Dear Valued Customer,

Thank you for purchasing Patton Electronics products! We do appreciate your business. I trust that you find this user manual helpful.

We manufacture one of the widest selections of data communications products in the world including CSU/DSU's, network termination units, powered and self-powered short range modems, fiber optic modems, interface converters, baluns, electronic data switches, data-line surge protectors, multiplexers, transceivers, hubs, print servers and much more. We produce these products at our Gaithersburg, MD, USA, facility, and can custom manufacture products for your unique needs.

We would like to hear from you. Please contact us in any of the following ways to tell us how you like this product and how we can meet your product needs today and in the future.

Web:	http:www.patton.com
Sales E-mail:	sales@patton.com
Support E-mail:	support@patton.com
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Fax:	(301) 869-9293
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We are committed to a quality product at a quality price. Patton Electronics is BABT and ISO 9001 certified. We meet and exceed the highest standards in the industry (CE, UL, etc.).

Please contact us and let us know how we may provide you with the answers to your needs.

Thank you.

Burton A.Patton
Vice President

P.S. Please tell us where you purchased this product.

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USER MANUAL

MODEL 1090
High Speed Synchronous Short Range Modem

PATTON Electronics Co.

ISO 9001

An ISO-9001 Certified Company

Part# 07M1090-B
Doc# 032011UB
Revised 5/26/98

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

1.0 WARRANTY INFORMATION

Patton Electronics warrants all Model 1090 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 1090 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 1090 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 1090 does cause interference to radio or television reception, which can be determined by removing power from the unit, 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 Technical Support.

1.2 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 1090. Technical Service hours: **8AM to 5PM EST, Monday through Friday.**

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

- Synchronous data rates of 48, 56, 64, 72, 80, 112, 128, 144 and 160 kbps
- Frequency Shift Key (FSK) modulation
- Full or half duplex operation over two twisted pair (4-wire)
- Point-to-point distances up to 11 miles (19 AWG @ 56 kbps)
- V.54 compliant local analog (LAL), remote digital (RDL) and local digital loopback tests
- V.52 compliant Bit Error Rate (BER) test pattern generator
- Replaceable DTE-DCE QuickConnect™ interface modules
- V.52 compliant BER test pattern generator
- Internal, external or receive recovered clocking options
- Automatic equalization
- Made in the U.S.A.

2.2 DESCRIPTION

The Patton Model 1090 Synchronous Short Range Modem is designed for point-to-point, high speed communication over 4-wires (two twisted pair). Supporting switch-selectable data rates from 48 to 160 kbps, the Model 1090 is perfect for connecting two bridge/routers, or for similar campus applications at distances up to 11 miles. The Model 1090 incorporates built-in V.54 loopback tests, a V.52 BERT pattern generator and seven front panel LED indicators. Data integrity is enhanced by automatic equalization and gain control. The Model 1090 also incorporates transformer isolation and surge protection to guard data and connected equipment against the hazards of ground loops and transient surges. Clocking options include internal, external and receive recover clock.

The Model 1090 is the first Patton product to feature replaceable DCE-DTE QuickConnect™ interface modules. Several different modules are available (call Patton Sales for details). Line connection is made by RJ-45 jack. Internal AC power supply options include 120 or 230VAC (switchable), 85-256VAC (universal) or 48VDC.

The Model 1090 is equipped with one set of eight DIP switches, and one set of four DIP switches (all externally accessible). These DIP switches allow configuration of clock source, carrier control, loopback tests and data rate. This section describes switch locations and explains all possible configurations.

3.1 EXTERNAL DIP SWITCH SETTINGS

The Model 1090's DIP switches are located on the underside of the unit (see Figure 1, below). Figure 2 (below), shows the orientation of the switch set. All possible settings for the Model 1090's DIP switches are presented in the summary table and descriptions on the following pages. If you have additional questions regarding configuration, contact Patton Technical Support at (301) 975-1007.

