USER MANUAL

MODEL 1040

Self-Powered
Universal
Short Range Modem

PATTON Electronics Co.

An ISO-9001 Certified Company

Part #07M1040-B
Doc. #054011UB
Revised 4/29/98

SALES OFFICE
(301) 975-1000
TECHNICAL SUPPORT
(301) 975-1007
http://www.patton.com

1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 1040 components to be free from defects, and will—at our option—repair or replace the product should it fail within one year from the first date of shipment.

This warranty is limited to defects in workmanship or materials, and does not cover customer damage, abuse or unauthorized modification. If this product fails or does not perform as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall **Patton Electronics** be liable for any damages incurred by the use of this product. These damages include, but are not limited to, the following: lost profits, lost savings and incidental or consequential damages arising from the use of or inability to use this product. **Patton Electronics** specifically disclaims all other warranties, expressed or implied, and the installation or use of this product shall be deemed an acceptance of these terms by the user.

1.1 RADIO AND TV INTERFERENCE

The Model 1040 generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The Model 1040 has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the Model 1040 does cause interference to radio or television reception, which can be determined by disconnecting the RS-232 interface, the user is encouraged to try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

1.2 CE NOTICE

The CE symbol on your Patton Electronics equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU). A Certificate of Compliance is available by contacting Patton Technical Support.

1.3 SERVICE

All warranty and non-warranty repairs must be returned freight prepaid and insured to Patton Electronics. All returns must have a Return Materials Authorization number on the outside of the shipping container. This number may be obtained from Patton Electronics Technical Service at

telephone: **(301) 975-1007,**
web address: **http://www.patton.com**;
email: **support@patton.com**.

NOTE: Packages received without an RMA number will not be accepted.

Patton Electronics' technical staff is also available to answer any questions that might arise concerning the installation or use of your Model 1040. Technical Service hours: **8AM to 5PM EST, Monday** ***through Friday.***

2.0 GENERAL INFORMATION

Thank you for your purchase of this Patton Electronics product. This product has been thoroughly inspected and tested and is warranted for One Year parts and labor. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Patton Electronics Technical Support at (301) 975-1007.

2.1 FEATURES

- Switch-selectable carrier control
- Synchronous or asynchronous operation
- No AC power or batteries required
- Data rates to 38.4 Kbps
- Distances to 12 miles (19.2 km)
- Point-to-point or multipoint operation
- Full or half duplex operation
- Internal, external or received loopback clocking
- V.54 loopback tests and V.52 compliant BER tests
- Automatic equalization
- Easy-to-read status LEDs
- Transformer isolation
- Silicon Avalanche Diode surge protection

2.2 DESCRIPTION

The Model 1040 carrier controlled short range modem supports synchronous and asynchronous data rates to 38.4 Kbps. Requiring no AC power or batteries, the Model 1040 supports distances to 12 miles over unconditioned twisted pair. The Model 1040 features front panel LEDs, automatic equalization, V.52 compliant BER tests, both internal and external clocking and V.54 loopback tests. Built-in transformer isolation and surge protection provide protection against ground potential differences and AC/DC over-voltages.

The Model 1040 is fully compatible with the Patton Model 1080A and 1080ARC. This compatibility allows you to combine miniature, standalone and rack mounted modems in a single system. In synchronous mode, the Model 1040 is also compatible with the Models 1020, 1025 and 1030.

Housed in an ABS plastic case, the Model 1040 comes with either a male or female DB-25 connector and a choice of interfaces (RJ-11 jack, RJ-45 jack or terminal blocks with strain relief).

3.0 CONFIGURATION

The Model 1040 is simple to install and is ruggedly designed for excellent reliability: just set it and forget it. The following instructions will help you set up and install the Model 1040 properly. If you have any questions, don't hesitate to call Patton Electronics Technical Support at (301) 975-1007.

3.1 CONFIGURATION SWITCHES

The Model 1040 uses a unique set of sixteen external DIP switches that allow configuration to an extremely wide range of applications. These DIP switches are grouped into two eight-switch sets and are externally accessible from the underside of the Model 1040 (see Figure 1). There is no need to open the Model 1040's case for configuration.

