

T-SMART® DIAGNOSTIC T1 CSU INSTALLATION INSTRUCTIONS

Digital Transmission
Equipment Stand-alone
Model 77961

Document 650-00246-00



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Revision History

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If you need assistance with this product or have questions not answered by this manual, please visit our Support page on the Kentrox Web site. You are also welcome to call or send email to our Technical Assistance Center. Please have your product's software revision and hardware serial numbers available to give to the Support representative. All product returns must include a Return Authorization number, which you can obtain by calling the Technical Assistance Center.

The numbers listed below are current at the time of publication. See the Kentrox Web site for detailed contact and warranty information.

1-800-733-5511 (continental USA only)

1-503-350-6001

email: support@kentrox.com

<http://www.kentrox.com>

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REGULATORY INFORMATION

NRTL Listing and cNRTL Certification

This equipment meets OSHA Nationally Recognized Testing Laboratory (NRTL) and Canadian NRTL listing requirements for information technology equipment.

FCC REQUIREMENTS, PART 68

This equipment complies with Part 68 of the FCC rules. On the bottom of this equipment is a label that contains, among other information, the FCC registration number for this equipment. Upon request of the telephone company, you should provide the FCC registration number of the equipment which is connected to your line. T-SMARTs registration number is F81-USA-19244-DE-N.

T-SMART operates with a 1.544 Mbps digital channel using RJ48 jack adapter cable Part Number 93xxx-151 (where xxx is cable length in increments of 5 feet) connecting to the D-style 15 pin connectors on the back of the T-SMART unit. The 12-slot Shelf Mount units connect to the network using RJ-48H connectors.

The service code is 6.0N. The Facility Interface Code is 04DU9-B for lines using Super Frame format, 04DU9-C for lines using the Extended Super Frame format, and 04DU9-S for lines using the B8ZS format.

The telephone company must be notified before removal of a T-SMART connected 1.544 Mbps digital service. If the telephone company notes a problem they may temporarily discontinue service, and will notify you of this disconnection. (If advance notice is not feasible, you will be notified as soon as possible.) When you are notified you will be given the opportunity to correct the problem and informed of your right to file a complaint with the FCC.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

FCC Part 15 Requirements

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interferences to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Telecommunications

This equipment does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Radio Interference Regulations of Canada. Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques Classe A prescrite dans le règlement sur le brouillage Radioélectrique Édité par Communications du Canada.

1. GENERAL

These Installation Instructions describe the mechanical installation of the stand alone **T-SMART**[®] Diagnostic T1 Channel Service Unit (CSU), Model #77961. For information on the operation of the T-SMART CSU refer to the T-SMART Diagnostic CSU operator manual.

Function

The T-SMART Diagnostic CSU is a network monitoring and control device for T1 (1.544 Mbps) digital networks. It is compliant with public network interface requirements. It performs format conversion and network monitoring functions for a T1 line, and provides for local or remote control of the monitoring and diagnostic functions.

2. INSTALLATION

To Install:

- ▣ Read Installation Instructions
- ▣ Inspect Materials
- ▣ Select Site
- ▣ Mount CSU Chassis (optional)
- ▣ Connect Network, Equipment and Control Cabling
- ▣ Connect Modem (optional)
- ▣ Connect Alarm Output Wiring (optional)
- ▣ Connect Frame Ground
- ▣ Configure Line/Local Power Switch if necessary
- ▣ Connect Local Power Wiring (optional)
- ▣ Configure VDT Switch if necessary
- ▣ Configure LBO Switch if necessary
- ▣ Configure Simplex Loop Continuity Jumper if Necessary
- ▣ Firmly insert CSU Card into the Chassis and secure
- ▣ Power Up and Self Test

A wide range of parameters on the T-SMART CSU can be configured through an ASCII terminal connected to the control port. Refer to the T-SMART Diagnostic CSU operator manual for details.

Site Selection

- The operating area should be clean and free from extremes of temperature, humidity, shock and vibration.
- Avoid environments which can cause condensation within the unit.
- Allow clearance for operation and maintenance accessibility.
- Allow at least 4.0 inches at the rear of the unit for cables and air flow.
- Do not block any of the air vents on the unit.

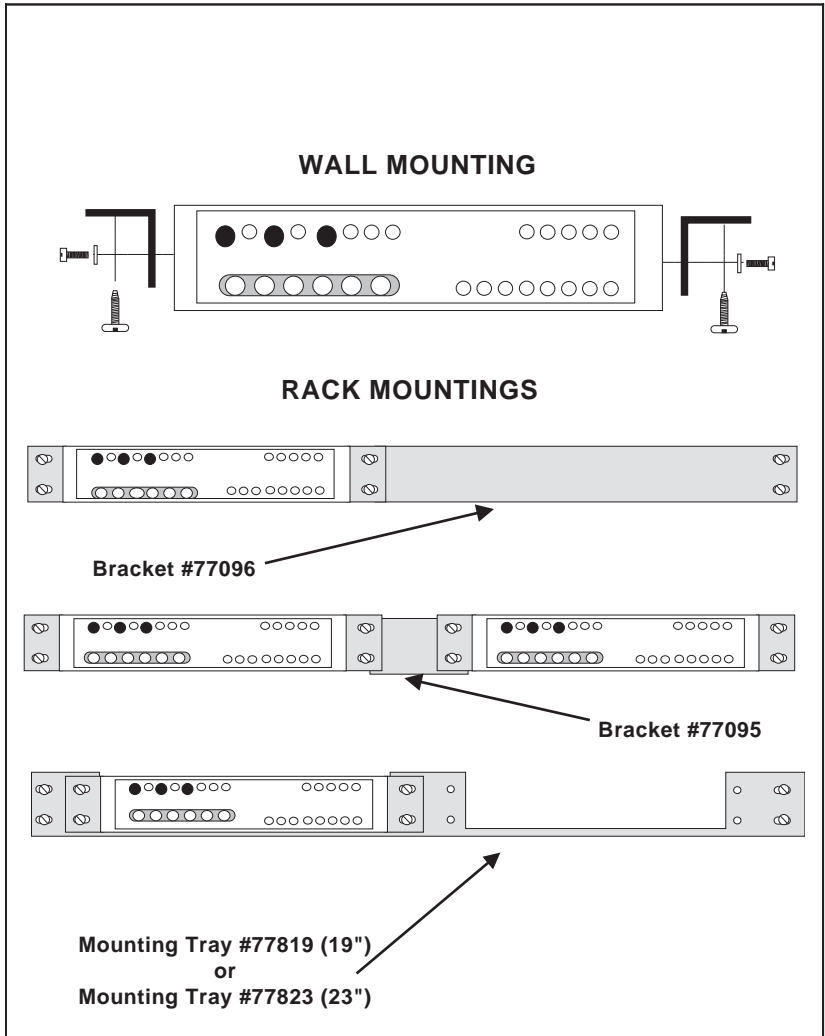
Refer to the *Specifications* section for environmental details.