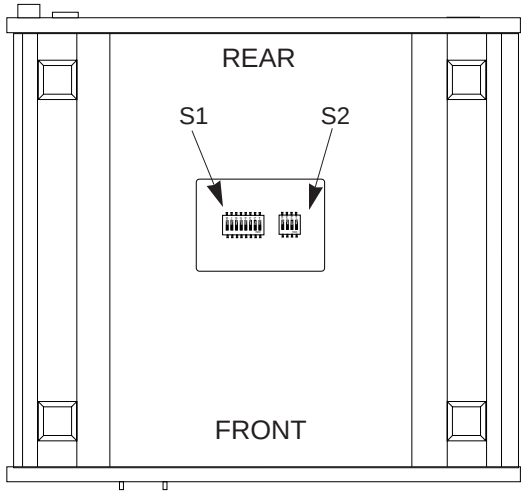


Figure 1. Underside of Model 1090 Wish External DIP Switch Locations

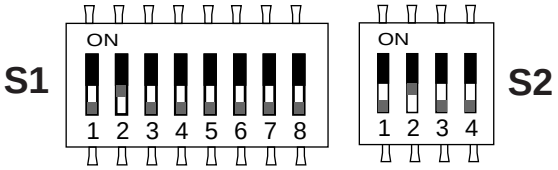


Figure 2. Close Up of Configuration Switches

S1 SUMMARY TABLE			
Position	**Function**	**Factory Default**	
S1-1	Clock Source*	On	Internal
S1-2	Clock Source*	On	
S1-3	RTS/CTS Delay	On	Short Delay
S1-4	LDL Control	Off	Disabled
S1-5	Carrier Control	Off	Constant
S1-6	DTE Control of RDL	Off	Disabled
S1-7	DTE Control of LAL	Off	Disabled
S1-8	V.54 Enable/Disable	Off	Enabled
***See Note in SWITCH SET S1 (Below) for X.21 Clock Sources			

Figure 3. Summary of DIP Switch Default Settings for S1

SWITCH SET S1

The configuration switches on S1 set clock source, RTS/CTS delay, carrier control, loopback tests. The default settings are summarized in Figure 3 (above).

S1-1 and S1-2: Clock Source

Switches S1-1 and S1-2 are set in combination to determine the source of timing for the Model 1090.

S1-1	S1-2	Setting
On	On	Internal
On	Off	Receive recover
Off	On	External transmit clock
Off	Off	Not a valid setting

NOTE: When an X.21 QuickConnect™ module is installed in one or both base units, one base unit **must** be configured for receive recover clock source. The particular application will dictate which unit must be configured for receive recover clock source.

S1-3: RTS/CTS Delay

Switch S1-3 determines the amount of delay between the time RTS is activated and the 1090 activates the CTS.

S1-3	Function
On	Short delay (4-9 msec)
Off	Long delay (33-71 msec)

S1-4: LDL Control

Switch S1-4 determines whether the front panel switch can activate a Local Digital Loopback (LDL) diagnostic test.

S1-4	Function
On	LDL Control Enabled
Off	LDL Control Disabled

S1-5: Carrier Control

The setting for switch S1-5 determines whether the carrier is “constantly on” or “controlled by RTS”. This setting allows for operation in switched carrier or hardware handshaking applications.

S1-5	Setting
On	Controlled by RTS
Off	Constantly ON

S1-6: DTE Control of RDL

The setting for switch S1-6 determines whether DTE control of remote-digital loopback test is enabled or disabled. If DTE control is disabled, the RDL test can only be initiated by the front panel switch.

S1-6	Setting
On	DTE control enabled
Off	DTE control disabled

S1-7: DTE Control of LAL

The setting for switch S1-7 determines whether DTE control of local analog loopback test is enabled or disabled. If DTE control is disabled, the LAL test can only be initiated by the front panel switch.

