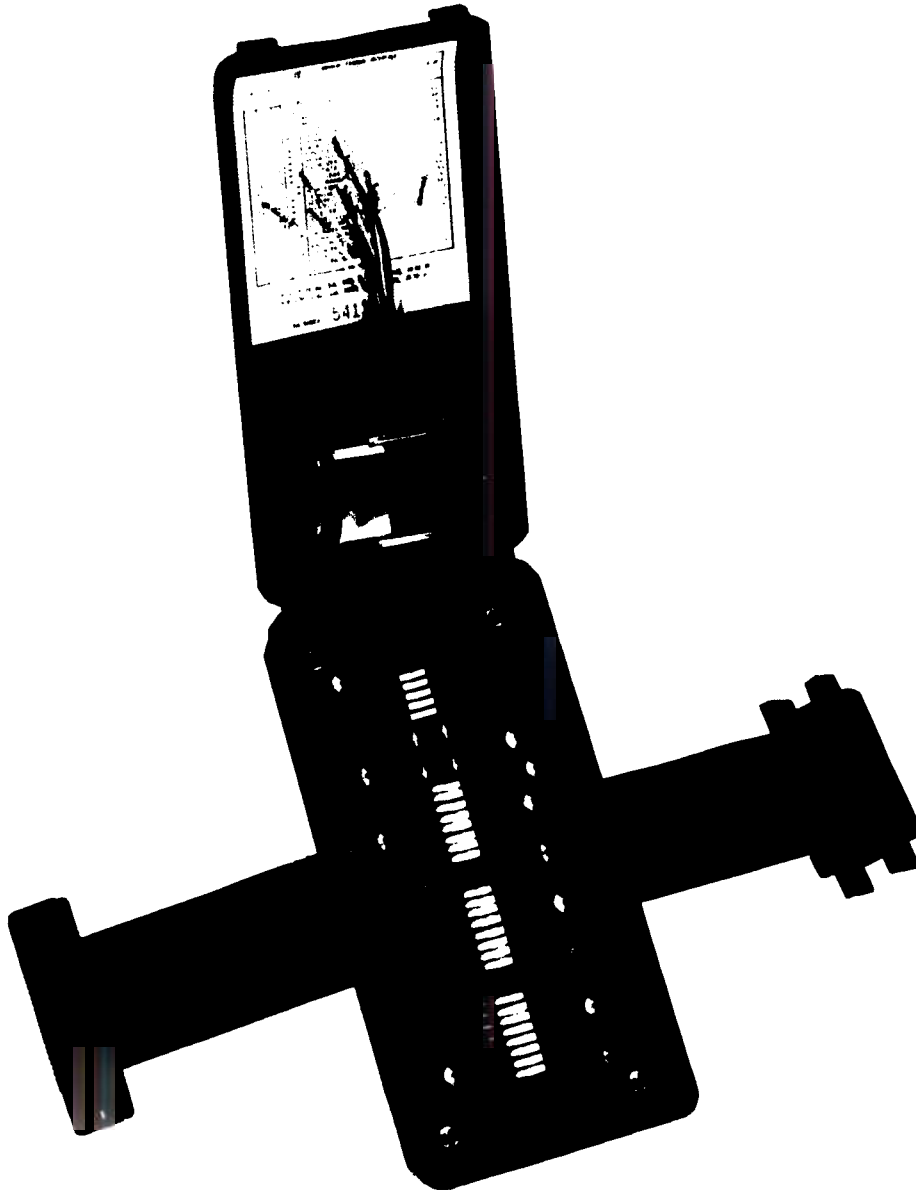


**TS160-586  
TS161  
TS162**

# **SAM 232-60 (POWERED) TRI-STATE**



# RS232 Tri-State Breakout Box & I/O Tester



## User's Manual

### FEATURES

- LIGHTWEIGHT** Weighs only eight ounces and fits in a shirt pocket for convenience.
- DUAL CABLES** Female and male connectors on the interface cables eliminate the need to carry freestanding patch cables.
- ACRYLIC FACEPLATE** The clear faceplate is machined from acrylic on a numerical controlled mill. Descriptions are silk-screened on the back to avoid marring or scratching.
- VELCRO JUMPER STRAP** Secures loose jumper wires.
- BATTERY SWITCH** On/off switch which allows on-line operation with no battery drain.
- LIGHT EMITTING DIODES** Thirteen Tri-State Light Emitting Diodes (LEDs) allow the monitoring of DTE and DCE signals. The LEDs are located on the appropriate DTE and DCE sides for ease of recognition.
- COLOR CODED JUMPERS** Single and multiple chain jumper connectors are color coded for ease in identification and use.
- FACEPLATE PIN IDENTIFICATION** Lines from LEDs and pins to switches simplify operation.
- CONNECTOR ALIGNMENT** Connectors are properly aligned for normal interconnection with DTE and DCE equipment.
- SWITCHABLE LINE SWAPPING** Easy reversal of Transmit Data (TD) and Receive Data (RD) lines is performed by setting individual rocker switches.
- SIMULATED CONTROL SIGNALS** The ability to set Data Set Ready (DSR), Clear To Send (CTS), or Data Carrier Detect (DCD) to a simulated high condition by switch selection.

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### INTRODUCTION

The RS232 Tri-State Input/Output Tester has been designed and manufactured to provide you with a versatile tool for monitoring data signals. The I/O Tester is a pocket sized unit which allows access to all 25 RS232 signal lines. Its interface is transparent to data and does not alter information passing through it. Cabling is included which allows the connection to both Data Terminal Equipment (DTE) and Data Communications Equipment (DCE).

### OPERATING CHARACTERISTICS

The RS232 Tri-State I/O Tester is a hand held, pocket sized, lightweight, self-contained breakout and activity monitor for the RS232 V24 interface.

Line 1, frame ground, is not normally switchable in the industry. The switch for signal ground, line 7, is disabled. This allows the LEDs to function for both the DTE and DCE side when the switches are all turned off. As a result, the operator is able to place the device between two pieces of equipment, turn off all the switches and monitor either piece of equipment.

