BLACK BOX
NETWORK SERVICES

ME475A-R2

Async/Sync Short-Haul Modem

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 • Mailing address: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018 • Web site: www.blackbox.com • E-mail: info@blackbox.com

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WARRANTY INFORMATION

Black Box warrants all ME475A-R2 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 the 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 performs as warranted, your sole recourse shall be repair or replacement as described above. Under no condition shall Black Box 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. Black Box 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.

RADIO AND TV INTERFERENCE

The ME475A-R2 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 ME475A-R2 has been tested and found to comply with the limits for a Class A computing device in accordance with specifications in Subpart B 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 l ME475A-R2 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).

CE NOTICE

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

1. GENERAL INFORMATION

Thank you for your purchase of this Black Box product. This product has been thoroughly inspected by Black Box's qualified technicians. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Black Box Technical Support at **724-746-5500** or **info@blackbox.com**.

1.1 FEATURES

- Synchronous or asynchronous operation
- Supports data rates up to 57.6 kbps
- Two-wire/half duplex or four-wire/full or half duplex
- V.52 & V.54 test modes
- Automatic equalization & gain control
- Anti-streaming timer
- Distances up to 20 miles (32 km)
- Point-to-point or multipoint
- Internal, external or received loopback clocking
- Hardware and software flow control support
- Built-in transformer isolation & high speed surge protection
- External AC power
- Bi-color LED indicators
- Detects broken or inferior cable by lighting error LED

1.2 DESCRIPTION

The ME475A-R2 Universal Short Range Modem operates 2-wire (half duplex) or 4-wire (full or half duplex), in synchronous or asynchronous modes, over unconditioned telephone lines. The ME475A-R2 supports bit rates up to 57.6 kbps. The ME475A-R2 operates in synchronous mode between the local and remote modems; when connected to an asynchronous RS-232 device, the ME475A-R2 SRM converts the asynchronous data to synchronous data.

The ME475A-R2 has several features to enhance overall performance: automatic equalization, automatic gain control, anti-streaming timer, transformer isolation to guard against data loss due to ground potential differences, and Silicon Avalanche Diode surge protection to guard against data line transients.

The ME475A-R2 features V.52 compliant bit error rate pattern tests and two V.54 test modes: local analog loopback and remote digital loopback. The operator at the local end may test both local and remote modems, plus the line, in the digital loopback mode. Both RDL and LAL modes can be controlled by a manual switch or via the V.24/RS-232 interface.

2. CONFIGURATION OVERVIEW

The ME475A-R2 is fairly 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 ME475A-R2 properly.

2.1 CONFIGURATION SWITCHES

The ME475A-R2 uses a unique set of 24 external mini DIP switches that allow configuration to an extremely wide range of applications. These 24 DIP switches are grouped into three eight-switch sets, and are externally accessible from the underside of the unit (see Figure 1). Since all configuration DIP switches are externally accessible, **there is no need to open the case for configuration**.

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

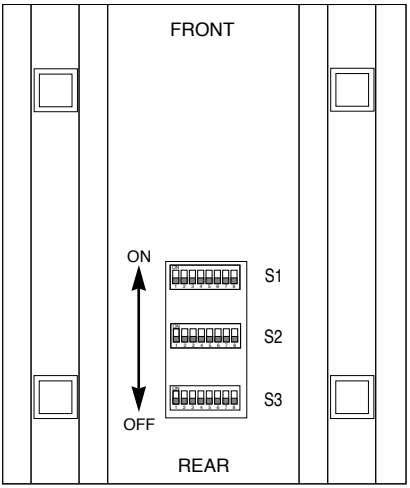


Figure 1. Underside of ME475A-R2, showing location of DIP switches

Each ME475A-R2 SRM has three sets of eight switches, yielding 24 total DIP switches. The three sets will be referred to as S1, S2 and S3. As Figure 2 shows, the orientation of all DIP switches is the same with respect to “ON” and “OFF” positions.

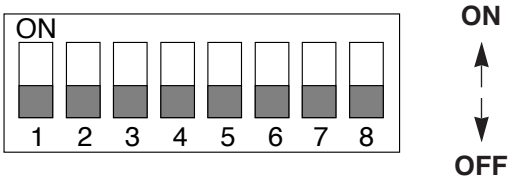


Figure 2. Close-up of DIP switches showing “ON” and “OFF” positions

2.2 CONFIGURATION SWITCH SET “S1”

The DIP switches on S1 set data rate, clock source, async./sync. mode and carrier control method. The default settings are summarized in Table 1.

Table 1: ME475A-R2 S1 Summary

Position	Function	Factory Default	
S1-1	Data Rate	On	9,600 bps (ME465A-R2)
S1-2		Off	
S1-3		Off	
S1-4		On	
S1-5	Clock Source	On	Internal
S1-6			
S1-7	Async./Sync.	On	Async.
S1-8	Carrier Control	Off	Constantly On

Switches S1-1 through S1-4: Data Rate Setting

Switches S1-1 through S1-4 are set in combination to determine the asynchronous and synchronous data rate for the ME475A-R2.