The configuration switches allow you to select data rates, clocking methods, V.52 & V.54 tests, word lengths, extended signaling rates, asynchronous or synchronous mode and 2- or 4-wire mode. The drawings, text and tables on the following pages describe all switch locations, positions and functions.

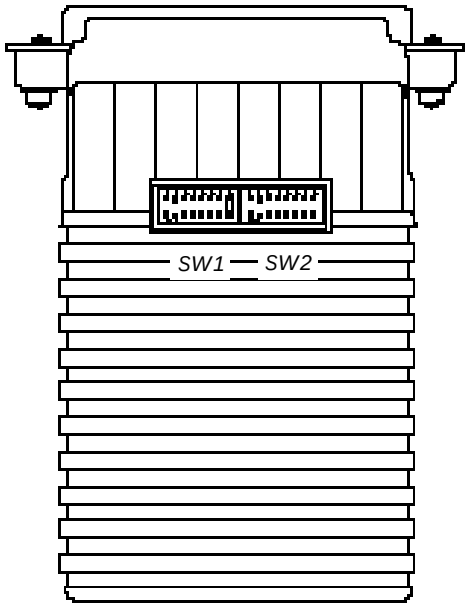


Figure 1. The back of the Model 1040

3.2 CONFIGURATION SWITCH SETTINGS

The Model 1040 has two sets of eight switches, yielding 16 total DIP switches. The two sets will be referred to as SW1 and SW2. As Figure 2 shows, the orientation of all DIP switches is the same with respect to “ON” and “OFF” positions.

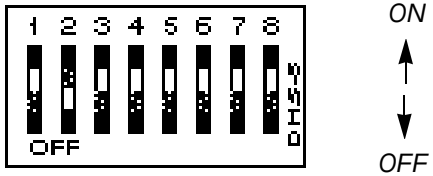


Figure 2. Close up of configuration switches

3.3 SWITCH SET SW1

The DIP switches on SW1 set data rate, clock source, async./sync. mode and carrier control method. The default settings are summarized in the table below.

SW1 SUMMARY TABLE			
Position	*Function*	*Factory Default*	
SW1-1	Data Rate	On	9,600 bps
SW1-2	Data Rate	Off	
SW1-3	Data Rate	Off	
SW1-4	Data Rate	On	
SW1-5	Clock Source	On	Internal
SW1-6	Clock Source	On	
SW1-7	Async./Sync.	On	Async.
SW1-8	Carrier Control	Off	Constantly On

SW1-1 through SW1-4: Data Rate Setting

Switches SW1-1 through SW1-4 are set in combination to determine the asynchronous and synchronous data rate for the Model 1040.

SW1-1	SW1-2	SW1-3	SW1-4	Setting
On	On	On	On	1.2 Kbps
Off	On	On	On	1.8 Kbps
On	Off	On	On	2.4 Kbps
Off	Off	On	On	3.6 Kbps
On	On	Off	On	4.8 Kbps
Off	On	Off	On	7.2 Kbps
On	Off	Off	On	9.6 Kbps
Off	Off	Off	On	14.4 Kbps
On	On	On	Off	19.2 Kbps
Off	On	On	Off	28.8 Kbps
On	On	Off	Off	38.4 Kbps

SW1-5 and SW1-6: Clock Source

Switches SW1-5 and SW1-6 are set in combination to determine the clock source for the Model 1040.

SW1-5	SW1-6	Setting
On	On	Internal transmit clock
Off	On	Receive recover clock
On	Off	External transmit clock

SW1-7: Asynchronous/Synchronous Mode

The setting for switch SW1-7 determines whether the Model 1040 is in asynchronous or synchronous operating mode.

SW1-7	Setting
On	Asynchronous
Off	Synchronous

SW1-8: Carrier Control Method

The setting for switch SW1-8 determines whether the carrier is "constantly on" or "controlled by RTS". This setting allows for operation in switched carrier, multipoint and/or hardware handshaking applications. Note: SW1-8 must be "ON" in all 2-wire applications.

SW1-8	Setting
Off	Constantly on
On	Controlled by RTS

3.4 SWITCH SET SW2

The DIP switches on SW2 set word length, extended signaling rate, RTS/CTS delay, 2-wire/4-wire and V.52/V.54 tests. The factory default settings for Switch Set SW2 are summarized in the table below.

