

# **Low Speed Modems for Dial and Leased Circuits**

**2400E-030-4 (Standalone)**

**2400R-030-4 (Rackmount)**



**QUALITY COMMUNICATIONS PRODUCTS**  
**Made in the U.S.A.**

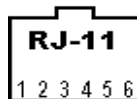
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## INTRODUCTION

The Data Connect ST2400E-2 and ST2400R-2 modems are designed for use on standard 2-wire dial or 2-wire leased circuits. The ST2400E-4 and ST2400R-4 will operate on 2-wire dial, 2-wire leased and 4-wire leased circuits. All models support the following standards: V.22bis, V.22 A&B, Bell 212A and Bell 103J. The DTE interface is compatible with V.24(RS-232-C), and operates in an asynchronous, autobaud mode. Standard data rates from 300 bps to 2400 bps are supported. In addition, Bell 103 mode will support any data rate less than or equal to 300 bps. The auto dial modes and configuration controls are AT compatible. The ST2400E models are packaged in a stand alone case and the ST2400R models are designed to fit into the Data Connect CC-2016, 16 slot rack mount enclosure.

## BACK PANEL CONNECTORS & SWITCHES

**LINE** This RJ-11 connector may be used to connect the modem to a 2-wire dial, 2-wire leased or 4-wire leased circuit. While two wire circuits use pins 3 and 4, four wire circuits must be connected as shown in the following diagram:



Transmit Pins (TX) = Pins #3 & 4  
Receive Pins (RX) = Pins #2 & 5

**DUAL SWITCHES** On all models, the top switch is used for removing the modem from the dumb mode of operation. The bottom switch is currently not active.

**RS-232-C** This DB-25 connector provides a standard RS-232-C(V.24) interface between the modem and a wide range of DTE. The following signals are provided:

PIN #	SIGNAL DESCRIPTION	SOURCE	NOTES
1	Frame ground	DTE/DCE	
2	Transmit Data	DTE	(SD light on front panel)
3	Receive Data	DCE	(RD light on front panel)
4	Request To Send	DTE	
5	Clear To Send	DCE	
6	Data Set Ready	DCE	(MR light on front panel)
7	Signal Ground	DTE/DCE	
8	Carrier Detect	DCE	(CD light on front panel)
20	Data Terminal Ready	DTE	(TR light on front panel)
22	Ring Indicator	DCE	

**POWER** This connector is present on all stand alone models and accepts a 9VAC or 9–14VDC power source. On rack mount versions, a different power connector is used and it provides DC voltages to the modem from the rack back plane. **CAUTION:** Several DC power options are available for special applications. Modems equipped with special power options will contain specifications that supersede the power specifications of this paragraph.

## SMART AND DUMB MODES OF OPERATION

All modems are factory configured for the smart mode of operation. This means that the device will respond to standard AT commands. Once the units have been configured for a specific application, it is sometimes desirable to place them in the dumb mode of operation (see **AT%D** command in Configuration Commands section). In this mode, the modem will no longer respond to AT commands. Therefore, the configuration cannot be changed inadvertently. If the modem is operating in dumb mode and it becomes necessary to return it to smart mode, please perform the following steps:

1. Locate the dual switches that are positioned next to the DTE connector (DB25) on the back of the modem.
2. Power the modem off.
3. Power the modem on and depress the top switch within ten seconds. During the ten second period when the upper switch is being monitored, all lights on the front panel of the modem will be illuminated.
4. The modem will now be in smart mode. If it is intended that the modem remain in smart mode, it will be necessary to save the new configuration using the **AT&W** command.

## LEASED LINE OPERATION

Two and four-wire leased line operation is enabled by selecting the proper AT commands and setting the appropriate hardware jumpers.

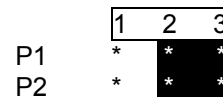
**Leased Line Parameters** - When configuring a pair of modems for leased line operation, the &L1 command must be selected. It is also necessary to configure one to answer mode (AT%A1) and one to originate mode (AT%A0). After the leased line configuration has been saved with the AT&W command, the modem will then reset and begin operation as a leased line modem. As a leased line device, the modem will operate in a dumb mode and will no longer respond to AT commands. Therefore, you must use the procedure described in the previous section when it becomes necessary to remove the modem from leased line mode and return it to a smart dial mode.

**Leased Line Jumpers** - In order to set the appropriate hardware jumpers, it is necessary to remove the cover from the modem. Jumpers P1 and P2 select either 2-wire or 4-wire operation. Jumpers P3 and P4 select transmit level.