Shown in the tables below are the Data Rate DIP Switch settings for ME475A-R2.

Table 2: ME475A-R2 Data Rate Settings

S1-1	S1-2	S1-3	S1-4	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
Off	On	Off	Off	57.6 kbps

Switches S1-5 and S1-6: Clock Source

Switches S1-5 and S1-6 are set in combination to determine the transmit clock source for the ME475A-R2.

S1-5	S1-6	Setting
On	On	Internal transmit clock
Off	On	Receive recover clock
On	Off	External transmit clock

Switch S1-7: Asynchronous/Synchronous Mode

The setting for switch S1-7 determines whether the ME475A-R2 is in asynchronous or synchronous operating mode.

S1-7	Setting
On	Asynchronous
Off	Synchronous

Switch S1-8: Carrier Control Method

The setting for switch S1-8 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.

S1-8	Setting
Off	Constantly on
On	Controlled by RTS

2.3 CONFIGURATION SWITCH SET “S2”

The DIP switches on S2 set word length, extended signaling rate, RTS/CTS delay, V.52 and V.54 diagnostic test and 2- and 4-wire operation.

Table 3: S2 Summary

Position	Function	Factory Default	
S2-1 S2-2	Word Length	Off	10 bits
S2-3	Extended Signalling Rate	Off	-2.5% to 1%
S2-4 S2-5	RTS/CTS Delay	On	7 ms
S2-6	V.52/V.54 Tests	Off	Normal Operation
S2-7	2-Wire/4-Wire	Off	(4-Wire)
S2-8	Not Used	N/a	

Switches S2-1 and S2-2: Word Length

Switches S2-1 and S2-2 are set in combination to determine the word length for asynchronous data.

S2-1	S2-2	Setting
Off	On	8 bits
On	On	9 bits
Off	Off	10 bits
On	Off	11 bits

Switch S2-3: Extended Signaling Rate

The setting for switch S2-3 determines the range of variability the ME475A-R2 "looks for" in asynchronous data rates (i.e., the actual variance from a given frequency level the ME475A-R2 will tolerate).

S2-3	Setting
Off	-2.5% to +1%
On	-2.5% to +2.3%

Switches S2-4 and S2-5: RTS/CTS Delay

The combined settings for switches S2-4 and S2-5 determine the amount of delay between the time the unit "sees" RTS and when it sends CTS. Options are no delay, 7 ms and 53 ms.

S2-4	S2-5	Setting
On	On	7 ms
Off	On	53 ms
On	Off	No delay
Off	Off	No delay

Switch S2-6: V.54 Loopback Test Enable

To reset the V.54 circuit, set switch S2-6 to the "ON" position, then back to the "OFF" position.

S2-6	Setting
Off	V.54 Normal Operation
On	V.54 Testing Disabled

Switch S2-7: 2-Wire/4-Wire Mode Selection

The setting for switch S2-7 determines whether the ME475A-R2 is operating in 2-wire or 4-wire mode.

S2-7	Setting
Off	4-wire (full or half duplex)
On	2-wire (half duplex only)

2.4 CONFIGURATION SWITCH SET "S3"

The DIP switches on S3 set the anti-stream control, local loopback enable, remote loopback enable and receive (input) impedance levels for the ME475A-R2. Factory default positions of Switch S3 are shown in the table below:

Table 4: S3 Summary

Position	Function	Factory Default	
S3-1 S3-2	Input Impedance	On Off	200 ohms
S3-3	Not yet assigned	N/A	
S3-4	Mode Selection	On	Point to Point
S3-5	Local Loopback	Off	Disabled
S3-6	Remote Loopback	Off	Disabled
S3-7 S3-8	Anti-stream Control	Off	Disabled

Switches S3-1 & S3-2: Input Impedance

The setting for Switches S3-1 and S3-2 determines the ME475A-R2's input impedance. This allows you to choose the optimum impedance setting for your application. In long distance applications the impedance of the cable must match the impedance of

the load (or resistor) of the ME475A-R2 unit. Thicker gauge cables requires a lower ohm setting, while a thinner gauge cable should receive a higher ohm setting. If you are using higher speeds you will need a lower ohm setting, and a higher ohm setting for the slower speeds. Refer to Table 5 for assistance in selecting a setting.