SW2 SUMMARY TABLE

Position	*Function*	*Factory Default*
SW2-1	Word Length	Off } 10 bits
SW2-2	Word Length	Off }
SW2-3	Extended Signaling	Off -2.5% to +1%
SW2-4	RTS/CTS Delay	On } 7 mS
SW2-5	RTS/CTS Delay	On }
SW2-6	2/4 Wire	On } 4-wire/full dpx
SW2-7	2/4 Wire	Off }
SW2-8	V.52/V.54 Tests	Off Enabled

SW2-1 and SW2-2: Word Length

SW2-1 and SW2-2 are set in combination to determine the word length for asynchronous/synchronous data.

SW2-1	SW2-2	Setting
Off	On	8 bits
On	On	9 bits
Off	Off	10 bits
On	Off	11 bits

SW2-3: Extended Signaling Rate

The setting for switch SW2-3 determines the range of variability the Model 1040 "looks for" in asynchronous data rates (i.e., the actual variance from a given frequency level the Model 1040 will tolerate).

SW2-3	Setting
Off	-2.5% to +1%
On	-2.5% to +2.3%

SW2-4 and SW2-5: RTS/CTS Delay

The combined settings for switches SW2-4 and SW2-5 determine the amount of delay between the time the Model 1040 "sees" RTS and when it sends CTS. Options are no delay, 7mS and 53mS.

SW2-4	SW2-5	Setting
On	On	7 mS
Off	On	53 mS
On	Off	No delay
Off	Off	No delay

SW2-6 and SW2-7: 2-Wire/4-Wire Mode Selection

The setting for switch SW2-6 determines whether the Model 1040 is operating in 2-wire or 4-wire mode. Note: SW1-8 must be ON in 2-wire mode.

SW2-6	SW2-7	Setting
On	On	4-wire (half duplex)
On	Off	4-wire (full duplex)
Off	On	2-wire (half duplex only)

SW2-8: V.52 and V.54 Diagnostic Tests

The setting for switch SW2-8 determines whether or not the Model 1040's V.52 and V.54 tests will be enabled. To reset the V.54 circuit, set switch SW2-8 to the "ON" position, then back to the "OFF" position.

SW2-8	Setting
On	Disabled
Off	Enabled

4.0 INSTALLATION

Once the Model 1040 is properly configured, it is ready to connect to your system. This section tells you how to connect the Model 1040 to the twisted pair and RS-232 interfaces.

4.1 CONNECTION TO THE TWISTED PAIR INTERFACE

The Model 1040 supports data-only communication between two RS-232 devices at distances to 12 miles (19.2) and data rates to 38.4 Kbps. There are two essential requirements for installing the Model 1040:

1. These units work in ***pairs***. Therefore, you must have one Model 1040 (or a compatible model) at each end of a two twisted pair interface.

2. To function properly, the Model 1040 needs two twisted pairs of metallic wire. These pairs must be ***unconditioned***, dry, metallic wire, between 19 and 26 AWG (the higher number gauges may limit distance somewhat). Standard dial-up telephone circuits or leased circuits that run through signal equalization equipment are *not acceptable*.

For your convenience, the Model 1040 is available with three different twisted pair interfaces: RJ-11 jack, RJ-45 jack and terminal blocks with strain relief.

4.1.1 TWISTED PAIR CONNECTION USING RJ-11 OR RJ-45

The RJ-11 and RJ-45 connectors on the Model 1040's twisted pair interface are pre-wired for a standard TELCO wiring environment (see Figure 5). The signal/pin relationships are shown on the table on the following page.

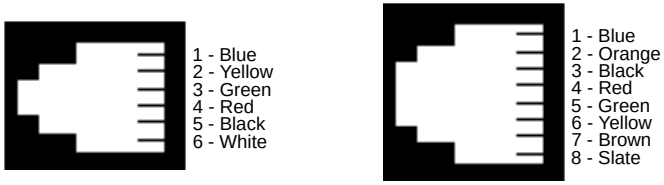


Figure 5. Standard AT&T color codes

RJ-11	*SIGNAL*
1	GND†
2	RCV◊
3	XMT
4	XMT
5	RCV
6	GND†

RJ-45	*SIGNAL*
1	N/C
2	GND†
3	RCV◊
4	XMT
5	XMT
6	RCV
7	GND†
8	N/C

†Connection to ground is optional
◊The Model 1040 is not polarity sensitive

When connecting two Model 1040s, it is necessary to use a "crossover" cable. The diagram below shows how a crossover cable should be constructed for an environment where both Model 1040s use a 6-wire RJ-11 connector. Similar logic should be followed when using RJ-45 connectors or a combination of the two.

