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DEFINITY® Communications System Generic 1, Generic 2, and Generic 3 V1 and V2

Integrated CSU Module Installation and Operation

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Contents

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These instructions describe procedures for field personnel to install and use the integrated channel service unit (ICSU) on Generic 1, Generic 2, and Generic 3 (Version 2 and earlier) systems. The integrated CSU is composed of the combination of a 120A CSU module and either a TN464E or TN767D or later suffix DS1 circuit pack. This CSU is called integrated because it acts as a part of the DS1 circuit pack as opposed to an external CSU which is independent of the DS1 circuit pack.

NOTE:
Throughout this document, the designation TN464E means any TN464E or future suffix TN464. Similarly, TN767D means any TN767D or future suffix TN767.

NOTE:
Throughout this document, the term integrated CSU module means the combination of a DS1 circuit pack and the 120A CSU module.

The 120A CSU module plugs into either a TN464E or TN767D DS1 circuit pack on the I/O connector panel on the back of the carrier. A modular cable plugs into the CSU module at one end and into a smart jack at the network interface on the other end. The integrated CSU module then performs the essential functions that the external ESF T1 CSU performs, but more reliably while using less equipment and space. The following figure depicts the 120A CSU module:

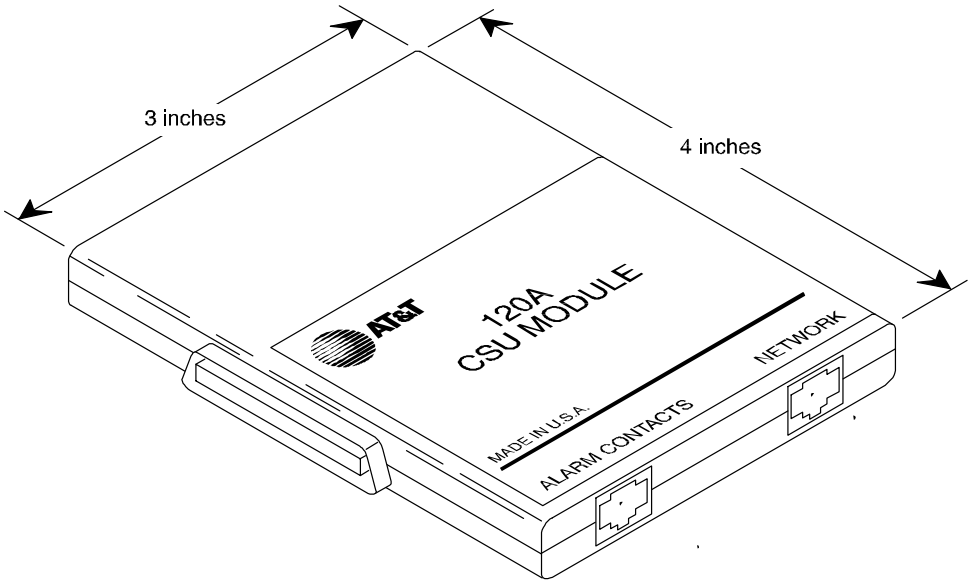

Figure 1. 120A CSU Module

In addition to supporting the 120A CSU module, the TN464E and TN767D support functions not present on previous circuit packs, including four alarm and status LEDs and six test jacks. These functions do not require any system software support and thus operate identically on any of the switching systems mentioned above. The TN464E and TN767D circuit packs can operate with either the 120A CSU module or with an external CSU such as the AT&T ESF T1 CSU.

Following are some of the advantages over an external CSU you can obtain by using the integrated CSU on the Generic 1, Generic 2, and Generic 3 Versions 1 and 2:

- Fewer cables are required. The 120A attaches directly to the 50 pin amphenol connector of its associated DS1 circuit pack on the rear of the cabinet. This eliminates the PBX-to-CSU cable along with the potential faults associated with it.
- The DS1 circuit pack automatically initializes and tests the 120A. This includes loop back testing at the equipment loop back point and the repeater loop back point.
- The DS1 circuit pack detects on-line alarms such as a loss of signal from the DS1 circuit pack.
- Connecting the switch to a network smart jack is much simpler.

- The test jacks, which are on the DS1 circuit pack's face plate, are more conveniently located and easier to access than those on external CSUs. This virtually eliminates problems associated with external CSUs. An example of a problem with external CSUs is the potential for confusing which CSU is connected to which DS1 circuit pack and then inadvertently looping the wrong CSU while trying to isolate a fault. This results in taking down an in-service T1 span and possibly taking down the entire switch if the CSU looped is the synchronization reference for the PBX!
- The LEDs indicating T1 span status and alarms, which are located on the DS1 circuit pack's face plate, are more conveniently located as opposed to those on an external CSU. Locating a faulty T1 span is as simple as opening the cabinet doors and looking for a red LED. A faulty 120A will also automatically be detected by DS1 circuit pack firmware.
- On G1 and G3 systems you can access certain performance counters associated with the DS1 facility through the switch's administration and maintenance terminal in the DS1 measurements screens and DS1 alarm reporting screens. These counters include errored second, severely errored second, bursty errored second, failed seconds, and slips. On G2 systems you can display errored seconds, misframes, and slips. Displaying these counters with an external CSU requires a separate PC connected to the external CSU's serial interface.
- The CSU function involves fewer parts and thus greater reliability when the CSU module is used. Now the functions that were formerly split across two processors, one on the DS1 circuit pack and one in the external CSU, are now handled by a single processor on the DS1 circuit pack.
- Product developers used input from field experts to help design the integrated CSU for easy installation and maintenance.
- The 120A typically consumes less than 1 watt of DC power as opposed to anywhere from 4 watts to 14 watts required by a stand-alone CSU.
- Because the switch powers the 120A, external power supplies and power distribution are not needed as they are with external CSUs.

120A CSU Module Description

The 120A CSU module connects to either a TN464E or a TN767D DS1 circuit pack on one end and to a network smart jack on the other end. In combination with the DS1 circuit pack it provides the essential functions that have historically been provided by the AT&T ESF T1 CSU and, before that, the AT&T 551 T1 CSU. These external CSUs, which have been the CSUs sold by AT&T for DS1 applications, are externally-mounted boxes that provide more functions than are typically needed by the TN464/767 circuit packs. This is because these functions are provided by switch administration options and supported by the circuit packs. For example, the ESF T1 CSU has switch settings allowing you to set either D4 or ESF framing and allowing you to set either AMI/ZCS or B8ZS line coding. You can administer both of these items in the switch, however, making these CSU options irrelevant. Thus, the 120A CSU module incorporates all the functions necessary to interface to the network smart jacks given the administration capabilities of the switches. In addition, the 120A CSU module is small, a little larger than a wallet. It is simpler to install than an externally mounted CSU and does not require any option switch settings.

