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BLACK BOX®
NETWORK SERVICES

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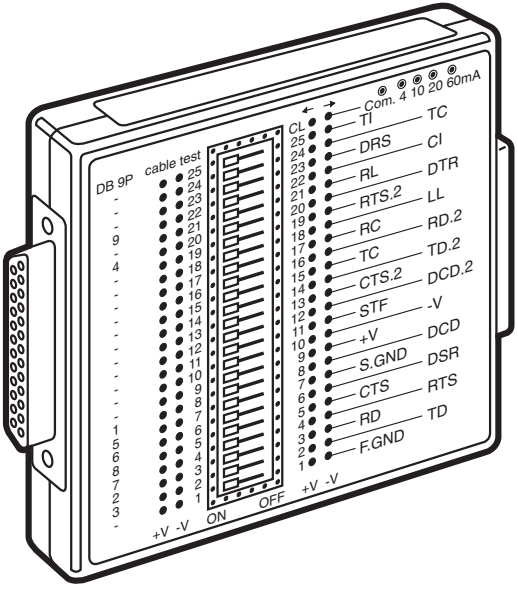
TS158A

SAM-232 Compact



CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)
FREE technical support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
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TRADEMARKS

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1. Specifications

Number of Breakout Switches—25

Number of Probe Points—50

Display—102 LEDs

Temperature—*Operating*: 32 to 122 °F (0 to 50 °C); *Storage*: -13 to 158 °F (-25 to 70 °C)

Size—3.4"H x 7.4"W x 0.7"D (8.5 x 18.8 x 2.3 cm)

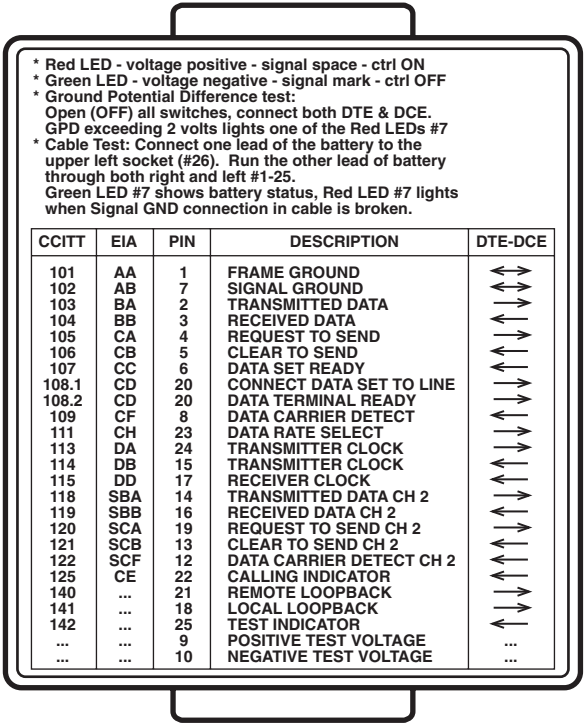
Weight—8.9 oz. (280 g)

2. Introduction

2.1 General

The SAM-232 Compact is the basic tool for testing and troubleshooting interfaces meeting CCITT V.24 specifications or the equivalent EIA standard RS-232C.

It's used for easy installation and to verify the proper operation of RS-232, the most widely accepted interface between computers, peripherals, modems, etc. Pocket-size, simple, and friendly, it's ideal for all users of data communications devices, as well as for specialists who install, repair, or sell RS-232 (V.24) devices. The SAM-232 Compact's features include a clear and logical layout of the faceplate, full four-state line-monitoring capability, convenient cable-test function, and a unique Ground Potential Difference Current Loop test.



