONENT [module, port]: module
MODULE ADDRESS: 60.1
COMMENT [up to 60 chars double quoted, none:
+("samml connected at 60")]:
+
DOWNLOAD SERVER [+(controller)]: +
SOFTWARE VERSION [+(standard)]: +
TOTAL NUMBER OF BOARDS [1-2: +(1)]: +
TRUNK SPEED [9600, 19200: +(9600)]: 19200
SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURES
      [10 second intervals, 20-420: +(60)]: +
PRIMARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254:
  +(15)]: +
SECONDARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254:
  +(15)]: +
PRIMARY FAILURE DECLARATION THRESHOLD (SECONDS) [2-50: +(8)]: 10
SECONDARY FAILURE DECLARATION THRESHOLD (SECONDS) [2-50: +(8)]: 10
PRIMARY RECOVERY DECLARATION THRESHOLD (SECONDS) [10-180: +(20)]: +
SECONDARY RECOVERY DECLARATION THRESHOLD (SECONDS) [10-180: +(20)]: +
MODULE ADDRESS:    Delete
CC0>
```

Prompted Entry: Changing SAM64 Port Information (SAMML-Connected)

```
CC0> change
OBJECTS [...sam... ]: sam
COMPONENT [module, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT NUMBER [1-32: +(1-32)]: 1
COMMENT [up to 60 chars double quoted, none:
+("added a port on 6/9")]:
+

PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc: +(async)]: +
SERVICE TYPE [console, host, modem, 2way, terminal: +(terminal)]: +
GROUP [up to 8 chars: +(samo)]: +
PREDEFINED DESTINATION [none: +(samhome)]: +
CABLE TYPE [dce, dte: +(dce)]: dte
BAUD RATE [75, 110, 150, 300, 1200,
          2400, 4800, 9600, 14400, 19200, auto: +(auto)]: +
PARITY [even, odd, off: +(off)]: +
NODE ECHOES USER INPUT [yes, no: +(yes)]: +
CALL HOLD [on, off: +(off)]: +
AT&T VDM ON THIS PORT [yes, no: +(no)]: +
PERMANENTLY ACTIVATED PORT [yes, no: +(no)]: yes
CONNECT-TIME BILLING [on, off: +(off)]: on
ATTENTION CHARACTER [none, 1brk, 2brk, del, a character: +(2brk)]: +
ATTENTION ACTION [command_mode, disconnect: +(command_mode)]: +
BITS PER CHARACTER [5, 6, 7, 8: +(8)]: +
NUMBER OF STOP BITS [1, 2: +(1)]: +
ENDPOINT NUMBER OR RANGE [0000-9999, none: +(none)]: +
PORT NUMBER [1-32: +(1-32)]: 2
COMMENT [up to 60 chars double quoted, none:
+("bisync service")]:
+

PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc: +(bisync)]: +
CODE SET [ascii, ebcdic: +(ascii)]: +
SERVICE TYPE [host, modem, terminal: +(terminal)]: +
GROUP [up to 8 chars: +(samo)]: +
PREDEFINED DESTINATION [+(samhome)]: +
CABLE TYPE [dce, dte: +(dte)]: +
PARITY [even, odd, off: +(off)]: +
ENABLE NRZI SIGNALING [yes, no: +(no)]: yes
AT&T VDM ON THIS PORT [yes, no: +(no)]: +
BUILDOUT VALUE [1-254: +(254)]: +
PERMANENTLY ACTIVATED PORT [yes, no: +(no)]: yes
CONNECT-TIME BILLING [on, off: +(off)]: on
PORT NUMBER [1-32: +(1-32)]: [Delete]
CC0>
```

delete sam

The **delete sam** command enables you to eliminate configuration information for SAM
components in the database.   You can delete information regarding SAM modules, boards, and
ports only after you have removed the particular component from service with **remove sam**.
Before you execute **delete sam** for the two highest-level components, you must first delete
information entered for the connected lower-level components.

Syntax

You can input **delete sam** in prompted or one-line entry.

```
CC0> delete
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]:
```

If COMPONENT is "module", "board", or "port":
```
MODULE ADDRESS:
```

If COMPONENT is "board":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
```
  If TYPE is "sam64":
```
BOARD ADDRESS [1-2: +(1-2)]:
```
  If TYPE is "sam504":
```
BOARD ADDRESS [1-16: +(1-16)]:
```

If COMPONENT is "port":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

  If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32: +(1-32)]:
```

  If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```
  If BOARD ADDRESS is "1-15":
```
PORT NUMBER [1-32: +(1-32)]:
```
  If BOARD ADDRESS is "16" and module is not SAMML-connected:
```
PORT NUMBER [1-24: +(1-24)]:
```
  If BOARD ADDRESS is "16" and module is SAMML-connected:
```
PORT NUMBER [1-19: +(1-19)]:
```

Parameters

Refer to the parameter definitions supplied in **enter sam**.

Prompted Entry: Deleting SAM64 Port Information (SAMML-Connected)

```
CC0> delete
OBJECTS [...sam... ]: sam
COMPONENT [module, board, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT ADDRESS [1-32: +(1-32)]: 3
CC0>
```

Prompted Entry: Deleting SAM64 Board Information (SAMML-Connected)

```
CC0> delete
OBJECTS [...sam... ]: sam
COMPONENT [module, board, port]: board
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2: +(1-2)]: 1
CC0>
```

Prompted Entry: Deleting SAM64 Module Information (SAMML-Connected)

```
CC0> delete
OBJECTS [ ...sam...]: sam
COMPONENT [module, board, port]: module
MODULE ADDRESS: 60.1
CC0>
```

One-line Entries: Deleting SAM64 Component Information (SAMML-Connected)

```
CC0> delete sam port 60.1 1 3
CC0> delete sam board 60.1 1
CC0> delete sam module 60.1
```

diagnose sam

The **diagnose sam** enables you to run on-line or off-line diagnostics to test SAM components and associated cabling.

Off-line diagnostics verify the integrity of SAM hardware when the corresponding SAM component is out of service.   They check the state of the memory system and the processor hardware.   In addition, they can help diagnose the state of a module, all ports connected to a board, or—for a SAM64 or SAM504—any cables connected to the I/O board.

On-line diagnostics can be run on SAM modules and ports.   The module diagnostics determine the state of the module without having to take the module out of service.   The port diagnostics consist of a set of loop-around tests that check the integrity of the port.   The port must be out of service.

Syntax

You can input **diagnose sam** in prompted or one-line entry.

```
CC0> diagnose
OBJECTS [...sam...]: sam
DIAGNOSTIC TYPE [off-line, on-line]:
```

If DIAGNOSTIC TYPE is "on-line":
```
COMPONENT [module, port]:
```

If COMPONENT is "module" or "port":
```
MODULE ADDRESS:
```

If COMPONENT IS "port" and TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

If COMPONENT is "port" and TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32]:
```

If COMPONENT is "port" and TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```
If BOARD ADDRESS is "1-15":
```
PORT NUMBER [1-32]:
```
If BOARD ADDRESS is "16" and module is not SAMML-connected:
```
PORT NUMBER [1-24]:
```
If BOARD ADDRESS is "16" and module is SAMML-connected:
```
PORT NUMBER [1-19]:
```

If a VDM is connected to the port:
```
TEST TYPE [internal_port, external_port, local_modem,
          remote_modem, vdm_ckloop: +(external_port)]:
```

Syntax *(continued)*

If a VDM is not connected to the port:
```
TEST TYPE [internal_port, external_port, local_modem,
          remote_modem: +(external_port)]:
```

If TEST TYPE is "local_modem" or "remote_modem" and port is set to autobaud:
```
BAUD RATE [75, 110, 150, 300, 1200,
          2400, 4800, 9600, 14400, 19200: +(9600)]:
```

If TEST TYPE is "external_port":
```
Test requires a loop-around connector on the port.
Replace port cable with loop-around connector.
```
If TEST TYPE is "local_modem" or "remote_modem":
```
Place local/remote modem in loop-around mode.

CONTINUE TESTING [yes, no: +(yes)]:
```
<test results>

If TEST TYPE is "external_port":
```
Replace the loop-around connector with normal
connection to avoid activating alarms.
```
If TEST TYPE is "local_modem" or "remote_modem":
```
Place local/remote modem back into non-looping mode to avoid activating alarms.
```

Command loops to TEST TYPE prompt.

For off-line diagnostics:
```
COMPONENT [module, board, cabling]:
```

If COMPONENT is "module", "board", or "cabling":
```
MODULE ADDRESS:
```

If COMPONENT is "board" or "cabling" and TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
```
If COMPONENT is "board" or "cabling" and TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```

If COMPONENT is "cabling" and BOARD ADDRESS is "1-15":
```
CABLE ASSEMBLY NUMBER [1-6: +(1-6)]:
```
If COMPONENT is "cabling" and BOARD ADDRESS is "16":
```
CABLE ASSEMBLY NUMBER [1-4: +(1-4)]:
```

If COMPONENT is "cabling":
```
Test requires a loop-around connector.
Terminate each cable or port on the board with a loop-around connector.

CONTINUE TESTING [yes, no: +(yes)]:
```
<test results>
```
Replace the loop-around connector with
normal connection to avoid activating alarms.
```

Parameters

Except for allowing specification of multiple port number entries, the `PORT NUMBER` parameter definition for **diagnose sam** is the same as that for **enter sam**. Definitions for the remaining parameters follow.

Parameters *(continued)*

BAUD RATE

If the port baud rate is set to *auto*, specifies the speed at which the local or remote modem is to communicate with the port when running the *local_modem* or *remote_modem* test.   If the modem baud rate is fixed, the modem and port rates must match.   If the modem baud rate is not fixed, set the port baud rate to the highest allowed rate for the modem.

CABLE ASSEMBLY

If **COMPONENT** is *cabling*, specifies if the cable on the I/O distribution board is *1* to *6* for a SAM64 or *1* to *4* for a SAM504.   Enter a single number, or a range or list of numbers. (This parameter is not applicable to the SAM16).

COMPONENT

If **DIAGNOSTIC TYPE** is *off-line*, specifies if the component to be tested is a *module* or *board,* or associated *cabling*.   (Off-line board and cabling diagnostics are not applicable to the SAM16.)
If **DIAGNOSTIC TYPE** is *on-line*, specifies if the component to be tested is a *module* or *port*.

CONTINUE TESTING

Specifies whether (*yes* or *no*) diagnostic testing should be continued.

DIAGNOSTIC TYPE

Specifies if *off-line* or *on-line* diagnostics are to be run.

TEST TYPE

Specifies the type of diagnostic to be run (each begins and ends at the Control Computer), as follows:

- *internal_port*
  This test extends to the DUSART within the module port being diagnosed.
- *external_port*
  This test extends through the port to an external loopback connector.   The connector can be attached to the port; but, depending on the building wire, it can also be located at the module port, at the patch panel, or in the office with the terminal.
- *local_modem*
  This test extends to the port's local modem.   The local modem must be in the loopback mode.   You are prompted for the local modem baud rate if the port baud rate is set to *auto*.   (The DTE/RTS designations for the modem should be compatible with those made for SAM ports.   If they are incompatible, system responses indicating *no data received* might be output.)

- *remote_modem*
  This test extends to the port's remote modem.   The remote modem must be in the
  loopback mode, and a modem or VDM must be connected to the line and powered up.
  (The system prompts for the remote modem baud rate if the port baud rate is set to *auto.*)
- *vdm_ckloop*
  This test, which applies only to SAMs with VDMs, detects if the local central office
  VDM, then the remote VDM, are stuck in remote loopback mode.

For the remaining parameters, refer to the definitions supplied in **enter sam**.

Prompted Entry: Running SAM64 Module Diagnostics (SAMML-Connected)

```
CC0> diagnose
OBJECTS [...sam...]: sam
DIAGNOSTIC TYPE [on-line, off-line]: off-line
COMPONENT [module, board, cabling]: module
MODULE ADDRESS: 60.1

    Diagnostic download in progress - . . . . . . . . . . . . . . . .

    <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose sam off-line module 60.1
Offline diagnostic SAM module test: PASS
CC0>
```

Prompted Entry: Running SAM64 Board Diagnostics (SAMML-Connected)

```
CC0> diagnose
OBJECTS [...sam...]: sam
DIAGNOSTIC TYPE [on-line, off-line]: off-line
COMPONENT [module, board, cabling]: board
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1

    <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose sam off-line board 60.1 1
Offline diagnostic ROM-based test for board 1: PASS

    <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose sam off-line board 60.1 1
Offline diagnostics: PASS
CC0>
```

Prompted Entry: Running SAM64 Port Diagnostics (SAMML-Connected)

```
CC0> diagnose
OBJECTS [...sam...]: sam
DIAGNOSTIC TYPE [on-line, off-line]: on-line
COMPONENT [module, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT NUMBER [1-32]: 3
TEST TYPE [internal_port, external_port, local_modem,
          remote_modem: +(external_port)]: +

   Test requires a loop-around connector on the port.
   Replace port cable with loop-around connector.
CONTINUE TESTING [yes, no: +(yes)]: +

   <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose sam on-line port 60.1 1 3 external_port
Diagnose completed - PORT 3, LOOP_AROUND COMPLETED SUCCESSFULLY

Replace the loop-around connector with normal
connection to avoid activating alarms.

TEST TYPE [internal_port, external_port, local_modem,
          remote_modem: +(external_port)]:  [ Delete ]
CC0>
```

Prompted Entry: Running SAM64 Cabling Diagnostics (SAMML-Connected)

```
CC0> diagnose
OBJECTS [...sam...]: sam
DIAGNOSTIC TYPE [on-line, off-line]: off-line
COMPONENT [module, board, cabling]: cabling
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
CABLE ASSEMBLY NUMBER [1-6: +(1-6)]: 1

   Test requires a loop-around connector.
   Terminate each cable or port on the board with a loop-around connector.
CONTINUE TESTING [yes, no: +(yes)]: +

   <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose sam off-line cabling 60.1 1 1
Offline diagnostics:  PASS

   Replace the loop-around connectors with normal
   connections to avoid activating alarms.
CC0>
```

One-line Entries: Running SAM64 Diagnostics (SAMML-Connected)

```
CC0>  diagnose sam off-line module 60.1
<diagnostic output>
CC0>  diagnose sam off-line board 60.1 1
<diagnostic output>
CC0>  diagnose sam on-line port 60.1 1 3 external_port
<diagnostic output>
CC0>  diagnose sam off-line cabling 60.1 1 1
<diagnostic output>
```

dmeas sam

The **dmeas sam** command enables you to receive a report containing maintenance measurements for an in-service SAM module or port and its associated trunk.   These measurements are useful when diagnosing network problems.   Because of the hierarchical structure of SAM components, whenever measurements are requested for a particular port, measurements for the connected module are automatically included.

Except for differences in the reporting interval, the same report can be gathered periodically on a CPU System using **schedule measurements**.

Syntax

You can input **dmeas sam** in prompted or one-line entry.

```
CC0> dmeas
OBJECTS [...sam...]: sam
COMPONENT [module, port]:
```

If COMPONENT is "module" or "port":
```
MODULE ADDRESS:
```

If COMPONENT is "port":

If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32: +(1-32)]:
```

If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```
If BOARD ADDRESS is "1-15":
```
PORT NUMBER [1-32: +(1-32)]:
```
If BOARD ADDRESS is "16" and module is not SAMML-connected:
```
PORT NUMBER [1-24: +(1-24)]:
```
If BOARD ADDRESS is "16" and module is SAMML-connected:
```
PORT NUMBER [1-19: +(1-19)]:

INTERVAL [current, previous: +(current)]:
```

Parameters

Except for not allowing the specification of *board*, the `COMPONENT` parameter definition for **dmeas sam** is the same as that for **enter sam**.

`INTERVAL`

Specifies if the on-demand report is to be printed for the *current* or *previous* reporting interval. The current interval includes those measurements accumulated since the previous scheduled report was generated; or if a report was not scheduled, those measurements accumulated since the module was last reset. Conversely, the previous interval includes those measurements accumulated prior to the current interval.

For the remaining parameters, refer to the definitions supplied in **enter sam**.

Prompted Entry: Displaying SAM64 Module Measurements (SAMML-Connected with a Dual Link)

```
CC0> dmeas
OBJECTS [...sam...]: sam
COMPONENT [module, port]: module
MODULE ADDRESS: 60.1
INTERVAL [current, previous: +(current)]: +
<report output>
```

Prompted Entry: Displaying SAM64 Port Measurements (SAMML-Connected with a Dual Link)

```
CC0> dmeas
OBJECTS [...sam...]: sam
COMPONENT [module, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT NUMBER [1-32: +(1-32)]: 1
INTERVAL [current, previous: +(current)]: +
<report output>
```

One-line Entry/Output: Displaying SAM64 Port Measurements (SAMML-Connected with a Dual Link)

```
CC0>  dmeas sam port 60.1 1 1-2 current
      <yy-mm-dd hh:mm:ss NODE=<name>
M  dmeas sam port 60.1 1 1-2 current


MODULE ADDRESS:  60.1   SAM (sam64)        97-01-01    12:00 -----> 12:15


----------- NODE TRUNK: SAMML, PRIMARY (97-01-01 12:00 ---> 12:15) -----------
<---- TRANSMITTED ----> <--------- RECEIVED -------->
 TOTAL      TRUNK  PEAK   TOTAL     TRUNK  PEAK  CRC     FAULTS   REMOTE CRC
 BYTES      UTIL   UTIL   BYTES     UTIL   UTIL  ERRS             ERRORED SECONDS
 96629       2%    2%    375639      9%    9%   0        0        0


----------- NODE TRUNK: SAMML, SECONDARY (97-01-01 12:00 ---> 12:15) ---------
<---- TRANSMITTED ----> <--------- RECEIVED -------->
 TOTAL      TRUNK  PEAK   TOTAL     TRUNK  PEAK  CRC     FAULTS   REMOTE CRC
 BYTES      UTIL   UTIL   BYTES     UTIL   UTIL  ERRS             ERRORED SECONDS
 96841       2%    2%    375984      9%    9%   3        0        0
---------------------------------- SAM ------------------------------------
 TO NODE    FM NODE    STATUS QUEUE
 RETRANS    ERRORS     OVERFLOW
 0          0          0
      <yy-mm-dd hh:mm:ss NODE=<name>
M  dmeas sam port 60.1 1 1-2 current

 MODULE ADDRESS:  60.1       PORT MEASUREMENTS FOR BOARD: 1


 PORT NO:      1     2
 TBUS TRAFFIC  0     1023
 FBUS TRAFFIC  0     0
 TBUS RETRANS  0     0
 FBUS ERRORS   0     0
 USART ERRORS  0     0
CC0>
```

The following reports show successful and unsuccessful output due to module type, report interval, and trunk type.

One-line Entry/Output: SAM504 Measurements (SAMML-Connected)

```
CC0> dmeas sam module 11.2 previous
      <yy-mm-dd hh:mm:ss NODE=<name>
M   dmeas sam module 11.2 previous

MODULE ADDRESS:  11.2   SAM (sam504)    97-01-01    06:00 -----> 12:00


---------------- NODE TRUNK: SAMML (97-01-01 06:00 ---> 12:00) ---------------
<---- TRANSMITTED ----> <--------- RECEIVED -------->
 TOTAL       TRUNK  PEAK    TOTAL       TRUNK  PEAK   CRC
 BYTES       UTIL   UTIL    BYTES       UTIL   UTIL   ERRS
 2290        0%     0%      7021        0%     0%     0
------------------------------------ SAM ------------------------------------
 TO NODE     FM NODE     STATUS QUEUE
 RETRANS     ERRORS      OVERFLOW
 0           0           0
CC0>
```

One-line Entry/Unsuccessful Output: SAM64 Measurements (T1-Connected)

```
CC> dmeas sam module 11 previous
COMMAND FAILED: Measurements not available for SAM trunk 11.
               Try again later.
    <yy-mm-dd hh:mm:ss NODE=<name>
M   dmeas sam module 11 previous

MODULE ADDRESS:  11           (sam64)    97-01-01    06:00 -----> 12:00

------------- NODE TRUNK: T1 (**-**-**  **:** ---> **-**-**  **:**)


Measurements are unavailable

------------------------------------ SAM ------------------------------------
TO NODE     FM NODE     STATUS QUEUE
RETRANS     ERRORS      OVERFLOW
2           1           0
CC0>
```

Report Fields

The following alphabetized report field descriptions are those that would appear for *every* variation of **dmeas sam**.