The dual cables feature molded stress relief RS232 connectors which eliminate the need to carry an additional jumper cable to the job site. The LEDs are powered by the battery and draw no voltage from the line when in operation. When signal voltage is between +3 volts and +25 volts the LED associated with the line will light in the RED state. Conversely, when the signal voltage is between -3 volts and -25 volts the LED will light in the GREEN state.

The on/off switch on the faceplate allows the unit's battery pack to be turned off when left in-line for lengthy periods of time. Contained in the lid of the device are five single jumpers easily distinguishable by their white insulation, and one four way jumper identifiable by its brown insulation. They are contained with a velcro strap which is mounted below the EIA CCITT modem/terminal interface signal list. The pins and jumpers are .025 square, an accepted industry standard. The use of this size pin enables easy interfacing with oscilloscope probes and other test equipment.

The five position dip switch allows the user to perform several common operations by setting rocker switches. The first two switches allow the user to reverse lines two, Transmit Data, and three, Receive Data. This solves many null modem installations. The other three positions permit either CTS, DSR, or DCD to be set to a simulated high condition.

## APPLICATIONS

The following is a summary of the specific applications for the RS232 I/O Tester. A detailed explanation of each application is included in the operating instructions.

### Monitoring The Terminal/Modem Processor Interface

The I/O Tester is transparent to the interface while it allows the operator to monitor and breakout all the RS232 signals.

### EIA Signal Test

The voltage circuits measure input signals to determine if they meet EIA specifications. LEDs will display a RED light if the voltage is within the positive range of the specifications. They will display a GREEN light if the input voltage is within the negative range of the specification. A separate test circuit is available to test lines not associated with a LED.

### EIA Line Attenuation Test

The I/O Tester attenuation network can be used to test the operation of the modem or terminal EIA driver circuits under a simulated full-load condition. The LED associated with the line under test will light if the driver circuits are operating properly.

### Modem Loop-Back Test

Transmit Data is looped into Receive Data at the digital side of the modem, allowing a loop-back test to be performed on modems with no loop-back capability.

### EIA Line Transition Monitoring

LEDs will alternately display a RED or GREEN light when there is a change between positive and negative input voltage within the limits of the specification.

### Non-Standard Interfaces

The I/O Tester may be used where a special cable is required to interconnect a terminal to a modem. This is normally an interim application until a special cable can be constructed.

