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VXI QUAD SERIAL MODULE

VXI-5534

**4 SERIAL PORTS IN
ONE MODULE**

DESCRIPTION

Introduction

The VXI-5534 is a programmable VXI module that provides four RS-232/RS-422 and RS-485 serial interfaces in one VXI slot. Each interface has its own logical address and is independently programmed. All operating parameters are program configurable from the VXIbus with nonvolatile storage of all settings. Data transmission and reception is totally transparent and does not require encapsulating the data in command strings. Outgoing VXIbus data can be transmitted immediately or messages can be stored and transmitted by VXIbus triggers. Received data is buffered until read by the VXIbus controller. Each channel can generate VXI interrupts upon receipt of a message or when there is a minimum number of data bytes in the receive buffer. A four character LED display on the front panel shows device activity, errors, SYSFAIL and diagnostics as alphanumeric messages.

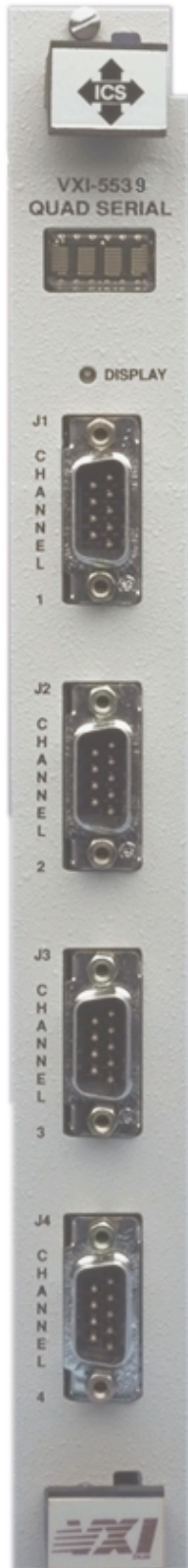
Serial Interfaces

Each Serial Interface provides RS-232, RS-422 and RS-485 compatible signals. Baud rates, character formats, transmission mode and terminations are independently programmable for each channel. Baud rates are selectable in all of the standard rates up to 115.2 Kbaud using the internal baud rate generator and up to 250 Kbits per second with external clocks. The VXI-5534 can generate 1X and 16X clocks internally or accept external clock inputs for isochronous systems. In normal operation, the outgoing data is only held in the channel's transmit buffer while it is being transmitted. Repeated messages or test messages can be stored in the channel's trigger buffers and then transmitted as often as desired with a VXIbus trigger or trigger command. Received data is buffered and is normally read as complete messages to minimize VXIbus transfer time. Channel buffer space is 10 Kbytes in the standard units, 40 Kbytes in expanded memory units.

Applications

There are numerous applications for a VXI-5534 in a VXIbus test system. The serial interfaces on a standard VXI-5534 support asynchronous communication for testing all types of devices with RS-232 or RS-422/RS-485 interfaces. Devices requiring synchronous bytes, IBM Bisync or other synchronous bit-oriented protocols such as IBM's SDLC or HDLC can be tested by adding custom firmware to the VXI-5534. The VXI-5534 can also be used to add communication links to the VXI system or output data to terminals, printers, or plotters.

- Four programmable RS-232/RS-422/RS-485 Serial Ports.
No need to remove the module to make changes.
- Multiprotocol hardware capability - asynchronous mode standard, synchronous bit and byte-oriented protocols with custom firmware.
Supports virtually any serial data transfer application.
- Asynchronous mode selects character format, flow control and clock sources.
Program any asynchronous format.
- Baud rates up to 115.2 Kbaud with internal clock or 250 Kbits/sec with external clocks.
Wide range of programmable baud rates.
- Direct or buffered data output by VXIbus triggers.
Synchronize test messages.
- Programmed termination resistors for RS-485 full or half duplex operation.
Eliminates external resistors.
- VXI 1.4 Compliant.
Meets latest VXI revision
- Alpha numeric status display on front panel.
Shows device activity and interface diagnostics for program debugging.