Mounting

The CSU can mount on a desk, on a wall, or in a computer cabinet or equipment rack. Two sets of holes for mounting the ears are provided to allow the CSU to extend from the rack the proper amount. It is a good practice to mount the Chassis before plugging in the card.

- To mount the CSU to a wall, use the wood screws provided.
- To mount it in a computer cabinet or equipment rack, use the brackets and machine screws provided. As shown in *Figure 1*, additional brackets may be required.

Figure 1. Mounting Arrangements



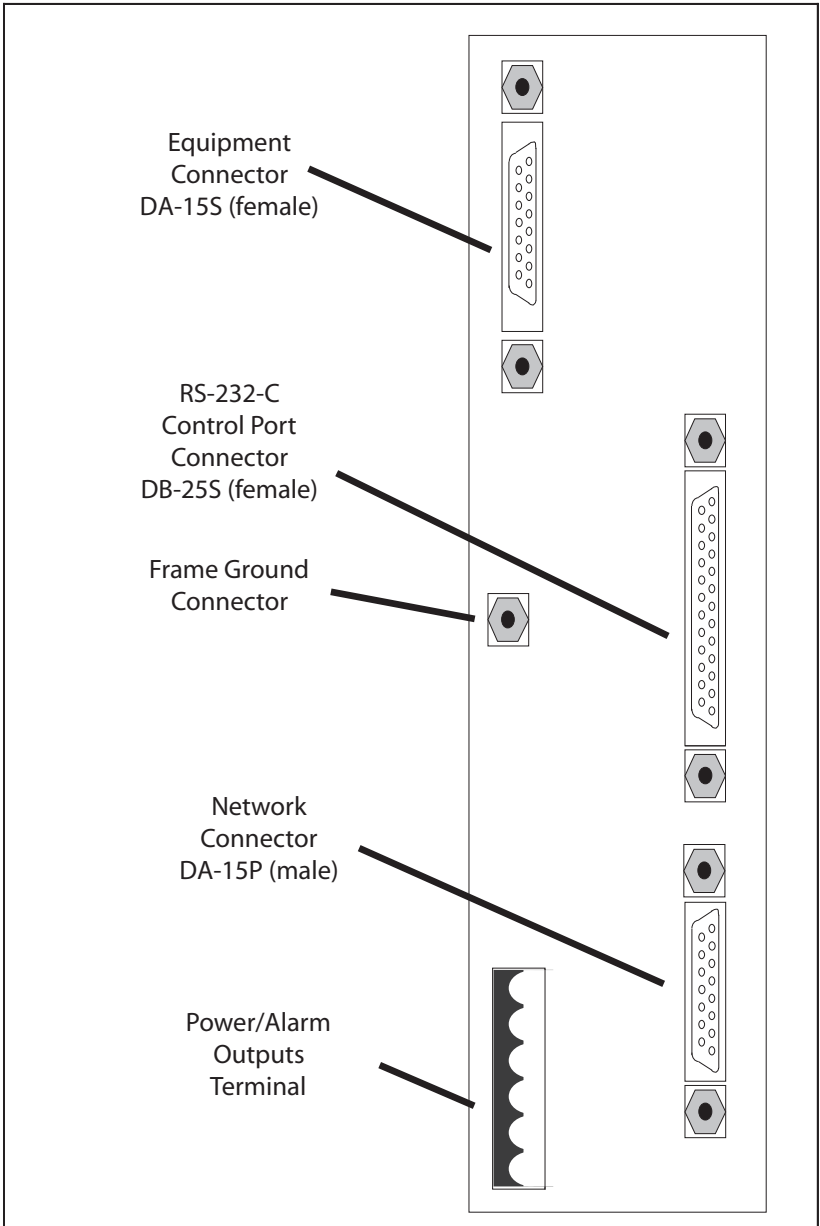
Cabling

Connections

Signal, power, output, and control connections to the unit are made through standard connectors on the rear panel, as shown in *Figure 2*.

- ▣ The equipment signal connector is a female 15-pin D-style connector.
- ▣ The network signal connector is a male 15-pin D-style connector.
- ▣ Power connects through a connectorized six-post terminal block at the bottom of the rear panel. Alarm outputs, if used, are also connected through this terminal block.
- ▣ A female 25-pin D-style connector provides control connections to a local or remote VDT (video display terminal) via an RS-232-C interface or modem.
- ▣ Kentrox offers cables for each of these connectors. Kentrox cables and their functions are listed in *Table A* and *Figures 3* and *4*.

Figure 2. T-SMART CSU Rear Panel



Cables

Kentrox offers pre-assembled cables for the signal connectors. See *Table A* and *Figures 3* and *4* for cabling options and specifications.