### 2-WIRE MODE:



### 4-WIRE MODE: (Default)



(The black areas in the above diagrams indicate that a jumper must be installed on those pins of P1 and P2)

### **TRANSMIT POWER LEVEL:**

	P3	P4
-4dBm	off	off
-10dBm	on	off
-13dBm	off	on (Default)
-16dBm	on	on

("On" indicates that a jumper should be installed. "Off" indicates that no jumper should be installed)

## **CONFIGURATION COMMANDS**

The following standard AT configuration and control commands are available when the modem is operating in smart mode:

- AT** Attention prefix; precedes all commands except the escape sequence (+++) and the repeat (A/) command. Entered alone, it causes no action but the return of result code 0, "OK."
- A/** Repeat last command.
- +++** Escape sequence; go to command state.
- ATA** Go into answer mode; attempt to go to on-line state.
- ATB0** Select CCITT V.22 or V.22bis as communication standard.
- ATB1** Select Bell 103/212A communication standard.
- ATD** Go into call (originate) mode; dial number that follows to go on-line. The following dial modifiers can be used with the ATD command:
- |           |   |
|-----------|---|
| 0-9#*ABCD | Digits/characters for dialing.                              |
| P         | Pulse dial (factory setting).                               |
| T         | Tone dial.  |
| !         | Hookflash.  |
| @         | Wait for quiet answer (no answer tone transmitted).         |
| W         | Wait for dial tone.   |
| ,         | Delay processing of next character by value in register S8. |
| R         | Reverse mode (to originate a call in answer mode).          |
| ;         | Return to command state after dialing.                      |
| S=n       | Dial number stored in location "n".                         |
- ATE0** Disable character echo in command state.
- ATE1** Enable character echo in command state.
- ATH0** Go on hook (hang up).
- ATH1** Go off-hook.

<b>ATI0</b>	Request product identification code.
<b>ATI1</b>	Perform checksum on firmware ROM; return checksum.
<b>ATI2</b>	Perform checksum on firmware ROM; returns OK or ERROR result codes.
<b>ATL0</b>	Low speaker volume (same as ATL1).
<b>ATL1</b>	Low speaker volume.
<b>ATL2</b>	Medium speaker volume.
<b>ATL3</b>	High speaker volume.
<b>ATM0</b>	Speaker off.
<b>ATM1</b>	Speaker on until carrier detected.
<b>ATM2</b>	Speaker always on.
<b>ATM3</b>	Speaker on until carrier detected, except off during dialing.
<b>ATO0</b>	Go to online state.
<b>ATQ0</b>	Modem returns result codes as selected by ATVn command.
<b>ATQ1</b>	Modem does not return result codes.
<b>ATSr</b>	Set pointer to address of register "r".
<b>ATSr=n</b>	Set register "r" to value "n".
<b>ATSr?</b>	Display value stored in register "r".
<b>ATV0</b>	Display result codes in numeric form.
<b>ATV1</b>	Display result codes in verbose forms (as words).
<b>ATX0</b>	Enable features represented by result codes 0-4.
<b>ATX1</b>	Enable features represented by result codes 0-5 and 10.
<b>ATX2</b>	Enable features represented by result codes 0-6 and 10.
<b>ATX3</b>	Enable features represented by result codes 0-5, 7 and 10.
<b>ATX4</b>	Enable features represented by result codes 0-7 and 10.
<b>ATY0</b>	Disable long space disconnect.
<b>ATY1</b>	Enable long space disconnect.
<b>ATZ</b>	Reset modem and recall factory configuration.
<b>ATZ0</b>	Reset modem and recall user profile 0.
<b>ATZ1</b>	Reset modem and recall user profile 1.
<b>AT&amp;C0</b>	Assume data carrier always present.
<b>AT&amp;C1</b>	Track presence of data carrier.
<b>AT&amp;D0</b>	Ignore DTR signal.
<b>AT&amp;D1</b>	Go to the command state when an ON-to-OFF transition on DTR occurs.
<b>AT&amp;D2</b>	Hang up and go to the command state when ON-to-OFF transitions on DTR occur.
<b>AT&amp;D3</b>	Reset when an ON-to-OFF transition of DTR occurs.

<b>AT&amp;F</b>	Recall the factory settings as the active configuration.
<b>AT&amp;G0</b>	Do not transmit guard tone.
<b>AT&amp;G1</b>	Transmit 550 Hz guard tone.
<b>AT&amp;G2</b>	Transmit 1800 Hz guard tone.
<b>AT&amp;L0</b>	Set the modem for operation on a normal dial circuit.
<b>AT&amp;L1</b>	Set the modem for operation on a 2 or 4-wire leased circuit. This command will only take effect after an AT&W command has been issued.
<b>AT&amp;P0</b>	Set pulse dial make:break ratio to 39:61 (North America).
<b>AT&amp;P1</b>	Set pulse dial make:break ratio to 33:67 (rest of world).
<b>AT&amp;S0</b>	Assume presence of DSR signal.
<b>AT&amp;S1</b>	Track presence of DSR signal.
<b>AT&amp;V</b>	View active configuration, user-defined profiles and stored numbers.
<b>AT&amp;W0</b>	Save storable parameters of active configuration as user profile 0.
<b>AT&amp;W1</b>	Save storable parameters of active configuration as user profile 1.
<b>AT&amp;Y0</b>	Recall user profile 0 on power-up.
<b>AT&amp;Zn=x</b>	Store phone number "x" in location "n" (n=0 to 3).
<b>AT%D0</b>	Places the modem in smart mode.
<b>AT%D1</b>	Places the modem in dumb mode. This command will only take effect after an AT&W command has been issued.
<b>AT%A0</b>	Places the modem in originate mode for leased line operation.
<b>AT%A1</b>	Places the modem in answer mode for leased line operation.