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Trigger Capability

Each serial channel has 4 or 8 trigger buffers for storing repeated or test messages. The stored data is transmitted upon receipt of a VXIbus TTL Trigger or the Trigger command. This capability lets the user store test patterns or messages in the VXI-5534 ahead of time and output them repeatedly as needed. The trigger can be either a pulse on a selected VXIbus TTL Trigger line, the Word Serial TRIGGER Command or a direct command to the interface. To arm the VXIbus trigger function, the user sends a special Word Serial ARMTRIGGER command to the interface to specify the buffer to be used and the VXIbus TTL Trigger line (if one is being used). ARMTRIGGER is an ICS created VXIbus word Serial command. Trigger commands trigger one channel at a time while an TTL Trigger line can be used to trigger multiple channels at the same time.

Status Byte and VXIbus Interrupts

Each serial channel has its own Status Byte that includes the Event Status Register summary bit, transmit buffer and receive buffer status bits. Table 1 lists the Status Byte bits. The buffer bits set when the transmit buffer is empty, when there is data in the receive buffer, when there is a message in the receive buffer or when the VXI-5534 detects a serial data error. For normal receive operation, the user periodically queries the Status Byte and reads a message when the Message-in-RX Buffer bit is set. For long binary strings, the user can set the Data-in-RX Buffer bit to come on when the buffer contains a specific number of characters and then read that number of characters from the RX Buffer.

A more sophisticated approach to inputting or outputting data is to have the serial channel generate a VXIbus interrupt when the specific condition occurs. Any of the Status Byte bits can be used to generate a VXIbus interrupt if the corresponding enable bit is set. The Slot 0 Controller program can either test the interrupt line periodically to see if the serial channel needs service or use the interrupt to branch to a service routine that will transfer data to or from the interrupting serial channel.

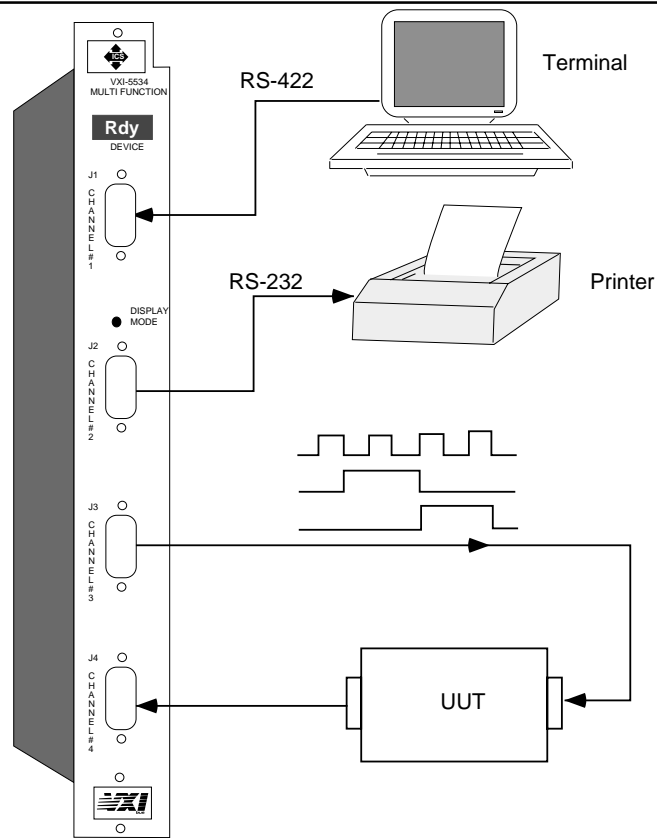


Figure 1 Typical VXI-5534 Uses

Front Panel Display

The four character alpha numeric display on the front panel provides module status, SYSFAIL display, error codes and device activity information to the user. At power turn-on, the display shows SysF while SYSFAIL is asserted, then when self test is completed, the display steps through its identification sequence to display Rdy for the start of normal operation. During normal operation the display shows the currently addressed logical device.

Display Mode Button

The display Mode Button changes the display mode to show an extended list of messages for debugging purposes, the module's VXI address switch setting and VXI Protocol status. Two other display modes run continuous self tests on the two slave processors.