S1-7	Setting
On	DTE control enabled
Off	DTE control disabled

S1-8: V.54 Enable / Disable

The setting for switch S1-8 determines whether the Model 1090 will respond when it receives the V.54 sequence. If you suspect the Model 1090 may be getting tricked into the loopback test by false detection of user data, you can try setting this to “Disable.”

S1-8	Setting
On	Disabled
Off	Enabled

SWITCH SET S2

The settings for DIP switches S2-1 through S2-4 determine the synchronous data rate of the Model 1090. All possible settings (including the default) are shown below:

S2-1	S2-2	S2-3	S2-4	Setting
Off	Off	Off	On	48 kbps
Off	Off	On	Off	56 kbps
Off	Off	On	On	*64 kbps
Off	On	Off	Off	72 kbps
Off	On	Off	On	80 kbps
Off	On	On	Off	112 kbps
Off	On	On	On	128 kbps
On	Off	Off	Off	144 kbps
On	Off	Off	On	160 kbps

* Default Setting

Once the Model 1090 is properly configured, it is ready to connect to the twisted pair interface, to the serial port, and to the power source. This section tells you how to make these connections.

4.1 CONNECTION TO THE TWISTED PAIR INTERFACE

The Model 1090 supports communication between two terminal devices at distances to 11 miles and data rates to 160 kbps. There are two essential requirements for installing the Model 1090:

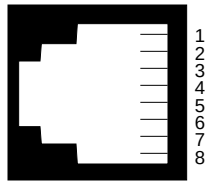
1. These units work in **pairs.** Therefore, you must have one Model 1090 (or a compatible model) at each end of a two twisted pair interface.

2. To function properly, the Model 1090 needs two **twisted** pairs of metallic wire. These twisted pairs must be **unconditioned,** dry, metallic wire, between 19 and 26 AWG (the higher number gauges may limit distance somewhat). Standard dial-equalization equipment, or standard, flat modular telephone type cable, are **not** acceptable.

4.1.1 TWISTED PAIR CONNECTION USING RJ-45

The Model 1090 uses a modular RJ-45 jack for twisted pair line connection. The signal/pin relationships are shown below:

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



*Connection to ground is optional

When connecting two Model 1090's, it is necessary to use a **crossover** cable. The diagram below shows how a crossover cable should be constructed.

RJ-45 Cable (4-Wire)

SIGNAL	PIN#	PIN#	SIGNAL
XMT+	1	8	RCV-
XMT-	2	7	RCV+
GND*	4	5	GND*
GND*	5	4	GND*
RCV+	7	2	XMT-
RCV-	8	1	XMT+

*Connection to ground is optional

4.2 CONNECTION TO THE SERIAL PORT

The serial port interface on the Model 1090 uses interchangeable Quick Connect Modules. Each Quick Connect Module has a 50-pin card edge connector on one side and a serial port interface on the other. Figure 4 (below) shows how a Quick Connect™ Module plugs into the back of the Model 1090.

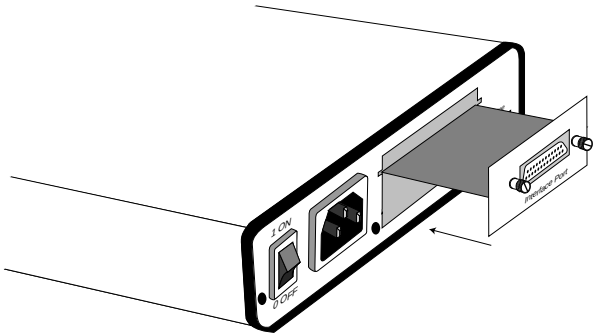


Figure 4. Installation of Model 1090 Plug-in Serial Interface Module

4.2.1 CHANGING QUICKCONNECT™ MODULES

When you purchase a particular version of the Model 1090, it should be shipped to you with the appropriate QuickConnect™ Module already installed. If you need to install a different QuickConnect™ Module, follow these steps.