S3-1	S3-2	Setting
On	On	130 ohms
On	Off	200 ohms
Off	On	320 ohms
Off	Off	High impedance (minimum 2k ohms)

Table 5: S3-1, S3-2 Selection Table for ME475A-R2

Gauge of Cable	Data Rates, kb/s											
	1.2	1.8	2.4	3.6	4.8	7.2	9.6	14.4	19.2	28.8	38.4	57.6
19AWG/.9mm	320	320	200	200	200	200	200	130	130	130	130	130
22AWG/.6mm	320	320	320	200	200	200	200	200	130	130	130	130
24AWG/.5mm	320	320	320	320	200	200	200	200	200	130	130	130
26AWG/.4mm	320	320	320	320	320	200	200	200	200	200	130	130

Switch S3-4: Mode Selection

The setting for switch S3-4 allows the user to choose the appropriate setting for point-to-point or multipoint applications.

S3-4	Setting
On	Point-to-point
On	Multipoint application as “Master”
Off	Multipoint application as “Slave”

Switch S3-5: RS-232 Initiation of Local Loopback Test

The setting for switch S3-5 determines whether or not the ME475A-R2’s local analog loopback test can be initiated by raising pin 18 on the RS-232 interface.

S3-5	Setting
On	RS-232 initiation enabled

S3-5	Setting
Off	RS-232 initiation disabled

Switch S3-6: RS-232 Initiation of Remote Loopback Test

The setting for switch S3-6 determines whether or not the ME475A-R2's remote digital loopback test can be initiated by raising pin 21 on the RS-232 interface.

S3-6	Setting
On	RS-232 initiation enabled
Off	RS-232 initiation disabled

Switches S3-7 and S3-8: Anti-stream Control

Switches S3-7 and S3-8 are set in combination to determine the time out period for the ME475A-R2's anti-stream control timer.

S3-7	S3-8	Setting
Off	Off	Disabled
Off	On	12.5 seconds
On	Off	50.0 seconds
On	On	12.5 seconds

3. INSTALLATION

The ME475A-R2 operates in four twisted pair topologies: 2-wire/point-to-point, 2-wire/multipoint, 4-wire/point-to-point, and 4-wire/multipoint. In each of these topologies, the twisted pair wire must be 19 - 26 AWG "dry", unconditioned metallic wire (see Appendix C for wire recommendations). Dial-up analog circuits, such as those used with a standard Hayes-type modem, are not acceptable. The twisted pair may be shielded or not shielded. Both types yield favorable results.

The ME475A-R2 offers two methods of twisted pair connection: RJ-45 jack and terminal blocks. Figure 3 shows the location of these interfaces on the rear panel of the ME475A-R2. Connect the wire to each ME475A-R2 as described in the instructions that follow the illustration. The "+" and "-" indicators are for reference only. The ME475A-R2 is not sensitive to polarity.

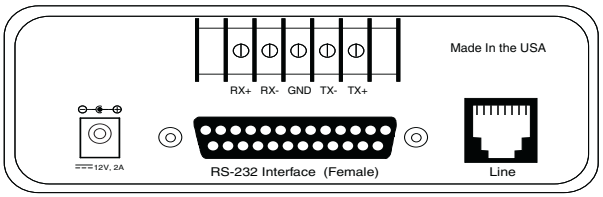


Figure 3. Rear view of ME475A-R2 - AC Power

3.1 TWO-WIRE INSTALLATION

When communicating over a single twisted pair circuit, the ME475A-R2 operates half duplex: that is, it transmits in only one direction at a time. This method of operation is effective for both point-to-point and multipoint applications.

In single-pair point-to-point applications, you will need a pair of ME475A-R2s for each circuit—one at each end of the single pair wire. In single-pair multipoint applications you will need three or more ME475A-R2 units. These can be connected using a star topology, although a daisy chain topology is usually used.

Two-Wire Cable Connection Via RJ-45

1. The RJ-45 jack on a ME475A-R2 Short Range Modem is pre-wired for a standard TELCO wiring environment. To be sure you have the right wiring, use the table below as a guide.

RJ-45		Signal
1	----------	NC
2	----------	GND†
3	----------	RCV
4	----------	XMT
5	----------	XMT
6	----------	RCV
7	----------	GND
8	----------	NC

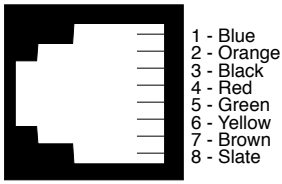
† Connection to ground is optional

2. Proper wiring of pairs between the two modems is as follows:

Signal	Pin#	Color*		Color	Pin#	Signal
XMT	4	Green	---------	Green	4	XMT
XMT	5	Red	---------	Red	5	XMT

*Standard color codes—yours may be different

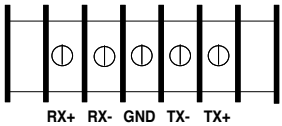
3. AT&T standard modular color codes:



Two-Wire Cable Connection Via Terminal Blocks

If you are not going to use the modular jacks, follow the instructions below.