TABLE 1 STATUS AND EVENT STATUS BYTE BITS

BIT	STATUS BYTE	EVENT STATUS BYTE
DIO7	Output Done	Power On
DIO6	Request Service	not used
DIO5	Event Status Summary	Command Error
DIO4	MAV	Execution Error
DIO3	Receive Data Error	Command not Executed
DIO2	Transmit Buffer Empty	Query Error
DIO1	Data in RX Buffer	not used
DIO0	Message in RX Buffer	Operation Complete

Block Diagram

The VXI-5534 is partitioned into three sections, a VXIbus Interface and two Serial Interface sections. Each section has its own microprocessor whose program is optimized for its specific task. Data and commands are passed from the VXIbus to the memory in the addressed interface. Each interface responds to the commands sent to it and transfers data to or from its serial port(s). Each interface can also respond to a selected VXIbus trigger to start a data transmission. All data transfers to/from the VXIbus are via registers allocated in a dual port RAM in the VXIbus Interface logic section.

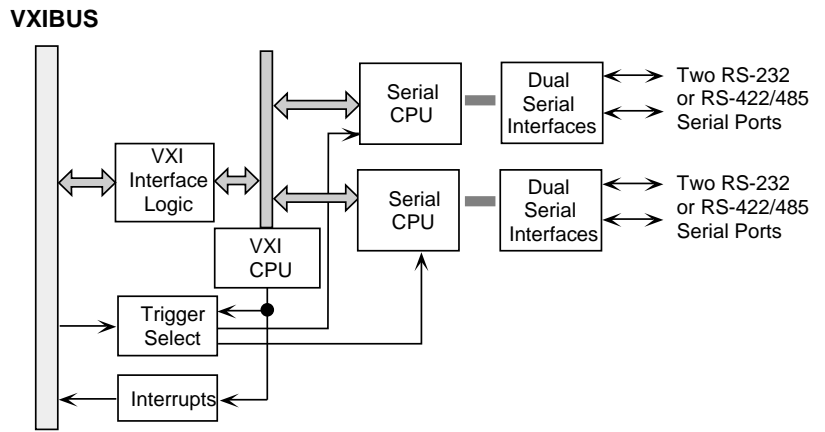


Figure 2 VXI-5534 Block Diagram

RS-485 Termination Resistors

RS-485 transmission systems often require termination resistors to minimize noise and to bias the line into a known state when nothing is being transmitted. Figure 3 shows how the terminating and bias resistors are used in a typical half-duplex circuit. If the serial channel is being used for RS-422 or RS-485 data transmission, an internal set of termination and bias resistors can be switched across the transmit and receive line pairs. The resistors are mounted on a plug-in adapter and can be changed by the user. Factory values are 220 ohm termination and 1 Kohm bias resistors.

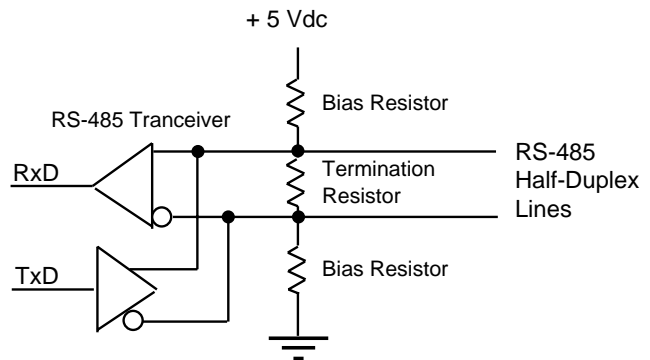


Figure 3 RS-485 Terminating Resistors

Serial Interface Commands

The VXI-5534's serial channels power up and normally operate in the data mode to transparently send and receive serial data. To configure the channel, the user sends the channel a Word Serial command that switches the channel into its command mode. When in the command mode, the serial channel accepts the Serial Configuration Commands listed in Table 2 and its 488.2 commands. When the configuration process is complete, the SAVE command saves the current configuration in EEPROM. Another Word Serial command is used to switch the serial channel back into its transparent data mode.

VXI Word Serial commands are single-word VXIbus commands that the VXI-5534's serial channels can respond to, even when in the transparent data mode. In the VXI-5534, Word Serial commands are used to select the serial channel's operating mode, to setup its VXI interface, to set interrupt levels and to assign TTL Triggers to the channels' trigger buffers.