Table A — Cables and Part Numbers

INTERFACE	CONNECTOR(S)	PART NUMBER
Network	DA15S female/ RJ48C	93xxx151
Network or Equipment	DA15P male/ DA15S female	93xxx091
Network	DA15S female/ stub	93xxx111
Equipment	DA15P male/ stub	93xxx101
Equipment	DA15P male/ DA15P male	93xxx131
RS-232-C Control	DB25P male/ DB25Pmale	95xxx021
xxx indicates cable length. Call Kentrox Customer Service for available lengths		

To make your own cables refer to *Figures 5, 6, 7* and *8*.

NOTE: To minimize cross-talk and EMI, the signal cables must provide separate shields for the Transmit and Receive leads. Do not depend on the shields to properly ground T-SMART equipment. The stand alone must be grounded separately from the network line's shield ground.

NOTE: 93xxx091 and 93xxx111 may be used for connection to approved interface equipment which connects to the network interface using RJ48C, RJ48H, or RJ48M connectors.

Figure 3. Network and Equipment Cables

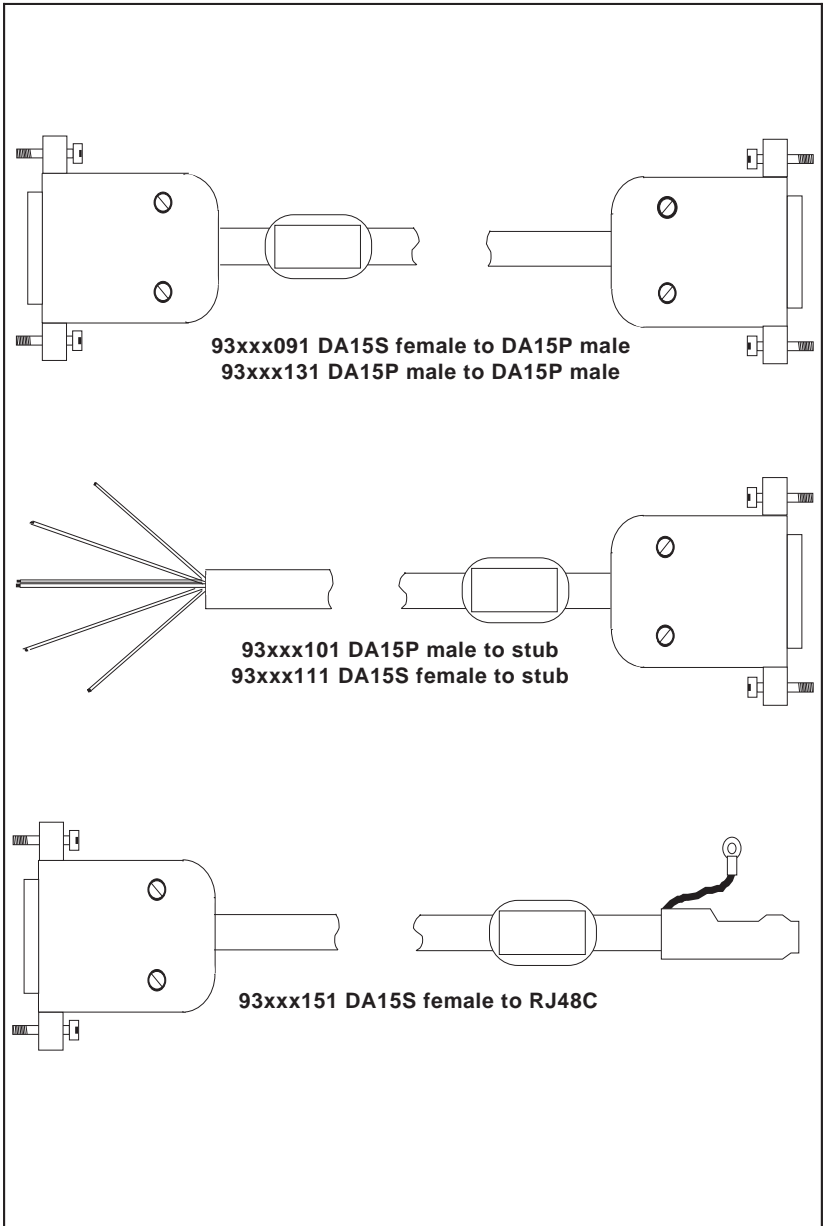


Figure 4. Network and Equipment Cable Options

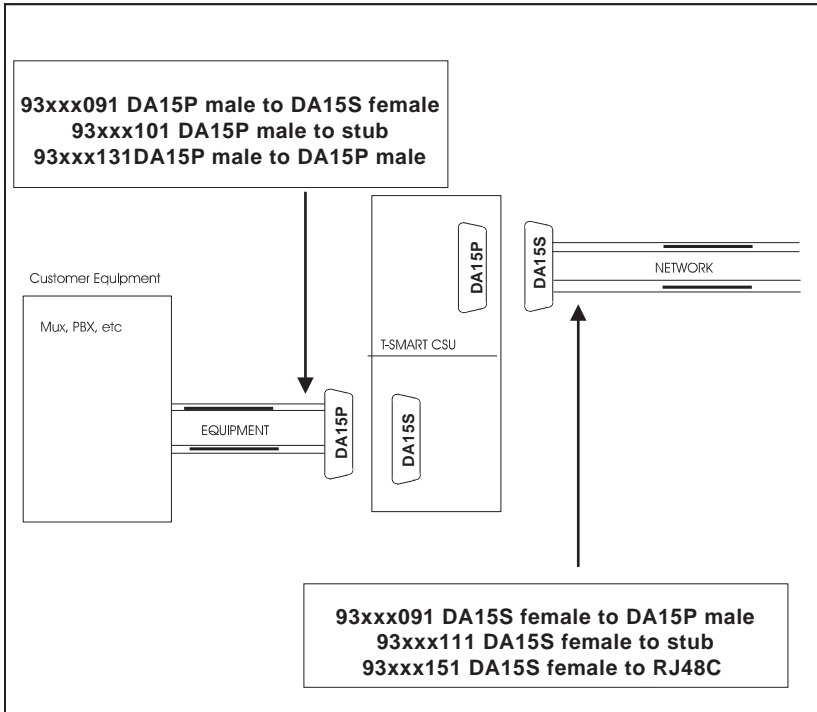
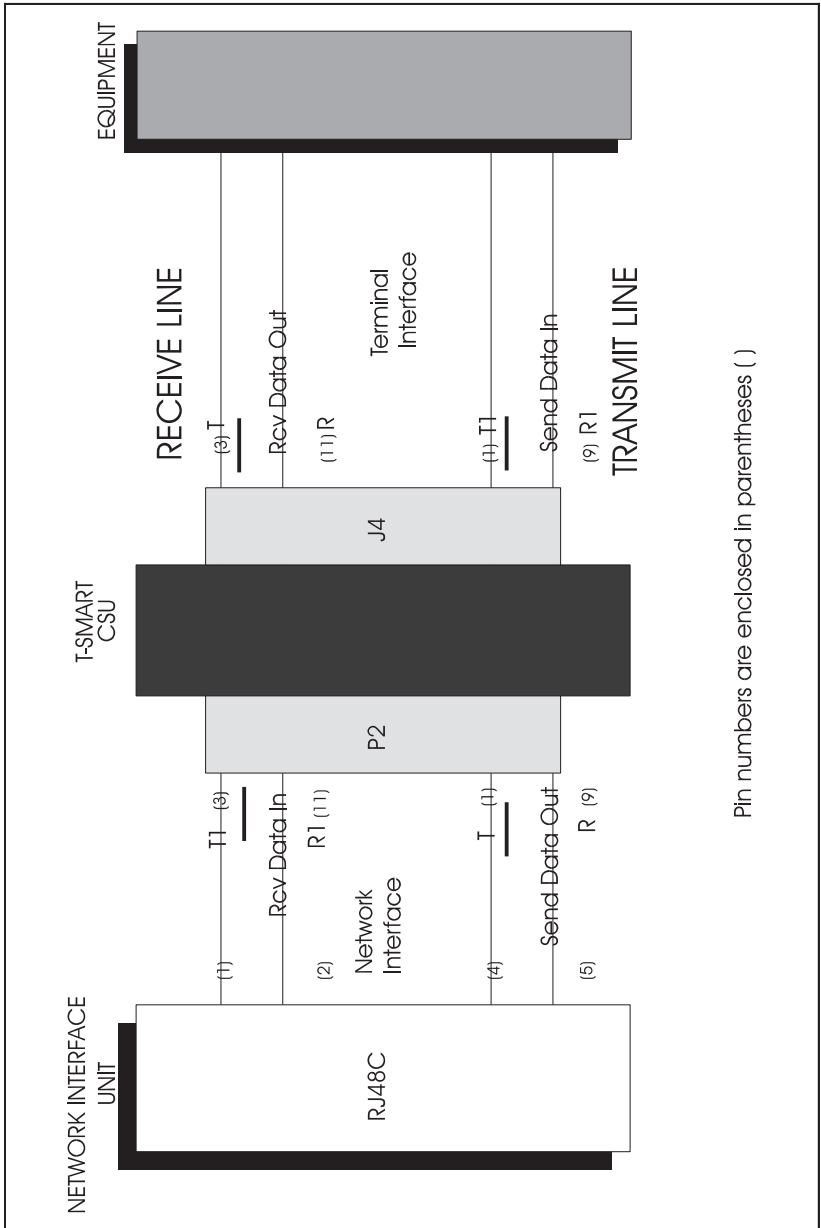


Figure 5. Tx and Rx Nomenclature and Connection Pinouts



Network Interface

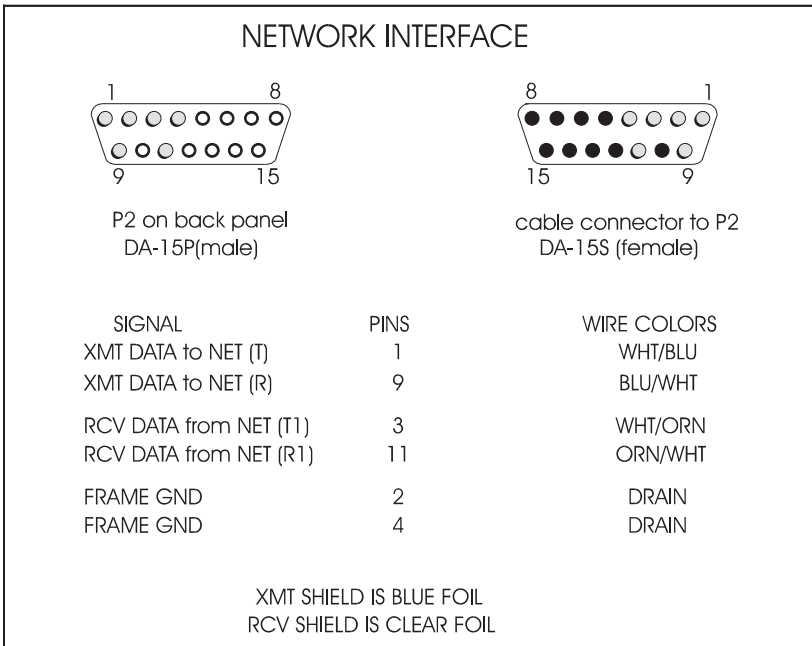
Connect the CSU to its network interface through the NETWORK connector on the rear panel.

WARNING:
Do not connect the cable shield across the network interface. See the Applications section for shielding requirements.