`CRC ERRS`
> For a SAMML or SAMSL node trunk, the number of port frames discarded due to cyclic redundance check (CRC-CCITT) errors on the line. For a T1 or HS node trunk, the number of intervals (normally two seconds) during which at least one port frame is discarded due to CRC-errors on the line.

`FAULTS`
> The number of times the trunk of a dual-link SAM faulted causing all traffic to be routed over the "good" link.

`FBUS ERRORS`
> The number of intervals in which data blocks containing errors were received from the specified port.

`FBUS TRAFFIC`
> The number of intervals in which one or more traffic characters traveled from the node to the specified port. If the report shows unexplained errors for all ports (even for those without traffic) check the hardware to determine if the board is bad.

`FM NODE ERRORS`
> The number of intervals in which data blocks received from the node contained errors.

`MODULE ADDRESS`
> A number that specifies the node slot that the trunk module, which connects to the SAM, occupies.

`NODE TRUNK`
> The section of measurements associated with the SAM trunk. The report interval of the trunk measurements is printed to determine if the collection of the SAM trunk measurements is not exactly synchronized with that of the SAM component measurements due to process delays.

`PEAK UTIL`
> The percentage of the line bandwidth being used to send or receive data during the peak five-minute interval.

`PORT MEASUREMENTS FOR BOARD`
> The board number for which port measurements are supplied.

`PORT NO.`
> The number of the port for which measurements are supplied.

RECEIVED
>   The section of measurements received by the node from the SAM over the trunk.

REMOTE CRC ERRORED SECONDS
>   The number of CRC-errored seconds (an "errored second" is a second during which one or more errors have occurred) received by the remote link of a dual-link SAM. The counter is also incremented every second when the trunk is dead.

SAM
>   The section of measurements for the SAM common equipment.

STATUS QUEUE OVERFLOW
>   The number of intervals in which a SAM status queue overflow occurred.

TBUS RETRANS
>   The number of intervals in which data blocks required retransmission from the specified port to the node.

TBUS TRAFFIC
>   The number of intervals in which one or more traffic characters traveled from the specified port to the node.

TO NODE RETRANS
>   The number of intervals in which data blocks sent to the node required retransmission.

TOTAL BYTES
>   The number of characters sent or received on the line.

TRANSMITTED
>   Measurements sent from the node to the SAM over the trunk.

TRUNK UTIL
>   The percentage of the line bandwidth being used to send or receive data.

USART ERRORS
>   The number of intervals in which the *USART* associated with the specified port had a parity or framing error.

dstat sam

The **dstat sam** command enables you to display the status of an in-service SAM module, board, or port.   High detail, which includes all hardware data and on-board software information, is available for modules only.   Displays for either lower level component include all low-detail information for the higher level components.

Syntax

You can input **dstat sam** in prompted or one-line entry.

```
CC0> dstat
OBJECTS [...sam...]: sam
COMPONENT [module, board, port: +(module)]:
```

If COMPONENT is "module", "board", or "port":
```
MODULE ADDRESS:
```

If COMPONENT is "module":
```
DETAIL [low, high: +(low)]:
```

If COMPONENT is "board":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
```
  If TYPE is "sam64":
```
BOARD ADDRESS [1-2: +(1-2)]:
```
  If TYPE is "sam504":
```
BOARD ADDRESS [1-16: +(1-16)]:
```

If COMPONENT is "port":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

  If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32: +(1-32)]:
```

  If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```
  If BOARD ADDRESS is "1-15":
```
PORT NUMBER [1-32: +(1-32)]:
```
  If BOARD ADDRESS is "16" and module is not SAMML-connected:
```
PORT NUMBER [1-24: +(1-24)]:
```
  If BOARD ADDRESS is "16" and module is SAMML-connected:
```
PORT NUMBER [1-19: +(1-19)]:
```

Parameters

Except for *module* being the system default of the `COMPONENT` parameter, the parameter definitions for **dstat sam** are the same as those for **enter sam**.

`DETAIL`

> If `COMPONENT` is *module*, specifies if the output is to show a limited amount of information (*low* detail) or more information (*high* detail).

For the remaining parameters, refer to the definitions supplied in **enter sam**.

Prompted Entry: Displaying SAM64 Module Status (SAMML-Connected with a Dual Link)

```
CC0> dstat
OBJECTS [...sam...]: sam
COMPONENT [module, board, port: +(module)]: module
MODULE ADDRESS: 60.1-2
DETAIL [low, high: (+low)]: high
<report output>
```

Prompted Entry: Displaying SAM64 Port Status (SAMML-Connected with a Dual Link)*

```
CC0> dstat
OBJECTS [...sam...]: sam
COMPONENT [module, board, port: +(module)]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT NUMBER [1-32: +(1-32)]: 1
<report output>
```

---

* Output occurs on an ECPU System only.

One-line Entry/Output: Displaying SAM64 Module Status (SAMML-Connected with a Dual Link)

```
CC0> dstat sam module 60.1-2 high
     <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat sam module 60.1-2 high
************************* MODULE 60  PORT 1: PRIMARY ***********************
MODULE TYPE          TRUNK TYPE
sam64               samml (dual)
NODE TRUNK STATUS:
------------------
PORT        EXPECT             ACTUAL             OPERATING        LAST
TYPE        SRVC STATE         SRVC STATE         STATE            FAULT
sam         in service         in service         up               none
DCD             DTR                RTS                CTS              DSR
on              on                 on                 on               on
XMT             BKPLN OUT          CHNL TASK          USART REG
FLAG            FLAG               FLAG               VALUES
idle            idle               idle               0x3ef4
     <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat sam module 60.1-2 high
------------------------------- HIGH DETAIL ---------------------------------
SYNC    RXCHAR    CHAN      CHAN      CHAN
HUNT    AVAIL     RCV       XMT       EXT ST
no      no        yes       yes       yes
VECTOR  TX        TX CRC    RX        RX CRC    GENERATOR
STATUS  ENABLE    ENABLE    ENABLE    ENABLE    ENABLE
yes     yes       yes       yes       no        no
PARITY  CRC/FRM   RCV FIFO  TX        TX
ERR     ERR       OVF       UN/EOM    BUF EMPTY
no      yes       no        yes       yes
----------------------------------------------------------------------------
     <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat sam module 60.1-2 high
********************** MODULE 60  PORT 2: SECONDARY *************************
MODULE TYPE          TRUNK TYPE
sam64               samml (dual)
NODE TRUNK STATUS:
------------------
PORT        EXPECT             ACTUAL             OPERATING        LAST
TYPE        SRVC STATE         SRVC STATE         STATE            FAULT
sam         in service         in service         up               none
DCD             DTR                RTS                CTS              DSR
on              on                 on                 on               on
XMT             BKPLN OUT          CHNL TASK          USART REG
FLAG            FLAG               FLAG               VALUES
idle            idle               idle               0x3ef4
```

One-line Entry/Output *(continued)*

```
      <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat sam module 60.1-2 high
-------------------------------- HIGH DETAIL --------------------------------
SYNC      RXCHAR    CHAN      CHAN      CHAN
HUNT      AVAIL     RCV       XMT       EXT ST
no        no        yes       yes       yes
VECTOR    TX        TX CRC    RX        RX CRC    GENERATOR
STATUS    ENABLE    ENABLE    ENABLE    ENABLE    ENABLE
yes       yes       yes       yes       no        no
PARITY    CRC/FRM   RCV FIFO  TX        TX
ERR       ERR       OVF       UN/EOM    BUF EMPTY
no        yes       no        yes        yes
----------------------------------------------------------------------------
      <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat sam module 60.1-2 high
SAM TRUNK STATUS:
----------------
  SERVICE STATE                      SERIAL NUMBER
  in service                         7042
  LAST SOFTWARE ALARM:
  none
  LAST TRUNK FADE START: none
  LAST TRUNK FADE END:   none
  ONLINE  ENABLED
  yes     yes
       <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat sam module 60.1-2 high
  ---------------------------- HIGH DETAIL --------------------------------
                            CURRENT STATUS
                            --------------
  MODULE  FM NODE    FIFO      FM NODE   CARRIER  CTS   TRNSMSN  RECV
  RESET   OVERFLOW   RESET     PARITY    LOSS     LOSS  LOSS     LOSS
  no      no         no        no        no       no    no       no
  SOFTWAR       SANITY
  RESET         ERROR
  no            no
CC0>
```

The output on the following pages shows the effects of various configurations.

Output: SAM64 Module Status (T1-Connected)*

```
      <yy-mm-dd hh:mm:ss NODE=<name>
 M  dstat sam module 4 high
 ******************************* MODULE 4 *********************************
 MODULE TYPE        TRUNK TYPE
 sam64              trkt1
 NODE TRUNK STATUS:
 ------------------
   SERVICE STATE    HARDWARE ERROR COUNT    SERIAL NUMBER
   in service       0                       2743
   LAST HARDWARE ALARM:
   none
   ONLINE   ENABLED CARRIER DSR
   yes      yes     yes     yes
   --------------------------- HIGH DETAIL ----------------------------------
   MODULE   TO NODE FM NODE TO NODE FM NODE
   RESET    PARITY  PARITY  OVERFLO OVERFLO
   0        0       0       0       0
   SYNCHRO CARRIER CRC      DSR     LOOPBAK
   PROBLEM COUNT   ERROR    COUNT   MODE
   0       0       0        0       no
   EXPECT  FULL     EMPTY    ACTUAL   ACTUAL   EXPECT   EXPECT
   TYPE    PACKETS  PACKETS  STAT1    STAT2    STAT1    STAT2
   trkt1   25266    0        1        0        1        0
   --------------------------------------------------------------------------
   RANGE   BAD
   ERRORS* PACKETS*
   1432    16
 SAM TRUNK STATUS:
 -----------------
   SERVICE STATE                           SERIAL NUMBER
   in service                              2759
   LAST SOFTWARE ALARM:
   none
   LAST TRUNK FADE START: none
   LAST TRUNK FADE END: none
   ONLINE   ENABLED
   yes      yes
   ----------------------------- HIGH DETAIL ---------------------------------
                                CURRENT STATUS
                                --------------
   MODULE  TO NODE  FM NODE   TO NODE FM NODE  SYNCHRO  CRC     ENCODE
   RESET   OVERFLOW OVERFLOW  PARITY  PARITY   PROBLEM  ERROR   ERROR
   no      no       no        no      no       no       no      no
   --------------------------------------------------------------------------
 CC0>
```

---

* Output occurs on an ECPU System only.

Output: SAM64 Port Status (T1-Connected)

```
      <yy-mm-dd hh:mm:ss NODE=<name>
  M  dstat sam port 4 8 1-4
  ******************************** MODULE 4 *********************************
  MODULE TYPE        TRUNK TYPE
  sam64              trkt1
  NODE TRUNK STATUS:
  ------------------
    SERVICE STATE    HARDWARE ERROR COUNT    SERIAL NUMBER
    in service       0                       2743
    LAST HARDWARE ALARM:
    none
    ONLINE  ENABLED CARRIER DSR
    yes     yes     yes     yes
  SAM TRUNK STATUS:
  -----------------
    SERVICE STATE                            SERIAL NUMBER
    in service                               2759
    LAST SOFTWARE ALARM:
    none
    LAST TRUNK FADE START: none
    LAST TRUNK FADE END:   none
    ONLINE  ENABLED
    yes     yes
  SAM BOARD STATUS:
  -----------------
      BOARD   SERVICE
      ADDR    STATE
       8      out
  SAM PORT STATUS:
  ---------------
        PORT     SERVICE   SERVICE
        NUMBER   TYPE      STATE
          1      terminal  out
          2      host      rfs
          3      modem     out
          4      console   rfs
  CC0>
```

Report Fields

The following alphabetized report field descriptions are those that would appear for *every* variation of **dstat sam**. References made to alarms refer to those alarms messages cited in the *Data Networking Products Messages Reference*.

ACTUAL SRVC STATE
   The service state of the SAMML port as reported from the module. The possible states are *in* (via **restore sam**), *out* (via **remove sam**), and *disabled* (via **remove samtrk**). If on-line diagnostics are running, the state is *in* or *disabled*; if off-line diagnostics are running, the state is *out* or *disabled*.

ACTUAL STAT1

The actual value of the hardware status byte of the most currently received status packet for the given module. The actual and expected values of STAT1 differ.

ACTUAL STAT2

The actual value of the software status byte of the most currently received status packet for the given module. The actual and expected values of STAT2 differ.

BAD PACKETS

For ECPU Systems, the count of packets with envelope parity errors transmitted by the module and detected by the switch. To determine if the module is defective, run module diagnostics.

BKPLN OUT FLAG

Indicates if (*yes* or *no*) a frame was received from the link but was not yet transmitted to the node backplane.

BOARD ADDR

The address of the board.

CARRIER

For Trunk-T1 or Trunk-HS, indicates if the module acknowledges the incoming carrier lead from the modem as asserted (*up*) or not asserted (*down*).

CARRIER COUNT

For Trunk-T1, Trunk-HS, or SAMSL, the number of times the carrier failed on the trunk. (The carrier lead between the modem and modem paddleboard went into the unasserted state.) The **LOST CARRIER** alarm is associated with this count.

CARRIER LOSS

For SAMSL or SAMML, indicates if (*yes* or *no*) the carrier lead from the modem was asserted at least once during the last SAM status reporting period. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

CHAN EXT ST

For SAMML, indicates if (*yes* or *no*) an external status interrupt is pending on the SAM USART channel.

CHAN RCV

For SAMML, indicates if (*yes* or *no*) a receive interrupt is pending on the SAM USART channel.

CHNL TASK FLAG

Indicates if (*yes* or *no*) node backplane data was transmitted to the link and if a request to transmit more data is pending.

CHAN XMT

For SAMML, indicates if (*yes* or *no*) a transmit interrupt is pending on the SAM USART channel.

CRC ERROR

For Trunk-HS or Trunk-T1, indicates corrupted data arriving at the module from the trunk line.   Because transmission over fiber links has very low error rates for the Trunk-HS, the most likely cause of CRC errors is disconnected or damaged fibers.   For Trunk-T1, CRC errors are due to transmission errors over the network. See **CRC ERROR** alarm. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

CRC/FRM ERR

For SAMML, indicates if (*yes* or *no*) the SAM USART channel detected a CRC or framing error.

CTS

For SAMML, indicates if the status of clear to send is *on* or *off* for the port.   Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

CTS COUNT
For SAMSL, the number of times the clear-to-send from the modem was not asserted.

CTS LOSS

For SAMSL, indicates if (*yes* or *no*) the clear-to-send signal was asserted at least once during the last SAM status reporting period.

DCD

For SAMML, indicates if the status of data carrier detect is *on* or *off* for the port.

DISTRIBU BOARD

For Trunk-HS, indicates if the I/O distribution board is compatible with a *fiber* or *metallic* trunk. Currently, the Trunk-HS only supports transmission over a fiber link.

DSR

For Trunk-T1, Trunk-HS, or SAMML indicates if the module acknowledges the incoming data-set-ready lead from the modem as asserted (*up*) or not asserted (*down*).

DSR COUNT

For Trunk-T1 or Trunk-HS, the number of times the data-set-ready lead from the modem dropped. See **LOST DSR** alarm.

DTR

For SAMML, indicates if the status of data terminal ready is *on* or *off* for the port.

EMPTY PACKETS

The number of empty status packets received. (Empty packets are received when a module is not physically present in the given shelf slot.) See **EMPTY SLOT** alarm.

ENABLED

Shows a status of *yes* only if the module MODE switch is in the ENABLE position or *U/A* to indicate this information is not available (possibly due to a trunk fade). See **MODE SWITCH NOT ENABLED** alarm. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

ENCODE ERROR

For Trunk-T1 or Trunk-HS, indicates encoding errors the module detected coming from the fiber link. The transmission scheme uses delay modulation encoding. Encoding errors could be caused by faulty hardware, a faulty fiber, or an improperly attached fiber. See **DELAY MODULATION ENCODING VIOLATION** alarm. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

EXPECT SRVC STATE

The service state of the SAMML port as recorded in the database. The possible states are *in* (via **restore sam**), *out* (via **remove sam**), and *disabled* (via **remove samtrk**). Either the primary or secondary port of a dual-link SAM can be disabled.

EXPECT STAT1

Shows the expected value of the hardware status byte for the given module.

EXPECT STAT2

Shows the expected value of the software status byte for the given module.

EXPECT TYPE

Shows the expected type of hardware in the shelf slot. The value of this field is determined by status information. See **WRONG MODULE TYPE** alarm.

FIFO RESET

For a node trunk, shows the number of times the hardware failed to send a packet due to an invalid packet address or packet format. For a SAM trunk, indicates the failure to send a packet during the last SAM reporting period. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

FM NODE OVERFLO

Any difference between the rate information arrives at a module and the rate the subscriber processes that information. (Overflow errors occur during typical operation and do not necessarily indicate a problem.) Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

FM NODE PARITY

Indicates how many packets coming from the node had parity errors. See **FROM BUS PARITY ERROR** alarm. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

FULL PACKETS

Indicates the number of full status packets received. (Full packets are received when a module is physically present in the given shelf slot.)

GENERATOR ENABLE

For SAMML, indicates if (*yes* or *no*) the baud rate generator for the port was enabled.

HARDWARE ERROR COUNT

An approximate sum of module errors detected since the last module restore. Counts of three or four can be typical for a given module; higher counts could indicate a problem.

LAST FAULT

The elapsed time in days, hours, minutes, and seconds since data on the transmission line from the SAMML to the SAM was transferred from the indicated trunk port to the other trunk port. If a fault was not recorded for more than 365 days, *>365* appears. If a fault has not occurred, then *none* appears.

LAST HARDWARE ALARM

The last alarm for the given module, based on status packet data. This data is not stored across reboots of the Control Computer.

LAST SOFTWARE ALARM

The text, date, and time of the last alarm the module issued by and for itself. This data is not stored across reboots of the module or Control Computer.

LAST TRUNK FADE END

The last time the node reestablished communication with the module.

LAST TRUNK FADE START

The last time the node temporarily lost communication with the module over the trunk. All calls were taken down. If the condition continues, use **diagnose samtrk** to determine which component failed.

LOOPBACK MODE

For Trunk-HS or Trunk-T1, indicates if (*yes* or *no*) the module is in any of three types of loop-around modes. The trunk should be in loop-around mode only during diagnostics. See **LOOPBACK MODE** alarm.

MODULE RESET

The number of module resets. For some modules, resets occur during normal operation. (See **MODULE WAS RESET** alarm.) Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

MODULE TYPE

According to status packet information received, what type of module is actually present. It does not reflect information supplied by the administrator through **enter**, **change**, or **delete** commands. This field is initialized to empty.

NODE TRUNK STATUS

The portion of the output that details the status of the node link.