Table 2 Serial Configuration Commands

Command	Function
BAUD n	Sets baud rate
BAUD#	Sets nonstandard baud constants
BITS n	Sets number of data bits per character
CONFIG?	Requests current configuration message
DEFAULT	Sets all parameters to defaults
EXTRN RECV	Selects external clock for receiver
EXTRN TRANS	Selects external clocks for transmitter
EXTRN OFF	Selects internal clocks
EXTRN CLKx	Sets 1X or 16X clocks
LOOPBACK a	Selects data loopback ON/OFF for testing
PACE a	Enables X-on/X-off flow control
PARITY a	Sets parity generation and detection
PDEFAULT a	Sets the power on default mode
SAVE	Saves current configuration in EEPROM
SBITS n	Sets number of stop bits per character
SETBUFINT n	Sets the number of RX buffer characters for setting bit DIO1 in the Status Byte
SET EOM hh	Sets the End-OF-Message byte
SET MASK hh	Sets the received character mask byte
STORE n, <string>	Store data in buffers (n) for Trigger
TERMRES	Switch termination/bias resistors in or out for RS-422/RS-485 operation
TRIGGER n	Sends data from buffer (n).
TYPE a <n1>	Selects RS-232 or RS-422/485 interface and full/half duplex operation

VXI-5534: SPECIFICATIONS

VXI Capabilities

Static and Dynamic configuration capability. Module uses four sequential logical addresses to address serial interfaces #1 through #4. Lowest logical address corresponds to serial channel #1.

Message based, I4 class instrument.

Programmable interrupter on each interface.

Supports VXI revision 1.4 instrument protocol and IEEE 488.2 common commands.

488.2 Common Commands

*CLS, *ESE, *ESE?, *ESR?, *IDN?, *OPC, *OPC?, *RCL, *RST, *SAV, *SRE, *SRE?, *STB?, *TRG, *TST? and *WAI

Indicator

Four character LED display that shows device activity, errors, SYSFAIL and diagnostic messages as alphanumeric mnemonics. Pushbutton selection of normal or extended messages and diagnostic routines. Normal display mnemonics are:

Display	Meaning
SysF	SYSFAIL asserted, Self test in progress
Init	Initialized
Rdy	VXI-5534 Ready (Begin Normal Operation received)
SER1	Serial Interface #1 addressed
SER2	Serial Interface #2 addressed
SER3	Serial Interface #3 addressed
SER4	Serial Interface #4 addressed
FAIL	Failed Self Test
ERnn	Error Code Number (nn)

Serial Interface

Four independent programmable channels with RS-232/RS-422/RS-485 signals and asynchronous characters.

Hardware capabilities

Asynchronous mode with internal or isochronous clocks (standard)
Synchronous (byte-oriented) formats and IBM Bisync or SDLC/HDLC formats require additional firmware.

Asynchronous capabilities

Baud rates from 50 to 115.2 K bits/second with internal baud rate generator. Isosynchronous rates up to 250 K bits/second with external clocks.

Character format:

- 5, 6 7 or 8 bits/character
- 1, 1.5 or 2 stop bits
- Odd, even or no parity

Flow control by hardware handshake or X-on/X-off protocol.

Transmission modes

- RS-232
- RS-485 Full Duplex
- RS-485 Half duplex

RS-232 signal levels

- Transmit ± 8 Vdc typ.
- Receive ± 3 Vdc max.

RS-422/RS-485 levels

- Transmit ± 2 Vdc min.
- Receive ± 0.2 Vdc min.

Termination resistors

(program selectable in RS-485 modes)
220 ohm load
1 Kohm bias to gnd and +5Vdc

Two data transfer modes

- Direct (outputted as received)
- Held in buffer and outputted when triggered.

Buffer partitions

Buffer	Std Unit	Exp Mem
Transmit	4 Kbytes	16 Kbytes
Receive	4 Kbytes	16 Kbytes
Trigger	4 at 512	8 @ 1 K
Total Space	10 Kbytes	40 Kbytes

Controls

Display Mode

Push button selects indicator display functions.

Address switch

Sets VXIbus logical address 4 through 248 or selects dynamic addressing.

Physical

Size, W x H x D

C-size card, single slot module with P1 and P2 VXI bus connectors.
(3.05 x 233.5 x 353.00 mm)

Weight

3.7 kg. (8 lbs.)

Power Consumption

+5 Vdc @ 2.0 Amps
 ± 12 Vdc @ 0.2 Amps

Connectors

Serial - DE-9P connectors with female screw locks

Included Accessories

Instruction Manual

ORDERING INFORMATION

VXI Quad Serial Module

VXI Quad Serial Module with expanded memory

Part Number

VXI-5534

VXI-5534-M



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