The following list describes the important characteristics of the 120A CSU:

- The integrated CSU module meets all applicable FCC parts 15 and 68 requirements. It is also UL/CSA registered.
- The 120A is powered from the +5V DC port carrier power supply and uses a maximum of 1.2 Watts.
- The 120A works only with the DS1 interface (24 channel) on the TN464E and TN767D. The CEPT1 interface (32 channel) is not supported. It does not work with the TN574 DS1 converter circuit pack.
- The 120A works only with smart jack interfaces at the network interface and with no equipment (such as a multiplexer) between the 120A and the smart jack. Smart jacks are the 8-pin modular jacks that have become common for connecting to the T1 facility provider (commonly called the network or span). Not all network interfaces are equipped with smart jacks, however. In those cases, you cannot use the 120A. The reason for this is that the software versions on the switches covered in this document cannot change the CSU's default 0dB transmit line build out (LBO). Smart jacks are designed to interface to CSUs using 0dB LBO. Older network interfaces are not equipped for this, however. Thus, with an interface other than a smart jack, the distance to the nearest repeater might not be great enough to handle 0dB line build out which could result in overloading the repeater.
- The 12A passes framing, either D4 or ESF, transparently between the network and the customer's switch.

- The 120A passes line coding, either AMI/ZCS or B8ZS, transparently between the network and the customer's switch.
- The 120A contains two loop back circuits, one for testing wiring between the DS1 circuit pack and the CSU module and another for testing the data path through the CSU module. The TN464E and TN767D automatically use these loop backs to test the 120A during initialization diagnostics. Refer to figure 4 for more information on these loop backs. Also refer to the section *Integrated CSU Module Loop Back Capabilities*.
- The 120A provides an in-band bit-oriented loop back detector that automatically responds to CSU line loop back requests from the network.
- The 120A automatically loops the network side DS1 signal back to itself, without regenerating it, upon loss of power to the 120A.
- You can connect the 120A to external alarm equipment. A separate jack and cable are provided to connect to this equipment. The 120A contains a relay contact closure that will activate this equipment during DS1 facility alarms and excessive bit error rates.
- The 120A protects and isolates the customer's switch from secondary surges of up to 1500 Volts.
- The 120A meets all FCC and UL specifications.

120A CSU Module Settings

Since the 120A CSU module/DS1 circuit pack combination does not have any option settings, it has a set of default values corresponding to most of the possible values in the external ESF T1 CSU. The following table shows the functions available with an external ESF T1 CSU and the corresponding default settings for the 120A CSU module/DS1 circuit pack combination:

Table 1. 120A vs. ESF T1 CSU Comparison of Functions

	Function	AT&T ESF T1 CSU	120A
1.	Equalizer DTE-CSU Cable Length	0-655 ft.	0-133 ft.
2.	Action during line loop back	AIS or loop back to DTE	AIS to DTE

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	Function	AT&T ESF T1 CSU	120A
3.	Action during CSU equipment loop back	AIS to network or network loop back	Network loop back
4.	Power up options determination.	Via back panel switches or EPROM	The power up options are set by the DS1 circuit pack.
5.	Keep-alive	Loop network or AIS to network	Network loop back at the CSU module without regeneration when the DS1 circuit pack is unplugged or when LOS from DS1 circuit pack occurs.
6.	DTE framing	D4 or ESF	The 120A passes framing, either D4 or ESF, transparently between the network and the customer's switch.
7.	Span framing	D4 or ESF	The 120A passes framing, either D4 or ESF, transparently between the network and the customer's switch.
8.	Signal format to span	AMI or B8ZS	The 120A passes line coding, either AMI/ZCS or B8ZS, transparently between the network and the customer's switch.

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	Function	AT&T ESF T1 CSU	120A
9.	CRC-6 Network to DTE	passes or terminates/regenerates	passes
10.	CRC-6 DTE to Network	passes or terminates/regenerates	passes
11.	Density Enforcement	AT&T Technical Reference 62411&pre-1990 or pre-1990	AT&T Technical Reference 62411
12.	Send Perf. Report Msg.	Yes or No	No
13.	Modem or Autoconfig	1200 baud modem or Autoconfig	Set from switch administration terminal.

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	Function	AT&T ESF T1 CSU	120A
14.	Net Management Protocol	TABS or OSI	TABS protocol per AT&T Technical Reference 54016 for ESF data link. The ICSU will respond to any messages received over the ESF data link from the far-end as specified in AT&T Technical Reference 54016. The ICSU presently will not respond to any proprietary protocols used by other vendors. Performance information for the ICSU may be accessed in G1 and G3 using the **List Measurements DS1 Log** and **List Measurements DS1 Summary** SAT commands available in G1 software releases R1V4 and later and in all G3 software releases. In G2, the Errored Seconds count for a 3 hour interval may be accessed via Proc 625. Because the 120A is integrated with the DS1 circuit pack, the ICSU responds to TABS messages on all addresses (A, B, Y, Z and broadcast). When the 120A is not present, the DS1 circuit pack responds on addresses A, Z, and broadcast and an external CSU responds on addresses B, Y, and broadcast.

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	Function	AT&T ESF T1 CSU	120A
15.	Network to DTE Yellow Alarm	Disable or Enable	transparent
16.	BER Threshold	10^{-4} to 10^{-9}, Disable	10^{-4}
17.	Idle Code	All 1's or LAPD flags	Transparent to idle code from the switch (0111 1111)
18.	Latching Mode	Yes or No	No
19.	CSU Unit Number	1 to 255	Not supported
20.	Power	Dry Loop or Wet Loop	Dry Loop
21.	Transmit Line Build Out	0, -7.5, -15	0dB

Integrated CSU Module Loop Back Capabilities

The 120A contains two loop back circuits that the TN464E and TN767D automatically use to test the 120A during initialization diagnostics. If you want to loop back from transmit to receive at the network interface jack on the CSU module, you can make a loop back fixture as follows:

1. Cut a DW8A-DE cable about 6 inches from the connector.
2. Strip the insulation from the cut end of the cable.
3. Connect pin 1 (blue) to pin 4 (red) and connect pin 2 (orange) to pin 5 (green).
4. Plug the resulting cable into the network interface jack on the CSU module.
5. Observe the LEDs on the circuit pack and confirm all facility alarms clear after about 20 seconds.

On the versions of the switches covered in this document, you cannot activate the line loop back at the far end CSU manually (e.g., by flipping a switch). Instead, you must use external DS1 test equipment and the test jacks on the DS1 circuit pack to send loop up and loop down codes to the far end. The 120A responds to industry standard in band, bit oriented, line loop up (1 in 5) code, line loop down (1 in 3) code, and ESF data link TABS payload loop back control codes received from the span. Refer to figure 4 for further details on loop backs internal to the integrated CSU module.