ONLINE

Shows a status of *yes* only if the green LED on the module is on or *U/A* to indicate this information is not available (possibly due to a trunk fade). Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

OPERATING STATE

The functioning state of the SAMML port that is reported by the module. For SAMs that are not SAMML-connected with a dual link, the possible states are *up* and *down*. For SAMs that are SAMML-connected with a dual link, the possible operating states are:

- *diag_offline* occurs if off-line SAM trunk or SAM diagnostics are running.
- *diag_online* occurs if on-line SAM trunk diagnostics are running.
- *disabled* occurs if **remove samtrk** was executed for the indicated trunk or the other trunk is running off-line diagnostics.
- *down* occurs for SAMs that are not SAMML-connected with a dual link if the EIA leads are down. *Down* occurs for SAMs that are SAMML-connected if the port is out of service and a fault occurred or diagnostics were running.
- *fault* occurs if the transmission on user channels from the SAMML to the SAM is rerouted from the indicated trunk port to the other trunk port due to an error.
- *up* occurs for SAMs that are not SAMML-connected with a dual link if the EIA leads are up. *Up* occurs for SAMs that are SAMML-connected if the port is in service and a fault did not occur or diagnostics were not running.

OPTICAL SIGNAL

For Trunk-HS, indicates if (*yes* or *no*) the trunk is receiving a valid optical signal.   If it is not, it is receiving an out-of-specification signal caused by a defective fiber optic cable, an unattached cable, or a defective transmitter on the other side of the fiber. See **OPTICAL SIGNAL ERROR** alarm.

PARITY ERR

For SAMML, indicates if (*yes* or *no*) the SAM USART detected a parity error for the port.

PORT NUMBER

The number of the port for which information is being shown.

PORT TYPE

Indicates that the module to which the port is attached is a *sam*.

RANGE ERRORS

For ECPU Systems only, the count of packets transmitted by the module on a channel that is beyond the limit for which the module is configured.   Range error counts might be attributed to a defective module that is corrupting the address field of the packet or to a channel configuration mismatch on the two sides of the trunks. To determine if the module is defective, run module diagnostics; to determine if a configuration mismatch has occurred, review the module configuration.

RECV LOSS

For SAMSL, indicates data loss in the receive direction. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

RCV FIFO OVF

For SAMML, indicates if (*yes* or *no*) the SAM USART detected a receiver FIFO overflow for the port.

RTS

For SAMML, the status of request to send is *on* or *off* for the port.

RXCHAR AVAIL

For SAMML, indicates if (*yes* or *no*) a received character is available from the SAM USART for the port.

RX CRC ENABLE

For SAMML, indicates if (*yes* or *no*) the *CRC* of the receiver was enabled for the port.

RX ENABLE

For SAMML, indicates if (*yes* or *no*) the receiver was enabled for the port.

SAM BOARD STATUS

The portion of the output that details the status of each configured board.

SAM PORT STATUS

The portion of the output that details the status of each configured port.

SAM TRUNK STATUS

The portion of the output that details the status of the SAM link.

SANITY ERROR

Indicates if (*yes* or *no*) a sanity error occurred on the trunk. If *yes*, replace the SAM trunk board. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

SERIAL NUMBER

Shows the factory-encoded unique number that appears on all modules (the node trunk and SAM trunk) that access the node backplane—that is, have a switch and LED. Under **SAM TRUNK STATUS** for a SAM16, the serial number is *0*. Maintaining records with these numbers can help track vintages of circuit packs.

SERVICE STATE

Shows if the current service state of the module, board, or port is *in service* (via **restore**), *oos,manual* (out of service via **remove**), or *oos,fault* (automatically taken out of service due to a fault).

SERVICE TYPE

The service connection provided by the port can be that of a *console, host, modem, terminal,* or *2way* device.

SOFTWAR RESET

For SAMSL or SAMML, indicates if (*yes* or *no*) the module software was reset. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

STATUS DURING LAST TRUNK FADE

The status of the remote trunk during the last trunk fade. If a trunk fade occurs for a SAM64 that is SAMML-connected with a dual link, both trunks are *disabled*. See **LAST FADE START/END** field for troubleshooting information.

SYNCHRO PROBLEM

For Trunk-HS or Trunk-T1, the module is having synchronization problems with incoming data. If synchronization is lost, the module automatically starts hunting for synchronization again (phase lock loop). See **PHASE LOCK SYNCHRONIZATION ERROR** alarm.

SYNC HUNT

For SAMML, indicates if (*yes* or *no*) the SAM synchronized hunt status is enabled for the port.

TO NODE OVERFLO

For Trunk-HS or Trunk-T1, how many characters arrived from the trunk and were dropped because the hardware FIFO was full. For a SAM16, this field is not applicable. (The Trunk-HS can transmit information at slightly greater than node backplane speeds. But, the node backplane only accepts information from any given module every other packet frame.) See **TO BUS OVERFLOW** alarm.

TO NODE PARITY

For Trunk-HS or Trunk-T1, how many packets came into the trunk from the transmission line without a parity error, then had a parity error introduced by the trunk, then had the parity error detected by the trunk, and then got deleted by the trunk. In other words, for Trunk-HS or Trunk-T1, this field indicates a faulty module. See **TO BUS PARITY** alarm. For a SAM16, this field does not appear.

TRNSMSN LOSS

For SAMSL, data loss in the transmit direction. Under **SAM TRUNK STATUS** for a SAM16, this field does not appear.

TRUNK TYPE

Indicates if the SAM is linked via a *hs*, *t1*, *samml*, or *samsl*.

TX BUF EMPTY

For SAMML, indicates if (*yes* or *no*) the transmit buffer was empty for the port.

TX CRC ENABLE

For SAMML, indicates if (*yes* or *no*) the transmitter CRC was enabled for the port.

TX ENABLE

For SAMML, indicates if (*yes* or *no*) the transmitter was enabled for the port.

TX UN/EOM

For SAMML, indicates if (*yes* or *no*) the SAM USART detected a transmit underrun or end of message for the port.

USART REG VALUES

The value of various USART registers.

VECTOR STATUS

For SAMML, indicates if (*yes* or *no*) the vector affected status for the port.

XMT FLAG

Indicates if (*yes* or *no*) the port is currently in service and is transmitting data.

enter sam

The **enter sam** command enables you to add information regarding SAM components into the database.   You must enter modules first, then boards, then ports.

Syntax

You can input **enter sam** in prompted entry only.

The sequence of prompts depends on your response to the **COMPONENT, SERVICE TYPE,** and **PROTOCOL** prompts. BISYNC, DDCMP, HDLC, SDLC, USCOPE, and ALC are synchronous protocols and are referred to as *synchronous*.   If asynchronous ports are being entered that require an EPN and/or CUG security, the sequence of the **ENDPOINT NUMBER OR RANGE, CLOSED USER GROUP PROFILE ID,** and **PORT FOR EPN/CUG ASSIGNMENT** prompts is repeated until all ports have been assigned EPNs/CUGs or the ⌞ Delete ⌟ key is pressed. The defaults are shown in parentheses.

```
CC0> enter
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]:
MODULE ADDRESS:
```

If COMPONENT is "module":
```
COMMENT [up to 60 chars double quoted]:
TYPE [sam16, sam64, sam504]:
DOWNLOAD SERVER [+(controller)]:
```
If DOWNLOAD SERVER is "controller":
```
SOFTWARE VERSION [+(standard)]:
```
If DOWNLOAD SERVER is not "controller":
```
SOFTWARE VERSION:
```

If TYPE is "sam64":
```
TOTAL NUMBER OF BOARDS [1-2]:
```
If TYPE is "sam504":
```
TOTAL NUMBER OF BOARDS [1-16]:
```

If TYPE is "sam64" or "sam504" and the module is not SAMML-connected:
```
TRUNK TYPE [hs, samsl, t1]:
```
If TYPE is "sam16" (not SAMML-connected) or TRUNK TYPE is "samsl":
```
TRUNK SPEED [9600, 19200, 48k, 56k, 64k: +(56k)]:
```
If TRUNK TYPE is "t1":
```
TRUNK SPEED [56k, 64k, 128k, 192k, 256k, 320k, 384k, 448k, 512k, 576k, 640k,
704k, 768k, 832k, 896k, 960k, 1.024M, 1.088M, 1.152M, 1.216M, 1.280M, 1.344M,
1.408M, 1.472M, 1.536M, 1.544M, 2.048M: +(1.544M)]:
```
If TYPE is "sam16" or "sam64" and module is SAMML-connected:
```
TRUNK CONNECTION [dual, single: +(single)]:
```
If TRUNK CONNECTION is "dual":
```
TRUNK SPEED [9600, 19200: +(9600)]:
SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE
     [10 second intervals, 20-420: +(50):
```

Syntax *(continued)*

```
PRIMARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254:
   +(15)]:
SECONDARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254:
   +(15)]:
PRIMARY FAILURE DECLARATION THRESHOLD (SECONDS) [2-<X>: +(4)]:
SECONDARY FAILURE DECLARATION THRESHOLD (SECONDS) [2-<X>: +(4)]:
PRIMARY RECOVERY DECLARATION THRESHOLD (SECONDS) [10-180: +(20)]:
SECONDARY RECOVERY DECLARATION THRESHOLD (SECONDS) [10-180: +(20)]:
```
If module is SAMML-connected and TRUNK CONNECTION is "single":
```
TRUNK SPEED [1200, 2400, 4800, 9600, 19200, 48k, 56k, 64k: +(9600)]:
CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254: +(15)]:
```
If SAMML is out of service:
```
INITIAL SERVICE STATE [in, out: +(out)]:
```
If TRUNK TYPE is a "wire t1", "samsl", or "samml" with TRUNK CONNECTION "single":
```
SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE
      [10 second intervals, 20-420: +(50):
```
Command loops to MODULE ADDRESS prompt.

If COMPONENT is "board":

If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
```
If TYPE is "sam64":
```
BOARD ADDRESS [1-2: +(1-2)]:
```
If TYPE is "sam504":
```
BOARD ADDRESS [1-16: +(1-16)]:

BOARD SOFTWARE VERSION [custom, standard: +(standard)]:
```

If module is out of service or ready for service:
```
INITIAL SERVICE STATE [in, out: +(out)]:
```

If TYPE is "sam64" or "sam504", command loops to BOARD ADDRESS prompt.

If COMPONENT is "port":

If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32: +(1-32)]:
```

If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```
If BOARD ADDRESS is "1-15":
```
PORT NUMBER [1-32: +(1-32)]:
```
If BOARD ADDRESS is "16" and module is not SAMML-connected:
```
PORT NUMBER [1-24: +(1-24)]:
```

Syntax *(continued)*

If BOARD ADDRESS is "16" and module is SAMML-connected:
```
PORT NUMBER [1-19: +(1-19)]:

COMMENT [up to 60 chars double quoted]:
```

If board is not "custom":
```
PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]:
```

If COMPONENT is "asynchronous port":
```
SERVICE TYPE [console, host, modem, 2way, terminal: +(terminal)]:
GROUP [up to 8 chars]:
```

If COMPONENT is "asynchronous modem", "two-way", or "terminal port":
```
PREDEFINED DESTINATION [+(none)]:
CABLE TYPE [dce, dte: +(dce)]:
BAUD RATE [75, 110, 150, 300, 1200,
           2400, 4800, 9600, 14400, 19200, auto: +(auto)]:
```
If SERVICE TYPE is "two-way" and BAUD RATE is "auto":
```
RCV BAUD RATE [75, 110, 150, 300, 1200,
               2400, 4800, 9600, 14400, 19200: +(9600)]:
PARITY [even, odd, off: +(off)]:
```

If CABLE TYPE is "dce":
```
FLOW CONTROL OF SAM BY DEVICE [xon/xoff, eia, none: +(none)]:
FLOW CONTROL OF DEVICE BY SAM [xon/xoff, eia, none: +(none)]:

NODE ECHOES USER INPUT [yes, no: +(yes)]:
CALL HOLD [on, off: +(off)]:
```

If FLOW CONTROL OF SAM BY DEVICE or FLOW CONTROL OF DEVICE BY SAM is "xon/xoff" or "none":
```
AT&T VDM ON THIS PORT [yes, no: +(no)]:
```

If FLOW CONTROL BY DEVICE is "xon/xoff":
```
XANY: ANY CHAR FROM DEVICE XONS DATAKIT [on, off: +(off)]:

PERMANENTLY ACTIVATED PORT [yes, no: +(no)]:
CONNECT-TIME BILLING [on, off: +(off)]:
ATTENTION CHARACTER [none, 1brk, 2brk, del, a character: +(2brk)]:
```

If ATTENTION CHARACTER is not "none":
```
ATTENTION ACTION [command_mode, disconnect: +(command_mode)]:
```

If PARITY is "odd" or "even":
```
BITS PER CHARACTER [5, 6, 7, 8: +(7)]:
```
If PARITY is "off":
```
BITS PER CHARACTER [5, 6, 7, 8: +(8)]:
```

If BAUD RATE equals or is less than "110":
```
NUMBER OF STOP BITS [1, 2: +(2)]:
```
If BAUD RATE equals or is greater than "300":
```
NUMBER OF STOP BITS [1, 2: +(1)]:
```

If board is out-of-service or ready-for-service:
```
INITIAL SERVICE STATE [in, out: +(out)]:
```

If COMPONENT is "asynchronous console" or "host port":

```
CABLE TYPE [dce, dte: +(dce)]:
BAUD RATE [75, 110, 150, 300, 1200, 2400, 4800, 9600, 14400, 19200: +(9600)]:
PARITY [even, odd, off: +(off)]:
```

If CABLE TYPE is "dce":
```
FLOW CONTROL OF SAM BY DEVICE [xon/xoff, eia, none: +(none)]:
FLOW CONTROL OF DEVICE BY SAM [xon/xoff, eia, none: +(none)]:
```

If FLOW CONTROL OF SAM BY DEVICE or FLOW CONTROL OF DEVICE BY SAM is "xon/xoff" or "none":
```
AT&T VDM ON THIS PORT [yes, no: +(no)]:

PERMANENTLY ACTIVATED PORT [yes, no: +(no)]:
```

If PARITY is "odd" or "even":
```
BITS PER CHARACTER [5, 6, 7, 8: +(7)]:
```
If PARITY is "off":
```
BITS PER CHARACTER [5, 6, 7, 8: +(8)]:
```

If BAUD RATE is less than or equal to "110":
```
NUMBER OF STOP BITS [1, 2: +(2)]:
```
If BAUD RATE is greater than or equal to "300":
```
NUMBER OF STOP BITS [1, 2: +(1)]:
```

If attached board is out of service or ready for service:
```
INITIAL SERVICE STATE [in, out: +(out)]:
```

If COMPONENT is "asynchronous port":

For a "single port":
```
ENDPOINT NUMBER OR RANGE [0000-9999, none: +(none)]:
```
If EPNs is/are not "none":
```
CLOSED USER GROUP PROFILE ID [up to 8 chars, none: +(none)]:
```

For "multiple ports" (looping continues until you press [Delete]

```
INFO: Assign EPNs and CUGs to ports using the following prompts.
     Hit <DEL> once when finished making assignments.

  PORT FOR EPN/CUG ASSIGNMENT [<X>: +(<Y>)]:
  ENDPOINT NUMBER OR RANGE (0000-9999, none: +(none)]:
  CLOSED USER GROUP PROFILE ID [up to 8 chars, none: +(none)]:
  PORT FOR EPN/CUG ASSIGNMENT [<X>: +(<Y>)]:  [ Delete ]
```

If COMPONENT is "synchronous port":

If PROTOCOL is "bisync":
```
CODE SET [ascii, ebcdic: +(ebcdic)]:
```

If PROTOCOL is "hdlc" or "sdlc":
```
BUFFER FLUSHING [enable, disable: +(disable]:
```

If PROTOCOL is "sdlc":
    FILLING BETWEEN FRAMES [mark, flag: +(flag)]:

    SERVICE TYPE [host, modem, terminal: +(terminal)]:
    GROUP [up to 8 chars]:

If SERVICE TYPE is "terminal":
    PREDEFINED DESTINATION:

    CABLE TYPE [dce, dte: +(dce)]:

If CABLE TYPE is "dce" and TYPE is "sam16":
    BAUD RATE [110, 300, 1200, 2400, 4800, 9600, 19200: +(9600)]:

If CABLE TYPE is "dce" and TYPE is "sam64" or "sam504":
    BAUD RATE [110, 300, 1200, 2400, 4800, 9600: +(9600)]:

If CODE SET is "ascii":
    PARITY [even, odd, off: +(off)]:

    ENABLE NRZI SIGNALING [yes, no: +(no)]:
If CABLE TYPE is "dte":
    AT&T VDM ON THIS PORT [yes, no: +(no)]:

    BUILDOUT VALUE [1-254: +(254)]:
    PERMANENTLY ACTIVATED PORT [yes, no: +(no)]:

If SERVICE TYPE is "terminal":
    CONNECT-TIME BILLING [on, off: +(off)]:

If attached board is out-of-service or ready-for-service:
    INITIAL SERVICE STATE [in, out: +(out)]:

For all ports, command loops to PORT NUMBER prompt.

Parameters

ATTENTION ACTION

    If **ATTENTION CHARACTER** is not set to *none*, specifies whether the attention signal can *disconnect* the port or toggle the port between *command_mode* and originate or transmit mode.

ATTENTION CHARACTER

    For asynchronous modem, terminal, or two-way ports, specifies if the attention character is to be set to *none*, a single break (*1brk*), double break (*2brk*), delete (*del*), or any ASCII character.

AT&T VDM ON THIS PORT

    If **FLOW CONTROL OF SAM BY DEVICE** or **FLOW CONTROL OF DEVICE BY SAM** is *xon/xoff* or *none*, specifies whether (*yes* or *no*) an AT&T Voice/Data Multiplexer (VDM) is connected to the port.

BAUD RATE

    Specifies the speed in which the port is to communicate with its attached devices.

BITS PER CHARACTER

Depending on parity, specifies if the number of bits per character to be transmitted is *5, 6, 7,* or *8*. (If the attached device uses 7 bits, set the port for 8 bits, no parity.)

BOARD ADDRESS

A number that identifies the slot in which the board resides in the SAM cabinet. Valid numbers are *1* for a SAM16, *1* to *2* for a SAM64, or *1* to *16* for a SAM504. If **COMPONENT** is *board*, multiple board addresses can be entered. If **COMPONENT** is *port*, a single board address can be entered.

BOARD SOFTWARE VERSION

Specifies the software to be downloaded to the board to be *standard* or *custom*. Standard software supports *async, bisync, ddcmp, hdlc, sdlc,* and *uscope* protocols. Custom software supports a site-customized synchronous protocol.

BUFFER FLUSHING

If **PROTOCOL** is *sdlc* or *hdlc*, specifies whether any buffers accumulated on the node channel in the direction of the time-out should be discarded (*enable*) or retained (*disable*).

BUILDOUT VALUE

For synchronous ports or custom board software, a number from *1* to *254* that specifies how many data bytes are to be collected before transmission to the Control Computer is to start.

CABLE TYPE

Specifies whether the cable is a *dte* or *dce*. For asynchronous ports, this field should always be *dce* unless connecting to a two-wire modem which requires RTS/CTS handshaking. For synchronous ports this field should be *dte* if connecting to a device which provides clocking, or *dce* if the SAM port provides clocking. The user's DCE should supply in-phase clocks— that is, TRXC and RTXC must be in phase.

CALL HOLD

If a PDD has not been entered for asynchronous modem, terminal, or two-way ports, specifies whether the call hold option is to be *on* or *off* for the port.

CLOSED USER GROUP PROFILE ID

If **ENDPOINT NUMBER OR RANGE** is specified, a string of 1 to 8 characters that identifies an existing CUG profile. See **Profile**.

CODE SET

If **PROTOCOL** is *bisync*, specifies if the code set is *ascii* or *ebcdic*.

COMMENT

If **COMPONENT** is *module* or *port*, an optional string of 1 to 60 characters, enclosed in double quotation marks, that contains useful administrative information.

COMPONENT

Specifies if the component is a *module*, *board*, or *port*.

CONNECT-TIME BILLING

For asynchronous and synchronous originating ports, specifies whether (*on* or *off*) billing information is to be logged for the port and reported to the billing process.

CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a single link, specifies the number of CRC seconds (*1* to *254*)*, per a static five-minute interval, that must elapse before an alarm is generated due to cyclic redundancy check errors.

DOWNLOAD SERVER

If **COMPONENT** is *module*, specifies the name of the software to be downloaded as a service address or the local *controller*.

ENABLE NRZI SIGNALING

For synchronous ports or custom board software, specifies if (*yes* or *no*) nonreturn to zero inverse signaling should be enabled.

ENDPOINT NUMBER OR RANGE

A unique four-digit address ranging from *0000* to *9999* that can be a single four-digit address or two four-digit addresses separated by a dash; where: the first address is the low end of the range and the second address is the high end. The word *none*, meaning no endpoint number, can also be specified.

FILLING BETWEEN FRAMES

If **PROTOCOL** is *sdlc*, specifies if the space between frames transmitted should be filled with *mark* or *flag* characters.

FLOW CONTROL OF SAM BY DEVICE

If **CABLE TYPE** is *dce*, specifies the flow control method used by the attached asynchronous device to be *xon/xoff, eia*, or *none*.

FLOW CONTROL OF DEVICE BY SAM

If **CABLE TYPE** is *dce*, specifies the flow control method used by the SAM to control the attached asynchronous device to be *xon/xoff, eia*, or *none*.

GROUP

A string of 1 to 8 characters that determines the group to which the port belongs. SAM ports cannot be mixed with other types of hardware in the same group.

INITIAL SERVICE STATE

Specifies if—upon completion of the database entry—the module, board, or port being entered is to be put *in* or *out* of service.

MODULE ADDRESS

A number specifying the node slot that the trunk module, which connects to the SAM, occupies. If the trunk module is a SAMML, the appropriate SAMML port number must be appended to the address, separated by a period: *<module.port>*. If the module is SAMML-connected with a dual link, the port number specified must be that of the primary port.

---

* A CRC second is one in which a cyclic redundancy check error occurs.

NODE ECHOES USER INPUT

For asynchronous modem, terminal, or two-way ports, specifies whether (*yes* or *no*) the node is to echo characters it receives from the attached device.

NUMBER OF STOP BITS

For an asynchronous port with a PDD and depending on the baud rate, specifies if the time needed to determine the end of character transmission is *1* or *2* bits.

PARITY

If **PROTOCOL** is *async* or if **PROTOCOL** is *bisync* with **CODE SET** *ascii*, specifies if the type of error checking done on the port is *even*, *odd,* or *off* parity.

PERMANENTLY ACTIVATED PORT

Specifies whether (*yes* or *no*) a call is to be established or stay up independently of DTR EIA lead state changes. If a PAP port is configured for *autobaud* and the baud of the attached device changes, the PAP port must be removed and restored to service in order to match the new baud of the device automatically.

PORT FOR EPN/CUG ASSIGNMENT

Specifies the port numbers entered at the **PORT NUMBER** prompt that can be assigned a unique EPN/CUG; where: *X* is the range or list of ports entered and *Y* is a port within this range or list appearing in sequential order. If the default is not specified, it does not appear in subsequent prompts.

PREDEFINED DESTINATION

A string of 1 to 72 alphanumeric characters that specifies the service address to which the port's attached device is to connect automatically. For asynchronous modem, terminal, or two-way ports, a PDD is optional. For synchronous ports or custom board software, a PDD is required.

PRIMARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a dual link, specifies the number of CRC seconds (*1* to *254*)*, per a static five-minute interval, that must elapse before an alarm is generated due to cyclic redundancy check errors on the primary link.

PRIMARY FAILURE DECLARATION THRESHOLD(SECONDS)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a dual link, the minimum number of consecutive errored seconds** that must elapse before the primary link is declared "failed." This time period is represented as *2-X*; where: *X*, which is the greater value in the range, equals 60 or the number of seconds before the call is disconnected due to a trunk failure minus 10, or whichever value is less. The initial default is *4* seconds.

---

* A CRC second is one in which a cyclic redundancy check error occurs.

** An errored second is one in which a keepalive message is lost. This threshold does not pertain to other types of transmission errors such as noise.

PRIMARY RECOVERY DECLARATION THRESHOLD (SECONDS)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a dual link, the minimum number of consecutive seconds (*10* to *180*)** that must elapse without an errored second before the primary link is declared "recovered."

PORT NUMBER

A number designating the address of a port or ports. For SAM16, port numbers are designated *1* to *16*. For SAM64, port numbers are designated *1* to *32*. For SAM504, port numbers are designated

- *1* to *32* if the board address is 1 to 15

- *1* to *24* if the board address is 16 and the module is not SAMML-connected.

- *1* to *19* if the board address is 16 and the module is SAMML-connected.

Multiple port entries are allowed.

PROTOCOL

If **BOARD SOFTWARE VERSION** is not *custom*, specifies if the protocol is *async, bisync, ddcmp, hdlc, sdlc, uscope, alc*.

RCV BAUD RATE

Specifies whether the receive rate for two-way port service is *75*, *110*, *150*, *300*, *1200*, *2400*, *4800*, *9600*, *14400* or *19200* when the baud is set to *auto*.

SECONDARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a dual link, specifies the number of CRC seconds (*1* to *254*)*, per a static five-minute interval, that must elapse before an alarm is generated due to cyclic redundancy check errors on the secondary link.

SECONDARY FAILURE DECLARATION THRESHOLD (SECONDS)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a dual link, the minimum number of consecutive errored seconds** that must elapse before the secondary link is declared "failed." This time period is represented as *2-X*; where: *X*, which is the greater value in the range, equals a maximum of 60 seconds (a minute) before the call is disconnected due to a trunk failure. The initial default is *4* seconds.

SECONDARY RECOVERY DECLARATION THRESHOLD (SECONDS)

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected with a dual link, the minimum number of consecutive seconds (*10* to *180*)** that must elapse without an errored second before the secondary link is declared "recovered."

SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE

Specifies a timer value, in 10-second intervals from *20* to *420*, that determines how long the system is to wait before taking down calls following a trunk failure.

SERVICE TYPE

Specifies if the type of service connection provided by the port is that type associated with a *console, host, modem, terminal,* or *2way* device. A *console* or *host* receives calls. A *modem* or *terminal* originates calls. A *2way* receives calls as a host and originates calls as a terminal.

SOFTWARE VERSION

A string of 1 to 14 characters specifying the **SOFTWARE VERSION** filename to be downloaded to the module. If **DOWNLOAD SERVER** is *controller,* the default is *standard*. If **DOWNLOAD SERVER** is not *controller,* enter the filename of the valid software release.

TOTAL NUMBER OF BOARDS

If **TYPE** is *sam64*, or *sam504*, specifies the number of boards supported by the module to be *1* to *2* (*sam64*), or *1* to *16* (*sam504*). For a *sam64* or *sam504*, this specification can be increased, but not decreased, using **change sam**.

TRUNK CONNECTION

If **TYPE** is *sam16* or *sam64* and the module is SAMML-connected, specifies whether the trunk is a *single* or a *dual* link connection. If the module is SAMDL-connected, *dual* must be specified regardless of the number of physical links present.

TRUNK SPEED

If **COMPONENT** is *module*, specifies the speed of the trunk module serving the SAM. See "Syntax" for conditions and speeds. (When the SAM is running at 48k or greater, only a single link can be configured on a SAMML.)

TRUNK TYPE

If **TYPE** is *sam64* or *sam504* and the module is not SAMML-connected, specifies the trunk used to connect the module to the remote SAM cabinet to be *hs, samsl,* or *t1*.

TYPE

If **COMPONENT** is *module*, specifies the type to be *sam16*, *sam64*, or *sam504*.

XANY: ANY CHAR FROM DEVICE XONS DATAKIT

For asynchronous modem, terminal, or two-way ports with flow control *on*, determines if any character—or just <CTRL Q>—can turn the transmission line *on*.

** An errored second is one in which a keepalive message is lost. This threshold does not pertain to other types of transmission errors such as noise.

Prompted Entry: Entering a SAM64 Module (SAMML-Connected)

```
CC0> enter
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: module
MODULE ADDRESS: 60.1
COMMENT [up to 60 chars double quoted]:
"samml connected at 60"
TYPE [sam64, sam504]: sam64
DOWNLOAD SERVER [+(controller)]: +
SOFTWARE VERSION [+(standard)]: +
TOTAL NUMBER OF BOARDS [1-2]: 1
TRUNK CONNECTION [dual, single: +(single)]: dual
TRUNK SPEED [9600, 19200: +(9600)]: +
SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE
      [10 second intervals, 20-420: +(50)]: 60
PRIMARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254:
  +(15)]: +
SECONDARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES) [1-254:
  +(15)]: +
PRIMARY FAILURE DECLARATION THRESHOLD (SECONDS) [2-50: +(4)]: 8
SECONDARY FAILURE DECLARATION THRESHOLD (SECONDS) [2-50: +(4)]: 8
PRIMARY RECOVERY DECLARATION THRESHOLD (SECONDS) [10-180: +(20)]: +
SECONDARY RECOVERY DECLARATION THRESHOLD (SECONDS) [10-180: +(20)]: +
INITIAL SERVICE STATE [in, out: +(out)]: +
MODULE ADDRESS:   [ Delete ]
CC0>
```

Prompted Entry: Entering a SAM64 Board (SAMML-Connected)

```
CC0> enter
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: board
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2: +(1-2)]: 1
BOARD SOFTWARE VERSION [custom, standard: +(standard)]: +
INITIAL SERVICE STATE [in, out: +(out)]: +
BOARD ADDRESS [1-2: +(1-2)]:   [ Delete ]
CC0>
```

Prompted Entry: Entering Two SAM64 Ports (SAMML-Connected)

```
CC0> enter
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT NUMBER [1-32: +(1-32)]: 1
COMMENT [up to 60 chars double quoted]:
"added a port on 6/9"

PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]: async
SERVICE TYPE [console, host, modem, 2way, terminal: +(terminal)]: +
GROUP [up to 8 chars]: samo
PREDEFINED DESTINATION [+(none)]: samhome
CABLE TYPE [dce, dte: +(dce)]: +
BAUD RATE [75, 110, 150, 300, 1200,
          2400, 4800, 9600, 14400, 19200, auto: +(auto)]: +
PARITY [even, odd, off: +(off)]: +
FLOW CONTROL OF SAM BY DEVICE [xon/xoff, eia, none: +(none)]: +
FLOW CONTROL OF DEVICE BY SAM [xon/xoff, eia, none: +(none)]: +
NODE ECHOES USER INPUT [yes, no: +(yes)]: +
CALL HOLD [on, off: +(off)]: +
AT&T VDM ON THIS PORT [yes, no: +(no)]: +
PERMANENTLY ACTIVATED PORT [yes, no: +(no)]: +
CONNECT-TIME BILLING [on, off: +(off)]: +
ATTENTION CHARACTER [none, 1brk, 2brk, del, a character: +(2brk)]: +
ATTENTION ACTION [command_mode, disconnect: +(command_mode)]: +
BITS PER CHARACTER [5, 6, 7, 8: +(8)]: +
NUMBER OF STOP BITS [1, 2: +(1)]: +
INITIAL SERVICE STATE [in, out: +(out)]: +
ENDPOINT NUMBER OR RANGE [0000-9999, none: +(none)]: +

PORT NUMBER [1-32: +(1-32)]: 2
COMMENT [up to 60 chars double quoted]:
"bisync service"

PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]: bisync
CODE SET [ascii, ebcdic: +(ebcdic)]: ascii
SERVICE TYPE [host, modem, terminal: +(terminal)]: +
GROUP [up to 8 chars]: samo
PREDEFINED DESTINATION: samhome
CABLE TYPE [dce, dte: +(dce)]: dte
PARITY [even, odd, off: +(off)]: +
ENABLE NRZI SIGNALING [yes, no: +(no)]: +
AT&T VDM ON THIS PORT [yes, no: +(no)]: +
BUILDOUT VALUE [1-254: +(254)]: +
PERMANENTLY ACTIVATED PORT [yes, no: +(no)]: +
CONNECT-TIME BILLING [on, off: +(off)]: +
INITIAL SERVICE STATE [in, out: +(out)]: +
PORT NUMBER [1-32: +(1-32)]:  [ Delete ]
CC0>
```

remove sam

The **remove sam** command enables you to remove a SAM component from service. Components must be taken out of service before database information can be changed or deleted.

Removing a SAM component causes all connected components, lying below the one being removed, to be put into the ready-for-service state providing they were in service.   In addition, if the SAM is linked to the node via a SAMML, the service state of the SAMML affects all connected SAM components.   When the SAMML is removed from service, SAM components are put in the ready-for-service state.

Syntax

You can input **remove sam** in prompted or one-line entry.

```
CC0> remove
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]:
```

If COMPONENT is "module", "board", or "port":
```
MODULE ADDRESS:
```

If COMPONENT is "board":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
```
  If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
```
  If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```

If COMPONENT is "port":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

  If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32: +(1-32)]:
```

  If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```
  If BOARD ADDRESS is "1-15":
```
PORT NUMBER [1-32: +(1-32)]:
```
  If BOARD ADDRESS is "16" and module is not SAMML-connected:
```
PORT NUMBER [1-24: +(1-24)]:
```
  If BOARD ADDRESS is "16" and module is SAMML-connected:
```
PORT NUMBER [1-19: +(1-19)]:
```

Parameters

Refer to the parameter definitions supplied in **enter sam**.

Prompted Entry: Removing a SAM64 Module from Service (SAMML-Connected)

```
CC0> remove
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: module
MODULE ADDRESS: 60.1
CC0>
```

Prompted Entry: Removing a SAM64 Board from Service (SAMML-Connected)

```
CC0> remove
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: board
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
CC0>
```

Prompted Entry: Removing a SAM64 Port from Service (SAMML-Connected)

```
CC0> remove
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT ADDRESS [1-32: +(1-32)]: 3
CC0>
```

One-line Entries: Removing SAM64 Components from Service (SAMML-Connected)

```
CC0>  remove sam module 60.1
CC0>  remove sam board 60.1 1
CC0>  remove sam port 60.1 1 3
```

restore sam

The **restore sam** command enables you to put SAM components into service after they have been taken out of service with **remove sam**.   In addition, **restore sam** enables you to put SAM components into service for the first time.

Restoring a SAM component causes all connected components, lying below the one being restored, to be brought into service providing they are in the ready-for-service state.   In addition, if the SAM is linked to the node via a SAMML, the service state of the SAMML affects all connected SAM components.   When the SAMML is restored to service, SAM modules, boards, and ports that are in the ready-for-service state are put into service.

Restoring SAM modules is also affected by whether the SAM module is SAMML-connected. Multiple SAM modules can be restored in the same command iteration only if they are of the same module address type—meaning, only SAMs on one SAMML can be restored at one time.

Syntax

You can input **restore sam** in prompted or one-line entry.   To have module downloading execute as a background process, press ⌐Delete⌐ only after the module download has started. Pressing ⌐Delete⌐ during the prompting sequence terminates the command process.

```
CC0> restore
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]:
```

If COMPONENT is "module", "board", or "port":
```
MODULE ADDRESS:
```

If COMPONENT is "board":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
```
  If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
```
  If TYPE is "sam504":
```
BOARD ADDRESS [1-16]:
```

If COMPONENT is "port":
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

  If TYPE is "sam64":
```
BOARD ADDRESS [1-2]:
PORT NUMBER [1-32: +(1-32)]:
```

Syntax *(continued)*

If TYPE is "sam504":
BOARD ADDRESS [1-16]:
If BOARD ADDRESS is "1-15":
PORT NUMBER [1-32: +(1-32)]:
If BOARD ADDRESS is "16" and module is not SAMML-connected:
PORT NUMBER [1-24: +(1-24)]:
If BOARD ADDRESS is "16" and module is SAMML-connected:
PORT NUMBER [1-19: +(1-19)]:

Parameters

Refer to the parameter definitions supplied in **enter sam**.

Prompted Entry: Restoring a SAM64 Module to Service (SAMML-Connected)

```
CC0> restore
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: module
MODULE ADDRESS: 60.1
<system responses>
```

Prompted Entry: Restoring a SAM64 Board to Service (SAMML-Connected)

```
CC0> restore
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: board
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
CC0>
```

Prompted Entry: Restoring a SAM64 Port to Service (SAMML-Connected)*

```
CC0> restore
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2]: 1
PORT ADDRESS [1-32: +(1-32)]: 3
CC0>
```

One-line Entries/Output: Restoring SAM64 Components to Service (SAMML-Connected)

```
CC0> restore sam module 60.1
Download in progress for module 60.1.
Download(s) in progress.
<DEL> puts process in background.
Download proceeding > > >   Delete
Download(s) started will proceed in background.
CC0> restore sam board 60.1 1
CC0> restore sam port 60.1 1 3
```

---

*   Output occurs on an ECPU System only.

verify sam

The **verify sam** command enables you to check the configuration entries made for SAM components in the database. When you issue **verify sam** for any subordinate component, you must specify the address of the above connected component or components. The system automatically outputs specific information regarding the attached higher component.

> **Example:** When you specify **verify sam** <**module x**>, the system outputs module-specific information on the SAM module residing at address *x* only. When you specify **verify sam** <**module all**>, the system outputs module-specific information for every SAM module entered. It does not output any information on attached boards or ports. When you specify a specific port or a range of ports during an iteration of **verify sam** <**port**>, however, the system outputs not only port-specific information for the specified port or ports, but it also outputs board-specific and module-specific information for the connected components.

Also, the **verify module** command for a SAM and the **verify sam** <**module**> command produce the same output—all information on the specified SAM module is displayed.

If the output of the **verify sam module** command shows the module to be in service, but the module does not appear to be operational, use **display connections** to determine if the SAM maintenance channel is in the *trunk fade (TFADE)* state. TFADE indicates that all call processes have been taken down. The system still leaves the module in service because it is possible to correct this problem without removing and restoring the module.

Syntax

You can input **verify sam** in prompted or one-line entry.

```
CC0> verify
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]:
```

If COMPONENT is "module":
```
MODULE ADDRESS [+(all)]:
```

If COMPONENT is "board":
```
MODULE ADDRESS:
```
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(1)]:
```
  If TYPE is "sam64":
```
BOARD ADDRESS [1-2: +(1-2)]:
```
  If TYPE is "sam504":
```
BOARD ADDRESS [1-16: +(1-16)]:
```

If COMPONENT is "port":
```
MODULE ADDRESS:
```
  If TYPE is "sam16":
```
BOARD ADDRESS [1: +(all)]:
```
    If BOARD address is not "all" and TYPE is "sam16":
```
PORT NUMBER [1-16: +(1-16)]:
```

Syntax *(continued)*

> *If TYPE is "sam64":*
>   **BOARD ADDRESS [1-2: +(all)]:**
> *If BOARD ADDRESS is not "all":*
>   **PORT NUMBER [1-32: +(1-32)]:**
> *If TYPE is "sam504":*
>   **BOARD ADDRESS [1-16: +(all)]:**
> *If BOARD ADDRESS is "1-15" and not all:*
>   **PORT NUMBER [1-32: +(1-32)]:**
> *If BOARD ADDRESS is "16" and module is not SAMML-connected:*
>   **PORT NUMBER [1-24: +(1-24)]:**
> *If BOARD ADDRESS is "16" and module is SAMML-connected:*
>   **PORT NUMBER [1-19: +(1-19)]:**

Parameters

Except for allowing specification of the word *all*, meaning every SAM module or every SAM board, the **MODULE ADDRESS** and **BOARD ADDRESS** parameter definitions for **verify sam** are the same as those for **enter sam**.   For the remaining parameters, refer to the definitions supplied in **enter sam**.

Prompted Entry: Verifying SAM64 Port Information (SAMML-Connected)*

```
CC0> verify
OBJECTS [...sam...]: sam
COMPONENT [module, board, port]: port
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2: +(all)]: 1
PORT NUMBER [1-32: +(1-32)]: 1-2
<report output>
```

---

*   Verification of SAM port information automatically includes module and board information.