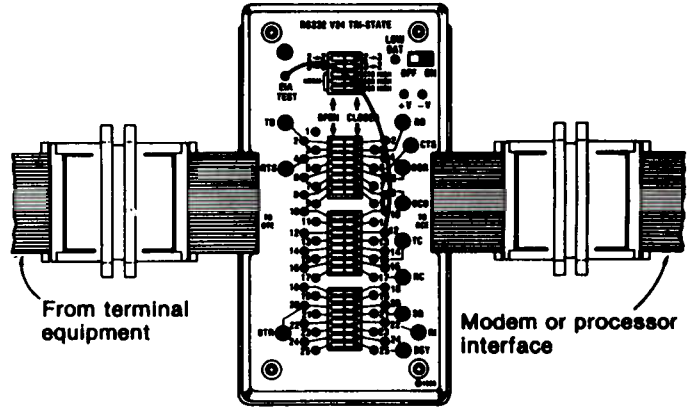
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## OPERATING INSTRUCTIONS

### Monitoring The Terminal/Modem/Processor Interface

The monitoring of signals is performed by placing the I/O Tester between two pieces of equipment where the user wishes to monitor transmission signals. The I/O Tester, because of its dual cables, can be plugged directly into the back of data equipment or inserted directly into the data line, where a male or female connection junction is located. Twelve LEDs monitor the data lines to which they are connected.

The user may wish to monitor a signal on a line which does not have an LED present. This is done by using a single jumper strap. Place one end of the jumper strap on the pin for the line to be monitored. Place the other end of the jumper strap on the EIA test pin. A signal present on the line being tested will then be displayed as either a RED or GREEN display on the test LED.

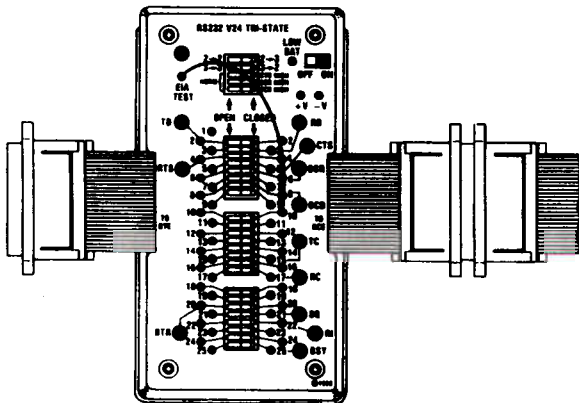


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## OPERATING INSTRUCTIONS

### EIA Signal Test

The EIA Signal Test is used for lines not monitored by LEDs to determine if the signal is within the range of the RS232 specification of +3 volts to +25 volts and -3 volts to -25 volts. The LED will display a RED light when the signal is between +3 volts to +25 volts. The LED will display a GREEN light when the voltage is between -3 volts to -25 volts. This test is performed by jumpering any pin to the EIA test pin associated with the LED directly above it. A signal within the RS232 specification will cause the LED to display either a RED or GREEN light.



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## OPERATING INSTRUCTIONS

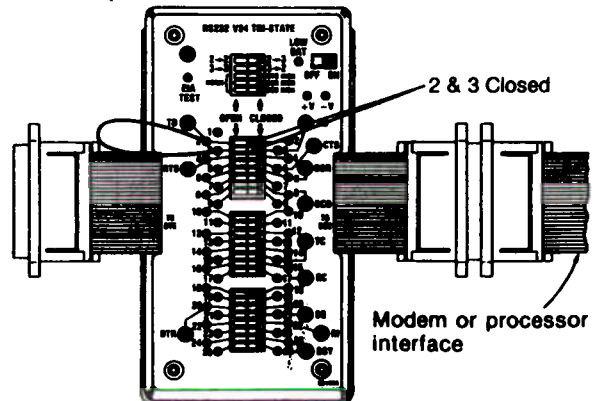
### EIA Line Attenuation Test

The EIA Line Attenuation Test determines whether or not the voltage on line falls within the range of +3 volts to +25 volts and -3 volts to -25 volts. The circuitry of this device precludes the LEDs from functioning below or above that specification. If the voltage on a line is outside of this range, the LED will not function. If it is necessary to test a signal on a line which has no LED, follow the instructions described previously for the EIA SIGNAL TEST.