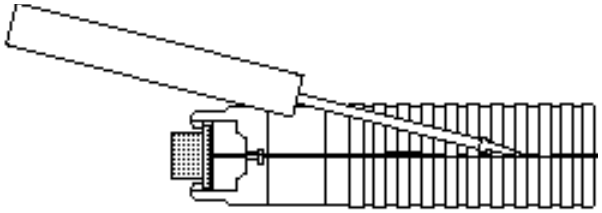
SIGNAL	*PIN#*	*COLOR* ‡	*COLOR*	*PIN#*	*SIGNAL*
GND†	1	Blue	White	6	GND†
RCV◊	2	Yellow	Red	4	XMT
XMT	3	Green	Black	5	RCV
XMT	4	Red	Yellow	2	RCV
RCV	5	Black	Green	3	XMT
GND†	6	White	Blue	1	GND†

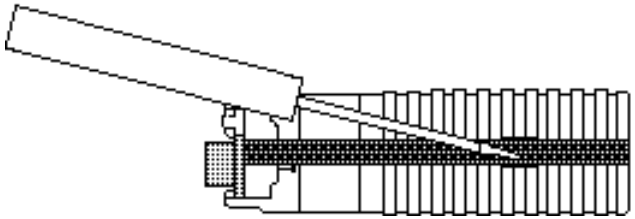
†Connection to ground is optional
‡Standard color codes—yours may be different
◊The Model 1040 is not sensitive to polarity

4.1.2 TWISTED PAIR CONNECTION USING TERMINAL BLOCKS

If your application requires you to connect two pairs of bare wires to the Model 1040, you must open the case to access the terminal blocks. The instructions on the following pages will tell you how to open the case, connect the bare wires to the terminal blocks and fasten the strain relief collar in place so that the wires won't pull loose.

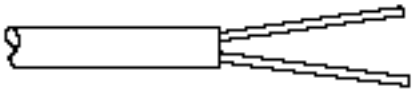
1. Open the unit by gently inserting a screwdriver into the special pry slot on the plastic case (below). Don't worry about breaking the plastic, but make sure that you do not insert the screwdriver more than 1/4” into the enclosure, as you may damage the unit.



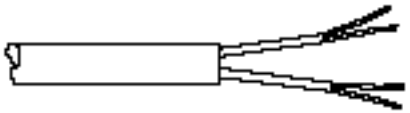


Once the unit has been opened, you will be able to see the terminal blocks located at the rear of the PC board.

2. Strip the outer insulation from the twisted pairs about one inch from the end.



3. Strip back the insulation on each of the 2 twisted pair wires about .25”.



4. Connect *one pair* of wires to the two XMT (transmit) poles on the terminal block. The Model 1040 is not polarity sensitive, so either wire may connect to either pole.

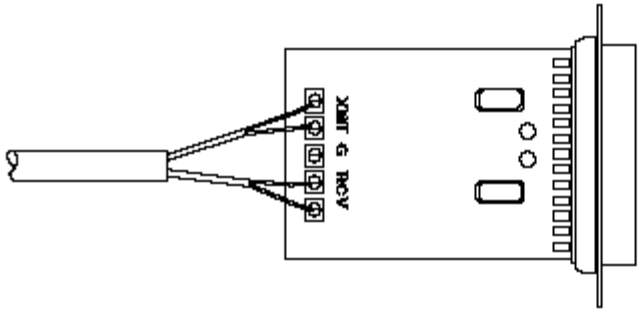
5. Connect the *other pair* of wires to the two RCV (receive) poles on the terminal block.