One-line Entry/Output: Verifying SAM64 Port Information (SAMML-Connected)

```
CC0>  verify sam port 60.1 1 1-2
      <yy-mm-dd hh:mm:ss NODE=<name>
M   verify sam port 60.1 1 1-2
    MODULE ADDRESS: 60.1
    MODULE TYPE: sam64               NCHLS: 40
    SERVICE STATE: out (manual)      SECS BEFORE DISCONNECT: 60
    TRUNK TYPE: samml (dual)         LINE SPEED: 19200
    PRIM CRC ALARM THRESH: 15        SEC CRC ALARM THRESH: 15
    PRIM FAILURE THRESH: 10          SEC FAILURE THRESH: 10
    PRIM RECOVERY THRESH: 20         SEC RECOVERY THRESH: 20
    TOTAL BOARDS: 1
    DOWNLOAD SERVER: controller
    VERSION: standard
    COMMENT: samml connected at 60

    BOARD       SERVICE            SOFTWARE
    ADDR        STATE              VERSION
     1          out                standard

      <yy-mm-dd hh:mm:ss NODE=<name>
M   verify sam port 60.1 1 1-2

              DEV  DKT              ATT  ATT
    PORT TYPE FC   FC   XANY BAUD  CHAR ACT PARITY SRVC BILL VDM  GROUP
     1   term N/A  N/A  off  auto  2brk  c   off    out  on   no   samo
     2   term N/A  N/A  N/A  N/A   N/A  N/A  off    out  on   no   samo

      <yy-mm-dd hh:mm:ss NODE=<name>
M   verify sam port 60.1 1 1-2

         CALL          NODE         BLD  CABLE       STOP
    PORT HOLD  RBAUD  ECHO  NRZI PAP OUT  TYPE  BITS  BITS   PROTO   CODE
     1   off   N/A    yes   N/A  yes N/A  dte    8     1    async   N/A
     2   N/A   N/A    N/A   yes  yes 254  dte   N/A   N/A   bisync  ascii

      <yy-mm-dd hh:mm:ss NODE=<name>
M   verify sam port 60.1 1 1-2


    PORT EPN          CUG PROFILE  BFLUSH   FRMFILL
     1                             N/A      N/A
     2                             N/A      N/A

      <yy-mm-dd hh:mm:ss NODE=<name>
M   verify sam port 60.1 1 1-2

    PORT   PDD
     1     samhome
     2     samhome

      <yy-mm-dd hh:mm:ss NODE=<name>
M   verify sam port 60.1 1 1-2

    PORT    COMMENT
     1      added a port on 6/9
     2      bisync service
CC0>
```

Report Fields

This table correlates each report field heading shown in the output of **verify sam** with the parameter for which you are prompted in **enter sam** or **change sam**. The information beneath each report field heading reflects the parameter option specified in either command. An *N/A* indicates that the parameter is *not applicable* or *not used*.

Report Field Name	Corresponding Parameter Name
ATT ACT	ATTENTION ACTION
ATT CHAR	ATTENTION CHARACTER
BAUD	BAUD RATE
BFLUSH	BUFFER FLUSHING
BILL	CONNECT-TIME BILLING
BITS	BITS PER CHARACTER
BLD OUT	BUILDOUT VALUE
BOARD ADDR	BOARD ADDRESS
CABLE TYPE	CABLE TYPE
CALL HOLD	CALL HOLD
CODE	CODE SET
COMMENT	COMMENT
CRC ALARM THRESH	CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)
CUG PROFILE	CLOSED USER GROUP PROFILE ID
DEV FC	FLOW CONTROL OF SAM BY DEVICE
DKT FC	FLOW CONTROL OF DEVICE BY SAM
DOWNLOAD SERVER	DOWNLOAD SERVER
EPN	ENDPOINT NUMBER OR RANGE
FRMFILL	FILLING BETWEEN FRAMES
GROUP	GROUP
LINE SPEED	TRUNK SPEED
MODULE ADDRESS	MODULE ADDRESS
MODULE TYPE	TYPE
NCHLS	None: number of user channels
NODE ECHO	NODE ECHOES USER INPUT
NRZI	ENABLE NRZI SIGNALING
PAP	PERMANENTLY ACTIVATED PORT
PARITY	PARITY
PDD	PREDEFINED DESTINATION
PORT	PORT NUMBER
PRIM CRC ALARM THRESH	PRIMARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)

Report Fields *(continued)*

Report Field Name	Corresponding Parameter Name
PRIM FAILURE THRESH	PRIMARY FAILURE DECLARATION THRESHOLD (SECONDS)
PRIM RECOVERY THRESH	PRIMARY RECOVERY DECLARATION THRESHOLD (SECONDS)
PROTO	PROTOCOL
RBAUD	RCV BAUD RATE
SEC CRC ALARM THRESH	SECONDARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)
SEC FAILURE THRESH	SECONDARY FAILURE DECLARATION THRESHOLD (SECONDS)
SEC RECOVERY THRESH	SECONDARY RECOVERY DECLARATION THRESHOLD (SECONDS)
SECS BEFORE DISCONNECT	SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE
SERVICE STATE	INITIAL SERVICE STATE *-or-* the service state of the component
SOFTWARE VERSION	BOARD SOFTWARE VERSION
SRVC	None: port service state
STOP BITS	NUMBER OF STOP BITS
TOTAL BOARDS	TOTAL NUMBER OF BOARDS
TRUNK TYPE	TRUNK TYPE
TYPE	SERVICE TYPE
VDM	AT&T VDM ON THIS PORT
VERSION	SOFTWARE VERSION
XANY	XANY: CHAR FROM DEVICE XONS DATAKIT

change samml

The **change samml** command enables you to modify information for a SAMML in the database. Before any information can be changed, the SAMML must be taken out of service.

Syntax

You can input **change samml** in prompted entry only. The command syntax for **enter samml** and **change samml** are similar. Because the `NUMBER OF CHANNELS` cannot be reduced below the total required to support any configured SAM, the system provides this message (before the prompt) if at least one SAM is configured:

`INFO: Number of channels required to support configured SAMs is <num>.`

Where: *<num>* is the number of channels.

The defaults for **change samml** are those values, conditions, or states that currently exist in the database. They are displayed within parentheses in the parameter prompt.

Parameters

Except for allowing specification of only one module address entry, the `MODULE ADDRESS` parameter definition for **change samml** is the same as that for **enter samml**.

For the remaining parameters, refer to the definitions supplied in **enter sam**.

Prompted Entry: Changing SAMML Information*

```
CC0> change
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
COMMENT [up to 60 chars double quoted, none:
+("in 60")]:
  "SAM not entered"
DOWNLOAD SERVER [+(controller)]: ++
MODULE ADDRESS:   Delete
CC0>
```

_____

*   The SAM has not been entered.

Prompted Entry: Changing SAMML Information*

```
CC0> change
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
COMMENT [up to 60 chars double quoted, none:
+("SAM not entered")]:
"SAM entered"
DOWNLOAD SERVER [+(controller)]: +
SOFTWARE VERSION [+(standard)]: +

INFO:  Number of channels required to support configured SAMS is 40.
NUMBER OF CHANNELS [16-507: +(507)]: 500
MODULE ADDRESS:   [ Delete ]
CC0>
```

---

*   The SAM has been entered.

delete samml

The **delete samml** command enables you to eliminate SAMML information from the database. Before any database information can be deleted, the module must be removed from service.   In addition, the SAMML module information cannot be deleted while entries for connected SAMs exist in the database.

Syntax

You can input **delete samml** in prompted or one-line entry.

```
CC0> delete
OBJECTS [...samml...]: samml
MODULE ADDRESS:
```

Parameters

Refer to the parameter definitions supplied in **enter sam**.

Prompted Entry: Deleting SAMML Information

```
CC0> delete
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
CC0>
```

One-Line Entry: Deleting SAMML Information

```
CC0> delete samml 60
```

diagnose samml

The **diagnose samml** command enables you to run off-line diagnostics on an out-of-service SAMML module.   These diagnostics check various aspects of the module hardware.

Syntax

You can input **diagnose samml** in prompted or one-line entry.

```
CC0> diagnose
OBJECTS [...samml...]: samml
MODULE ADDRESS:
```

Parameters

Except for allowing specification of only a single module address entry, the `MODULE ADDRESS` parameter definition for **diagnose samml** is the same as that for **enter samml**.

Prompted Entry: Running SAMML Off-line Diagnostics

```
CC0> diagnose
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
     <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose samml 60

   Boot tests in progress - . .
   <yy-mm-dd hh:mm:ss NODE=<name>
M

   Offline diagnostic boot test: PASS

   Extended RAM test in progress - . . .
   <yy-mm-dd hh:mm:ss NODE=<name>
M

   Offline diagnostic memory test: PASS

   Diagnostic download in progress -
. . .
     <yy-mm-dd hh:mm:ss NODE=<name>
M

   Offline diagnostic downloaded test:
      Inst. set:  PASS
      Timer test: PASS
      Port 1:     PASS
      Port 2:     PASS
      Port 3:     PASS
      Port 4:     PASS
      Port 5:     PASS
      Port 6:     PASS
      Port 7:     PASS
      Port 8:     PASS
DIAGNOSTIC COMPLETED
CC0>
```

One-Line Entry: Running SAMML Off-line Diagnostics

```
CC0> diagnose samml 60
<diagnostic output>
```

dmeas samml

The **dmeas samml** command enables you to generate on-demand measurements reports for the SAMML.   These reports contain traffic, performance, and utilization measurements for the specified module or port.   Except for differences in the reporting interval, the same report can be gathered periodically on a CPU System using **schedule measurements**.

Syntax

You can input **dmeas samml** in prompted or one-line entry.

```
CC0> dmeas
OBJECTS [...samml...]: samml
COMPONENT [module, port]:
MODULE ADDRESS:
```
If COMPONENTi is "port":
```
PORT NUMBER [1-8: +(1-8)]:
INCLUDE CRC ERROR DATA [yes, no: +(yes)]:

INTERVAL [current, previous: +(current)]:
```

Parameters

COMPONENT

Specifies whether measurement reports are to be generated for the *module* or *port*.

INCLUDE CRC ERROR DATA

Specifies whether (*yes* or *no*) cyclic redundancy check error data should be included for any ports configured.

INTERVAL

Specifies if the on-demand report is to be printed for the *current* or *previous* reporting interval.   The current interval includes those measurements accumulated since the previous scheduled report was generated; or if a report was not scheduled, those measurements accumulated since the module was last reset.   Conversely, the previous interval includes those measurements accumulated before the current interval.

PORT NUMBER

A number from *1* to *8* specifying a port on a SAMML module. Multiple port number entries are allowed.

For the remaining parameter, refer to the definition supplied in **enter sam**.

Prompted Entry: Displaying SAMML Port Measurements

```
CC0> dmeas
OBJECTS [...samml...]: samml
COMPONENT [module, port]: port
MODULE ADDRESS: 60
PORT NUMBER [1-8: +(1-8)]: 1
INCLUDE CRC ERROR DATA [yes, no: +(yes)]: +
INTERVAL [current, previous: +(current)]: +
<report output>
```

One-Line Entry/Output: Displaying SAMML Port Measurements*

```
CC0> dmeas samml port 60 1 yes current
    <yy-mm-dd hh:mm:ss NODE=<name>
M  dmeas samml port 60 1 yes current

MODULE ADDRESS:   60          91-12-31    04:00 -----> 04:44

PACKETS     PACKETS     PARITY    CHAN    BP RCVR          MIN
FM NODE     TO NODE     ERRS      ERRS    OVRNS     IDLE   IDLE
450         59          0         0       0         99%    99%

MODULE ADDRESS:   60          PORT: 1 (primary)    SPEED: 9600

PT RCVR  XMTR    CRC     BAD     OVRSZ   ABORT   FAULTS   REMOTE CRC
OVRNS    UNDRS   ERRS    FRMS    FRMS    RCVD             ERRORED SECONDS
0        0       0       0       0       0       0        1

<-------RECEIVED-------->   <------TRANSMITTED------>
 PORT    TOTAL     OVHD      PORT    TOTAL     OVHD
 UTIL    BYTES     BYTES     UTIL    BYTES     BYTES
   0%    7021      76%         0%    2290      55%

<----------PEAK DATA----------> PEAK INTERVAL:  04:35 -----> 04:40
<-------RECEIVED-------->   <------TRANSMITTED------>
 PORT    TOTAL     OVHD      PORT    TOTAL     OVHD
 UTIL    BYTES     BYTES     UTIL    BYTES     BYTES
   0%    254       58%         0%    268       54%

CRC ERRORED SECONDS:
<-----------------------MINUTE------------------------->
 HOUR    +0    +5   +10   +15   +20   +25   +30   +35   +40   +45   +50   +55
 04:00   0     0    0     0     0     0     0     0     N/A   N/A   N/A   N/A
CC0>
```

---

*   Includes CRC data. The port is the primary port on a SAM64 that is SAMML-connected with a dual link.

Output: Scheduled SAMML Port Measurements*

NOTE: Except for the date stamp heading, the scheduled measurements report consists of the same fields as the on-demand report. The following report is invoked with **schedule measurements** on a CPU System and is printed at the indicated interval.

```
     <yy-mm-dd hh:mm:ss NODE=<name>
A   REPORT MEAS SAMML
    SAMML ADMINISTRATIVE MEASUREMENTS REPORT

MODULE ADDRESS:   60            91-12-31    04:00 -----> 05:00

PACKETS      PACKETS     PARITY    CHAN    BP RCVR           MIN
FM NODE      TO NODE     ERRS      ERRS    OVRNS     IDLE    IDLE
450          59          0         0       0         99%     99%

MODULE ADDRESS:   60          PORT: 1 (primary)    SPEED: 9600

PT RCVR  XMTR   CRC    BAD    OVRSZ  ABORT  FAULTS  REMOTE CRC
OVRNS    UNDRS  ERRS   FRMS   FRMS   RCVD           ERRORED SECONDS
0        0      0      0      0      0      0        1

<-------RECEIVED--------->  <------TRANSMITTED------>
 PORT    TOTAL      OVHD     PORT    TOTAL      OVHD
 UTIL    BYTES      BYTES    UTIL    BYTES      BYTES
  0%     7021        76%      0%     2290        55%

<---------PEAK DATA----------> PEAK INTERVAL:  04:35 -----> 04:40
<-------RECEIVED--------->  <------TRANSMITTED------>
 PORT    TOTAL      OVHD     PORT    TOTAL      OVHD
 UTIL    BYTES      BYTES    UTIL    BYTES      BYTES
  0%     254         58%      0%     268         54%

CRC ERRORED SECONDS:
<-----------------------MINUTE------------------------->
 HOUR    +0    +5   +10  +15  +20  +25  +30  +35  +40  +45  +50  +55
 04:00   0     0    0    0    0    0    0    0    N/A  N/A  N/A  N/A
CC0>
```

---

*   Includes CRC data. The port is the primary port for a SAM64 that is SAMML-connected with a dual link.

Report Fields

ABORT RCVD

The number of frames discarded due to an abort sequence received.   If this value is not zero, the traffic load for the connected SAM was too great or there was noise on the facility.

BAD FRMS

The number of port frames discarded due to a frame format error.   A modem/facility problem undetected by a CRC error, or a hardware or software problem with the SAMML or the connected SAM can cause such an error.

BP RCVR OVRNS

The number of node backplane packets discarded for this port due to lack of buffers. Insufficient buffers are caused by a facility problem with any SAMML port or a traffic load too great for the SAMML.

CHAN ERRS

The number of node backplane packets discarded due to a channel error.   A channel error can be caused by faulty software or hardware on the SAMML module.

CRC ERRORED SECONDS

The total number of errored seconds in every five-minute interval.   (The maximum errored seconds reported is 254.) This data is useful to correlate general network errors with facility problems and to evaluate the facility performance.   The left-most column indicates the hour and the top row indicates the minute when the five-minute interval begins.

CRC ERRS

The number of port frames discarded due to cyclic redundancy check errors on the line. CRC errors are caused by the modem/facility.   The output does not show the CRC errors generated by endpoints. The output only shows CRC errors (noise on the trunk) when the SAM is connected to the SAMML.

FAULTS

For a SAM64 that is SAMML-connected with a dual link, the number of times the link faulted and all traffic was forced to the other link.

IDLE

The average percentage of time the SAMML was idle.   This number has an inverse relationship to queuing delays on the link.

MIN IDLE

The minimum percentage of time the SAMML was idle during its busiest five-minute interval.

OVHD BYTES

The percentage of bytes required to frame the user and internal protocol bytes to the total bytes received and transmitted.

OVRSZ FRMS

The number of port frames discarded due to a frame size error. A modem/facility problem undetected by a CRC error, or a hardware or software problem with the SAMML or connected SAM can cause such an error.

PACKETS FM NODE

The number of packets received by the SAMML from the node.

PACKETS TO NODE

The number of packets transmitted to the node from the SAMML.

PARITY ERRS

The number of node envelopes discarded due to a parity error. A parity error can be caused by faulty node hardware or inserting a circuit pack into the backplane.

PEAK DATA

The peak five-minute interval and the data recorded during that interval.

PORT UTIL

The percentage of the line bandwidth being used to send/receive data (all non-idle time).

PT RCVR OVRNS

The number of port frames that have been discarded due to lack of buffers. Insufficient buffers are due to a traffic load greater than the SAMML can handle for that port.

REMOTE CRC ERRORED SECONDS

For a SAM64 that is SAMML connected with a dual link, the number of errored seconds received by the remote SAMDL. An errored second is a second during which one or more errors have occurred. The counter that records these errored seconds is also incremented every second that the link is dead.

TOTAL BYTES

The total number of non-idle characters sent or received on the line.

XMTR UNDRS

The number of frames the SAMML port aborted. This error, which is most likely to occur on higher numbered ports, is caused by the instantaneous traffic on the module (as a whole) exceeding the SAMML capacity.

dstat samml

The **dstat samml** command enables you to display information on the status of a SAMML module and port.

Syntax

You can input **dstat samml** in prompted or one-line entry.

```
CC0> dstat
OBJECTS [...samml...]: samml
COMPONENT [module, port: +(module)]:
MODULE ADDRESS:
```

If COMPONENT is "port":
```
PORT NUMBER [1-8: +(1-8)]:

DETAIL [low, high: (+low)]:
```

Parameters

COMPONENT
Specifies whether status reports are to be generated for the *module* or *port*.

DETAIL Specifies if the output is to show a limited amount of information (*low* detail) or more information (*high* detail).

PORT NUMBER A number from *1* to *8* specifying a port on a SAMML module. Multiple port number entries are allowed.

For the remaining parameter, refer to the definition supplied in **enter sam**.