Removing the Existing QuickConnect™ Module

1. Turn the power switch off. Leave the power cord plugged into a grounded outlet to keep the unit grounded.

2. Loosen the two thumbscrews on the module by turning them counterclockwise.

3. Grasp the two thumbscrews and gently pull the module from the unit. Apply equal force to the thumbscrews to keep the module straight during the removal process.

Installing the New QuickConnect™ Module

1. Make sure the power switch is off. Leave the power cord plugged into a grounded outlet to keep the unit grounded.

2. Hold the module with the faceplate toward you and align the module with the guide slots in the rear panel of the Model 1090.

3. While keeping the module's faceplate parallel with the Model 1090 rear panel, slide the module straight in–so that the card edge contacts line up with the socket inside the chassis.

   Note: The card edge connector should meet the socket when it is almost all the way into the chassis. If you encounter a lot of resistance, remove the module and repeat Steps 2 and 3.

4. With the card edge contacts aligned with the socket, firmly seat the module by using your thumbs to apply pressure directly to the right and left edges of the module faceplate. Applying moderate and *even* pressure should be sufficient to seat the module. You should hear it snap into place.

5. To secure the module in place, push the thumbscrews into the chassis and turn the screws clockwise to tighten.

4.2.2 CONNECTION TO A "DTE" DEVICE

The serial port on most QuickConnect™ interface modules (all except the X.21 module) is hard-wired as a DCE. Therefore these modules "want" to plug into a DTE such as a terminal, PC or host. When making the connection to your DTE device, use a **straight through** cable of the shortest possible length—we recommend 6 feet or less. When purchasing or constructing an interface cable, please refer to the pin diagrams in **Appendix D** as a guide.

4.2.3 CONNECTION TO A "DCE" DEVICE

If the Model 1090's QuickConnect™ interface module is hard-wired as a DCE (all except the X.21 module), you must use a *null modem* cable when connecting to a printer, modem, multiplexer or other DCE device. This cable should be of the shortest possible length—we recommend 6 feet or less. When purchasing or constructing a null modem interface cable, use the pin diagrams in **Appendix D** as a guide.

Note: Pin-out requirements for null modem applications vary widely between manufacturers. If you have any questions about a specific application, contact Patton Technical Support: **(301) 975-1007; http://www.patton.com**; or, **support@patton.com**.

4.2.4 RECONFIGURING THE X.21 QUICKCONNECT™ MODULE

The serial port on the X.21 QuickConnect™ Module is default wired as a DCE, but may be switched to a DTE. This is done by reversing the orientation of the DCE/DTE strap, as described below:

To reverse DCE/DTE orientation, remove the module according to the instructions in **Section 4.2.1**. The DCE/DTE strap is located on the bottom side of the module's PC board. The arrows on the top of the strap indicate the configuration of the X.21 port (for example, if the DCE arrows are pointing toward the DB-15 connector, the X.21 port is wired as a DCE). Reverse the DCE/DTE orientation by pulling the strap out of its socket, rotating it 180º, then plugging the strap back into the socket. You will see that the DCE/DTE arrows now point in the opposite directions, showing the new configuration of the X.21 port. Reinstall the module according to the instructions in **Section 4.2.1**.

4.3 CONNECTION TO THE POWER SOURCE

The Model 1090 is available with three power supply options:

The **Standard** power supply option (**Model 1090** or **1090-230**) is factory configured for either 115 or 230 VAC, depending on how the product is ordered, and is available with a variety of domestic and international power cords (see **Appendix C**).

The **Universal Interface** power supply option (**Model 1090-UI**) operates in environments ranging from 85 to 265 VAC, with no re-configuration necessary (see **Appendix C** for available domestic and international power cords).

The **DC** power supply option (**Model 1090-DC**) operates in 48 VDC environments and is equipped with a 3-pin terminal block with spring-type contacts (please refer to the Model 1090 Service Manual for wiring instructions).

WARNING! There are no user-serviceable parts in the power supply section of the Model 1090. Voltage setting changes and fuse replacement should only be performed by qualified service personnel. Any questions may be answered by contacting Patton Electronics Technical support at (301) 975-1007; support@patton.com; or **http://www.patton.com**.