To prevent cross-talk between signals and minimize the electromagnetic interference (EMI), the Transmit and Receive lines should be separated and shielded separately, as Kentrox cables are. See also *Figure 5, Tx and Rx Nomenclature*.

The network cable will need a 15-pin female D-style connector, wired with the pin assignments as given in *Figure 6*. Attach the connector to the CSU’s NETWORK connector and tighten the mounting screws firmly.

Figure 6. Connector Wiring — Network Side



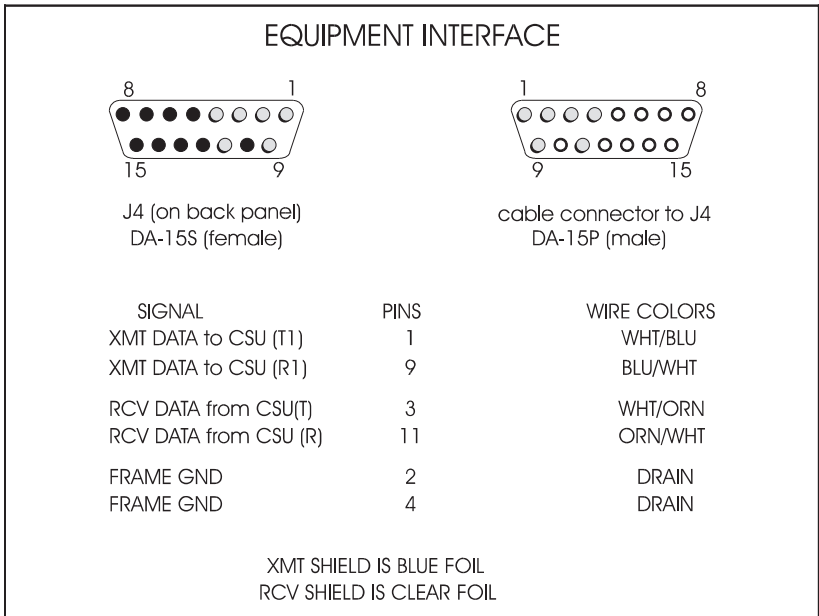
Equipment Interface

Connect the unit to its equipment interface through the EQUIPMENT connector on the rear panel.

To prevent cross-talk between signals and minimize the electromagnetic interference (EMI), the Transmit and Receive lines must be separated and shielded separately, as Kentrox cables are. See also *Figure 5, Tx and Rx Nomenclature*.

The equipment cable will need a 15-pin male D-style connector, wired with the pin assignments as given in *Figure 7*. Attach the connector to the CSU's EQUIPMENT connector and tighten the mounting screws firmly.

Figure 7. Connector Wiring — Equipment Side



Controlling Terminal Interface

Connect the unit to a controlling ASCII terminal through the RS-232 connector on the rear panel.

The control cable will need a 25-pin male D-style connector, wired with the pin assignments as given in *Figure 8*. Attach the connector to the CSU's DB-25S connector and tighten the mounting screws firmly.

NOTE: T-SMART is configured as DCE (Data Communications Equipment), making it compatible with any standard ASCII terminal. To connect to another DCE device (such as a modem) a null modem cable must be used. Refer to *Figure 10*.

Figure 8. Connector Wiring — RS-232-C Control Port

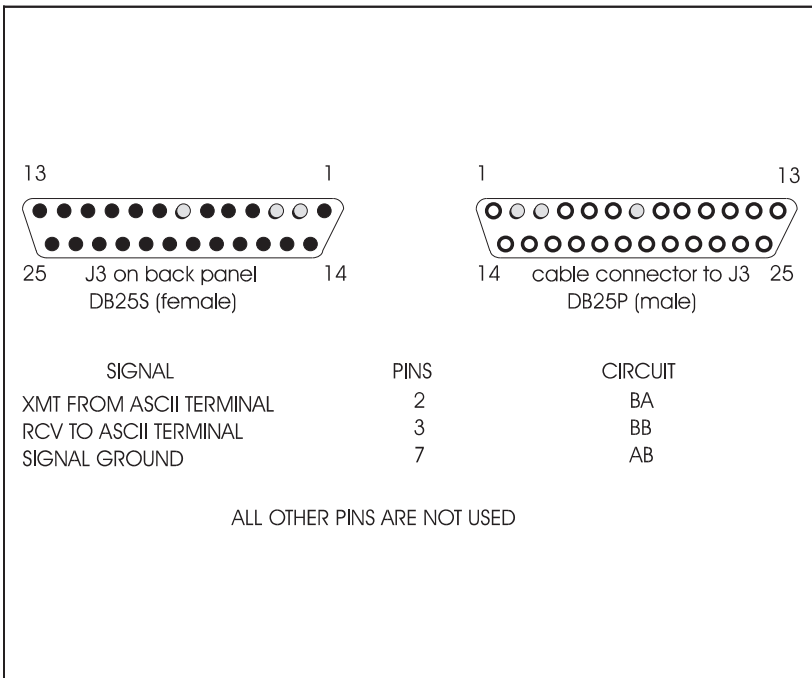
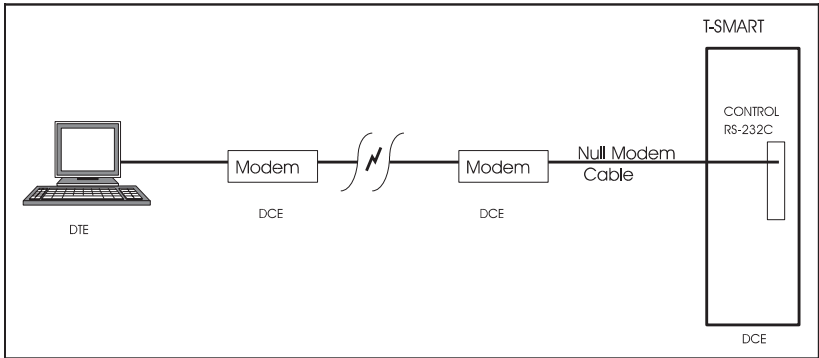