NOTE:
On the status LEDs on the DS1 circuit pack face plate, loop back indications share the same LEDs as alarm indications. Thus, loop back indications take priority over alarm indications. Alarm indications shown while loop backs are active should be ignored. For example, if the status 2 LED is yellow, indicating a loop back, then status 3 and status 4 alarm indications should be ignored.

Installing the 120A CSU Module

Refer to the following figures and tables when installing the 120A CSU module. Installation instructions follow these figures and tables.

Table 2. Parts List

PEC	Description	Part	Code	Notes
63185/A	120A CSU Module			
		120A CSU Module	106606536	
		120A Installation and Operation Documentation	847107935	This is the document you are presently reading.
		120A CSU to Network Smart Jack Cable	H600-383 Group 1-6 ordered by attribute code.	Shipped loose with CSU. Six lengths are available as follows: Group 1 25 ft Group 2 50 ft (def) Group 3 75 ft Group 4 100 ft Group 5 125 ft Group 6 200 ft
65952/A	G2 Packet Adjunct Cable			This PEC is required when TN555 is used with TN767D on G2 systems. This is required on non NFAS ISDN PRI interfaces.
		PRI Connector	847214178	This is the bracket that holds the connector.
		Packet Adjunct DS1/CSU Cable Assembly	H600-411 G1	This is the Y cable that connects to the bracket and to the TN767D and TN555.

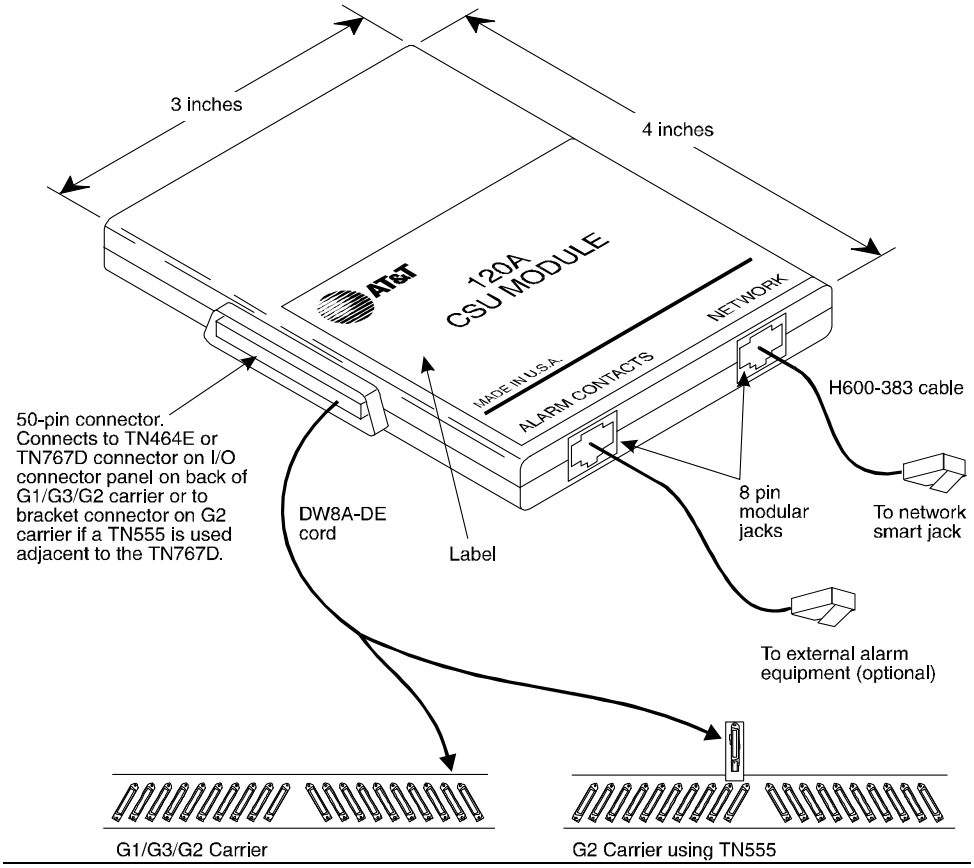


Figure 2. 120A CSU Module Installation

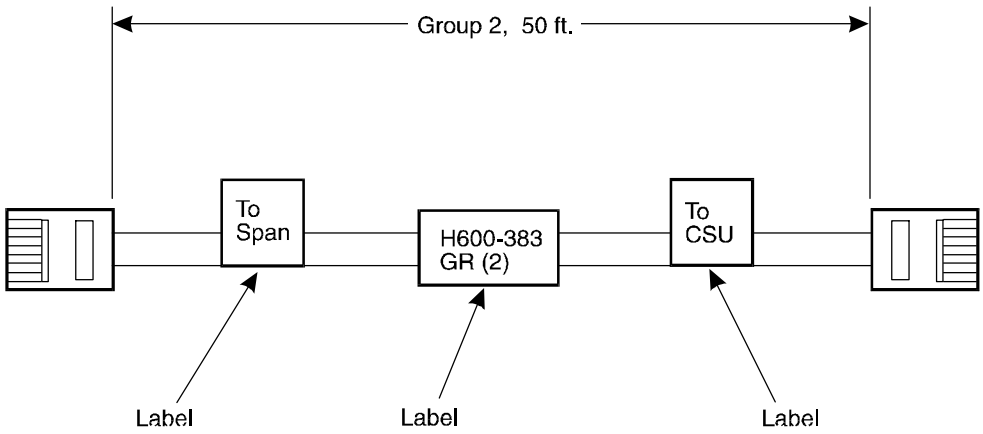


Figure 3. H600-383 CSU-to-Network Smart Jack Cable

Table 3. H600-383 Connector Pin Assignments

CI RCV (to CSU) (CI = Customer Interface)	R1	BK	1	1	BK	Line In 0	CSU RCV (to CSU)
	T1	Y	2	2	Y	Line In 1	
			3	3	Shield		
CI XMT (from CSU)	R	R	4	4	R	Line Out 0	CSU XMT (from CSU)
	T	G	5	5	G	Line Out 1	
			6	6	Shield		
Reserved			7	7			Reserved
Reserved			8	8			Reserved
Network Smart Jack End				CSU End			