1. Locate the terminal block on the back of the unit. It should look like the following diagram:



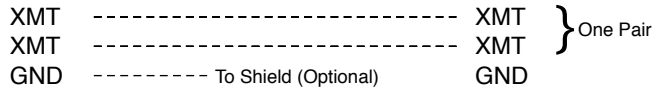
Note The "+" and "-" indicators are for reference only. The ME475A-R2 is not sensitive to polarity.

2. Connect one wire of the pair to a Transmit lug (TX+ or TX-) on both the local and remote ME475A-R2.

3. Connect the other wire of the pair to the other Transmit lug on both the local and remote ME475A-R2.

4. If there is a shield around the telephone cable, it may be connected to GND on the terminal block. We recommend connecting the shield at the computer end only to avoid ground loops. A ground wire is not necessary for proper operation of these units.

5. When you finish connecting the telephone line to units at both ends, it should look like the following diagram:



3.2 FOUR-WIRE INSTALLATION

When communicating over a two twisted pair circuit, the ME475A-R2 can operate full or half duplex, point-to-point or multipoint. In two pair point-to-point applications, you will need a *pair* of ME475A-R2s for each circuit—one at *each end* of the single pair wire. In two pair multipoint applications you will need three or more ME475A-R2 units. These can be connected using a star topology, although a daisy chain topology is usually used.

Four-Wire Cable Connection Via RJ-45

1. The RJ-45 jack on a ME475A-R2 Short Range Modem is pre-wired for a standard TELCO wiring environment. To be sure you have the right wiring, use the table below as a guide.

RJ-45		Signal
1	----------	NC
2	----------	GND†
3	----------	RCV
4	----------	XMT
5	----------	XMT
6	----------	RCV
7	----------	GND
8	----------	NC

†Connection to ground is optional

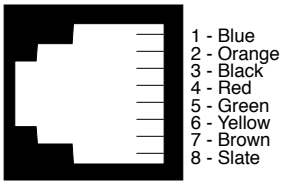
2. Proper crossing of pairs between the two modems is as follows:

Signal	Pin#	Color*		Color	Pin#	Signal
GND†	2	Orange	---------	Brown	7	GND
RCV	3	Black	---------	Green	5	XMT
XMT	4	Red	---------	Yellow	6	RCV
XMT	5	Green	---------	Black	3	RCV
RCV	6	Yellow	---------	Red	4	XMT
GND	7	Brown	---------	Orange	2	GND

*Standard color codes—yours may be different

†Connection to ground is optional

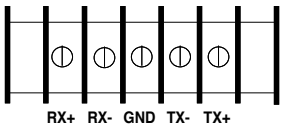
3. AT&T standard modular color codes:



Four-Wire Cable Connection Via Terminal Blocks

If you are not going to use the modular jacks then follow the instructions below.

1. Locate the terminal block on the back of the unit. It should look like the following diagram:



* The “+” and “-” indicators are for reference only.
The ME475A-R2 is not sensitive to polarity.

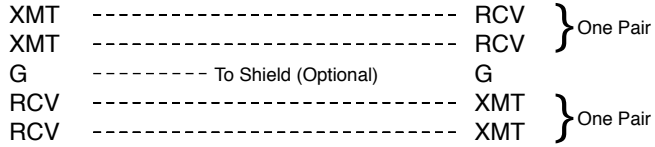
2. Connect one pair of wires in the telephone cable to the Transmit lugs (TX+ and TX-) on the terminal block.

3. Connect the other pair of wires in the telephone cable to the Receive lugs (RX+ and RX-) on the terminal block.

4. If there is a shield around the telephone cable, it may be connected to "G" on the terminal block. We recommend connecting the shield at the computer end only

to avoid ground loops. A ground wire is not necessary for proper operation of these units.

5. When you finish connecting the telephone line to units at both ends, it should look like the following diagram:



3.3 FOUR-WIRE, MULTIPOINT INSTALLATION

Multipoint operation involves the connection of several terminals to one host port. In such an application, one local ME475A-R2 is used as a master unit, and it is connected to several remote ME475A-R2s that are acting as slaves. Up to 25 ME475A-R2 slaves may be connected to one host ME475A-R2 master SRM, provided that the computing hardware and software support that many terminal drops.

In a multipoint environment the master ME475A-R2 transmits continually. Initiation of two-way communication is carrier-controlled by each “slave” ME475A-R2 unit.

To facilitate multipoint communication, the master ME475A-R2 should have its carrier control DIP switch set to “constantly ON” (S1-8=OFF). Each slave ME475A-R2 unit should have its carrier control DIP switch set to “controlled by RTS” (S1-8=ON). Figure 4 illustrates a typical ME475A-R2 multipoint application.