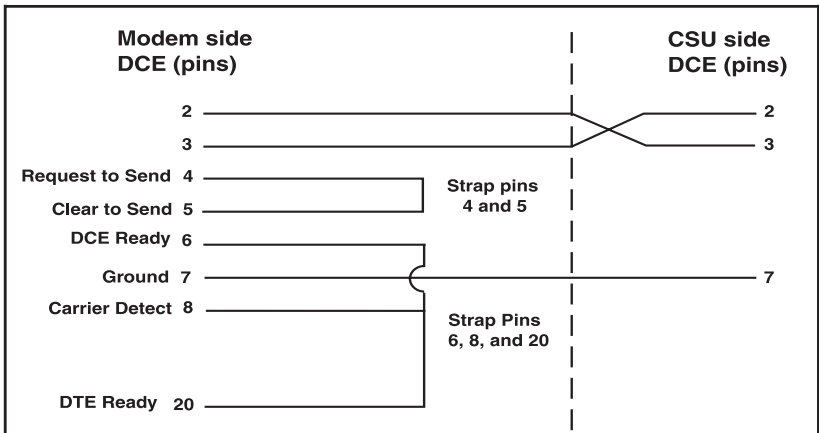
Figure 9. Typical Modem Application



Modem Connections

When T-SMARTs are installed in multiple locations, the control port connection may be via modem, as shown in *Figure 9*. Since the modem and the unit are both configured as DCE (Data Communications Equipment), a null modem cable, or adapter #77893, must be used between them. The purpose of the null cable is to invert Pins 2 and 3 of the RS-232-C connector as shown in *Figure 10*. Note that the T-SMART system is using only Pins 2, 3, and 7 in this configuration. If the modem expects a handshake, strap the pins together as shown in *Figure 10*. At the modem end, strap Pin 4 with Pin 5; and strap together Pin 6, Pin 8, and Pin 20.

Figure 10. Null Modem Cable Wiring



Automatic Alarm Dial-Up

CSUs can be configured to automatically dial-up a modem when an alarm occurs and to store alarm messages until a connection is made (see the Operator Manual for command and setup information). Use an AT command compatible modem set for Autoanswer On (ATS1), Echo On (ATE1), and Quiet Mode (ATQ1). The baud rate may also need to be configured for a specific operating protocol such as CCITT or Bell.

Alarm Outputs

See *Figure 11* or *Figure 12*. T-SMART provides an optional alarm output through Posts 5 and 6 of the power connector. Circuit or signal failure in the unit causes a contact closure between the internal alarm connections. This triggers the alarm outputs and activates your external alarm.

Grounding

Use 14 gauge wire on Post 4 of the six-post terminal plug, or the frame ground stud on the case for frame ground. **Do not use both at once.**

CAUTION: Frame ground must be connected to Earth ground to provide protection from excessive line voltages such as lightning or power line crossings.



Power Connections

The CSU can be powered from a local supply or from the carrier's line. This option is selected on the CSU module with the Line/Local Power Option Jumper.

Line/Local Power Option Jumper

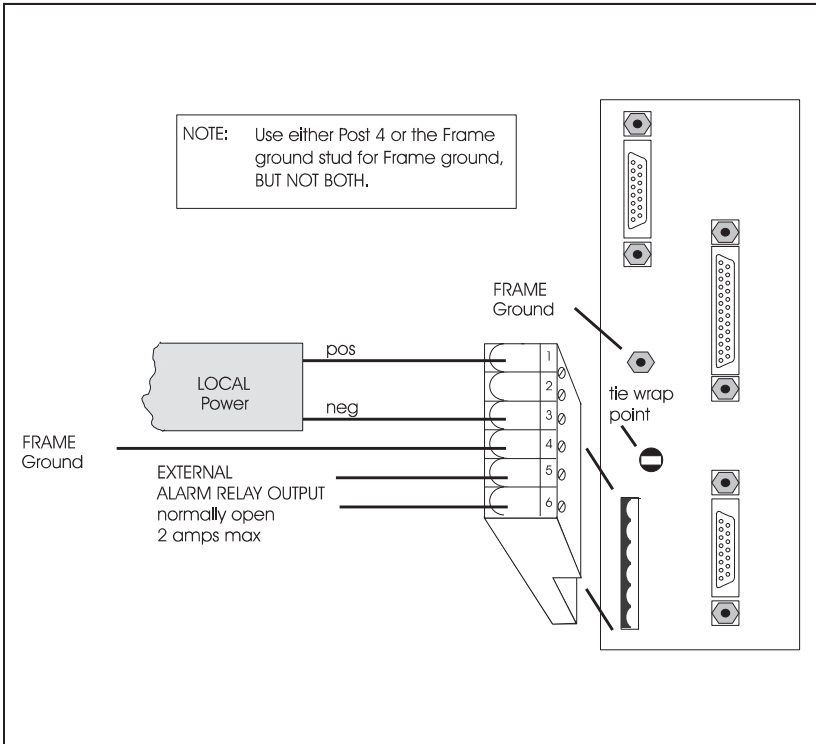
T-SMART CSUs use a jumper to select line or local power. One side of the jumper is labeled LOCAL and the other side is labeled LINE. The unit is in Local power mode when the LOCAL label is facing the edge of the PC board. The unit is in Line power mode when the LINE label is facing the edge of the PC board.

To remove the jumper pry it up with a small screw driver being careful not to bend any of the legs. To insert the jumper, line up the legs with the sockets on the PC board and press down gently until seated. Line/Local jumper location is shown in *Figures 13 and 14*.