   Ultimately, you will want to construct a two-pair crossover cable that makes a connection with the two Model 1040s as shown below:

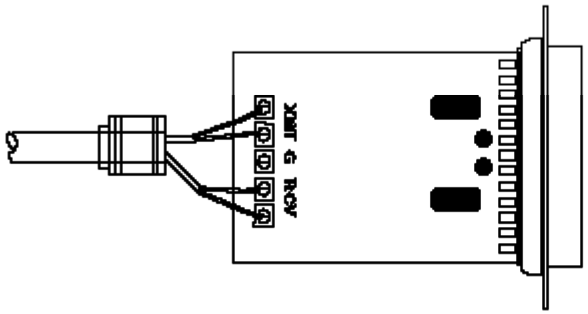
```
XMT ---------------------------- RCV }
XMT ---------------------------- RCV } One Pair
G   ---------- To Shield (Optional) G
RCV ---------------------------- XMT }
RCV ---------------------------- XMT } One Pair
```

6. If there is a shield around the telephone cable it may be connected to “G” on the terminal block. To avoid ground loops, we recommend connecting the shield at the computer end only. A ground wire is *not necessary* for proper operation of the Model 1040.

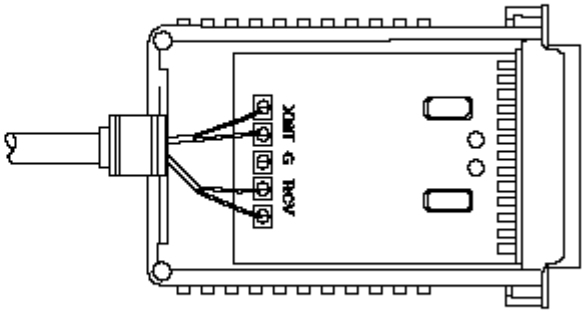
7. When you finish connecting the wires to the terminal block, the assembly should resemble the diagram below:



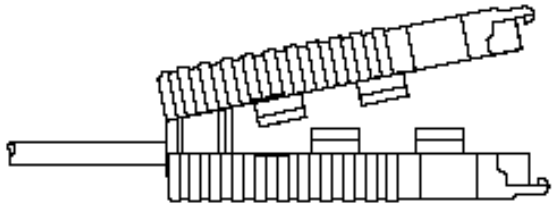
8. Place the 2 halves of the strain relief assembly on either side of the telephone wire and press together very lightly. Slide the assembly so that it is about 2 inches from the terminal posts and press together firmly. If your cable diameter is too small or too large for our strain relief, please contact our technical support. We have strain relief assemblies to accommodate most cable diameters.



9. Insert the strain relief assembly with the wire going through it into the slot in the bottom half of the modem case and set it into the recess in the case.



10. BEND the top half of the case as necessary to place it over the strain relief assembly. Do not snap the case together yet.



11. Insert one captive screw through a saddle washer, then insert the entire piece through the hole in the DB-25 end of the case. Snap that side of the case closed. Repeat the process for the other side. This completes cable installation.

4.2 CONNECTION TO THE RS-232 INTERFACE

Once you have connected the twisted pair wires correctly, simply plug the Model 1040 directly into the DB-25 port of the RS-232 device. After doing so, remember to insert and tighten the two captive connector screws.

4.2.1 CONNECTION TO A "DTE" DEVICE

The Model 1040 is wired as a DCE, and therefore "wants" to plug into a DTE such as a terminal, PC or host. Because the Model 1040 is interface powered, a direct connection to the RS-232 DTE port is most desirable. If you must use a cable to connect the Model 1040 to the DTE port, make sure it is a *straight through* cable of the shortest possible length—we recommend 6 feet or less.

4.2.2 CONNECTION TO A "DCE" DEVICE

Since the Model 1040 is wired as a DCE, you cannot connect it directly to another DCE such as a modem, multiplexer or printer. If you need to connect the Model 1040 to another DCE device, you must use a *null modem cable* wired according to diagram below. We recommend a cable of the shortest possible length, preferably 6 feet or less.

Connection to Model 1040 DB-25 Pin No.	*Connection to DCE Device DB-25 Pin No.*
1	1
2	3
3	2
4	8
8	4
6	20
20	6
17	24
24	17
7	7

†Note: When connected to another DCE device, the Model 1040 should be configured for “external clock” (see Section 3.3).