Prompted Entry: Displaying High Detail SAMML Port Status

```
CC0> dstat
OBJECTS [...samml...]: samml
COMPONENT [module, port: +(module)]: port
MODULE ADDRESS: 60
PORT NUMBER [1-8: +(1-8)]: 1
DETAIL [low, high: (+low)]: high
<report output>
```

One-Line Entry/Output: Displaying High Detail SAMML Port Status**

```
CC0> dstat samml port 60 1 high
    <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat samml port 60 1 high
******************************* MODULE 60 *********************************
MODULE TYPE      SERVICE STATE    HARDWARE ERROR COUNT   SERIAL NUMBER
samml            in service       0                      32
LAST HARDWARE ALARM:
none
LAST SOFTWARE ALARM:
none
ONLINE   ENABLED
yes      yes
-------------------------------- HIGH DETAIL --------------------------------
MODULE  FIFO    FM NODE FM NODE SANITY
RESET   RESET   PARITY  OVERFLO ERROR
1       0       0       0       0
EXPECT  FULL    EMPTY   ACTUAL  ACTUAL  EXPECT  EXPECT
TYPE    PACKETS PACKETS STAT1   STAT2   STAT1   STAT2
samml   897     0       1       0       1       0
MEMORY   STACK   END      END      END      MEMORY   START    TOTAL
END      SPACE   BSS      DATA     TEXT     LEFT     BUFS     BUFMEM
0x80000  0x2000  0x74512  0x278f0  0x1dc00  0x2e94   0x766f0  0x5910
SOFTWARE NUMBER  TIMEOUT TIMEOUT TRUNC   AVG RSP
ALARMS   TRANS   MOD     SYNCM   TRANS   TIME (msec)
0        28      0       0       0       U/A
RANGE   BAD
ERRORS* PACKETS*
11      9
************************* MODULE 60 PORT 1: PRIMARY ************************
PORT      EXPECT            ACTUAL            OPERATING      LAST
TYPE      SRVC STATE        SRVC STATE        STATE          FAULT
sam       in service        in service        up             10:05:20:03
DCD           DTR            RTS            CTS            DSR
on            on             on             on             on
XMT           BKPLN OUT      CHNL TASK      USART REG
FLAG          FLAG           FLAG           VALUES
idle          idle           idle           0x3ef0
    <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat samml port 60 1 high
-------------------------------- HIGH DETAIL --------------------------------
SYNC    RXCHAR   CHAN    CHAN    CHAN
HUNT    AVAIL    RCV     XMT     EXT ST
no      no       yes     yes     yes
```

---

* Output occurs on an ECPU System only.

** The port is the primary port on a SAM64 that is SAMML-connected with a dual link.

One-Line Entry/Output *(continued)*

```
VECTOR    TX         TX CRC    RX        RX CRC    GENERATOR
STATUS    ENABLE     ENABLE    ENABLE    ENABLE    ENABLE
yes       yes        yes       yes       no        no
PARITY    CRC/FRM    RCV FIFO  TX        TX
ERR       ERR        OVF       UN/EOM    BUF EMPTY
no        no         no        yes       yes
CC0>
```

One-Line Entry/Output: Displaying High Detail SAMML Port Status**

```
     <yy-mm-dd hh:mm:ss NODE=<name>
M  dstat samml port 5 1 high
******************************* MODULE 5 ********************************
MODULE TYPE       SERVICE STATE    HARDWARE ERROR COUNT   SERIAL NUMBER
samml            in service    0                           3
LAST HARDWARE ALARM:
none
LAST SOFTWARE ALARM:
none
ONLINE  ENABLED
yes     yes
--------------------------------- HIGH DETAIL ----------------------------------
MODULE  FIFO     FM NODE FM NODE SANITY
RESET   RESET    PARITY  OVERFLO ERROR
0       0        0       0       0
EXPECT  FULL     EMPTY   ACTUAL  ACTUAL  EXPECT   EXPECT
TYPE    PACKETS  PACKETS STAT1   STAT2   STAT1    STAT2
xxxxx   897      0       1       0       1        0
MEMORY   STACK    END      END      END      MEMORY   START     TOTAL
END      SPACE    BSS      DATA     TEXT     LEFT     BUFS      BUFMEM
0x80000  0x2000   0x74512  0x278f0  0x1dc00  0x2e94   0x766f0   0x5910
SOFTWARE NUMBER   TIMEOUT TIMEOUT TRUNC   AVG RSP
ALARMS   TRANS    MOD     SYNCM   TRANS   TIME (msec)
0        28       0       0       0       U/A
RANGE    BAD
ERRORS*  PACKETS*
11       9
```

---

*   Output occurs on an ECPU System only.

** The port is not connected to a SAM that is SAMML-connected with a dual link.

One-Line Entry/Output *(continued)*

```
    --------------------------------------------------------------------------------
    **************************** MODULE 5  PORT 1 ****************************
    PORT               EXPECT          ACTUAL          OPERATING
    TYPE               SRVC STATE      SRVC STATE      STATE
    sam                in service      in service      up
    DCD                DTR             RTS             CTS             DSR
    on                 on              on              on              on
    XMT                BKPLN OUT       CHNL TASK       USART REG
    FLAG               FLAG            FLAG            VALUES
    idle               idle            idle            0x3ef0
    ------------------------------ HIGH DETAIL --------------------------------
    SYNC    RXCHAR   CHAN     CHAN     CHAN
    HUNT    AVAIL    RCV      XMT      EXT ST
    no      no       yes      yes      yes
    VECTOR  TX       TX CRC   RX       RX CRC   GENERATOR
    STATUS  ENABLE   ENABLE   ENABLE   ENABLE   ENABLE
    yes     yes      yes      yes      no       no
    PARITY  CRC/FRM  RCV FIFO TX       TX
    ERR     ERR      OVF      UN/EOM   BUF EMPTY
    no      no       no       yes      yes
    --------------------------------------------------------------------------------
    CC0>
```

Report Fields

References made to alarms refer to those alarms messages cited in the *Data Networking Products Messages Reference*.

ACTUAL SRVC STATE

The service state of the SAMML port as reported by the module. The possible states are: *in* (via **restore sam**), *out* (via **remove sam**), and *disabled* (via **remove samtrk**). If on-line diagnostics are running, the state is *in* or *disabled*. If off-line diagnostics are running, the state is *out* or *disabled*.

ACTUAL STAT1

The actual value of the hardware status byte of the most currently received status packet for the given module. The actual and expected values of STAT1 differ.

ACTUAL STAT2

The actual value of the software status byte of the most currently received status packet for the given module. The actual and expected values of STAT2 differ.

AVG RSP TIME (msec)

The average response time for administrative and maintenance transactions which is derived by dividing the total module response time by the total number of module transactions.

BAD PACKETS

For ECPU Systems only, the count of packets with envelope parity errors transmitted by the module and detected by the switch. To determine if the module is defective, run module diagnostics.

BKPLN OUT FLAG

Indicates if (*yes* or *no*) a frame was received from the link but was not yet transmitted to the backplane.

CHAN EXT ST

Indicates if (*yes* or *no*) external status interrupts are enabled on the SAMML port USART so the USART can generate an interrupt when EIA lead transitions occur.

CHAN RCV

Indicates if (*yes* or *no*) receive interrupts are pending on the SAMML port USART so USART can generate an interrupt when data has been received.

CHNL TASK FLAG

Indicates if (*yes* or *no*) the data currently on the backplane was transmitted on the link and if an outstanding request exists to transmit more data.

CHAN XMT

Indicates if (*yes* or *no*) a transmit interrupt is pending on the SAMML port USART so the USART can generate an interrupt when data has been transmitted.

CRC/FRM ERR

Indicates if (*yes* or *no*) the SAMML USART channel detected a CRC or framing error.

CTS

The status of the EIA lead clear to send is *on* or *off* for the port.

DCD

The status of the EIA lead data carrier detect is *on* or *off* for the port.

DSR

The status of the EIA lead data set ready is *on* or *off* for the port.

DTR

The status of the EIA lead data terminal ready is *on* or *off* for the port.

EMPTY PACKETS

The number of empty status packets received. (Empty packets are received when a module is not physically present in the given shelf slot.) See **EMPTY SLOT** alarm.

END BSS

The end of BSS for the module.

END DATA

The end of data for the module.

END TEXT

The end of text for the module.

EXPECT SRVC STATE

The service state of the SAMML port as recorded from the database. The possible states are: *in* (via **restore sam**), *out* (via **remove sam**), and *disabled* (via **remove samtrk**). Either the primary or secondary port of a dual-link SAM can be disabled.

EXPECT STAT1

The expected value of the hardware status byte for the given module.

EXPECT STAT2

The expected value of the software status byte for the given module.

EXPECT TYPE

The expected type of hardware in the shelf slot.   The value of this field is determined by status information. See **WRONG MODULE TYPE** alarm.

FIFO RESET

A count of FIFO resets (a hardware synchronization problem) on the module. See **FIFO RESET** alarm.

FM NODE OVERFLO

Any difference between the rate information arrives at a module and the rate the subscriber processes that information.

FM NODE PARITY

How many packets coming from the node had parity errors. See **FROM BUS PARITY ERROR** alarm.

FULL PACKETS

The number of full status packets received.   (Full packets are received when a module is present in the given shelf slot.)

GENERATOR ENABLE

Indicates if the baud rate generator for the port was enabled.   (This field always reads *no*.)

HARDWARE ERROR COUNT

An approximate sum of module errors detected since the last module restore.   Counts of three or four can be typical for a given module; higher counts probably indicate some problem.

LAST FAULT

The elapsed time in days, hours, minutes, and seconds since data on the transmission line from the SAMML to the SAM was transferred from the indicated trunk port to the other trunk port. If a fault was not recorded for more than 365 days, *>365* appears in this field. If a fault has not occurred, this field reads *none*.

LAST HARDWARE ALARM

The last alarm for the given module, based on status packet data. This data is not stored across reboots of the Control Computer.

LAST SOFTWARE ALARM

The text, date, and time of the last alarm the module issued by and for itself. This data is not stored across reboots of the module or Control Computer.

MEMORY END

The end of memory for the module.

MEMORY LEFT

The available memory for stack.

MODULE RESET

The number of module resets. For some modules, resets occur during normal operation.

MODULE TYPE

Indicates, according to status packet information received, what type of module is actually present. It does not reflect information supplied by the administrator through **enter** and **delete**. This field is initialized to empty.

NUMBER TRANS

The number of transactions processed since the last reboot.

ONLINE

According to status packet data, shows *yes* if the green LED on the module is *on*.

OPERATING STATE

The functioning state of the SAMML port that is reported by the module:

- *diag_offline.* For SAMs that are SAMML-connected with a dual link only, occurs if the module is out of service and if off-line SAM trunk or SAM diagnostics are running.
- *diag_on.* For SAMs that are SAMML-connected with a dual link only, occurs if SAM is in service and if on-line SAM trunk diagnostics (loop-around tests) are running.
- *disabled.* For SAMs that are SAMML-connected with a dual link only, occurs if off-line trunk diagnostics are running or if the link was disabled due to the execution of **remove samtrk**.
- *fault.* For SAMs that are SAMML-connected with a dual link only, occurs if a failure declaration threshold has been reached and traffic *up.* For SAMs that are SAMML-connected with a dual link, occurs if the EIA leads are up, or if a fault has not occurred, or if **remove samtrk** has not been executed. For SAMs that are SAMML-connected with a single link, occurs if the EIA leads are up, or if the module is in service, or if loop-around diagnostics are running and the module is out of service due to **diagnose sam** or **diagnose samtrk**.
- *down.* For SAMs that are SAMML-connected with a dual link, occurs if the EIA leads are down or the link was disabled due to the execution of **remove samtrk**. For SAMs that are SAMML-connected with a single link, occurs if the EIA leads are down, or if the module is out of service and diagnostics are not running, or if the module is in service, but a fault has occurred.

PARITY ERR

Indicates if (*yes* or *no*) the SAMML USART detected a parity error for the port.

PORT TYPE

The module to which the port is attached is a *sam*.

RANGE ERRORS

For ECPU Systems only, the count of packets transmitted by the module on a channel that is beyond the limit for which the module is configured.   Range error counts might be attributed to a defective module that is corrupting the address field of the packet or to a channel configuration mismatch on the two sides of the trunks. To determine if the module is defective, run module diagnostics; to determine if a configuration mismatch has occurred, review the module configuration.

RCV FIFO OVF

Indicates if (*yes* or *no*) the SAMML USART detected a receiver FIFO overflow for the port.

RTS

The status of the EIA lead request to send is *on* or *off* for the port.

RXCHAR AVAIL

Indicates if (*yes* or *no*) a received character is available from the SAMML USART for the port.

RX CRC ENABLE

Indicates if (*yes* or *no*) the CRC of the receiver was enabled for the port.

RX ENABLE

Indicates if (*yes* or *no*) the receiver was enabled for the port.   If this field reads *no*, the SAMML does not recognize data carrier detect (DCD).

SANITY ERROR

See **MACHINE MALFUNCTION** alarm.

SERIAL NUMBER

The factory-encoded unique number that appears on all modules that access the backplane—that is, have a switch and LED.   Maintaining records with these numbers can help track vintages of circuit packs.

SERVICE STATE

Shows if the current service state of the module is *in service* (via **restore**), *oos,manual* (out of service via **remove**), or *oos,fault* (automatically taken out of service due to a fault).

SOFTWARE ALARMS

The number of alarms reported for the module since the last reboot.

STACK SPACE

The amount of stack space available on the module.

START BUFS

The address of the start of buffer space for the module.

SYNC HUNT

Indicates if the SAMML synchronized hunt status is enabled (*yes*) or disabled (*no*) for the port. If *yes*, the receiver is searching for the beginning of the frame.

TIMEOUT MOD

The number of administrative and maintenance transactions that timed out at the module since the last reboot.

TIMEOUT SYNCM

The number of administrative and maintenance transactions that were returned from the module, but were timed out by **syncmaint**, since the last reboot.

TOTAL BUFMEM

The amount of buffer memory available on the module.

TRUNC TRANS

The number of truncated transactions that occurred since the last reboot.

TX BUF EMPTY

Indicates if (*yes* or *no*) the transmit buffer is empty for the port.

TX CRC ENABLE

Indicates if (*yes* or *no*) the transmitter CRC was enabled for the port.

TX ENABLE

Indicates if (*yes* or *no*) the transmitter was enabled for the port. If the port is in service, this field always reads *yes*.

TX UN/EOM

Indicates if (*yes* or *no*) the SAMML port USART terminates the current frame as an underrun (*yes*) or provides proper CRC for data transmitted when the transmit buffer bus is empty.

USART REG VALUES

The value of various USART registers.

VECTOR STATUS

Indicates if (*yes* or *no*) the vector returned on an interrupt is variable for the type of interrupt that occurred.

XMT FLAG

Indicates if (*yes* or *no*) the port is currently in service and is *transmitting* data.

enter samml

The **enter samml** command enables you to add SAMML module information into the database. To add SAMML ports, use the **enter sam** command.

Syntax

You can input **enter samml** in prompted entry only. The defaults are shown in parentheses.

```
CC0> enter
OBJECTS [...samml...]: samml
MODULE ADDRESS:
COMMENT [up to 60 chars double quoted]:
DOWNLOAD SERVER [+(controller)]:
```

If DOWNLOAD SERVER is "controller":
```
SOFTWARE VERSION [+(standard)]:
```
If DOWNLOAD SERVER is not "controller":
```
SOFTWARE VERSION:

NUMBER OF CHANNELS [16–507: +(128)]:
```

Command loops to MODULE ADDRESS prompt.

Parameters

COMMENT

An optional string of 1 to 60 characters, enclosed in double quotation marks, that specifies useful administrative information.

DOWNLOAD SERVER

Specifies the source of the software to be downloaded to the module. It must be a valid service address or the local *controller*.

MODULE ADDRESS

A number identifying the node slot number that the SAMML occupies. (The SAMML can reside only in the node.) Multiple address entries are allowed.

NUMBER OF CHANNELS

A number from *16* to *507* that specifies the total number of user channels for the module. The number specified must equal, or exceed, the total number of SAM ports supported, plus eight channels per SAM. For example: to support *n* ports distributed among *m* SAMs, specify [n+(m*8)] channels.

SOFTWARE VERSION

A string of 1 to 14 or characters specifying the **SOFTWARE VERSION** filename to be downloaded to the module. If **DOWNLOAD SERVER** is *controller,* the default is *standard*. If **DOWNLOAD SERVER** is not *controller,* enter the filename of the valid software release.

Prompted Entry: Entering SAMML Information

```
CC0> enter
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
COMMENT [up to 60 chars double quoted]:
"in 60"
DOWNLOAD SERVER [+(controller)]: +
SOFTWARE VERSION [+(standard)]: +
NUMBER OF CHANNELS [16-507: +(128)]: 507
MODULE ADDRESS:   Delete
CC0>
```

remove samml

The **remove samml** command enables you to take SAMML modules out of service.   Removing a SAMML from service puts any connected, in-service SAM component into the ready-for-service state.   All in-progress calls on connected SAMs are terminated.

Syntax

You can input **remove samml** in prompted or one-line entry.

```
CC0> remove
OBJECTS [...samml...]: samml
MODULE ADDRESS:
```

Parameters

Refer to the parameter definition supplied in **enter sam**.

Prompted Entry: Removing a SAMML from Service

```
CC0> remove
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
CC0>
```

One-Line Entry: Removing a SAMML from Service

```
CC0> remove samml 60
```

restore samml

The **restore samml** command enables you to bring SAMML modules into service for the first time or to bring them into service after they have been taken out of service manually (via **remove samml**) or automatically (by the system).   Once a SAMML is restored, all connected SAMs that were in the ready-for-service state are brought into service.   And consequently, all SAM boards and ports that were in the ready-for-service state are also restored to service.

Syntax

You can input **restore samml** in prompted or one-line entry.   To have module downloading execute as a background process, press Delete only after the module download has started.   Pressing Delete during the prompting sequence terminates the command process.

```
CC0> restore OBJECTS [...samml...]: samml MODULE ADDRESS:
```

Parameters

Refer to the parameter definition supplied in **enter sam**.

Prompted Entry: Restoring a SAMML to Service

```
CC0> restore
OBJECTS [...samml...]: samml
MODULE ADDRESS: 60
<system responses>
```

One-Line Entry/Output: Restoring a SAMML to Service

```
CC0> restore samml 60
Download in progress for module 60.
All downloads in progress.  Hit <DEL>
to put process in background.
All downloads started will proceed in the background.
Download proceeding > > >   Delete
CC0>
```

verify samml

The output of the **verify samml** command enables you to check existing database information for a SAMML. The top portion of the output furnishes you with SAMML module information that reflects data supplied through SAMML commands only. If SAMML ports have not been entered with the SAM command, the report indicates **NO PORTS CONFIGURED.** Once SAMML ports have been entered, the bottom portion of the report shows information regarding any connecting port. (Refer to the following output.)

Syntax

You can input **verify samml** in prompted or one-line entry.

```
CC0> verify
OBJECTS [...samml...]: samml
MODULE ADDRESS [+(all)]:
```

Parameters

Except for being able to specify the word *all*, meaning every SAMML module, the **MODULE ADDRESS** parameter definition for **verify samml** is the same as that for **enter samml**.

Prompted Entry: Verifying SAMML Information

```
CC0> verify
OBJECTS [...samml...]: samml
MODULE ADDRESS [+(all)]: 60
<report output>
```

One-Line Entry/Output: Verifying SAMML Information (SAM Ports Not Configured)

```
CC0> verify samml 60
    <yy-mm-dd hh:mm:ss NODE=<name>
M  verify samml 60
   MODULE ADDRESS: 60
   MODULE TYPE: samml                NCHLS: 507
   SERVICE STATE: out (manual)
   DOWNLOAD SERVER: controller
   VERSION: standard
   COMMENT: SAM entered
   NO PORTS CONFIGURED
CC0>
```

One-Line Entry/Output: Verifying SAMML Information (SAM Ports Configured)

```
CC0> verify samml 60
    <yy-mm-dd hh:mm:ss NODE=<name>
M  verify samml 60
    MODULE ADDRESS: 60
    MODULE TYPE: samml                 NCHLS: 500
    SERVICE STATE: out (manual)
    DOWNLOAD SERVER: controller
    VERSION: standard
    COMMENT: SAM entered

    PORT  TYPE             CHNLS   RANGE    SPEED    SRVC
      1   sam64  (dual)     40     5-44     9600     out
      2   sam64  (dual)                     9600     out
    PORT  COMMENT
      1   samml connected at 60
      2
CC0>
```

Report Fields

This table correlates each report field heading shown in the output of **verify samml** with the parameter for which you are prompted in **enter samml** or **change samml**.   The information beneath each report field heading reflects the parameter option specified in either command.   An *N/A* indicates that the parameter is *not applicable* or *not used*.