Table B — Power Requirements

Equipment	Current		Voltage
Each T-SMART (Line Powered)	57 to 85 mA	at	53 V \pm 3 V
Each T-SMART (Local Powered)	70 mA	at	50 V \pm 6 V
	140 mA	at	24 V \pm 4 V

Figure 11. Power and Alarm Connections, Local Power Mode



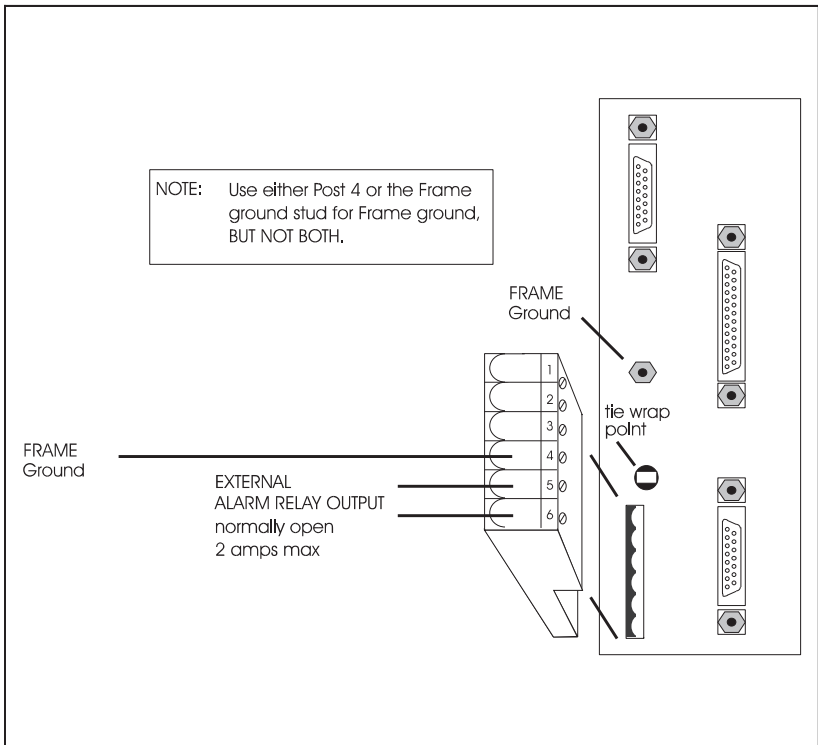
Local Power

In the local power mode, use a supply capable of providing a voltage in the range 20 to 56 Vdc. Power requirements for the T-SMART are listed in *Table B*. Using 14 gauge wire, use Post 4 of the six-post terminal plug, or the frame ground stud on the case for frame ground.

Do not use both at once.

Using 20 to 14 gauge leads, wire power to the supplied six-post terminal plug (see *Figure 11*) and install the plug into the rear panel.

Figure 12. Power and Alarm Connections, Line Power Mode



Use the tie wrap point and wire tie (included) to provide strain relief to the power supply cord.

Line Power

In the line power mode, power is delivered across the carrier's Transmit and Receive pairs. Power requirements for the CSU are listed in *Table B*. Posts 1, 2, and 3 of the supplied six-post terminal plug are not used; it is only necessary to connect frame ground to earth ground (see *Figure 12*). Using 14 gauge wire, use Post 4 of the six-post terminal plug, or the frame ground stud on the case for frame ground. **Do not use both at once.**

NOTE: Subscribers using the line power mode should inform the T1 carrier that T-SMART requires 56 volts.

VDT and Control Port Configuration

T-SMART is shipped from the factory with its control port configured for 9600 baud rate, eight-bit words, one stop bit, and no parity. Either configure the controlling video terminal (VDT) to match these settings, or configure the CSU to match your VDT's settings. The CSU module can be configured to match your VDT using the switches shown in *Figures 13 and 14*. See *Table C* for the switch settings. Note

Table C — Control Port Switch Settings

that position S4 sets a 5 ms or a 1 second delay before transmitting an Alarm Indication Signal (AIS) to the terminal.

Parameter	S1	S2	S3	S4	S5	S6	S7	S8
<i>300 baud</i>	CL	CL	CL					
<i>600 baud</i>	OP	CL	CL					
<i>1200 baud</i>	CL	OP	CL					
<i>2400 baud</i>	OP	OP	CL					
<i>4800 baud</i>	CL	CL	OP					
<i>*9600 baud</i>	OP	CL	OP					
<i>19200 baud</i>	CL	OP	OP					
<i>AIS Delay - 1 second</i>				CL				
<i>*AIS Delay - 5 ms</i>				OP				
<i>Parity</i>					CL			
<i>*No Parity</i>					OP			
<i>Even Parity</i>						CL		
<i>*Odd Parity</i>						OP		
<i>7 bit words</i>							CL	

Switch position UP is OPEN (OP)
 Switch position DOWN is CLOSED (CL)