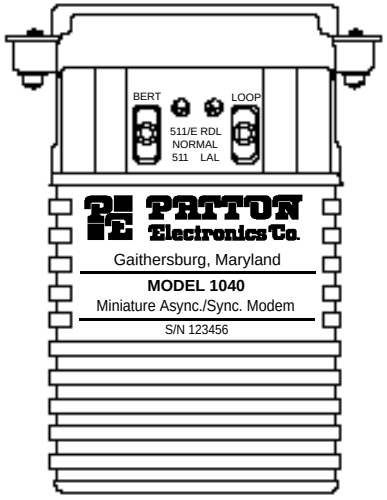


Figure 6. Model 1040’s LED indicators and test switches

5.0 OPERATION

Once the Model 1040 is properly configured and installed, it should operate transparently—as if it were a standard cable connection. Operating power is derived from the data and control signals; there is no “ON/OFF” switch. Section 5.0 describes reading the LED status monitors, powering-up and using the built-in V.52 and V.54 test modes.

5.1 FRONT PANEL aSWITCHES

During normal operation, both front panel switches should be in the “normal” center position. To operate a test mode, see Section 5.3.

5.2 LED STATUS MONITORS

The Model 1040 features 2 front panel LEDs that indicate the condition of the V.52 and V.54 test modes. Figure 6 shows the location of each LED. Section 5.3 describes each LED’s function in more detail.

5.3 V.54 TEST MODES

The Model 1040 offers two V.54 test modes to evaluate the condition of the modems and the communication link. These tests can be activated physically from the front panel, or via the RS-232 interface. Note: V.54 test modes on the Model 1040 are available for point-to-point and 4-wire applications only.

5.3.1 Local Analog Loopback (LAL)

The Local Analog Loopback (LAL) test checks the operation of the local Model 1040, and is performed separately on each unit. Any data sent to the local Model 1040 in this test mode will be echoed (returned) back to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal screen. To perform a LAL test, follow these steps:

A. Activate LAL. This may be done in one of two ways: First, by moving the front panel toggle switch DOWN to “LAL”. Second, by raising pin 18 on the RS-232 interface (Note: Make sure DIP switch SW2-8 is OFF). Once LAL is activated, the Model 1040 transmit output is connected to its own receiver. The “test” LED should be lit.

B. Verify that the data terminal equipment is operating properly and can be used for a test. If a fault is indicated, call a technician or replace the unit.

C. Perform a BER (bit error rate) test on each unit. If the BER test equipment indicates no faults, but the data terminal indicates a fault, follow the manufacturer’s checkout procedures for the data terminal. Also, check the RS-232 interface cable between the terminal and the Model 1040.

5.3.2 Remote Digital Loopback (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Model 1040s and the communication link between them. Any characters sent to the remote Model 1040 in this test mode will be returned back to the originating device. For example, characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote Model 1040 and looped back. To perform an RDL test, follow these steps:

A. Activate RDL. This may be done in two ways: first, by moving the front panel toggle switch UP to “RDL”. Second, by raising pin 21 on the RS-232 interface (Note: Make sure SW2-8 is OFF).

B. Perform a BER (bit error rate) test on the system.

C. If the BER test equipment indicates a fault, and the Local Analog Loopback test was successful for both Model 1040s, you may have a problem with the twisted pair line between the modems. Make sure you check the twisted pair line for proper connections and continuity.

5.3.3 Using the V.52 BER Test Independently

The V.52 BER test can be used independently of the V.54 loopback tests. This requires two operators: one to initiate and monitor the test at the local Model 1040, and one at the remote Model 1040. To use the V.52 BER test by itself, both operators should simultaneously follow these steps:

1. Locate the “511/511E” toggle switch on the front panel of the 1040 and move it DOWN. This activates the V.52 BER test mode and transmits a “511” test pattern to the other unit. If any errors are present, the receiving modem’s red “Error” LED will blink sporadically. Note: For this test to function, the “511” switch on both Model 1040s must be on.

2. If the test indicates no errors are present, move the V.52 toggle switch UP, activating the “511/E” test with periodic errors present. If the test is working properly, the receiving modem's red “Error” LED will light continuously. A successful “511/E” test will confirm that the link is in place, and that the Model 1040’s built-in “511” generator and detector are working properly.