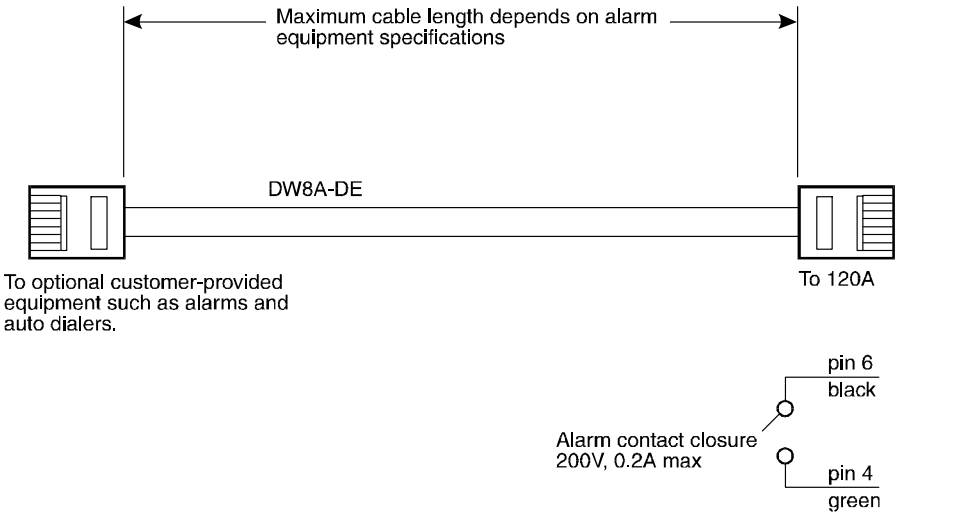


Figure 4. Alarm Equipment Cable

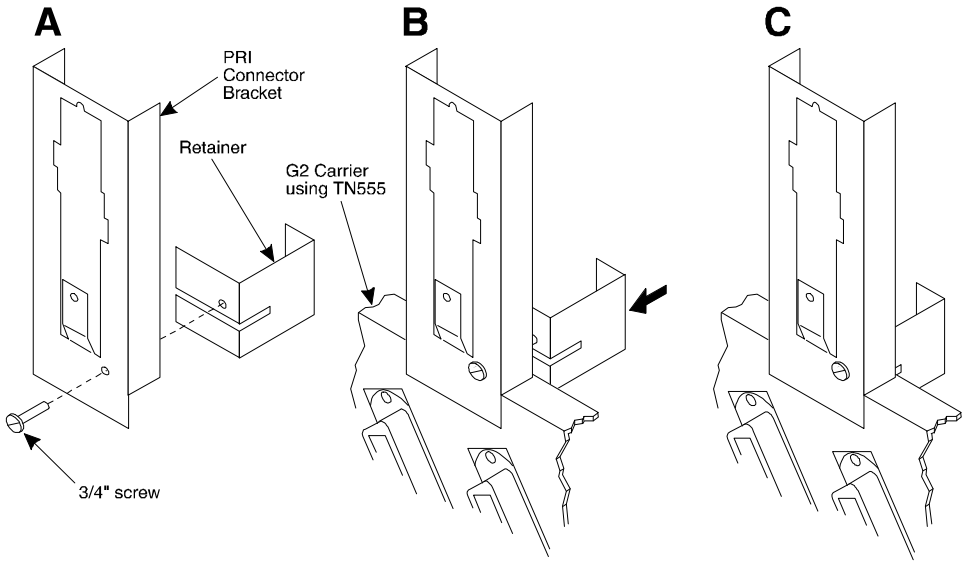
Installing the 120A Connector Bracket on a G2 System with TN555

Installing the 120A on a G2 system is the same as for a G1 or G3 system with the exception that the Y cable and bracket on the back of the carrier must also be installed if the TN767D has a TN555 packet adjunct circuit pack in the adjacent slot. The TN555 is required if the TN767D contains an ISDN PRI D channel. The bracket consists of two parts, the retainer and the PRI connector bracket. The retainer slides onto the edge of the connector panel from the inside. The PRI connector bracket is then connected to the retainer from the outside with a screw. This holds the entire assembly tightly in place anywhere along the edge of the connector panel. The Y cable then connects to the two ports and to the bracket. The CSU then connects to the Y cable connector attached to the bracket. Following are the instructions for installing this bracket and cable:

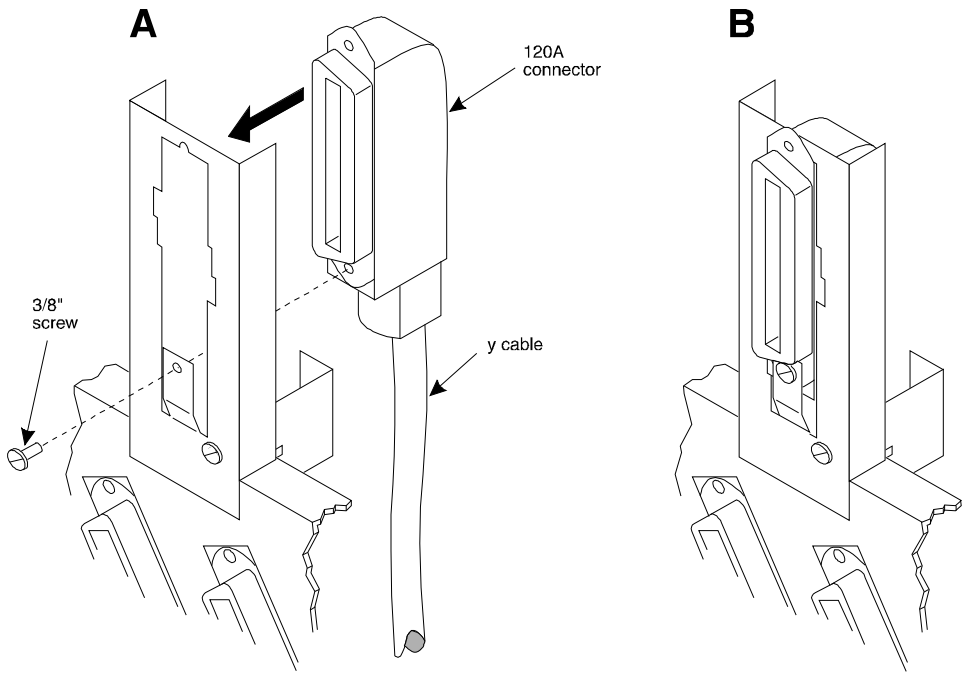
NOTE:
You must install the TN767 before installing TN555. The TN555 will not initialize if the TN767 is not present.

NOTE:
The following instructions show how to install the bracket above the connectors on the upper edge of the connector panel. You can also install the connector on the panel below the connectors. If installed above the connectors, the modular connectors on the CSU module will face up and the cables will exit toward the top of the cabinet. If you want these cables to exit downward, install the bracket on the lower edge of the connector panel. Also, if installed on the lower edge, you do not have to feed the Y cable inside the carrier.