Report Field Name	Corresponding Parameter Name
*CHNLS	None: number of channels assigned to the port
COMMENT	**COMMENT**
*COMMENT	None: comments regarding the SAM module
DOWNLOAD SERVER	**DOWNLOAD SERVER**
MODULE ADDRESS	**MODULE ADDRESS**
MODULE TYPE	None: type of module entered
NCHLS	**NUMBER OF USER CHANNELS**
*PORT	None: port number on the SAM module
*RANGE	None: range of channels assigned to the port
SERVICE STATE	None: module service state
*SPEED	None: trunk speed
*SRVC	None: service state of the port which is *in, out*, or *disabled*
*TYPE	None: type of SAM module attached to the port
VERSION	**SOFTWARE VERSION**
* Parameter is not specified with any SAMML command; specified via SAM commands.	

diagnose samtrk

The **diagnose samtrk** command enables you to initiate loopback diagnostics for a SAM module connected to the node by a Trunk-HS, Trunk-T1, SAMSL, or SAMML module.   Before **diagnose samtrk** can be executed, the SAM module must be entered in the database with **enter sam** and be out of service.   For SAM16s or SAM64s that are SAMML-connected with a dual link, the SAM16s or SAM64 can be in or out of service. However, the primary or secondary link of SAMDL must be disabled with **remove samtrk.**

Syntax

You can input **diagnose samtrk** in prompted or one-line entry.

```
CC0> diagnose
OBJECTS [...samtrk...]: samtrk
MODULE ADDRESS:
```
If module is "sam16" or "sam64" and is SAMML-connected with a dual link:
```
TRUNK [primary, secondary]:
```
For a "Trunk-HS":
```
TEST TYPE [local_trk, external_trk, remote_trk: +(local_trk)]:
```
For a "Trunk-T1":
```
TEST TYPE [local_trk, near_dsu, far_dsu,
  remote_trk: +(local_trk)]:
```
For a "SAMSL" or "SAMML":
```
TEST TYPE [near_dsu, far_dsu, remote_trk: +(remote_trk)]:

REPETITIONS [1-1000; 'c' for continuous: +(1)]:
```
If TEST TYPE is "external_trk":
```
INFO: Replace the fiber optic link connection on the I/O board with
      the loop-around connector.
```
If TEST TYPE is "near_dsu":
```
INFO: Place local digital service unit in loop-around mode.
```
If TEST TYPE is "far_dsu":
```
INFO: Place remote digital service unit in loop-around mode.
```
For SAMs that are not SAMML-connected with a dual link and if TEST TYPE is remote_trk:
```
WARNING: This test will fail if the SAM trunk module is not in reverse
         looping mode.

CONTINUE TESTING [yes, no +(yes)]:
```
Test results appear; command then loops to TEST TYPE prompt.

Parameters

CONTINUE TESTING[*]
> Specifies whether (*yes* or *no*) diagnostic testing should be continued.

MODULE ADDRESS
> A number that specifies the node slot that the trunk module, which provides connectivity to the SAM, occupies.   If the module is SAMML-connected, the appropriate SAMML port number must be appended to the address, separated by a period.   If the module is SAMML-connected with a dual link, the port number specified must be that of the primary port.

REPETITIONS*
Specifies whether the test is to be run *1* to *1000* times or if continuous testing (*c*) should occur.

TEST TYPE*
Specifies the test or option to be run.   Each diagnostic begins and ends at the local Control Computer.

- *local_trk*
  This test extends to the local Trunk-HS or Trunk-T1. It affects trunk service.
- *remote_trk*
  This test extends to the trunk module resident in the SAM cabinet—or for a SAM16, the resident (built-in) trunk function.   It tests the local Trunk-HS, Trunk-T1, SAMSL, or SAMML; the local and remote I/O interfaces; and transmission facilities. It affects service on the trunk circuit.   The remote trunk module must be in the loopback mode. For an out-of-service SAM16 connected via a dual link to the SAMML, loopback mode is effected by turning the power off and on.
- *external_trk*
  This test extends through the local Trunk-HS fiber optic interface.   It tests the local Trunk-HS and the local fiber optic interface.   It affects service on the trunk circuit. The fiber optic link connection on the I/O distribution board (IODB) must be replaced with a special fiber optic loop-around connector.
- *near_dsu*
  This test extends through the local Trunk-T1, SAMSL, or SAMML to the local digital service unit (DSU). It tests the local trunk module, the I/O distribution board, and the transmission facilities to the local DSU. It affects service on the trunk module circuit. The local DSU must be in loopback mode.
- *far_dsu*
  This test extends through the local Trunk-T1, SAMSL, or SAMML, local DSU, and remote DSU. It tests the local trunk module, local I/O distribution board, and transmission facilities, including the local DSU to the remote DSU. It affects service on the trunk module circuit. The remote DSU must be in loopback mode.

TRUNK
If the module is SAMML-connected with a dual link, specifies whether the link to be tested is the *primary* or *secondary*. (If the SAM is in service, the system confirms that the trunk is disabled. If the trunk is not disabled, it issues an **INPUT ERROR.**)

---

*   The SAM64 is out of service and the designated trunk is disabled.

Prompted Entry: Diagnosing a SAMML-Connected SAM64.*

```
CCO>  diagnose
OBJECTS  [ ...samtrk...]:  samtrk
MODULE ADDRESS:  60.1
TRUNK [primary, secondary]:  primary
TEST TYPE  [near_dsu, far_dsu, remote_trk:  +(remote_trk)]:  +
REPETITIONS  [1-1000];  'c'  for continuous:  +(1)]:  +

    <yy-mm-dd hh:mm:ss NODE=<name>
M  diagnose samtrk 60.1 primary remote_trk 1
   0 Errors in 1000 Transmissions
   LOOP-AROUND DIAGNOSTIC SUCCEEDED

TEST TYPE  [near_dsu, far_dsu, remote_trk:  +(remote_trk)]:  <DEL>
CCO>
```

One-line Entry: Diagnosing a SAMML-connected SAM64.*

```
CCO>  diagnose samtrk 60.1 primary + +
```

---

*   The SAM64 is out of service and the designated trunk is disabled.

remove samtrk

So diagnostics can be run, the **remove samtrk** command enables you to take one link of the SAMDL or one link of the integrated trunk function in the SAM16 out of service. The SAM16 or the SAM64 and the other link must be in service.

Syntax

You can input **remove samtrk** in prompted or one-line entry.

```
CC0> remove
OBJECTS [...samtrk...]: samtrk
```

If the SAM16 or SAM64 is SAMML-connected with a dual link:

```
MODULE ADDRESS:
TRUNK [primary, secondary]:
```

Parameters

MODULE ADDRESS

A number that specifies the node slot that the trunk module, which provides connectivity to the SAM16 or SAM64, occupies. The port number of the primary SAMML port number must be appended to the address, separated by a period.

Prompted Entry: Removing the Primary Dual-Link SAMTRK from Service.

```
CC0> remove
OBJECTS [...samtrk...]: samtrk
MODULE ADDRESS: 60.1
TRUNK [primary, secondary]: primary
CC0>
```

One-Line Entry: Removing the Primary Dual-Link SAMTRK from Service.

```
CC0> remove samtrk 60.1 primary
```

restore samtrk

The **restore samtrk** command enables you to put both links of the SAMDL back into service providing the SAM64 is in service or you can put the integrated trunk function of the SAM16 into service providing the SAM16 is in service.

Syntax

You can input **restore samtrk** in prompted or one-line entry.

```
CC0> restore
OBJECTS [...samtrk...]: samtrk
```

If the SAM16 or SAM64 is SAMML-connected with a dual link:

```
MODULE ADDRESS:
TRUNK [primary, secondary]:
```

Parameters

MODULE ADDRESS

A number that specifies the node slot that the trunk module, which provides connectivity to the SAM16 or SAM64, occupies. The port number of the primary SAMML port number must be appended to the address, separated by a period.

Prompted Entry: Restoring the Primary Dual-Link SAMTRK to Service.

```
CC0> restore
OBJECTS [...samtrk...]: samtrk
MODULE ADDRESS: 60.1
TRUNK [primary, secondary]: primary
CC0>
```

One-Line Entry: Restoring the Primary Dual-Link SAMTRK to Service.

```
CC0> restore samtrk 60.1 primary
```

display eia

The **display eia** command enables you to display the Electronic Industries Association (EIA) RS-232-C or RS-422 leads status for asynchronous SAM ports. (Leads cannot be displayed for synchronous SAM ports.) For modules using EIA RS-232-C leads, the display shows the DTR (data terminal ready) or DCD (data carrier detect) and RTS (request to send) or CTS (clear to send) lead states. For modules using EIA RS-422 leads, the display shows the RR (receiver ready) and TR (terminal ready) for each channel.

When displaying leads status for asynchronous SAM ports, the port can be in or out of service; the SAM module and board must be in service.

A warning message indicating that normal data transfer might be interrupted is issued when the report is requested for in-service ports. If a module is using EIA RS-232-C leads and its port is out of service, DCD is lowered, the options are reset to all defaults, DCD is then raised and the lead status is requested at this time. If module ports are in service, DCD or options are not changed. The lead status is requested with no attempt to alter them.

This section is supplemented by material in **Appendix B**.

Syntax

You can input **display eia** in prompted or one-line entry.

```
CC0> display
OBJECTS [...eia...]: eia
MODULE ADDRESS:
```

For a SAM16:
```
BOARD ADDRESS [1: +(1)]:
PORT NUMBER [1-16: +(1-16)]:
```

For a SAM64:
```
BOARD ADDRESS [1-2: +(1-2)]:
PORT NUMBER [1-32: +(1-32)]:
```

For a SAM504:
```
BOARD ADDRESS [1-16: +(1-16)]:
```
If BOARD ADDRESS is 1-15:
```
PORT NUMBER [1-32: +(1-32)]:
```
If BOARD ADDRESS is 16 and module is not SAMML-connected:
```
PORT NUMBER [1-24: +(1-24)]:
```
If BOARD ADDRESS is 16 and module is SAMML-connected:
```
PORT NUMBER [1-19: +(1-19)]:
```

If the SAM port is in service:
```
WARNING: Specified ports are in service; normal data transfer may be disrupted.
CONTINUE [yes, no: +(no)]:
```

Parameters

This section contains explanations of parameters used in the **display eia** prompting sequence that differ from those used in **enter sam**. Refer to **enter sam** for explanations of MODULE ADDRESS, PORT NUMBER, and CONTINUE. Refer to Syntax for the prompting sequence, system defaults, and parameter options.

`BOARD ADDRESS`

>   A number from *1* to *16* identifying the address of the board.   For a SAM16, the address is *1*; for a SAM64, the address range is *1* to *2*; for a SAM504, the address range is *1* to *16*.

>   For a SAM16, port numbers are designated *1* to *16*.   For a SAM64, port numbers are designated *1* to *32*.   For a SAM504, port numbers are designated *1* to *32* if the board address is 1 to 15; *1* to *24* if the board address is 16; and the module is not SAMML-connected; or *1* to *19* if the board address is 16 and the module is SAMML-connected.

>   Multiple port number entries are allowed.   (All ports must be in the same service state.)

Prompted Entry: Displaying EIA Lead Status

```
CC0> display
OBJECTS [...eia...]: eia
MODULE ADDRESS: 60.1
BOARD ADDRESS [1-2: +(1-2)]: 1
PORT NUMBER [1-32: +(1-32)]: 1-3
WARNING: Specified ports are in service; normal data transfer may be disrupted.
CONTINUE [yes, no: +(no)]: yes
<report output>
```

One-line Entry/Output: Displaying EIA Lead Status

```
CC0> display eia 60.1 1 1-3
WARNING: Specified ports are in service; normal data transfer may be disrupted.
CONTINUE [yes, no: +(no)]: yes
     <yy-mm-dd hh:mm:ss NODE=<name>
M  display eia 60.1 1 1-3
                              MOD EIA LEADS      DEV EIA LEADS
MOD      BOARD    PORT   TYPE  DCD-DTR  CTS-RTS  DCD-DTR  CTS-RTS
60.1      1        1     SAM     ON       ON       ON       ON
60.1      1        2     SAM     ON       ON      OFF      OFF
60.1      1        3     SAM     ON       ON       ON      OFF
CC0>
```

Report Fields

The display shows the module address, board number, port number, and module type. The leads shown under the heading `MOD EIA LEADS` are the output of the node module; those leads under the `DEV EIA LEADS` are the output of the user device connected to the port.

For SAMs using EIA RS-232-C leads, the display shows the DTR or the DCD lead state and the RTS or CTS lead state. Only one state, *ON* or *OFF*, is shown under each heading. How *ON* or *OFF* should be interpreted depends on whether the port or device is configured to be a DTE or DCE. DTE or DCE behavior depends on the type of cabling and device connected to the port. Cable type is a configurable option.

When a port or device acts like a DCE, the module or device controls DCD and CTS. When a port or device acts like a DTE, the module or device controls DTR and RTS.

If the module controls the lead, that lead status appears under the `MOD EIA LEADS` heading; otherwise, the device controls it and it appears under the heading `DEV EIA LEADS.`

NOTE: This command output shows the inputs/outputs of the device to which the module is attached from a SAM perspective. It shows what EIA lead signals the SAM last sent and what EIA lead signals the device last sent. As such, an apparent inconsistency in report output results when using a physical line monitor.

`CTS`

If SAM ports with connector type *dte* are connected to a DCE, the device raises and lowers CTS. CTS is an output signal from the DCE device to the DTE port. It appears under the `DEV EIA LEADS` heading under the `CTS-RTS` column.

If SAM ports with connector type *dce* are acting like a DCE, the module controls the CTS lead. CTS is an output signal from the port. It appears under the `MOD EIA LEADS` heading under the `CTS-RTS` column.

`DCD`

If SAM ports with connector type *dte* are connected to a DCE, the device raises and lowers DCD. DCD is an output signal from the DCE device to the DTE port. It appears under the `DEV EIA LEADS` heading under the `DCD-DTR` column.

If SAM ports with connector type *dce* are acting like a DCE, the module controls the DCD lead. DCD is an output signal from the port. It appears under the `MOD EIA LEADS` heading under the `DCD-DTR` column.

Parameters *(continued)*

`DTR`

> If SAM ports with connector type *dte* are acting like a DTE, the module raises and lowers DTR.   DTR is an output signal from the port to the device.   It appears under the **MOD EIA LEADS** heading under the **DCD-DTR** column.

> If SAM ports with connector type *dce* are connected to a DTE, the device raises and lowers DTR.   DTR is an output signal from the DTE device.   It appears under the **DEV EIA LEADS** heading under the **DCD-DTR** column.

`RR`

> An RS-422 lead that indicates receiver ready.   It is similar to DCD for RS-232-C interfaces.

`RTS`

> If SAM ports with connector type *dte* are acting like a DTE, the module raises and lowers RTS.   RTS is an output signal from the port to the device.   It appears under the **MOD EIA LEADS** heading under the **CTS-RTS** column.

> If SAM ports with connector type *dce* are connected to a DTE, the device raises and lowers RTS.   RTS is an output signal from the DTE device.   It appears under the **DEV EIA LEADS** heading under the **CTS-RTS** column.

`TR`

> An RS-422 lead that indicates terminal ready.   It is similar to DTR for RS-232-C interfaces.

Appendix A.
SAM Database Entry Forms

Appendix A contains sample database entry forms. These forms give prompts that appear when **enter** commands are used, and the possible values (or range of values) that can be entered in response to the prompts. Default values are shown in *italics*.

FORM A-1. Entering a SAMML

MODULE ADDRESS				
COMMENT [up to 60 chars double-quoted, *none*]				
DOWNLOAD SERVER [*controller*]				
If DOWNLOAD SERVER is *controller*: **SOFTWARE VERSION** [*standard*]				
If DOWNLOAD SERVER is not *controller*: **SOFTWARE VERSION**				
NUMBER OF CHANNELS [16-507, *128*]				

Values in *italics* are defaults.

FORM A-2. Entering a SAM Connected to a SAMML

COMPONENT [module, board, port]	module	module	module	module
MODULE ADDRESS				
COMMENT [up to 60 chars double-quoted]				
TYPE [sam16, sam64, sam504]				
DOWNLOAD SERVER [*controller*]				
If DOWNLOAD SERVER is a *controller*: **SOFTWARE VERSION** [*standard*]				
If DOWNLOAD SERVER is not *controller*: **SOFTWARE VERSION**				
If TYPE is *sam64*: **TOTAL NUMBER OF BOARDS** [1-2]				
If TYPE is *sam504*: **TOTAL NUMBER OF BOARDS** [1-16]				
If TYPE is *sam16* or *sam64*: **TRUNK CONNECTION** [dual, *single*]				
If TRUNK CONNECTION is *dual*: **TRUNK SPEED** [*9600*, 19200]				
If TRUNK CONNECTION is *dual*: **SECONDS BEFORE** **CALL DISCONNECT** **TO TRUNK FAILURE** [20-420, *50*]				

Values in *italics* are defaults.

FORM A-2. **Entering a SAM Connected to a SAMML** (continued)

If TRUNK CONNECTION is *dual*: **PRIMARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)** [1-254, *15*]				
If TRUNK CONNECTION is *dual*: **SECONDARY CRC ALARM THRESHOLD (ERRORED SECONDS PER 5 MINUTES)** [1-254, *15*]				
If TRUNK CONNECTION is *dual*: **PRIMARY FAILURE DECLARATION THRESHOLD (SECONDS)** [2-40, *4*]				
If TRUNK CONNECTION is *dual*: **SECONDARY FAILURE DECLARATION THRESHOLD (SECONDS)** [2-40, *4*]				
If TRUNK CONNECTION is *dual*: **PRIMARY RECOVERY DECLARATION THRESHOLD (SECONDS)** [10-180, *20*]				
If TRUNK CONNECTION is *dual*: **SECONDARY RECOVERY DECLARATION THRESHOLD (SECONDS)** [10-180, *20*]				
If TRUNK CONNECTION is *single*: **TRUNK SPEED** [1200, 2400, 4800, *9600*, 19200, 48k, 56k, 64k]				

Values in *italics* are defaults.

FORM A-2. Entering a SAM Connected to a SAMML (continued)

If TRUNK CONNECTION is *single*: **CRC ALARM THRESHOLD (ERRORED IN SECONDS PER 5 MINUTES)** [1-254, *15*]				
If SAMML is out of service: **INITIAL SERVICE STATE** [in, out]				
If TRUNK TYPE is a wire *t1, samsl,* or *samml* with TRUNK CONNECTION *single*: **SECONDS BEFORE CALL DISCONNECT DUE TO TRUNK FAILURE** [20-420 (10 second intervals), *50*]				

Values in *italics* are defaults.

FORM A-3. Entering a SAM Connected to a Trunk-T1, Trunk-HS, or SAMSL

COMPONENT [module, board, port]	module	module	module	module
MODULE ADDRESS				
COMMENT [up to 60 chars double-quoted, *none*]				
TYPE [sam16, sam64, sam504]				
DOWNLOAD SERVER [*controller*]				
If DOWNLOAD SERVER is a *controller*: **SOFTWARE VERSION** [*standard*]				
If DOWNLOAD SERVER is not *controller*: **SOFTWARE VERSION**				
If TYPE is *sam64*: **TOTAL NUMBER OF BOARDS** [1-2]				
If TYPE is *sam504*: **TOTAL NUMBER OF BOARDS** [1-16]				
If TYPE is *sam64* or *sam504*: **TRUNK TYPE** [hs, samsl, t1]				
If TRUNK TYPE is *samsl*: **TRUNK SPEED** [9600, 19200, 48k, *56k*, 64k]				
If TRUNK TYPE is *t1*: **TRUNK SPEED** [56k, 64k, 128k, 192k, 256k, 320k, 384k, 448k, 512k, 576k, 640k, 704k, 768k, 832k, 896k, 960k, 1.024M, 1.088M, 1.152M, 1.216M, 1.280M, 1.344M, 1.408M, 1.472M, *1.544M*, 2.048M]				

_____

Values in *italics* are defaults.