CCITT	EIA	PIN	DESCRIPTION	DTE-DCE
101	AA	1	FRAME GROUND	↔
102	AB	7	SIGNAL GROUND	↔
103	BA	2	TRANSMITTED DATA	→
104	BB	3	RECEIVED DATA	←
105	CA	4	REQUEST TO SEND	→
106	CB	5	CLEAR TO SEND	←
107	CC	6	DATA SET READY	←
108.1	CD	20	CONNECT DATA SET TO LINE	→
108.2	CD	20	DATA TERMINAL READY	→
109	CF	8	DATA CARRIER DETECT	←
111	CH	23	DATA RATE SELECT	→
113	DA	24	TRANSMITTER CLOCK	→
114	DB	15	TRANSMITTER CLOCK	←
115	DD	17	RECEIVER CLOCK	←
118	SBA	14	TRANSMITTED DATA CH 2	→
119	SBB	16	RECEIVED DATA CH 2	←
120	SCA	19	REQUEST TO SEND CH 2	→
121	SCB	13	CLEAR TO SEND CH 2	←
122	SCF	12	DATA CARRIER DETECT CH 2	←
125	CE	22	CALLING INDICATOR	←
140	...	21	REMOTE LOOPBACK	→
141	...	18	LOCAL LOOPBACK	→
142	...	25	TEST INDICATOR	←
...	...	9	POSITIVE TEST VOLTAGE	...
...	...	10	NEGATIVE TEST VOLTAGE	...

Figure 2-1. Front View of the SAM-232 Compact.

2.2 Functional Description

2.2.1 Interface Connectors

The SAM-232 Compact has one female DB25 connector fixed on the left-hand side plus one male DB25 connector fixed on the right-hand side, so you don't need adapters to join the cables to the tester.

2.2.2 Signal Status Display

The SAM-232 Compact has "in-line monitors" showing all interface lines at both sides of the breakout switches. Each monitor circuit uses two LEDs to indicate the state of the signal (MARK/SPACE/CLOCKING/ NONE) defined by the value of the line voltage V_S with respect to signal ground (lead #7 in RS-232/V.24 standard).

The red LED indicates the SPACE/ON state of the signal; that is, V +3V. The green LED indicates MARK/OFF state, that is, V -3V. In both cases the brightness of the LED corresponds to the voltage value. For clock or data signals, both LEDs will light. If the signal voltage is in the transition region, that is, between -3V and +3V, neither LED will light.

2.2.3 Breakout Switches

Each of the 25 interface lines has an individual switch for breaking the circuit and network reconfiguration. The switches are located in the center part of the main control panel.

2.2.4 Access Sockets

On both sides of the breakout switches are sockets that allow direct access to both interfaces for cross-patching of lines via jumper cables. Access sockets also let you attach external monitoring instruments to any line.

2.2.5 Jumper Cables/Patching

A set of jumper cables with high-quality plugs is provided to allow cross-patching of interface lines. For multiple-line connections, two sets of four-plug jumper cables are supplied with the unit.

2.2.6 Ground Potential Difference Test Circuit

The difference in ground potentials of the two interfaced devices can cause problems with signal interpretation. The circuit testing this difference uses the G.P.D. monitor connected to the left side of switch #7. For more detailed information, see **Section 3.5**.

2.2.7 Power/Test Voltage Sources

The basic functions of the SAM-232 Compact do not require battery power.

2.2.8 Current Loop Test Circuit

You can access the current loop (C.L.) test circuit via 5 sockets in the horizontal row above breakout switch #25. The common socket at the beginning of the row forms a common input, while the right sockets marked 4, 10, 20, 60mA become the second input.

One of two C.L. LED monitors lights up at 80% of the stated current, and indicates the current direction as well. The maximum current is 3 times the stated current with an upper limit of 80 mA.

3. Instructions for Use

3.1. Introduction

The SAM-232 Compact can function as a breakout box, a status activity tester, a Ground Potential Difference tester, a cable tester, and a Current Loop tester. The following instructions explain basic tests that can be performed.

3.2 Breakout Box Functions/Patching

Breakout functions do not require power. Depending on the configuration of equipment and the particular problem to be solved, the tester has to be connected either to one of the devices or between both instruments. Before connecting the tester, make sure the power is off in both devices. Connect the tester's left-side DB25 connector to one of the ports via a cable (preferably 25-wire straight-through), and connect the right DB25 connector to the other port.