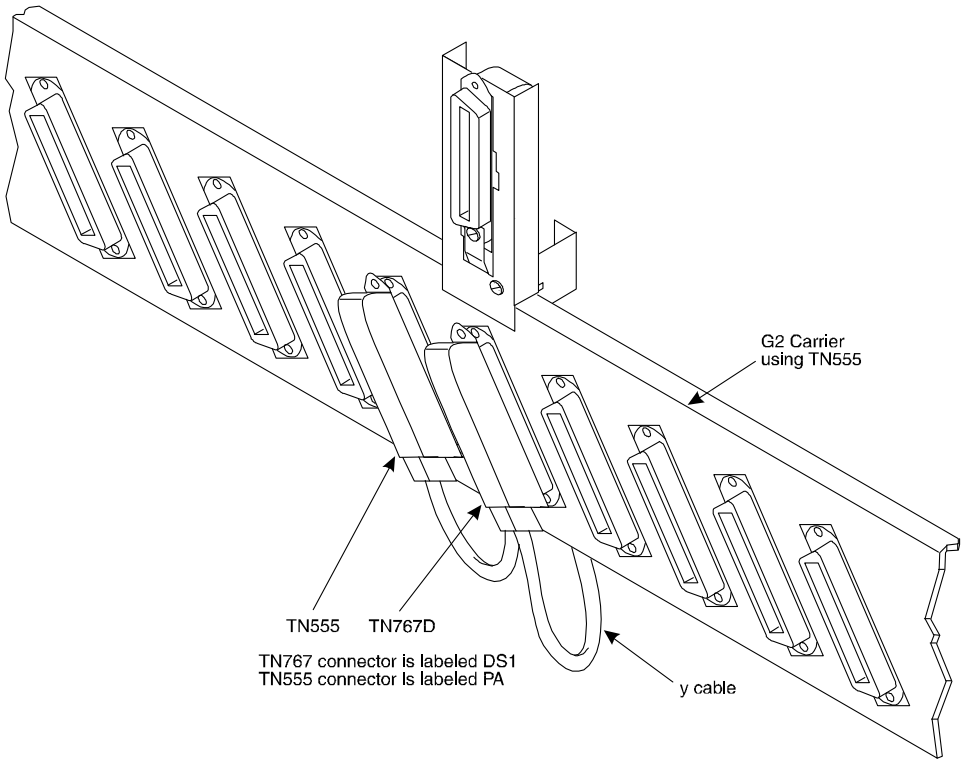
1. The following figure shows the steps to attach the bracket to the G2 carrier. Figure A shows the bracket and the retainer separately. Before starting the installation, you should attach the bracket to the retainer by just barely starting the 3/4" screw into the retainer. Next, slide the retainer onto the edge of the connector panel from the inside as shown in figure B. Position it roughly above the TN767D and TN555 connectors on the panel, although you can slide it to any position you want for convenience. When positioned where you want it, tighten the 3/4" screw. This will hold the bracket firmly in place on the connector panel as shown in figure C.



2. Feed the single connector end of the Y cable inside the connector panel and into the opening in the connector bracket as shown in the following figure. Make sure that the upper flange on the connector is all the way through the opening and rests against the bracket such that when you push on the connector it is stopped by the bracket. Fasten the connector to the bracket with the 3/8" screw:



3. Connect the Y cable to the TN767D and to the TN555 as shown in the figure below:



4. Attach the CSU module with a 4C retainer to the 50-pin connector on the connector bracket as described in the following section.

Installing the 120A CSU Module

CAUTION:
Before installing the 120A, observe the following cautions:

- Do not plug the 120A into any circuit pack other than a TN464E or TN767D or later release/vintage. Furthermore, make sure the DS1 circuit pack is optioned for 24 channel operation (1.544 Mbps). The CSU does not work with the 32 channel interface. This option is set both in administration and by a switch on the circuit pack.

- Do not touch the connector terminals on the 120A because the 120A can be damaged by static discharge.
- Do not touch the external alarm cable when it is connected to the 120A unless you are properly grounded. A solid state relay in the 120A might be damaged by static discharge.
- Do not connect the 120A to any interface other than a network smart jack. The 120A, in combination with the systems discussed in this document, does not support this capability.

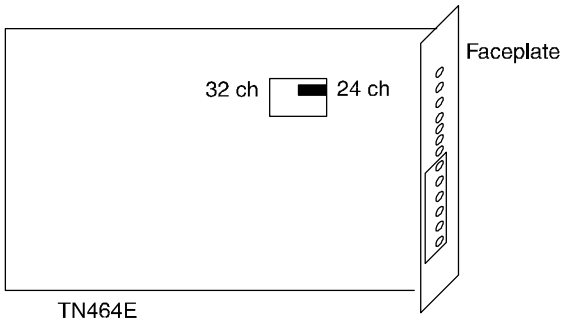
Following are the steps you should follow to install the 120A CSU Module:

NOTE:
If installing more than one ICSU in a G3VS all the DS1 circuit packs should be located either in slots 1 through 4 *or* in slots 5 through 10 but not in both. This reduces cable congestion on the rear of the switch. Placing DS1 boards in both slot ranges causes CSU modules to be in close proximity on the backplane and requires the CSU module-to-network interface cable to be bent at a sharp angle. This configuration will work but should be avoided.

1. Properly ground yourself.
2. Make sure the slot in which the DS1 circuit pack you are connecting to is empty (the circuit pack is unplugged).
3. Install a 4C retainer in the 50 pin plug associated with the DS1 circuit pack slot.
4. Plug the 120A's50 pin connector into the 50 pin plug associated with the DS1 circuit pack slot.
5. Secure the 4C retainer around the 120A.
6. Attach the H600-383 cable to the CSU and to the network smart jack. This cable is directional. You can determine the end that connects to the CSU module by doing a continuity test between pins 3 and 6. The end with this continuity is the CSU end. The shield is grounded only at the CSU end. You should use the cable provided. If you use cabling other than that provided with the 120A, observe the following guidelines:
   - For best results under normal circumstances, 24 gauge cable providing individually shielded, twisted pairs for transmit and receive signals should be used between the network interface and the CSU. The shields of this cable should be grounded only at the CSU end to avoid ground loops.
   - Cabling between the network interface and CSU can have no bridge taps.

- If attempting to use standard house riser cable for connections between the network interface and the CSU, a 100 pair separation should be maintained between the receive and transmit twisted pairs.
- If attempting to use standard house riser cable for connections between the network interface and the CSU, cross connects through type 66 or 110 cross connect blocks must be limited to a maximum of 2.
- Never use quad cable (untwisted two pair telephone cable) in a DS1 line.
- Avoid mixing wires of different gauges in a DS1 line.

7. If you are using external alarm equipment, attach a DW8 cable to the CSU and to the external equipment, providing strain relief at each end. The maximum length of this cable depends on the electrical specifications of the alarm equipment.
8. If you are using a TN464E, make sure the circuit pack is optioned for 24 channel operation. You do this by setting a switch on the board as shown in the following figure:



9. Set the line compensation value for 0-133 feet. This is the distance between the DS1 circuit pack and the CSU module. This is set from the switch administration terminal. In G1 and G3 systems you do this in the DS1 circuit pack form in the field **line compensation**. In G2 systems, you do this in procedure 260, word 1, field 18. This setting should not be confused with the distance from the CSU module to the smart jack which is automatically compensated for by the CSU module.
10. Using the procedures for your particular switch, insert the DS1 board in the slot

NOTE:
Removing and reinserting the DS1 circuit pack automatically resets the 120A. To completely test the 120A, the DS1 circuit board must be inserted after the 120A is installed. Always reinsert the DS1 board when you want to completely test the 120A.