FORM A-4. Entering a SAM Board

COMPONENT [module, board, port]	board	board	board	board
MODULE ADDRESS				
If TYPE is *sam504*: **BOARD ADDRESS** [*1-16*]				
If TYPE is *sam64*: **BOARD ADDRESS** [*1-2*]				
If TYPE is *sam16*: **BOARD ADDRESS** [*1*]				
BOARD SOFTWARE VERSION [custom, *standard*]				
If attached module is out of service: **INITIAL SERVICE STATE** [in, *out*]				

Values in *italics* are defaults.

FORM A-5. Entering a SAM Asynchronous Port for Modem, Two-way, or Terminal Service

COMPONENT [module, board, port]	port	port	port	port
MODULE ADDRESS				
BOARD ADDRESS [1-16]				
For SAM504, if BOARD ADDRESS is *1-15*: **PORT NUMBER** [*1-32*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is SAMML-connected: **PORT NUMBER** [*1-19*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is *not* SAMML-connected: **PORT NUMBER** [*1-24*]				
For SAM64, if BOARD ADDRESS is *1-2*: **PORT NUMBER** [*1-32*]				
For SAM16: **PORT NUMBER** [*1-16*]				
COMMENT [up to 60 chars double-quoted, *none*]				
PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]	async	async	async	async

---

Values in *italics* are defaults.

FORM A-5. **Entering a SAM Asynchronous Port for Modem, Two-way, or Terminal Service** (continued)

SERVICE TYPE [console, host, modem, 2way, *terminal*]	modem__ 2way__ terminal__	modem__ 2way__ terminal__	modem__ 2way__ terminal__	modem__ 2way__ terminal__
GROUP [up to 8 chars]				
PREDEFINED DESTINATION [*none*]				
CABLE TYPE [*dce*, dte]				
BAUD RATE [75, 110, 150, 300, 1200, 2400, 4800, 9600, 14400, 19200, *auto*]				
If SERVICE TYPE is *2way* and BAUD RATE is *auto*: **RCV BAUD RATE** [75, 110, 150, 300, 1200, 2400, 4800, *9600*, 14400, 19200]				
PARITY [even, odd, *off*]				
FLOW CONTROL OF SAM **BY DEVICE** [xon/xoff, eia, *none*]				
FLOW CONTROL OF DEVICE **BY SAM** [xon_xoff, eia, *none*]				
NODE ECHOES USER INPUT [*yes,* no]				
CALL HOLD [on, *off*]				
AT&T VDM ON THIS PORT [yes, *no*]				

Values in *italics* are defaults.

FORM A-5. Entering a SAM Asynchronous Port for Modem, Two-way, or Terminal Service (continued)

If FLOW CONTROL BY DEVICE is *xon/xoff*: **XANY: ANY CHAR FROM DEVICE XONS DATAKIT** [on, *off*]				
PERMANENTLY ACTIVATED PORT [yes, *no*]				
CONNECT-TIME BILLING [on, *off*]				
ATTENTION CHARACTER [none, 1 brk, *2brk,* del, a character]				
If an attention character is entered: **ATTENTION ACTION** [disconnect, *command mode*]				
If PARITY is *odd* or *even*: **BITS PER CHARACTER** [5, 6, *7*, 8]				
If PARITY is *off*: **BITS PER CHARACTER** [5, 6, 7, *8*]				
If BAUD RATE is less than or equal to 110: **NUMBER OF STOP BITS** [1, *2*]				
If BAUD RATE is greater than or equal to 300: **NUMBER OF STOP BITS** [*1*, 2]				
If attached board is out of service or ready for service: **INITIAL SERVICE STATE** [in, *out*]				

Values in *italics* are defaults.

FORM A-5. Entering a SAM Asynchronous Port for Modem, Two-way, or Terminal Service (continued)

If configuring range or list of ports: **PORT FOR EPN/CUG ASSIGNMENT** Enter a port in the range or list of ports entered at the PORT NUMBER prompt.				
For a single port: **ENDPOINT NUMBER OR RANGE** [0000-9999, *none*]				
CLOSED USER GROUP PROFILE ID [up to 8 chars, *none*]				

Values in *italics* are defaults.

FORM A-6. **Entering a SAM Asynchronous Port for Console or Host Service**

COMPONENT [module, board, port]	port	port	port	port
MODULE ADDRESS				
BOARD ADDRESS [1-16]				
For SAM504, if BOARD ADDRESS is *1-15*: **PORT NUMBER** [*1-32*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is SAMML-connected: **PORT NUMBER** [*1-19*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is *not* SAMML-connected: **PORT NUMBER** [*1-24*]				
For SAM64, if BOARD ADDRESS is *1-2*: **PORT NUMBER** [*1-32*]				
For SAM16: **PORT NUMBER** [*1-16*]				
COMMENT [up to 60 chars double-quoted, *none*]				
PROTOCOL [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]	async	async	async	async
SERVICE TYPE [console, host, modem, 2way, *terminal*]	console__ host__	console__ host__	console__ host__	console__ host__

_____

Values in *italics* are defaults.

FORM A-6. Entering a SAM Asynchronous Port for Console or Host Service
(continued)

GROUP [up to 8 chars]				
CABLE TYPE [*dce*, dte]				
BAUD RATE [75, 110, 150, 300, 1200, 2400, 4800, *9600*, 14400, 19200]				
PARITY [even, odd, *off*]				
FLOW CONTROL OF SAM **BY DEVICE** [xon_xoff, eia, *none*]				
FLOW CONTROL OF DEVICE **BY SAM** [xon_xoff, eia, *none*]				
AT&T VDM ON THIS PORT [yes, *no*]				
PERMANENTLY ACTIVATED **PORT** [yes, *no*]				
If PARITY is *odd* or *even*: **BITS PER CHARACTER** [5, 6, *7*, 8]				
If PARITY is *off*: **BITS PER CHARACTER** [5, 6, 7, *8*]				
If BAUD RATE is less than or equal to 110: **NUMBER OF STOP BITS** [1, *2*]				
If BAUD RATE is greater than or equal to 300: **NUMBER OF STOP BITS** [*1*, 2]				

_____

Values in *italics* are defaults.

FORM A-6. Entering a SAM Asynchronous Port for Console or Host Service (continued)

If attached board is out of service or ready for service: **INITIAL SERVICE STATE** [in, *out*]				
If configuring range or list of ports: **PORT FOR EPN/CUG ASSIGNMENT** Enter a port in the range or list of ports entered at the PORT NUMBER prompt.				
For a single port: **ENDPOINT NUMBER OR RANGE** [0000-9999, *none*]				
If an endpoint number or range is entered: **CLOSED USER GROUP PROFILE ID** [up to 8 chars, *none*]				

Values in *italics* are defaults.

FORM A-7. Entering a SAM Synchronous/Custom Port for Terminal Service

COMPONENT [module, board, port]	port	port	port	port
MODULE ADDRESS				
BOARD ADDRESS [1-16]				
For SAM504, if BOARD ADDRESS is *1-15*: **PORT NUMBER** [*1-32*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is SAMML-connected: **PORT NUMBER** [*1-19*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is *not* SAMML-connected: **PORT NUMBER** [*1-24*]				
For SAM64, if BOARD ADDRESS is *1-2*: **PORT NUMBER** [*1-32*]				
For SAM16: **PORT NUMBER** [*1-16*]				
COMMENT [up to 60 chars double-quoted, *none*]				
If not custom: **PROTOCOL** [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]				
If PROTOCOL is *bisync*: **CODE SET** [ascii, *ebcdic*]				

Values in *italics* are defaults.

FORM A-7. Entering a SAM Synchronous/Custom Port for Terminal Service
(continued)

If PROTOCOL is *hdlc* or *sdlc*: **BUFFER FLUSHING** [enable, *disable*]				
SERVICE TYPE [host, *terminal*]	terminal	terminal	terminal	terminal
GROUP [up to 8 chars]				
PREDEFINED DESTINATION				
CABLE TYPE [*dce*, dte]				
If CABLE TYPE is *dce*: **BAUD RATE** [110, 300, 1200, 2400, 4800, *9600*]				
If CABLE TYPE is *dce*: **PARITY** [even, odd, *off*]				
If CODE SET is *ascii*: **ENABLE NRZI SIGNALING** [yes, *no*]				
If CABLE TYPE is *dte*: **AT&T VDM ON THIS PORT** [yes, *no*]				
BUILDOUT VALUE [1-254, *254*]				
PERMANENTLY ACTIVATED PORT [yes, *no*]				
CONNECT-TIME BILLING [on, *off*]				
If attached board is out of service or ready for service: **INITIAL SERVICE STATE** [in, *out*]				

_____

Values in *italics* are defaults.

FORM A-8. Entering a SAM Synchronous/Custom Port for Host Service

COMPONENT [module, board, port]	port	port	port	port
MODULE ADDRESS				
BOARD ADDRESS [1-16]				
For SAM504, if BOARD ADDRESS is *1-15*: **PORT NUMBER** [*1-32*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is SAMML-connected: **PORT NUMBER** [*1-19*]				
For SAM504, if BOARD ADDRESS is *16* and SAM is *not* SAMML-connected: **PORT NUMBER** [*1-24*]				
For SAM64, if BOARD ADDRESS is *1-2*: **PORT NUMBER** [*1-32*]				
For SAM16: **PORT NUMBER** [*1-16*]				
COMMENT [up to 60 chars double-quoted, *none*]				
If not custom: **PROTOCOL** [async, bisync, ddcmp, hdlc, sdlc, uscope, alc]				
If PROTOCOL is *bisync*: **CODE SET** [ascii, *ebcdic*]				

Values in *italics* are defaults.

FORM A-8. Entering a SAM Synchronous/Custom Port for Host Service (continued)

If PROTOCOL is *hdlc* or *sdlc*: **BUFFER FLUSHING** [enable, *disable*]				
If PROTOCOL is *sdlc*: **FILLING BETWEEN FRAMES** [mark, *flag*]				
SERVICE TYPE [host, *terminal*]	host	host	host	host
GROUP [up to 8 chars]				
CABLE TYPE [*dce*, dte]				
For SAM64 or SAM504, if CABLE TYPE is *dce*: **BAUD RATE** [110, 300, 1200, 2400, 4800, *9600*]				
For SAM16, if CABLETYPE is *dce*: **BAUD RATE** [110, 300, 1200, 2400, 4800, *9600*, 19200]				
If CODE SET is *ascii*: **PARITY** [even, odd, *off*]				
ENABLE NRZI SIGNALING [yes, *no*]				
If CABLE TYPE is *dte*: **AT&T VDM ON THIS PORT** [yes, *no*]				

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Values in *italics* are defaults.

FORM A-8. **Entering a SAM Synchronous/Custom Port for Host Service** (continued)

BUILDOUT VALUE [1-254, *254*]				
PERMANENTLY ACTIVATED PORT [yes, *no*]				
If attached board is out of service or ready for service: **INITIAL SERVICE STATE** [in, *out*]				

Values in *italics* are defaults.

Appendix B.
SAM EIA Lead States

This appendix explains the implications of EIA RS-232-C lead states when SAM service types are administered as *console, host, terminal, modem, dialer,* or *2way,* and flow control is administered as *eia*.

SAMs and the Host Interface

A host that connects to the node through a SAM module can be administered in the database as **SERVICE TYPE** *host* or *console*, depending on its use of EIA leads. A host that has been administered for *host* service allows connections to the host computer only when the DTR lead is up. A host that has been administered for *console* service allows connections to the host computer without regard to the DTR lead. The DTR lead is simply ignored. (This service is intended for three-wire host ports.) The following tables show SAM supported leads. The leads are designated from the host perspective, including the node cable specified for the application.

Hosts as Call Receivers

When a host is the call receiver, the node acts as a DCE. The supported RS-232-C leads from the call-receiving host perspective, including the node cable specified for the application, are shown in Table B-1 and Table B-2.

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TABLE B-1. **Supported Lead States for Host Interface**

RS-232-C Lead	Pin	Controlled By	Action
DTR	20	host	If DTR drops during a call, the call is taken down. For host service, this lead must be up for the node to accept a call to the host. For console service, the node accepts a call to the host regardless of the DTR state.
DCD	8	node	Asserts DCD to signal the start of a call; drops DCD at the end of a call.
DSR	6	node	Asserts DSR to signal start of call; drops DSR at the end of a call.

TABLE B-1. **Supported Lead States for Host Interface** (continued)

RS-232-C Lead	Pin	Controlled By	Action
RTS	4	host	Ignored unless EIA flow control is enabled. See Table B-5.
CTS	5	node	Follows DCD unless EIA flow control is enabled. See Table B-5.
TD	2		Carries data transmitted to node.
RD	3		Carries data received from node.

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TABLE B-2. **Supported Lead States for Host Interface (EIA Flow Control Enabled)**

RS-232-C Lead	Pin	Controlled By	Action
RTS	4	host	During a call, if RTS is up, the node can transmit data to the host. If down, the node cannot transmit data.
CTS	5	node	During a call, if CTS is up, then the host can transmit data to the node. If down, the host cannot transmit data.

SAMs and the Terminal Interface

A terminal that connects to the node through a SAM module can be administered in the database as **SERVICE TYPE** *terminal* or *2way*. A terminal administered for *terminal* service originates calls; a terminal administered for *2way* service can originate and receive calls.

Terminals as Call Originators

When a terminal is the call originator, the node acts as a DCE.   The terminal interface is administered for *terminal* service.   The supported RS-232-C leads, from the call-originating terminal perspective, including the node cable specified for the application, are shown in Table B-3 and Table B-4.

TABLE B-3. Supported Lead States for Terminal Interface

RS-232-C Lead	Pin	Controlled By	Action
DTR	20	terminal	If DTR drops during a call, the call is taken down. If DTR goes up, the node prompts for destination and sets up a circuit.
DCD	8	node	Asserts DCD all the time. On the recommended cord, DCD is strapped to DSR.
DSR	6	node	On the recommended cord, DCD is strapped to DSR.
RTS	4	terminal	Ignored unless EIA flow control is enabled. See Table B-7.
CTS	5	node	Asserts CTS all the time unless EIA flow control is enabled. See Table B-7.
TD	2		Carries data transmitted to node.
RD	3		Carries data received from node.

TABLE B-4. Supported Lead States for Terminal Interface (EIA Flow Control Enabled)

RS-232-C Lead	Pin	Controlled By	Action
RTS	4	terminal	During a call, if RTS is up, the node can transmit data to the terminal. If down, the node cannot transmit.
CTS	5	node	During a call, if CTS is up, then the terminal can transmit data to the node. If down, the terminal cannot transmit.

Terminals as Call Originators and Receivers

When a terminal is a call originator and receiver, the node acts as a DCE.   The terminal interface is administered for *2way* (two-way) service.   The supported RS-232-C leads from the terminal perspective, including the node cable specified for the application, are shown in Table B-5 and Table B-6.

TABLE B-5. Supported Lead States for Two-way Interface as a Call Receiver

RS-232-C Lead	Pin	Controlled By	Action
DTR	20	terminal	If DTR drops during a call, the call is taken down. Must be up for the port to accept or receive a call to the terminal.
DCD	8	node	Asserts DCD at the start of a call and drops it at the end of the call.
DSR	6	node	Asserts DSR to signal start of a call; drops DSR at the end of the call.
RTS	4	terminal	Ignored unless EIA flow control is enabled. See Table B-9.
CTS	5	node	Is asserted unless EIA flow control is enabled. See Table B-9.
TD	2		Carries data transmitted to the node.
RD	3		Carries data received from the node.

TABLE B-6. Supported Lead States for Two-way Interface as a Call Receiver (EIA Flow Control Enabled)

RS-232-C Lead	Pin	Controlled By	Action
RTS	4	terminal	During a call, if RTS is up, the node can transmit data to the terminal. If down, the node cannot transmit.
CTS	5	node	During a call, if CTS is up, the terminal can transmit data to the node. If down, the terminal cannot transmit.

Entry of a ⌜ Return ⌝ or an attention signal in receive mode from the connected end device switches the port to originate mode, which asserts DCD/RTS. If the connected end device cannot output data with DCD/RTS down, then it can never switch to originate mode.

SAMs and the Modem Interface

A modem that connects to the node through a SAM module can be administered in the database as **SERVICE TYPE** *modem, console,* or *dialer.*   Modem service is used when a modem originates calls to the node. Console service provides an interface to the modem so the user can dial out from the node.   Dialer service provides a more intelligent interface to the modem to insulate the user from the modem when using special modems to dial out from the node. A list of these modems can be found in the *System Description.*

Modems as Call Originators (Modem Service)

When a modem is a call originator, the node acts as a DTE. The modem is administered in the database as **SERVICE TYPE** *modem.* The supported RS-232-C leads from the call-originating modem perspective, including the node cable specified for the application, are shown in Table B-7 and Table B-8.

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TABLE B-7. Supported Lead States for Modem Interface (Call Originator)

RS-232-C Lead	Pin	Controlled By	Action
DTR	20	node	Keeps DTR up except after the end of a call.
			Lowers DTR shortly after the modem drops DCD, then asserts it after a two-second delay.
			Lowers DTR if the other end of a PDD connected through a modem hangs up. After two seconds, the node asserts DTR.
			Lowers DTR if the modem asserts DCD but does not transmit a dial string. After two minutes, the node drops DTR, waits two seconds, then reasserts DTR.
DCD	8	modem	When DCD is asserted, the node prompts for destination and sets up a circuit.
			If DCD is dropped during a call, the connection is taken down.
RTS	4	node	Follows DTR unless EIA flow control is enabled. See Table B-8.
CTS	5	modem	Ignored unless EIA flow control is enabled. See Table B-8.
TD	2		Carries data received from the node.
RD	3		Carries data transmitted to the node.

TABLE B-8. Supported Lead States for Modem Interface (Call Originator/EIA Flow Control Enabled)

RS-232-C Lead	Pin	Controlled By	Action
RTS	4	node	During a call, if RTS is up, the modem can transmit data to the node.
CTS	5	modem	During a call, if CTS is up, the node can transmit data to the modem.

Some modems assert DCD whenever they sense that DTR is asserted or they echo data transmitted to them by the node. This echoing can cause an infinite echo loop, waste Control Computer resources, and cause the alarm `REPORT FAILURE: Too Many Invalid Attempts` to be printed.   When the *Penril*® DATACOMM 300/1200 Modem (equipped with the automatic repertory dialer option) is administered for *modem* service, this problem occurs.

Modems as Call Receivers (Console Service)

When a modem is a call receiver, the node acts as a DTE. The modem is administered in the database as **SERVICE TYPE** *console*. The supported RS-232-C leads, from the call-receiving modem perspective, including the node cable specified for the application, are shown in Table B-9 and Table B-10.

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TABLE B-9. Supported Lead States for Modem Interface (Call Receiver)

RS-232-C Lead	Pin	Controlled By	Action
DTR	20	node	Raises DTR to signal the start of a call. Lowers DTR to signal the end of a call.
DCD	8	modem	Asserts DCD to transmit to the node.
RTS	4	node	Follows DTR unless EIA flow control is enabled. See Table B-10.
CTS	5	modem	Ignored unless EIA flow control is enabled. See Table B-10.
TD	2		Carries data received from the node.
RD	3		Carries data transmitted to the node.

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TABLE B-10. Supported Lead States for Modem Interface (Call Receiver/EIA Flow Control Enabled)

RS-232-C Lead	Pin	Controlled By	Action
RTS	4	node	During a call, if RTS is up, then the modem can transmit data to the node.
CTS	5	modem	During a call, if CTS is up, then the node can transmit data to the modem.

Console service can be administered for any intelligent modem that supports RS-232-C type connections. EIA flow control does not function with standard modems; but it does function with some statistical multiplexers and fiber optic multiplexers.

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