### Modem Loop-Back Test

The modem loop-back test is performed by plugging the I/O Tester into the modem terminal connector. Switches 2 and 3 are turned to the closed position and pins 2 and 3 are strapped together on the terminal side of the I/O Tester.

### Modem loop-back test



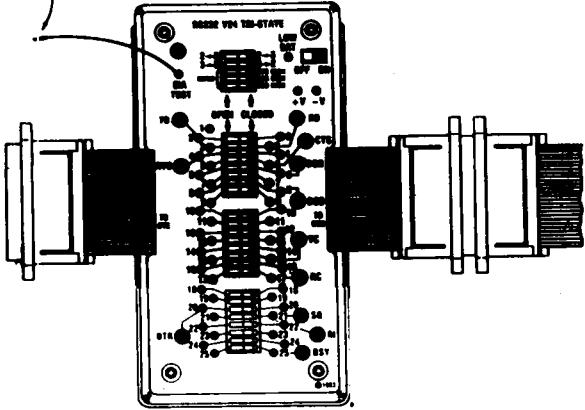
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## OPERATING INSTRUCTIONS

### EIA Line Transition Monitoring

An EIA Line Transition can be observed on any of the Tri-State LEDs. A change from RED to GREEN, or GREEN to RED indicates a change in the state of the line. A spare EIA test LED is available to monitor those lines without an individual LED. See example below. A positive voltage will cause the LED to display a RED light while a negative voltage will cause it to display a GREEN light. The RED (positive) display would indicate a binary "0" or control on. A GREEN (negative) display would indicate a binary "1" or control off.

Attach this box connector to pin in question



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## EIA-CCITT INTERFACE SIGNALS

### EIA-CCITT Modem Terminal Interface Signals

- Positive Voltage Equals Binary Zero, Signal Space, Control 0.
- Negative Voltage Equals Binary One, Signal Mark, Control Off.

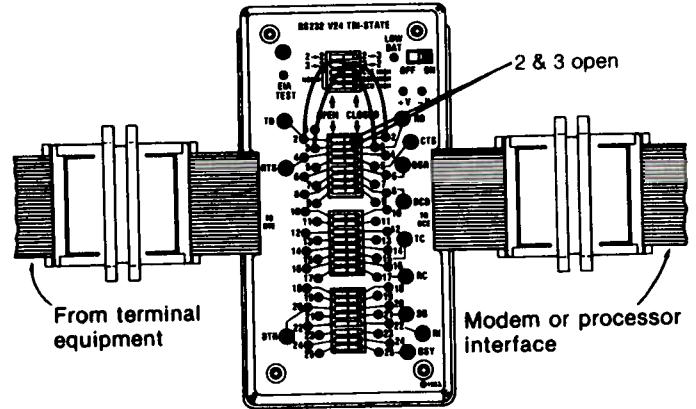
Contact Number	Circuit	Pin Assignments RS-232-C
1	AA	Protective Ground. Electrical Equipment Frame Ground. Also may be AC Power Ground.
2	BA	Transmitted Data. Data from terminal to data communications equipment (modem).
3	BB	Received Data. Data from modem to terminal.
4	CA	Request to Send (RTS). Indicates to sending modem that terminal is ready to transmit.
5	CB	Clear to Send (CTS). Indicates to terminal that modem is ready to transmit.
6	CC	Data Set Ready (DSR). Indicates to terminal that modem is connected to a communications channel and not in a test or loopback mode.

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## OPERATING INSTRUCTIONS

### Non-Standard Interfaces

Non-standard interfaces are resolved by switching or strapping individual lines. Each rocker dip switch, with the exception of line 7 which is signal ground, allows the user to break the line between the two devices. Each jumper pin on either side of the switches can then be a terminal point to attach a jumper to connect a line to another pin position on the other side of the device. An example of this would be a null modem cable interface as illustrated below. In this situation, pins two and three are reversed.



This particular non-standard interface could also be resolved with our line swapping feature. Switches one and two on the five position rocker switch are closed. The first two switches on the eight position rocker switch below it are opened.