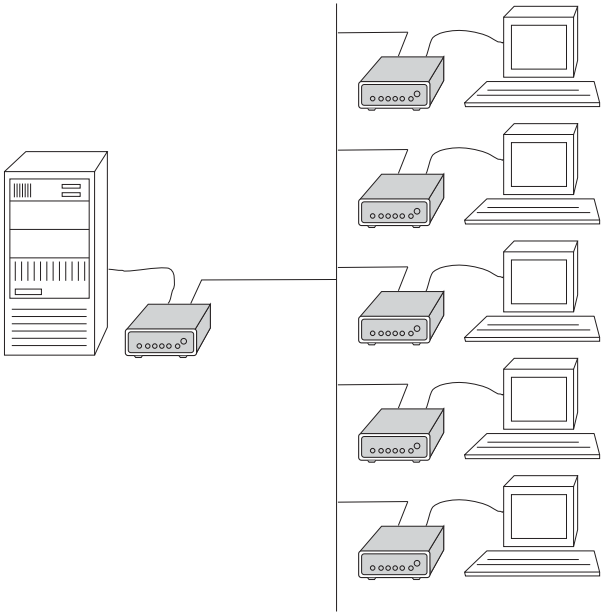


Figure 4. Typical multipoint set-up

Multipoint Twisted Pair Connection

The ME475A-R2 supports multipoint applications using a star topology. Maximum distance between the units will vary based upon the number of drops, data rate, wire gauge, etc. The diagrams below show how to wire the one-pair and two-pair cables properly for a star topology. Note that the ground connection is not needed.

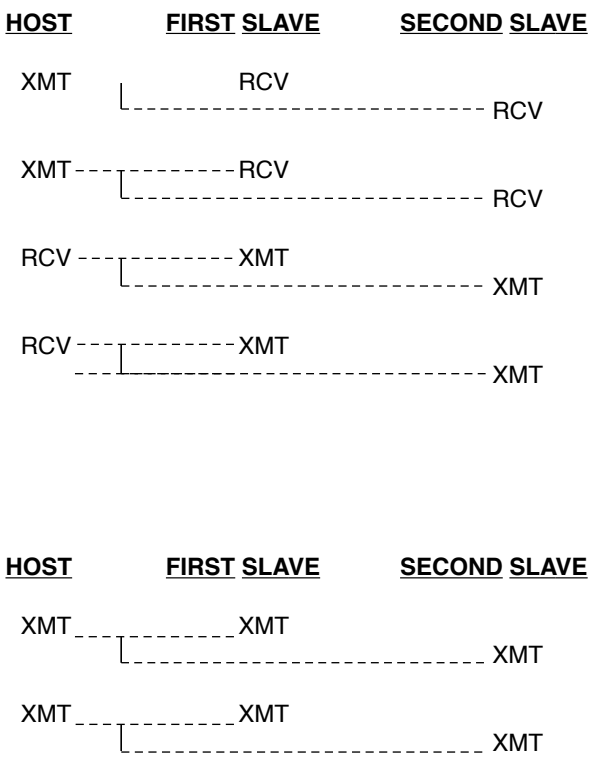


Figure 5. Twisted Pair Connection

3.4 RS-232 CONNECTION

Connect the synchronous or asynchronous output of your RS-232 device to the DB-25 interface on the rear panel of the ME475A-R2.

Note The ME475A-R2 is wired to connect to a DTE. If your RS-232 output device is DCE, Operation

Once you have configured each ME475A-R2 unit properly and connected the twisted pair and RS-232 cables (see Section 4.0), you are ready to operate the units. This section describes reading the LED status monitors, powering-up and using the built-in V.52 and V.54 test modes.

4. OPERATION

4.1 LED STATUS MONITORS

The ME475A-R2 features six front panel status LED that indicate the condition of the modem and communication link. Figure 6 shows the front panel location of each LED. Following Figure 6 is a description of each LED's function.

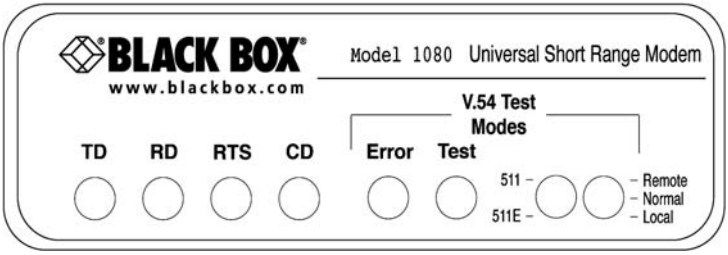


Figure 6. Front view of ME475A-R2

The "TD" and "RD" Indicators

The "TD" and "RD" indicators blink red and green with data activity. Red indicates a low RS-232 logic level, green indicates a high RS-232 logic level.

Note RS-232 devices idle in a low state, so the LED will glow red if the connections are correct and the RS-232 device is in an idle state.