4.3.1 AC POWER CONNECTION

The two AC power supply options–**Standard** and **Universal**–are equipped with a male IEC-320 power connection. A domestic (US) power supply cord is supplied with the unit at no extra charge. To connect the standard or universal power supply, follow these steps:

1. Attach the power cord (supplied) to the shrouded male IEC-320 connector on the rear of the Model 1090.
2. Plug the power cord into a nearby AC power outlet.
3. Turn the rear power switch ON.

5.0 OPERATION

Once the Model 1090 is properly configured and installed, it should operate transparently. This sections describes power-up, reading the LED status monitors, and using the built-in loopback test modes.

5.1 POWER-UP

Before applying power to the Model 1090, first be sure that you have read **Section 4.3**, and that the your power source matches the power rating shown on the bottom label of the Model 1090. **Failure to do so could result in damage to the unit and connected equipment, and may constitute a fire hazard.** If your Model 1090 is AC powered, plug the AC power cord into both the Model 1090 and the AC outlet. Then power-up the unit using the rear power switch. If your Model 1090 is DC powered, and has been connected to the DC power source according to the instructions in **Section 4.3**, turn on the DC power supply and then power-up the unit using the rear power switch.

5.2 LED STATUS MONITORS

The Model 1090 features seven front panel LEDs that monitor transmit data, receive data, request to send, carrier detect, data terminal ready, test modes and error conditions. Figure 5 (above) shows the front panel location of each LED. Following Figure 6 is a description of each LED's function.

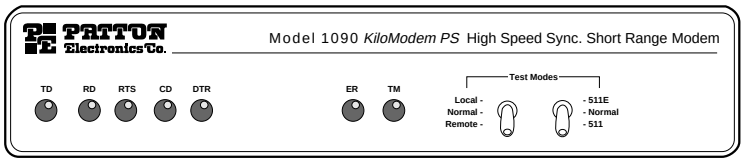


Figure 5. Model 1090 Front Panel

TD and RD - Will glow red to indicate an idle condition of Binary 1 data on the respective terminal interface signals. Green indicates Binary"0 data.

RTS - Will glow green to indicate that the Request to Send signal from the terminal is active.

CD- Will glow red if no carrier signal is being received from the remote modem. Green indicates that the remote modem's carrier is being received.

DTR - Will glow green to indicate that the Data Terminal Ready signal from the terminal is active.

ER - Will glow red to indicate the likelihood of a Bit Error in the received signal. During the 511 or 511/E test, ER will flash to indicate that the Test Pattern Detector has detected a bit error.

TM - Will glow green to indicate that the Model 1090 has been placed in Test Mode. The unit can be placed in test mode by the local user or by the remote user.

5.3 DIAGNOSTICS

The Model 1090 is equipped with three sets of diagnostics to evaluate the condition of the local and remote units, as well as the twisted pair link between them: local analog loopback (LAL), remote digital loopback (RDL), and local digital loopback (LDL) according to the CCITT V.54 Standard, and bit error rate BER test according to the CCITT V.52 Standard.

5.3.1 LOCAL ANALOG LOOPBACK (LAL)

The Local Analog Loopback (LAL) test checks the operation of the local Model 1090. Any data sent to the local Model 1090 in this test will be echoed (returned) back to the user device (see Figure 6, below)..

To perform an Analog Loopback test, follow these steps:

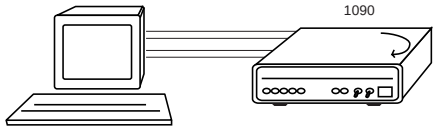


Figure 6. Local Analog Loop

A. Activate Local Analog Loopback. This may be done in one of two ways: First, by moving the front panel toggle switch UP to Local. Second, by raising signal LL on the terminal interface (for pin numbers, see **Appendix D**). Once LAL is activated, the Model 1090 transmit output is connected to its own receiver. The TM LED should be lit.