Switch both devices ON. Enabling/disabling of individual lines via the breakout switches and jumpers, crossing over or bussing the access sockets allows for any modification of the standard interface. To solve problems of an existing interface switch, turn both devices OFF. Disconnect one end of the interface cable and connect it to the tester, then plug the tester into the free port. Switch both devices ON. All kinds of null-modem and loop-back configurations can be established, for example, to form a basic asynchronous null-modem interface:

- Open (OFF) the breakout switch #2 and 3.
- connect left access socket #2 to the right socket # 3 via a jumper cable.
- connect left socket #3 to the right socket #2.

Often in addition to lines 2 and 3, similar cross-over of the control lines, usually #6 and 20, is required.

3.3 Monitoring the Interface Signals

The tester connected according to **Section 3.2** immediately indicates the states of the signals transmitted by the interface. Each of the interface lines has two monitoring systems, located on either side of the corresponding breakout switch. Full monitoring doesn't depend on the positions of the breakout switches.

The red LED lights when the corresponding circuit is in the SPACE/ON state; the green LED signals the MARK/OFF state. If both LEDs are off, there's no signal. LED light intensity depends on the strength of the monitored signal.

3.4 Control-Signal Simulation

Tests on the RS-232 (V.24) interface often require signal simulation in various control lines. The SAM-232 Compact simulates signals without a battery. Connect the access sockets belonging to the forced line to a line providing suitable voltage (often DTE lines 9 or 20 [DCE 6 or 9] can supply +V, while line 10 in many devices supplies -V).

3.5 Ground Potential Difference Test

Ground Potential Difference develops when two pieces of equipment are powered from different power-distribution systems or when a ground problem occurs in one of the devices.

Follow these steps to test Ground Potential Difference:

- Switch both devices OFF.
- Open (OFF) all breakout switches #1 through 25.
- Connect the tester between both devices via any cable supporting line #7.
- Switch both devices ON.

One of the Red LEDs located at position #7 lights up if G.P.D. is more than 2V. Problems with signal-level interpretation can occur when G.P.D. exceeds 2 volts. In that case, galvanic ground separation is required in one of the connected devices.

3.6 Current Loop Circuit Examination

Though current loop differs substantially from the RS-232 (V.24) standard, it is sometimes used in older RS-232 (V.24) installations to communicate over longer distances or to establish ground separation.

The Current Loop test circuit is a unique feature of the SAM-232 Compact that allows you to examine current loops mixed with the RS-232 (V.24) circuits, as well as external current-loop interfaces (short-haul modems). Follow these steps to test the current loop circuit using the RS-232 (V.24) lines:

- Identify break-out switches belonging to the tested current loop.
- Disconnect one of the current loop wires by either opening the corresponding break-out switch or unplugging the jumper cable, closing the loop.
- Connect both ends of the opened current loop to the C.L. circuit inputs, via jumper cables, to the left input marked “Common” and the dedicated “..mA” access socket.

You can test independent current loops by connecting the open circuit to the input marked “Common” and the dedicated access socket marked “..mA.” In both cases one of the C.L. LED monitors lights when the current is at least 80% of the chosen range and shows current directions well. The current-loop test circuit does not require power from the built-in battery and is galvanically separated from the 25 RS-232 (V.24) lines.

3.7 Cable Testing

The SAM-232 Compact can test any interface cable with DB25 connectors. To test the cable follow these steps:

- Open (turn OFF) all switches #1 through 25.
- Plug the cable into the left and right DB25 connectors.
- Connect the -DC supply to the tester’s upper left socket located at position #26.
- Connect the +DC supply to the left socket # 7. One of the Red LEDs (pos. # 7) will light if line # 7 is broken.

- Run the jumper cable connected to the +DC supply through the left and right access sockets.

Lighting LEDs indicate pins shorted in each connector as well as connections between the two.