The "RTS" and "CD" Indicators

The "RTS" and "CD" indicators are bi-color and will glow red for a "low" signal or green for a "high" signal. RTS lights for an incoming signal on RS-232 pin 4. CD lights for an incoming signal on the line side, and the resulting output signal on RS-232 pin 8.

The "Test" Indicator

The green "Test" LED indicates that V.52 or V.54 tests are running.

The "Error" Indicators

The "Error" indicator LED has three functions:

1. When the ME475A-R2 unit is in test mode (green "Test" LED is lit), the error LED glows red when bit errors occur.
2. When not in test mode (green "Test" LED is off), the error LED is used to indicate an RTS streaming condition. (See Section 5.2) for information on the anti-streaming circuitry.
3. The "Error" LED is also used to detect line quality as depected by the following:

   A. The improper use of flat (non-twisted pair) cable to connect the modems.

   B. One or more broken wires in the 4 wire twisted pair cable.

   C. The use of low quality twisted pair cable to connect the modems.

   D. Broken or corroded connector.

Note In detecting line quality the "Error" LED indicator is designed for 4 wire twisted pair cable only, and may not function properly with two wire cable.

Setting Up The "Error" LED To Test Cable Quality

If there is any question as to the quality of your line we recommend the following test:

1. Disconnect both local and remote modems from their RS-232 interface. Make sure "TD", "RD" and "RTS" LEDs are lit red.
2. Set input impedance of both modems to 200 ohms. (S3-1 "On", S3-2 "Off").
3. For **ME475A-R2**, set data rate on both modems for **9.6 kbps**.
4. On local modem set "Carrier Constantly On". (S1-8 "Off")
5. Set remote modem to RTS control (S1-8, "On").
6. Place both front panel toggle switches to neutral position. (Test Led will not light)
7. Connect both modems to the 4 wire twisted pair cable.

Reading The Test

1. If line quality is good, "Error" LED on local modem will not light and "CD" LED will be red. On remote modem "Error" LED will not light and "CD" LED will light green.

2. If flat cable is used or parts of the line are flat cable, “Error” LED on local modem will light red and “CD” LED will light green. On remote modem “Error” LED will not light and “CD” LED will light green.

3. If one wire from the 4 wire twisted pair is broken “Error” LED will light red and “CD” LED will light green on at least one modem.

Note We cannot guarantee accurate detection if small pieces of flat cable are present in the line beyond 1500ft of the local modem.

4.2 ANTI-STREAMING ERROR INDICATOR

When not in test mode (green “Test” LED is off), the front panel “Error” LED is used to indicate a streaming error. When the ME475A-R2’s anti-streaming circuitry is enabled, the RTS signal from the DTE is timer controlled. The timer begins to count when the DTE raises RTS. If the time period that RTS remains high exceeds the preset time out period, the anti-stream circuit will force RTS low. The “Error” LED will light red, indicating a streaming condition (RTS continually on). This feature prevents a malfunctioning terminal from tying-up a computer port in a multi-drop or polling environment. When the DTE drops RTS, the anti-streaming timer is automatically reset and the front panel “Error” LED turns off. The time out period is DIP switch selectable for 12.5 or 50 seconds.

4.3 POWER-UP

Apply AC power to the ME475A-R2 by plugging the separate AC power adapter first into the rear panel of the ME475A-R2, and then into an acceptable AC power outlet. There is no power switch on the ME475A-R2; and the remote/normal/loopback switch should be set to “normal”. When the local and remote ME475A-R2s are both powered up, and passing data normally, the following LED conditions will exist:

- TD & RD = flashing red and green
- RTS & DCD = green
- TEST = off

4.4 V.54 TEST MODES

The ME475A-R2 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 are available for point-to-point applications only.

Local Analog Loopback (LAL)

The Local Analog Loopback (LAL) test checks the operation of the local ME475A-R2 unit, and is performed separately on each unit. Any data sent to the local ME475A-R2 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:

1. Activate LAL. This may be done in one of two ways: First, by moving the front panel toggle switch DOWN to "Local". Second, by raising pin 18 on the RS-232 interface (Note: Make sure DIP switch S2-6 is OFF, and DIP switch S3-5 is ON). Once LAL is activated, the ME475A-R2's transmit output is connected to its own receiver. The "test" LED should be lit.

2. 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.

3. 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 ME475A-R2.

Remote Digital Loopback (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote ME475A-R2s, *and* the communication link between them. Any characters sent to the remote ME475A-R2 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 ME475A-R2 and looped back. To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in two ways: First, by moving the front panel toggle switch UP to "Remote". Second, by raising pin 21 on the RS-232 interface.

   Note Make sure DIP switch S3-6 is ON; and DIP switch S2-6 is OFF.

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

3. If the BER test equipment indicates a fault, and the Local Analog Loopback test was successful for both ME475A-R2 units, you may have a problem with the twisted pair line between the modems. You should then test the twisted pair line for proper connections and continuity.