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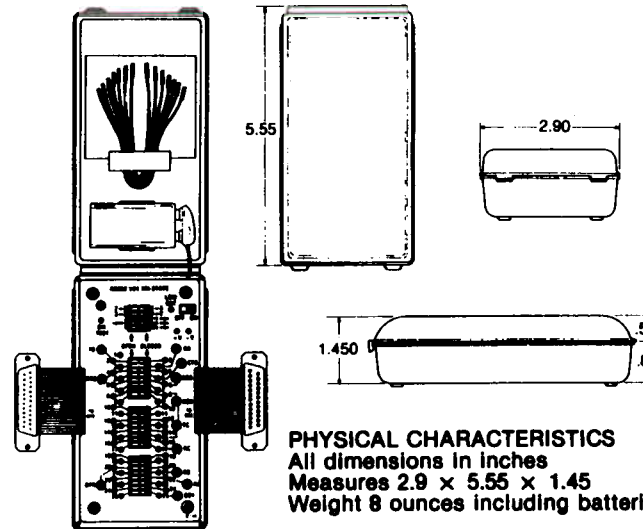
Contact Number	Circuit	Pin Assignment RS-232-C
7	AB	Signal Ground. The common ground reference potential for all circuits except protective ground.
8	CF	Received Line Signal Detector (RLSD). Indicates to terminal that receiving modem is receiving carrier from remote transmitting modem.
9	(+ V)	Reserved for dataset testing. Often has (+ 12V) voltage available for testing.
10	(- V)	Reserved for dataset testing. Often has negative (- 12V) voltage available for testing.
11	—	Unassigned.
12	SCF	Secondary Received Line Signal Detector. Indicates to terminal that receiving modem is receiving secondary carrier signals from remote transmitting modem.
13	SCB	Secondary Clear to Send. Indicates to terminal that local modem is ready to transmit signals over secondary channel.
14	SBA	Secondary Transmitted Data. Equivalent of transmitted data circuit on pin 2 except that it is used to transmit data over the secondary channel.
15	DB	Transmitter Signal Element timing signal from modem to terminal transmitter interface to provide signal element timing.

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## SPECIFICATIONS

Contact Number	Circuit	Pin Assignment RS-232-C
16	SBB	Secondary Received Data equivalent to received data circuit on Pin 3 except that it is used for receiving data from the secondary channel.
17	DD	Receiver Signal Element timing signal from modem to terminal receiver interface to provide signal element timing.
18	—	Unassigned.
19	SCA	Secondary Request to Send. Indicates to modem that sending terminal is ready to transmit data over the secondary channel.
20	CD	Data Terminal Ready (DTR). Signal from terminal to modem indicating that terminal is ready to receive and transmit data.
21	CG	Signal Quality Detector signal from modem indicating whether or not there is a predefined high probability of error in received data.
22	CE	Ring Indicator (RI) signal from modem indicating that a ringing signal is being detected over the line.
23	CH	Data Signal Rate Selector. (DTE Source) Selects between the two data rates for dual rate modems.
24	DA	Transmit Signal Element Timing. Transmit clock supplied by terminal to modem.
25	—	Unassigned.

**Input Signal** -  $\pm 25$  volts as per EIA RS232-C specification:  
 $\pm 2.5$  volts minimum input for LED indication.  
**Power Source** - One 9 volt alkaline battery.  
**Size** - Height: 5.55"  
 Width: 2.90"  
 Depth: 1.45"  
**Weight** - 8 ounces including batteries  
**Case** - Durable polypropylene injection molded case with an integral living hinged cover.  
**Front Panel** - Machined clear acrylic.



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## GLOSSARY OF TERMS

- DTE** Data Terminal Equipment
- DCE** Data Communication Equipment
- CCITT** The Consultative Committee International Telegraph and Telephone. A United Nations group established to recommend international communications standards.
- MARK** A signal corresponding to binary one, occurring on the RS232-C channel when the negative voltage is between -3 volts and -25 volts.
- SPACE** A signal corresponding to binary zero, occurring on the RS232-C channel when the positive voltage is between +3 volts and +25 volts.
- PULSE** A signal which has a constant duration time and amplitude.
- RS232-C** The technical specifications agreed on by the Electronics Industries Association for communications equipment. This specification standard specifies the control functions and signal paths of signal lines interconnecting modems and terminals. The RS232C specification specifies twenty lines for routine operation, two lines for modem testing and three lines left unassigned.
- STRAP** To connect with wires or jumpers.
- LED** Light Emitting Diode.

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