11. Independent of the host switch, the DS1 circuit pack initializes and tests the CSU module. Initialization and testing is complete when the green LED (2nd from the top) goes off. After initializing and testing the CSU module, the DS1 circuit pack will indicate the status of the circuit pack and CSU module as shown in the following figure:

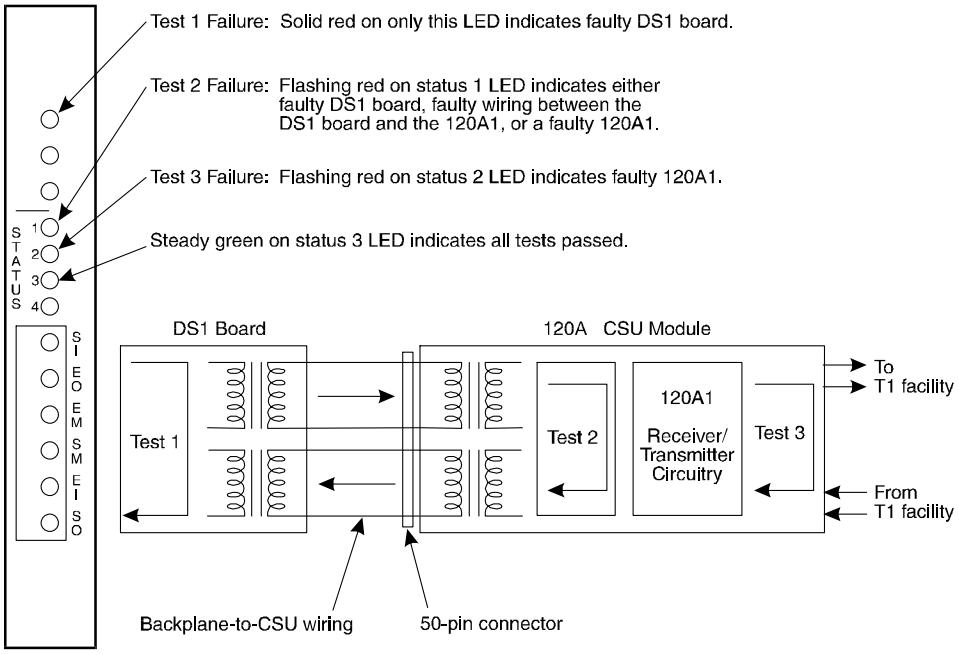


Figure 5. LED Interpretation

12. When test 1 fails, the circuit pack is considered dead and does not report any errors to the system. When tests 2 or 3 fail, the DS1 circuit pack will attempt to function in the same manner as if a defective external CSU were present.
13. If all tests pass, the top LED will be off. This indicates that the DS1 circuit pack and CSU are operating correctly.

14. After you determine that the DS1 circuit pack and 120A are functioning properly, observe the four status LEDs. These LEDs indicate various conditions that can occur during normal operation, as shown in the following table. This table shows the LED definitions when a 120A is present. If an 120A is not present, these LEDs are always off:

Table 4. LED Interpretation

LED	Color	Condition Indicated	Notes
STAT1	Green	Far end line loop back (LLB) active	A near end DS1 circuit pack-initiated line loop back is active at the far end CSU.
	Yellow	Bit error rate (BER) alarm active	The error rate from the network exceeds 10^{-4}.
	Solid Red	Loss of signal (LOS) from DS1 circuit pack	If the DS1 circuit pack fails to send a signal to the CSU module, the top LED on the circuit pack will turn on red.
	Steady Flashing Red	Failed equipment loop back (ELB) test	The flash rate is .5 sec. on and off. The problem could be a bad DS1 circuit pack where the problem is between the circuit pack loop back and the edge of the circuit pack, bad wiring between the DS1 and the CSU module, or a bad CSU module.
	Off	Normal operation	
STAT2	Green	CSU repeater loop back (RLB) or ELB active	
	Yellow	Near end CSU module LLB or PLB active	
	Solid or randomly flashing Red	Span alarm indicated by STAT3 or STAT4 is active	
	Flashing Red	Failed RLB test	The flash rate is .5 sec. on and off. Replace the 120A.
	Off	Normal operation	

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LED	Color	Condition Indicated	Notes
STAT3	Green	Pulses present	If this LED is off, the STAT4 LED will be red, indicating a LFA or LOS from the span. Thus, either STAT3 or STAT4 will always be on if an 120A is present on the circuit pack. Note that situations may arise where pulses from the span are intermittent. In this case, the LED might go off for several seconds, for example, then come back on. During the several seconds it was off, other status LEDs will indicate alarms.
	Yellow	Bipolar violation (BPV) received from span	This LED flashes each time a bipolar violation is received from the network. B8ZS BPVs are not reported.
	Red	CRC or frame bit error from span	This LED flashes each time a CRC or bit error is received from the network.
	Off	No pulses.	This condition triggers the STAT4 red LED.
STAT4	Green	Alarm indication signal (AIS) received from span	Alarm indication signal. This is the blue alarm, indicating the equipment on the far end is down.
	Yellow	Remote frame alarm (RFA) received from span	Remote frame alarm. Indicates the far end cannot frame on the DS1 circuit pack's signal.
	Red	Loss of frame alignment (LFA) from span	Loss of frame alignment.
	Off	Normal operation	

The following list describes these facility alarms:

CRC Errors Cyclic redundancy check (CRC) errors may be produced by marginal or faulty line repeaters, NCTE, noise on the transmission line, or by the circuitry that generates the framing pattern or CRC at the transmit end. Bit errors, in a DS1's signal, are detected via CRC errors when ESF is used.

The switch keeps count of the number of misframe or CRC errors and uses the count to process the minor and major alarms. G2 systems allow you to measure errored seconds, misframes, and slips in procedure 625. G1 and G3 systems allow you to measure errored seconds, bursty errored seconds, severely errored seconds, and failed seconds through the traffic measurements capability. The misframe or CRC count is used in choosing clock references for the switch. Also, an unterminated transmission line could generate noise that looks like a DS1's signal. The absence of a framing pattern or continuous CRC errors is used to show that it is not a DS1.

LFA (Loss of Frame Alarm), Red Alarm The receive DS1's signal should contain either the D4 or ESF framing pattern. Which framing pattern is determined by administration details. An LFA alarm occurs when the near end interface cannot frame up on the DS1's signal. The LFA alarm is also known as the red alarm because a red LED lights on D4-channel banks when this alarm is on. One frequent cause of this alarm is an incorrect setting of the framing option at one end of the transmission facility or within the network (for example, the near end set for the D4 and the far end set for ESF, or vice-versa). This scenario will cause the LFA at both ends of the transmission link. Another possible cause is an intermittent or broken cable, or a rain-attenuated signal (with microwave transmission facilities).