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 ME475A-R2, and one at the remote ME475A-R2. 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 unit and move it UP. 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 ME475A-R2 units must be on.

2. If the test indicates no errors are present, move the V.52 toggle switch DOWN, activating the “511/E” test with periodic errors present. If the test is working properly, the receiving modem’s red “ERROR” LED will blink *regularly.* A successful “511/E” test will confirm that the link is in place, and that the ME475A-R2’s built-in “511” generator and detector are working properly.

4.5 POWER-DOWN

Turn off the ME475A-R2 by simply unplugging the AC or DC power source from the wall. There is no power switch.

A. SPECIFICATIONS

A.1 TRANSMISSION FORMAT

Synchronous or asynchronous, 2-wire/half duplex, or 4-wire/full or half duplex

A.2 INTERFACE

RS-232 (CCITT V.24) connection via DB-25 female; twisted pair connection via RJ-45 or terminal block

A.3 TRANSMISSION LINE

2 or 4-wire UTP, 19 - 24 AWG

A.4 DATA RATES

Synchronous or asynchronous at 1.2, 1.8, 2.4, 3.6, 4.8, 7.2, 9.6, 14.4, 19.2, 28.8, 38.4, and 57.6 kbps—switch selectable

A.5 CLOCKING

Internal, external or receive recover

A.6 CONTROLS

Carrier constantly “ON” or “controlled by RTS”; RTS/CTS delay set to no delay, 7 or 53 ms

A.7 APPLICATIONS

Point-to-point or multi-point

A.8 INDICATORS

Bi-color LED indicators for TD, RD, RTS & DCD; single LED indicators for Test and Error

A.9 RTS ANTI-STREAM TIMER

12.5 sec., 50 sec., or disabled (switch selectable); tolerance: +50%, -0%

A.10 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 RS-232 interface

A.11 TRANSFORMER ISOLATION

1500 V RMS

A.12 SURGE PROTECTION

Immune to IEC-801-5 Level 2, 1kV

A.13 TEMPERATURE

32–122°F (0–50°C)

A.14 HUMIDITY

0–95%, non-condensing

A.15 DIMENSIONS

6.2W x 4.2H x 1.5L in. (15.7W x 10.7H x 3.8L cm)

A.16 POWER INPUT (US)

12, 24, or 48 VDC

B. CABLE RECOMMENDATIONS

All Black Box Short Range Modems are tested to the distances published in our Catalogs and Specification Sheets on 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+/ft.
24 AWG(.5mm)	83nF/mi or 15.72 pF/ft.	.05165 ohms/ft.
26 AWG(.4mm)	83nF/mi or 15.72 pF/ft.	.08235 ohms/ft.

We fully expect that the Short Range Modems will operate on lines with specifications different from those tested, but to reduce the potential difficulties in the field, one should ensure that the cable being used has similar or better characteristics (lower capacitance or lower resistance).

Wire with capacitance of 20pF/ft. or less is suitable for all our Short Range Modems however, distances may vary from those published in our catalog. Resistance will also affect distance but not functionality. Wire should be 26 ohms (.4mm) or larger (smaller AWG#).

Black Box products are designed to withstand normal environmental noise and conditions however, other environmental factors too numerous to discuss in this format may affect proper operation of the SRM's.

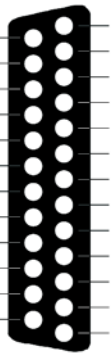
Selection of the proper SRM for an application is critical to maintaining Customer Satisfaction and should be taken seriously. Certain SRM configurations are better suited for particular applications and environments than others.

ME475A-R2 Distance Table in Miles (km)				
Data Rate (bps)	AWG Wire Gauge (mm)			
	19 (.9)	22 (.6)	24 (.5)	26 (.4)
57,600	12.0 (19.3)	7.0 (11.2)	5.3 (8.5)	4.0 (6.4)
38,400	13.0 (29.9)	7.5 (12.1)	6.2 (10.0)	4.2 (6.8)
28,800	14.0 (22.5)	8.0 (12.9)	6.6 (10.6)	4.6 (7.4)
19,200	16.0 (25.8)	8.5 (13.7)	7.0 (11.3)	5.1 (8.2)
14,400	17.0 27.4)	11.0 (17.7)	9.2 (14.9)	6.5 (10.50)
9,600	18.5 (29.8)	13.0 (20.9)	10.4 (16.7)	7.5 (12.1)
7,200	19.0 (30.6)	13.5 (21.7)	10.9 (17.5)	8.0 (12.9)
4,800	19.5 (31.4)	14.0 (22.5)	11.3 (18.2)	8.8 (14.2)
3,600	20.0(32.2)	14.5 (23.3)	11.5 (18.5)	8.8 (14.2)
2,400	20.5 (33.0)	15.0 (24.2)	11.6 (18.7)	9.0 (14.5)
1,800	20.5 (33.0)	15.0 (24.2)	11.5 (18.5)	8.9 (14.3)
1,200	20.0(32.2)	15.0 (24.2)	11.4 (18.4)	8.9 (14.3)