## S REGISTERS

Register	Description	Range
S0	Number of ring cycles before automatic answer	0-255
S1	Ring cycle count (incremented each ring cycle).	0-255
S2	ASCII code for escape sequence character	0-127
S3	ASCII code for carriage return character.	0-127
S4	ASCII code for line feed character.	0-127
S5	ASCII code for backspace character.	0-32,127
S6	Wait time prior to blind dialing.	2-255 sec
S7	Wait time for carrier or dial tone.	2-255 sec
S8	Pause time for comma modifier in dial string.	0-255 sec
S9	Carrier Detect response time.	1-255 1/10 sec
S10	Delay from carrier loss to hanging up.	1-255 1/10 sec
S11	Duration and spacing of DTMF tones.	50-255 ms
S12	Escape sequence guard time.	20-155 1/50 sec
S13-15	Reserved	
S16	Reserved	
S17	Reserved	
S18	Reserved	0-255 sec
S19-24	Reserved.	
S25	DTR change detect time.	0-255 1/100 sec
S26	RTS to CTS delay	0-255 1/100 sec

## MESSAGES AND RESULT CODES

No.	Words	Description
0	OK	Command executed.
1	CONNECT	Connection at 0 to 300 bit/s.
2	RING	Ring signal detected.
3	NO CARRIER	Carrier signal not detected or lost.
4	ERROR	Invalid command, error in command line, command line exceeds buffer or invalid checksum.
5	CONNECT 1200	Connection at 1200 bit/s.
6	NO DIALTONE	Dial tone was not detected.
7	BUSY	Busy signal returned from remote end after dial.
8	NO ANSWER	No silence detected when dialing a system not providing a dial tone.
10	CONNECT 2400	Connection at 2400 bit/s.

## RMA PROCEDURE

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Before returning any DCE product, an RMA number must be obtained. Before asking for an RMA number, ascertain that the product was purchased from DCE. If you bought the product from a Distributor or Systems Integrator, the product should be returned to that vendor.

The most convenient method to obtain an RMA authorization for a product purchased from DCE is to submit a request by fill in the form from [www.data-connect/returns.htm](http://www.data-connect/returns.htm). Information required must include

- Company name
- Address (including any Mail Stop or specific delivery information)
- Name, contact information, and e-mail address for the technical contact(s) at your company

If the above information is on your letterhead, that format is acceptable.

For each item you wish to return, please include:

- The product model number (usually found on the serial number tag)
- The serial number for each item you wish to return
- A description of the problem you are encountering
- The cause of the problem (if known)

A product support specialist may call to verify that the product is properly installed or may ask you to perform tests to insure that the product has actually failed. After reviewing the problem, DCE will assign an RMA number and you will be notified by email or FAX.

The product must be properly packed and returned to:

Data Connect Enterprise.  
3405 Olandwood Court,  
Olney, MD 20832  
Attn: RMA Technical Support

The RMA number must be legibly displayed on the shipping carton. No RMAs will be issued without a product review. DCE will not be responsible for any product returned without an RMA number.

If you believe the product may be out of warranty, include a method of payment for repairs (either a Purchase Order number or credit card number), card holder name, date of expiration on the RMA request. Repairs currently require 5 working days and are returned UPS second day air.

Contact us by e-mail [mspellerberg@data-connect.com](mailto:mspellerberg@data-connect.com) or call 301.924.7400 x25 if you should have any questions.



## CERTIFICATIONS

### **FCC Part 68**

This equipment complies with U.S. Code of Federal Regulations, Title 47, FCC Rules and Regulations Part 68. Located on the equipment is the FCC Registration Number and Ringer Equivalence Number (REN). You must provide this information to the telephone company if requested.

The Registration Number and REN will be on a label attached to the unit. The FCC requires these numbers be prominently displayed on an outside surface of the equipment.

The REN is used to determine the number of devices you may legally connect to your telephone line. In most areas, the sum of the REN of all devices connected to one line must not exceed five (5.0). You should contact your telephone company to determine the maximum REN for your calling area. The telephone company may change technical operations or procedures affecting your equipment. You will be notified of changes in advance to give you ample time to maintain uninterrupted telephone service.

If you experience trouble with this telephone equipment, please contact Data Connect Enterprise, Inc. at (301) 924-7400 x17 for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been resolved. If your equipment continues to disrupt the network, the telephone company may temporarily disconnect service. If this occurs, you will be informed of your right to file a complaint with the FCC.

This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs.

### **FCC Part 15**

This equipment has been tested and complies with the limits for a Class A computing device according to U.S. Code of Federal Regulations, Title 47, FCC Rules and Regulations Part 15. Operation is subject to the following two conditions:

- (1) This device may cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.