The LFA alarm is tripped several seconds after detecting a continuous loss of framing and clears several seconds after restoring the in-frame condition. The end of the span with the LFA sends an RFA to the other end to indicate it cannot frame on the other end's signal.

RFA (Remote Frame Alarm) Yellow Alarm

The remote frame alarm (RFA), when received at the near end, shows that the far end is unable to frame up on the signal sent by the near end (the end receiving this alarm). The far end interface will be in an LFA state. An RFA is also known as the yellow alarm because a yellow LED lights on D4-channel banks when this alarm is on.

This alarm shows that something is wrong with the part of the transmission facility that transmits the DS1's signal from the near end to the far end. This alarm may be caused by a broken conductor in the transmission cable wiring or within the network.

LOS (Loss of Signal) Alarm

The loss of signal (LOS) alarm shows that there is no bipolar signal present at the receiver input. This alarm will occur in parallel with the LFA alarm. A LOS alarm is usually caused by cable-related problems such as a broken pair inside a cable, an intermittent cable at a cross-connect point, or a cable connector not completely seated.

AIS (Blue Alarm)

The blue alarm shows that maintenance activities are in progress and that the out-of-service condition exists for that DS1 facility. This alarm is recognized as a continuous stream of 1s containing no framing bit. Depending on the particular network circuit terminating equipment (NCTE) being used (such as a CSU), this alarm condition may be treated differently. This condition may result in the NCTE automatically looping the signal back to the switch. If the looped facility is providing synchronization, then the synchronization subsystem must detect that the facility is looped and deal with that condition. Otherwise, synchronization problems will abound.

In Definity systems, if a blue alarm is received from the primary synchronization reference facility, the synchronization software will automatically switch to the secondary reference.

DS1 Circuit Pack Administration

For the switch software releases covered in this document the only administration required is the line compensation setting for the DS1 circuit pack. This should be set to 0 dB (0-133 feet). In G3 and G1 systems you administer this in the DS1 Circuit Pack form. In G2 systems you administer this in procedure 260, word 1, field 18.

120A CSU Module Operating Mode

In the switch releases discussed in this document, after the 120A has been installed and passes initialization and testing, it operates in a default operating mode as follows:

- The equipment loop back is off.
- The repeater loop back is off.
- The line loop back is disabled and under control of the in-band line loop back signal detector.
- The receive automatic line build out (ALBO) is set for a maximum of 26 dB of gain.
- The transmit LBO is 0 dB.

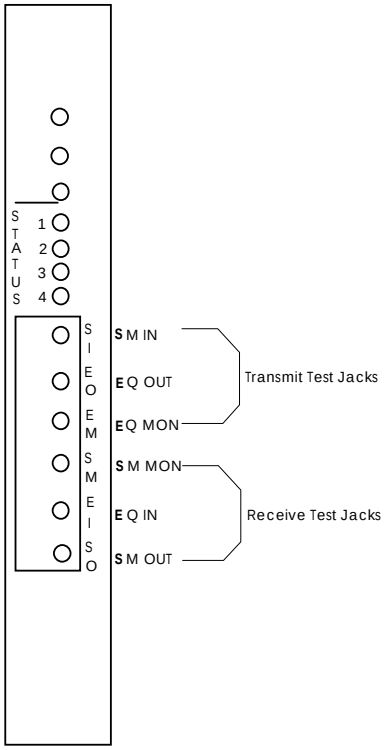
The 120A performs the following functions when in normal operating mode:

- If the 120A loses power for any reason, it will loop the signal from the network back to itself until power is restored. This is a passive loop back performed by closing a relay.
- The 120A will loop the signal from the network after 10 seconds of loss of signal from the DS1 circuit pack using the passive loop back.
- The 120A will provide a network loop back and transmit AIS to the DS1 circuit pack in response to an LLB request from the network. The 120A responds to 00001 loop up code and the 001 loop down code present for greater than 5 seconds with a bit error rate less than or equal to 10^{-3}. The 120A will respond to both embedded and overwrite codes.
- The 120A will close the alarm contact in the event of LOS, LFA, AIS, or RFA alarm conditions or when the 10^{-4} error rate is exceeded.

Standard DS1 facility alarms and other conditions indicated by the status LEDs (such as bipolar violations and active loop backs) will indicate when the 120A fails during normal operation. If the 120A fails during normal operation, you should reinitialize the DS1 circuit pack and subsequently observe the LEDs to help isolate faults to the 120A.

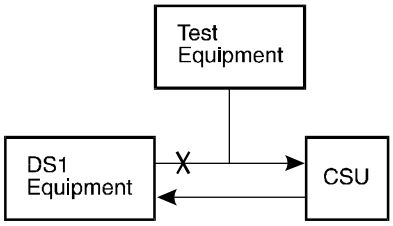
TN464E and TN767D Test Jacks

Six bantam type test jacks have been added to these circuit packs as shown in the following figure:

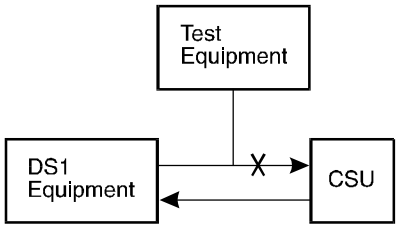


These jacks have the same functions as the six test jacks on the external ESF T1 CSU. The only difference is that when an 120A is present, these functions have been relocated from the CSU side of the DSX1 wiring to the DS1 circuit pack side. Thus, if an external CSU is being used instead of the 120A, you have two sets of test jacks with which you can access the DSX1 signal, one set accessing the CSU end signal and one set accessing the DS1 circuit pack end signal. Following are the definitions of these jacks:

SI (SM IN) Signal Monitor Input. The jack typically used to provide break-in access to the transmit DSX-1 signal from the DS1 side of the CSU or CSU Module towards the CSU or CSU Module. When test equipment is inserted into this jack, the DSX-1 signal from the DS1 towards the CSU or CSU Module is broken and replaced by the signal generated by the test equipment. This jack retains the same name as the one on the AT&T ESF T1 CSU for familiarity reasons. In the context of the DS1, this jack allows the transmitted DSX-1 signal to be replaced by the test equipment signal whether or not a CSU or CSU Module is present.