(continued)

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 using a separate BER tester. 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 interface cable between the terminal and the Model 1090.

5.3.2 REMOTE DIGITAL LOOPBACK (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Model 1090', *and* the communication link between them. Any characters sent to the remote Model 1090 in this test mode will be returned back to the originating device.
To perform an RDL test, follow these steps:

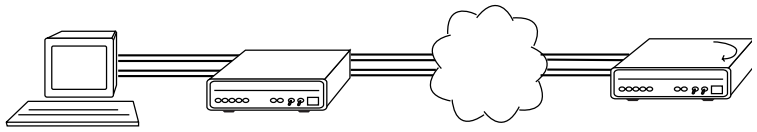


Figure 7. Remote Digital Loop

A. Activate RDL. This may be done in one of two ways: First, by moving the front panel toggle switch DOWN to “Remote”. Or, second, by raising the RL signal on the terminal interface (for pin numbers, see Appendix D).

B. Perform a BER (bit error rate) test on the system, using BER testers on both ends.

C. If the BER test equipment indicates a fault and the Local Analog Loopback test was successful for both Model 1090s, you may have a problem with the line between the Model 1090s. You should inspect the line for proper connections.

5.3.3 LOCAL DIGITAL LOOPBACK (LDL)

The Local Digital Loopback (LDL) test checks the local and remote 1090s and all communication paths. In LDL, the TX/RX circuit of the local 1090 closes, thereby allowing characters sent from BOTH the local terminal and remote terminal to loop back (echo) to themselves (See Figure 8, below). To accurately perform LDL diagnostics, technicians must send characters (or BER diagnostics) from each end. To perform a LDL, follow the instructions below:

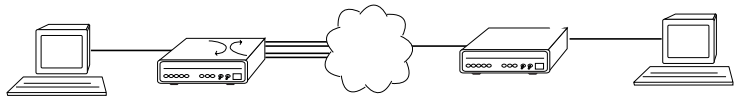


Figure 8. Local Digital Loop

A. On the bottom of the unit, turn S1-4 to the ON position.

B. Enable LDL by moving the front panel toggle switch up to “Local”, Or, by raising the signal LL on the terminal interface(for pin numbers, see Appendix D).

C. Perform a BER (bit error rate) test on the system, using BER testers on both ends.

D. If the BER test equipment indicates a fault and the Local Analog Loopback test was successful for both Model 1090s, you may have a problem with the line between the Model 1090s. You should inspect the line for proper connections.

NOTE: LDL will only work when S1-4 is ON.

5.3.4 V.52 BER TEST GENERATOR

The Model 1090 has a built-in test pattern generator and detector. It can be invoked at both ends of a link simultaneously or it can be used with the Local Analog, Remote Digital or Local Digital Loopbacks. The following example requires two operators: one to initiate and monitor the test at the local Model 1090, and one at the remote Model 1090. To use the V.52 BER test by itself, both operators should simultaneously follow these steps.

A. Locate the 511/511E toggle switch on the front panel of the Model 1090 and move it DOWN. This activates the V.52 BER test mode and transmits a 511 pseudorandom test pattern to the other unit. If any errors are received, the receiving Model 1090's red ER LED will blink sporadically.

   NOTE: For this test to function, the 511 switch on both Model 1090's must be on.

B. If the test indicates no errors are present, move the V.52 toggle switch UP, activating the 511/E test. The 511/E test transmits the 511 pseudorandom test pattern and injects intentional errors about once per second. If the test is working properly, the receiving Model 1090's red ER LED will blink *regularly*.

   A successful 511/E test will confirm that the link is in place, and that the Model 1090 built-in 511 generator and detector are working properly.