5.4 POWER-DOWN

Turn off the Model 1040 by simply removing it from the circuit or by turning off the terminal that is directly connected to the Model 1040.

APPENDIX A

PATTON MODEL 1040 SPECIFICATIONS

Transmission Format:	Sync. or async., full or half duplex
Transmission Line:	Unconditioned twisted pair 19 - 26 AWG
Clocking:	Internal, external or receive loopback
Interfaces:	EIA RS-232, CCITT V.24
Data Rates:	1.2, 1.8, 2.4, 3.6, 4.8, 7.2, 9.6, 14.4, 19.2, 28.8, 38.4 Kbps (switch selectable)
Isolation:	Minimum 1500 V RMS via isolation transformers
Control Signals:	Constantly “on” or controlled by RTS
RTS/CTS Delay:	No delay, 7mS, 53mS
Connectors:	DB-25 male or female on RS-232 side; RJ-11, RJ-45 or terminal block with strain relief on line side
Power Supply:	None required; uses power from EIA data and control signals
Surge Protection:	Compliant with IEC 801.5 level 2, 1kV
Temperature Range:	0-60°C (32-140°F)
Altitude:	0-15,000 feet
Humidity:	5 to 95% noncondensing
Dimensions:	3.0” x 2.1” x .81” (7.6 x 5.3 x 2.1 cm)
Weight:	2 oz. (56.7g)

APPENDIX B

PATTON MODEL 1040 CABLE RECOMMENDATIONS

The Patton Model 1040 operates at frequencies of 20kHz or less and has been performance tested by Patton technicians using twisted-pair cable with the following characteristics:

Wire Gauge	*Capacitance*	*Resistance*
19 AWG/.9mm	83nf/mi or 15.72 pf/ft.	.0163 Ohms/ft.
22 AWG/.6mm	83nf/mi or 15.72 pf/ft.	.0326 Ohms/ft.
24 AWG/.5mm	83nf/mi or 15.72 pf/ft.	.05165 Ohms/ft.

To gain optimum performance from the Model 1040, please keep the following guidelines in mind:

- *Always* use **twisted pair** wire—this is not an option.
- Use twisted pair wire with a capacitance of 20pf/ft or less.
- Avoid twisted pair wire thinner than 26 AWG (i.e. avoid higher AWG numbers than 26)
- Use of twisted pair with a resistance greater than the above specifications may cause a reduction in maximum distance obtainable. Functionality should not be affected.
- Environmental factors too numerous to mention can affect the maximum distances obtainable at a particular site. Use “maximum distance” figures as a **general guideline only**.

Model 1040 Distance Table in Miles (km)

Data Rate (bps)	*Wire Gauge*		
	19 AWG (0.9 mm)	24 AWG (0.5 mm)	26 AWG (0.4 mm)
38,400	6.0(9.7)	4.5(7.2)	2.5(4.0)
19,200	9.0(14.5)	6.5(10.5)	4.0(6.4)
9,600	10.0(16.1)	7.0(11.3)	5.0(8.0)
4,800	11.0(17.7)	8.0(12.9)	6.0(9.7)
1,200	12.0(19.3)	10.0(16.1)	6.0(9.7)

APPENDIX C

PATTON MODEL 1040 PIN/SIGNAL ASSIGNMENTS

DIRECTION	"DCE" STANDARD SETTING	DIRECTION
	1- (FG) Frame Ground	
From Model 1040	Transmitting Clock - 15	To Model 1040
	2- (TD) Transmit Data	From Model 1040
From Model 1040	Receive Clock - 17	To Model 1040
	3- (RD) Receive Data	From Model 1040
To Model 1040	Local Analog Loopback - 18	
	4- (RTS) Request to Send	To Model 1040
	5- (CTS) Clear to Send	From Model 1040
	6- (DSR) Data Set Ready	From Model 1040
	7- (SG) Signal Ground	
To Model 1040	Data Term. Ready (DTR) - 20	
	8- (DCD) Data Carrier Detect	From Model 1040
To Model 1040	Remote Digital Loopback - 21	To Model 1040
	9- +DCV	
To Model 1040	External Clock - 24	
From Model 1040	Test Mode - 25	

APPENDIX D

PATTON MODEL 1040 BLOCK DIAGRAM