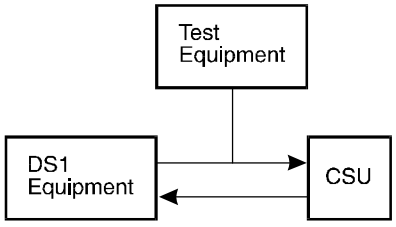


EO (EQ OUT) Equipment Out. The jack typically used to provide break-in access to the transmit DSX-1 signal from the DS1 side of the CSU or CSU Module. When test equipment is inserted into this jack, the DSX-1 signal from the DS1 towards the CSU or CSU Module is broken and re-routed into the test equipment. This jack retains the same name as the one on the AT&T ESF T1 CSU for familiarity reasons. In the context of the DS1, this jack re-routes the transmitted DSX-1 signal away from the DS1 output whether or not a CSU or CSU Module is present.

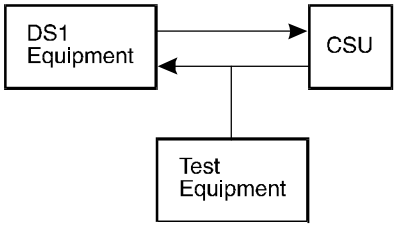


NOTE:
Inserting test equipment into only this jack kills the signal to the CSU module. This causes the integrated CSU module to raise an alarm indicating loss of signal from the DS1 circuit pack. This in turn causes the CSU module to loop the span back to itself. Thus, to avoid this alarm, you should use the EM jack instead or also provide a signal to the CSU module via the SM In jack.

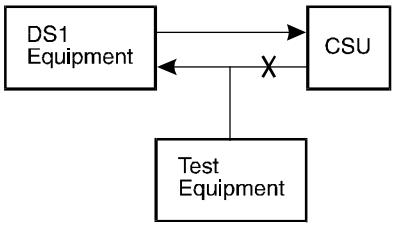
EM (EQ MON) Equipment Monitor. The jack typically used to provide non-intrusive bridged access to the transmitted signal from the DS1 towards the CSU or CSU Module. This jack retains the same name as the one on the AT&T ESF T1 CSU for familiarity reasons. In the context of the DS1, this jack monitors the transmitted DSX-1 signal through a 432 W resistor, whether or not a CSU or CSU Module is present.



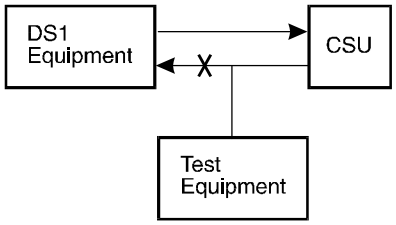
SM (SM MON) Signal Monitor Circuit Output Monitor: The jack typically used to provide non-intrusive bridged access to the received DSX-1 signal from the CSU or CSU Module towards the DS1 (the Signal Monitor circuit in an external CSU is the circuit that monitors the incoming DS1 line signal for errors; its output connects to the DS1 DSX-1 receive input). This jack retains the same name as the one on the AT&T ESF T1 CSU for familiarity reasons. In the context of the DS1, this jack monitors the received DSX-1 signal, whether or not a CSU or CSU Module is present.



EI (EQ IN) Equipment In. The jack typically used to provide break-in access to the receive DSX-1 signal from the DS1 side of the CSU or CSU Module towards the DS1 (or the "equipment" to which an external CSU would be connected). When test equipment is inserted into this jack, the DSX-1 signal from the CSU Module towards the DS1 circuit pack is broken and replaced by the signal generated by the test equipment. This jack retains the same name as the one on the AT&T ESF T1 CSU for familiarity reasons. In the context of the DS1, this jack allows the received DSX-1 signal to be replaced by the test equipment signal whether or not a CSU or CSU Module is present.



SO (SM OUT) Signal Monitor Circuit Output. The jack typically used to provide break-in access to the receive DSX-1 signal from the DS1 side of the CSU or CSU Module (the Signal Monitor circuit in an external CSU is the circuit that monitors the incoming DS1 line signal for errors; its output connects to the DS1 DSX-1 receive input). When test equipment is inserted into this jack, the DSX-1 signal from the CSU Module towards the DS1 circuit pack is broken and re-routed into the test equipment. This jack retains the same name as the one on the AT&T ESF T1 CSU for familiarity reasons. In the context of the DS1, this jack re-routes the received DSX-1 signal away from the DS1 input whether or not a CSU or CSU Module is present.



The following figure illustrates the test jacks circuitry:

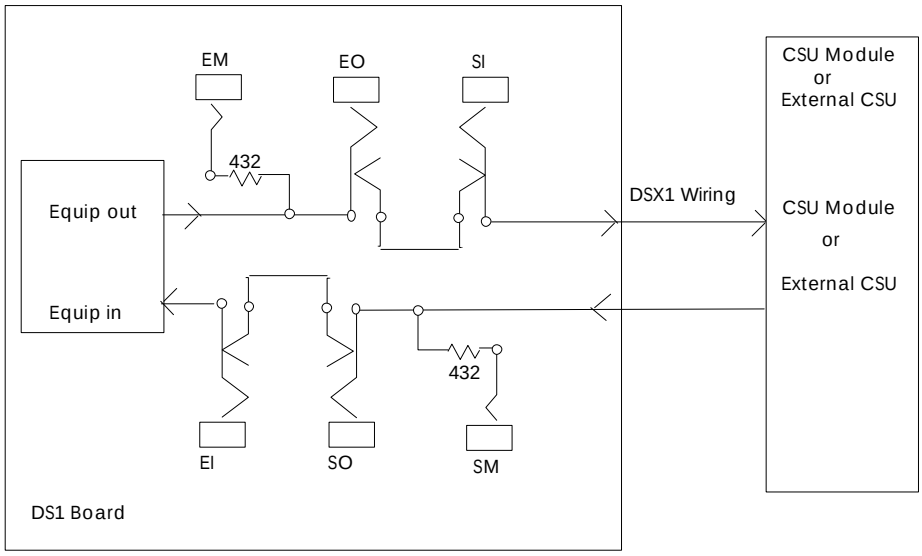


Figure 6. Test Jacks Circuitry

Abbreviations

A

AIS
Alarm Indication Signal

AMI
Alternate Mark Inversion

B

B8ZS
Bipolar with 8 Zero Substitution

BER
Bit Error Rate

BPV
Bipolar Violation

C

CEPT1
Conference of European Postal and Telecommunications Rate 1

CRC
Cyclic Redundancy Code - 6

CSU
Channel Service Unit

D

dB
Decibel

DS1
Digital Signal Level 1

DSX
Digital Signal Cross Connect

DTE
Data Terminal Equipment

E

ELB
Equipment Loop Back

EQ
Equipment

ESF
Extended Super Frame

I

ICSU
Integrated Channel Service Unit

ISDN PRI
Integrated Services Digital Network Primary Rate Interface

L

LBO
Line Build Out

LED
Light Emitting Diode

LOS
Loss of Signal

O

OSI
Open Systems Interconnect

P

PLB
Payload Loop Back

R

RLB
Repeater Loop Back

T

TABS
Telemetry Asynchronous Block Serial

Z

ZCS
Zero Code Suppression

Index

R

S

T

U

Y