C. This test can be done by one operator by first activating the local analog loop or remote digital loop.

APPENDIX A

1090 SPECIFICATIONS

Transmission Format	Synchronous
Transmission Line:	Unconditioned twisted pair 19 - 26 AWG
Clocking:	Internal, external or receive loopback
Distance:	Up to 11 miles (19 AWG @ 56 kbps)
Data Rates:	48, 56, 64, 72, 80, 112, 128, 144 and 160 kbps (switch selectable)
Carrier Control:	Constantly on or Controlled by RTS
RTS/CTS Delay:	No delay, short delay (4 - 9 mSec), long delay (33 - 71 mSec).
Diagnostics:	V.52 compliant bit error rate pattern (511/511E pattern) generator and detector with error injection mode; V.54 compliant—local analog loopback and remote digital loopback, activated by front panel switch or via serial interface
LED Status Indicators:	TD, RD, RTS, CD, DTR, ER and TM (test mode)
Isolation:	Minimum 3000V RMS via transformers
Surge Protection:	600W power dissipation at 1 ms
DCE/DTE Interface:	Field-replaceable Quick Connect™ modules.
Twisted Pair Interface:	8-position modular jack (RJ-45)
Power:	115/230 VAC (switch selectable), 50/60 Hz; 85 - 256 VAC, 50/60 Hz (universal input option); 48 VDC (option). 5 watts.
Temperature Range:	0-50°C (32-122°F)
Altitude:	0-15,000 feet
Humidity:	5 to 95% non-condensing
Dimensions:	7.3" x 6.6" x 1.62" (185mm x 168mm x 41mm)
Weight:	2.02 lbs. 1.0 Kg

APPENDIX B

1090 CABLE RECOMMENDATIONS

The Patton Model 1090 operates at frequencies of 160 kHz or less and has been performance tested by Patton technicians using twisted-pair cable with the following characteristics:

Wire Gauge	Capacitance	Resistance
19 AWG	83nF/mi or 15.72 pF/ft.	.0163 Ohms/ft.
22 AWG	83nF/mi or 15.72 pF/ft.	.0326 Ohms/ft.
24 AWG	83nF/mi or 15.72 pF/ft.	.05165 Ohms/ft.
26 AWG	83nF/mi or 15.72 pF/ft.	.08347 Ohms/ft.

To gain optimum performance from the Model 1090 Series, 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.
- Many environmental factors can affect the maximum distances obtainable at a particular site. Use the data rate/distance table (below) as a **general guideline only.**

Model 1090 Distance Table in Miles

	Wire Gauge			
Data Rate (kbps)	19G (0.9 mm)	22G (0.64mm)	24G (0.5 mm)	26G (0.4 mm)
160	8.14	5.87	4.07	3.03
144	8.52	6.06	4.36	3.13
128	9.00	6.16	4.64	3.22
112	9.19	6.25	4.83	3.22
80	9.19	6.44	5.21	3.22
72	10.80	6.63	5.49	3.41
64	10.98	6.82	5.49	3.41
56	11.08	6.82	5.49	3.41
48	10.80	6.63	5.40	3.31

APPENDIX C

1090 FACTORY REPLACEMENT PARTS AND ACCESSORIES

Patton Model #	Description
0805US	American Power Cord
0805EUR	European Power Cord CEE 7
0805UK	United Kingdom Power Cord
0805AUS	Australia/New Zealand Power Cord
0805DEN	Denmark Power Cord
0805FR	France/Belgium Power Cord
0805IN	India Power Cord
0805IS	Israel Power Cord
0805JAP	Japan Power Cord
0805SW	Switzerland Power Cord
07M1090SVC	Service Manual

APPENDIX D

M/34F Connector-DCE
(V.35 Interface)

Pin #	Signal
B	SGND (Signal Ground)
C	RTS (Request to Send)
D	CTS (Clear to Send)
E	DSR (Data Set Ready)
F	CD (Carrier Detect)
H	DTR (Data Transfer Ready)
L	LLB (Local Line Loop)
M	TM (Test Mode)
N	RDL (Remote Digital Loop)
P	TD(Transmit Data)
R	RD (Receive Data)
S	TD/ (Transmit Data-B)
T	RD/ (Receive Data-B)
U	XTC (External Transmit Clock)
V	RC(Receive Timing)
W	XTC/ (External Transmit Clock)
X	RC/ (Receive Timing)
Y	TC(Test Control-A)
AA	TC/ (Test Control-B)