*factory default settings

Figure 13. Switch and Jumper Locations I

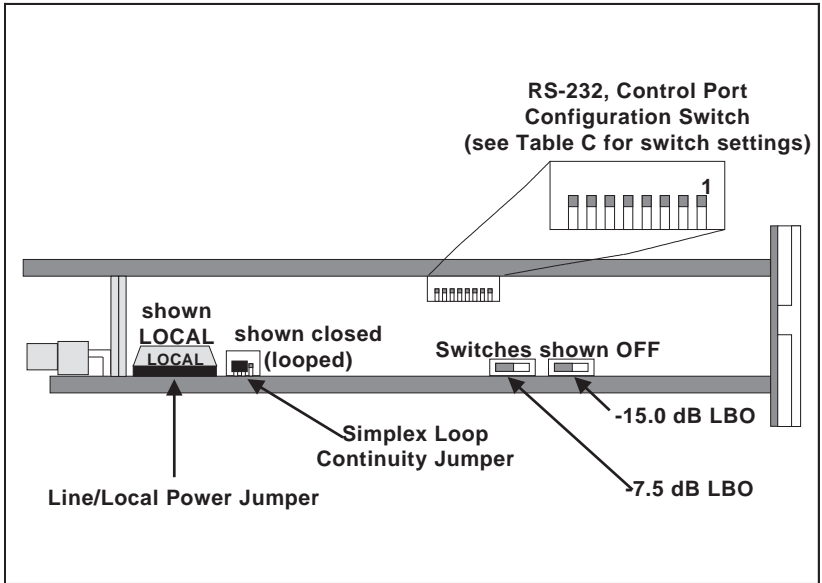
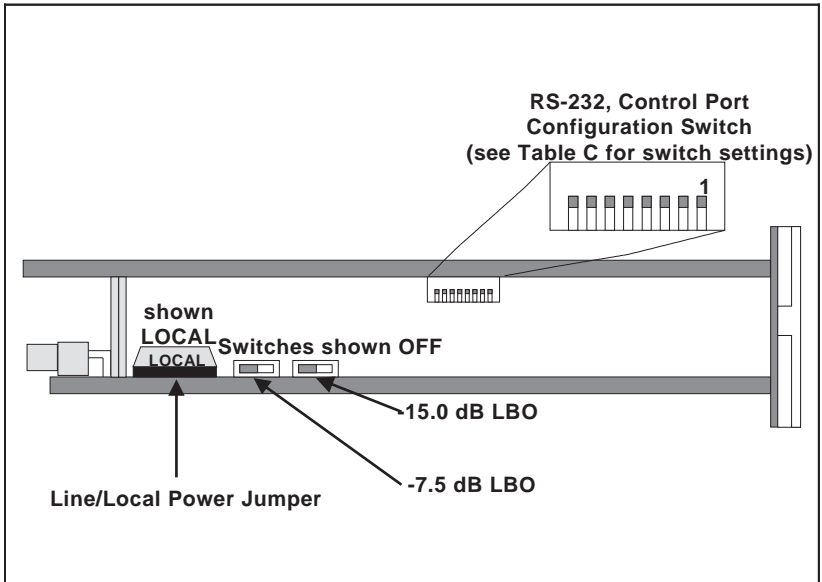


Figure 14. Switch and Jumper Locations II



Parameter	S1	S2	S3	S4	S5	S6	S7	S8
*8 bit words							OP	
2 stop bits								CL
*1 stop bit								OP

Line Build-Out (LBO)

Line Build-Out to the network is switch selectable, using the switches shown in *Figures 13* and *14*. Proper setting of the LBO switch ensures reliable operation of the network, both for you and for other users. An improper setting results in unreliable operation and interference between user services. Your carrier can advise you of the required setting: 0.0 dB, -7.5 dB or -15.0 dB.

The loss between the last repeater and the demarcation must not exceed -15.0 dB. If the repeater is at the maximum distance (-15 dB loss), set 0.0 dB LBO; if it is at the minimum distance, set -15.0 dB LBO. If the distance is unknown, set the CSU for -7.5 dB of LBO.

If the carrier has installed a Network Interface Device or a Smart Jack, the LBO should be set at 0.0 dB unless otherwise instructed.

Simplex Loop Continuity Jumper

Your T-SMART may include a Simplex Loop Continuity Jumper as shown in *Figure 13*. The CSU is shipped set for simplex current loop continuity (closed).

In Line power mode the jumper remains in the closed position (connecting the two left hand pins).

In Local power mode there is the possibility of faulty simplex current conditions which may be avoided by resetting this jumper to the open position. This eliminates induced noise that may have been caused by the faulty line conditions. To break this induced current, remove the jumper and place it over the two right hand pins (open position).

Card Insertion

Once the switches have been set, remove the front bezel from the chassis and plug in the stand alone card. Fix the card into the chassis with the provided screw and replace the bezel.

Power Up and Self Test

At power-up, the T-SMART CSU runs a complete self test routine that checks all the data paths, I/O ports, read/write memory, and the program checksum. At the end of the self test the LEDs will flash in sequence.

If the **POWER/FAIL** LED lights red after self test, this indicates a failed test by the equipment or the power supply.

If the **POWER/FAIL** LED lights green after self test, all tests were passed and operation may begin as normal.

If the **POWER/FAIL** LED continues to glow red, call Kentrox Technical Support.

In the Continental United States of America: 1-800-733-5511
Elsewhere: 1-503-643-1681

CAUTION: Always disconnect all telephone lines from the wall outlets before servicing or disassembling this equipment.

3. SPECIFICATIONS

Mechanical

Size:	7" wide x 1.75" wide x 10.5" deep
Mounting:	Wall, Relay Rack, or Cabinet
Network Connection:	DA-15P connector
Local Equipment Connection:	DA-15S connector
Power/Alarm Connections:	Six post terminal block
Control Port Connection:	DB-25S (RS-232-C) connector

Network Side I/O

Input Level:	DSX-1 to -27 dB
Output Level:	DSX-1
Line Build-Out	0.0, 7.5, 15.0, or 22.5 dB
I/O Impedance:	100 ohms \pm 10 ohms
Lightning Protection:	1000 V, 10 x 1000 ms pulse

Equipment Side I/O

Input Level:	DSX-1 to -10 dB
Output Level:	Equalized to DSX-1
Equalization:	Up to 655 feet (selectable)
I/O Impedance:	100 ohms \pm 10 ohms

Environmental

Operating Temperature:	0 to 50 °C
Humidity:	Up to 95%, non-condensing

Power Requirements

Local Power:	20 to 56 Vdc at 2.5 W per unit 24 Vdc at 140 mA; 48 Vdc at 70 mA
Line Power:	51 to 56 Vdc at 57 to 85 mA
Fusing:	0.5 A