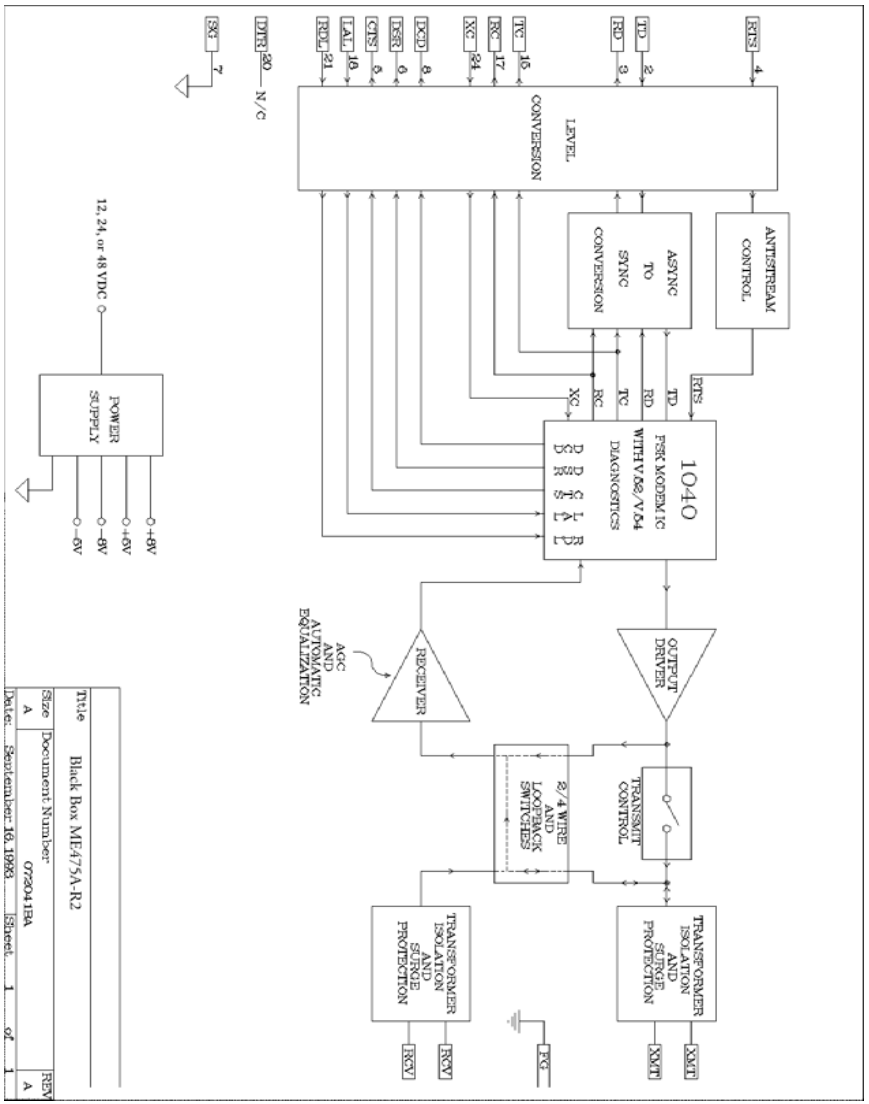
C. INTERFACE PIN ASSIGNMENT

RS-232 Female, D-Sub 25 Connector
(DCE Orientation)

DIRECTION	STANDARD RS-232C/V.24 "DCE" SETTING	DIRECTION
	1- (FG) Frame Ground	
	2- (TD) Transmit Data	To ME475A-R2
	3- (RD) Receive Data	From ME475A-R2
	4- (RTS) Request to Send	To ME475A-R2
To ME475A-R2	Analog Loop - 18	From ME475A-R2
	5- (CTS) Clear to Send	
	6- (DSR) Data Set Ready	From ME475A-R2
	7- (SG) Signal Ground	
To ME475A-R2	Data Term. Ready (DTR) - 20	
	8- (DCD) Data Carrier Detect	From ME475A-R2
To ME475A-R2	Digital Loop - 21	
From ME475A-R2	Test Mode - 25	



D. BLACK BOX ME475A-R2 BLOCK DIAGRAM



BLACK BOX
NETWORK SERVICES

About Black Box

Black Box provides an extensive range of networking and infrastructure products. You'll find everything from cabinets and racks and power and surge protection products to media converters and Ethernet switches all supported by free, live 24/7 Tech support available in 30 seconds or less.

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