1092 INTERFACE PIN ASSIGNMENT
DB-25F Connector-DCE

Pin #	Signal
1	FG (Frame Ground)
2	TD(Transmit Data)
3	RD (Receive Data)
4	RTS (Request to Send)
5	CTS (Clear to Send)
6	DSR (Data Set Ready)
7	SGND (Signal Ground)
8	CD (Carrier Detect)
9	RC/ (Receive Timing-B)
10	CD/ (Carrier Detect-B)
11	XTC/(External Transmit Clock)
12	TC/ (Test Control-B)
13	CTS/ (Clear to Send)
14	TD/ (Transmit Data-B)
15	TC (Test Control-A)
16	RD (Receive Data)
17	RC (Receive Timing)
18	LLB (Local Line Loop)
19	RTS/ (Request to Send)
20	DTR (Data Transfer Rate)
21	RDL (Remote Digital Loop)
22	DSR/ (Data Set Ready)
23	DTR/ (Data Transfer Rate)
24	XTC (External Transmit Clock)
25	TM (Test Mode)

1090 INTERFACE PIN ASSIGNMENT TABLES

M/34F Connector-DCE
(V.35 Interface)

Pin #	Signal
B	SGND (Signal Ground)
C	RTS (Request to Send)
D	CTS (Clear to Send)
E	DSR (Data Set Ready)
F	CD (Carrier Detect)
H	DTR (Data Transfer Ready)
L	LLB (Local Line Loop)
M	TM (Test Mode)
N	RDL (Remote Digital Loop)
P	TD(Transmit Data)
R	RD (Receive Data)
S	TD/ (Transmit Data-B)
T	RD/ (Receive Data-B)
U	XTC (External Transmit Clock)
V	RC(Receive Timing)
W	XTC/ (External Transmit Clock)
X	RC/ (Receive Timing)
Y	TC(Test Control-A)
AA	TC/ (Test Control-B

1090 INTERFACE PIN ASSIGNMENT

DB-25F Connector-DCE
(X.21 Interface)

Pin #	Signal
1	FG (Frame Ground)
2	TD(Transmit Data)
3	RD (Receive Data)
4	RTS (Request to Send)
5	CTS (Clear to Send)
6	DSR (Data Set Ready)
7	SGND (Signal Ground)
8	CD (Carrier Detect)
9	RC/ (Receive Timing-B)
10	CD/ (Carrier Detect-B)
11	XTC/(External Transmit Clock)
12	TC/ (Test Control-B)
13	CTS/ (Clear to Send)
14	TD/ (Transmit Data-B)
15	TC (Test Control-A)
16	RD (Receive Data)
17	RC (Receive Timing)
18	LLB (Local Line Loop)
19	RTS/ (Request to Send)
20	DTR (Data Transfer Rate)
21	RDL (Remote Digital Loop)
22	DSR/ (Data Set Ready)
23	DTR/ (Data Transfer Rate)
24	XTC (External Transmit Clock)
25	TM (Test Mode)

APPENDIX D

DB-15F Connector-DCE Setting (X.21 Interface)

Pin #	Signal
1	Frame Ground
2	T (Transmit Data-A)
3	C (Control-A)
4	R (Receive Data-A)
5	I (Indication-A)
6	S (Signal Element Timing-A)
7	BT (Byte Timing-A)
8	SGND (Signal Ground)
9	T/ (Transmit Data-B)
10	C/ (Control-B)
11	R/ (Receive Data-B)
12	I/ (Indication-B)
13	S/ (Signal Element Timing-B)
14	BT/ (Byte Timing-B)

Note: X.21 uses balanced data and control signals.