

635-SIF and 735-SIF
SERIAL (RS-232)
INTERFACE
Operator's Manual



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SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

The TransEra 635-SIF and 735-SIF are general purpose interfaces between programs written in Tektronix 4050 series BASIC and external RS-232 devices. The 635 and 735 offer flexibility in the way that data can be sent and received between the Tektronix computers and the external devices. The model 635-SIF ROM pack is intended for use with the Tektronix model 4051 computer; the model 735-SIF ROM pack is intended for use with the Tektronix models 4052, 4052A, 4054, and 4054A computers.

INSTALLATION INSTRUCTIONS

To install the 635 or 735-SIF, turn the power to the 4052 or 4054 off. Insert the ROM pack into one of the backpack slots or into a slot in a ROM expander. Consult appendix B to be sure that the ROM pack pinouts match the connections to the external RS-232 compatible device and follow the instructions in appendix B to change the pinouts if needed. Connect an RS-232 cable from the 635 or 735 to the external device. Note the baud rate and parity needed to communicate with the external device and add statements to change the baud rate and character framing to your BASIC program if needed (the default values are 9600 baud and even parity with 7-bit characters).

In the command descriptions, the 635-SIF or 735-SIF device address is referred to as P. This address is taken from the slot that contains the ROM pack. In a machine with two slots, the leftmost slot has address 41 and the rightmost address 51. In a four slot machine, the leftmost slot has address 41, the next 51, the next 61, and the rightmost slot has address 71. ROM expander slot numbers begin at the slot that the expander replaces and increase by 1 from the lowest left-hand slot to the upper right-hand slot. See the Tektronix documentation for a more detailed explanation of the slot numbers.

If the external device is powered on before the Tektronix computer, it may indicate an error when the computer is powered on, due to a false character sent by the ROM pack when powered on. This error may have to be cleared before data can be exchanged with the device.

HANDSHAKING

The 635 and 735-SIF control data transfer using two lines in the ROM pack. These lines are connected to pins 20 (DTR) and 5 (CTS) when the ROM pack is shipped, but may be connected to other pins by following the procedure in appendix B.

The DTR line is used by an external device to control the ROM pack's data transmission. When DTR is held below -3 volts, no data transmission is possible, and the ROM pack waits if it is outputting data. When DTR is held above +3 volts, the ROM pack outputs data. DTR can be disabled, if necessary, as described in appendix B.

The CTS line is used by the ROM pack to control data reception from an external device. If the ROM pack sets CTS to -10 volts, the external device should not send data to the ROM pack. If the ROM pack sets CTS to +10 volts, the ROM pack can receive data. If the external device sends data to the ROM pack when CTS is at -10 volts, that data will be lost.

SECTION 2

DESCRIPTIONS OF COMMANDS

SET BAUD RATE

SYNTAX PRINT @P,0:B

PARAMETERS A numeric value that specifies the baud rate in bits per second. Permissible baud rates are listed in appendix A.

DESCRIPTION SET BAUD RATE sets the baud rate for all communications between the 635-SIF or 735-SIF and the external RS-232 device. The baud rate set after power up is 9600 baud.

EXAMPLE The following example sets the baud rate to 2400 baud:

PRINT @P,0:2400

SET CHARACTER FRAMING

SYNTAX PRINT @P,11:N

PARAMETERS The single numeric parameter is an integer between 0 and 10 representing the type of parity and the number of significant bits (7 or 8) in each unit. The meaning of the integers is given in appendix A.

DESCRIPTION SET CHARACTER FRAMING establishes the character framing for all communications between the 635-SIF or 735-SIF and the external device. After power up, the framing is set to 7 bits and even parity (N=0).

EXAMPLE The following example sets the framing to 8 bits with no parity:

PRINT @P,11:5

SET TURNAROUND DELAY

SYNTAX PRINT @P,15:N

PARAMETERS The parameter is a numeric constant or expression between 0 and 255 that represents the turnaround delay in milliseconds.

DESCRIPTION Turnaround delay is a delay introduced by the ROM pack in the character output when a control character (an ASCII character with a value smaller than 32) is transmitted to an external device. Some devices require this delay when carriage returns, form feeds, and other control functions are performed. The default value for this delay is 25 milliseconds and the maximum value for this delay is 255 milliseconds (about 1/4 second).

If the character can be changed to another value by sending the serial command shown above (PRINT @P,15:N), it contains the new ASCII value of the character at the end of the character. It contains the new ASCII value of the previous character (unless the S16 and T16 bit are set due to a shared device). This character is most common (either the same as at the end of the character). N1 contains the value of the character to be sent. The default values for these characters are as follows: carriage return is the end of line character; N1 is the non-printing character where N1 is 255 is the end of the character; and S16 = 0. If two or more of the parameters are the same, S16 takes precedence over N1 and T16 takes precedence over N1. The alternate addresses are only used to LOAD and OUTPUT commands containing a percent sign ("%") before the device address (for example, INPUT \$10%).

A more complete description of these commands can be found in the 650 reference manual in the section about Processor Serial Parameters.

The SET INTRUDER command affects both input and output to all devices used with the 650 graphics system, including the internal timer, clock and the screen.

SET TEXT DELIMITERS

SYNTAX PRINT @37,26:N and PRINT @37,0:N1,N2,N3

PARAMETERS All of the parameters must be numeric constants or numeric expressions that evaluate to a value between 0 and 255, inclusive.

DESCRIPTION The normal end of line delimiter in the 4050 graphics systems is a carriage return. The first command, PRINT @37,26:N, changes the end of line delimiter to a carriage return followed by a line feed when N \neq 0 and returns the end of line delimiter to carriage return is N=0. These delimiters will be used in all input and output commands containing the at sign ("@") before the device address (for example, INPUT @P:).

The end of line delimiter can be changed to any character by executing the second command shown above, PRINT @37,0:N1,N2,N3. N1 contains the new ASCII value of the end of line character. N2 contains the new ASCII value of the end of text character (since the 635-SIF and 735-SIF are not file structured devices, this character in most cases is treated the same as an end of line character). N3 contains the value of the character to be deleted. The default values for these characters are N1=13 (carriage return is the end of line character), N2=255 (the non printing character whose value is 255 is the end of file character) and N3=255. When two or more of the parameters are the same, N1 takes precedence over N2, and N2 takes precedence over N3. The alternate delimiters are only used in input and output commands containing a percent sign ("%") before the device address (for example, INPUT %P:).

A more complete description of these commands can be found in the 4050 reference manual in the section about processor status parameters.

NOTE The SET TEXT DELIMITER commands affect text input and output to all devices used with the 4050 graphic system, including the internal tape drive and the screen.

PRINT

SYNTAX

PRINT @P:list
PRINT @P: USING nnnn:list
PRINT @P: USING "xxxx":list

PRINT %P:list
PRINT %P: USING nnnn:list
PRINT %P: USING "xxxx":list

PARAMETERS

Any parameter list may be included that is acceptable to the 4052/4054. nnnn represents the line number of a valid IMAGE statement. "xxxx" represents a valid IMAGE statement given within the PRINT command.

DESCRIPTION

PRINT sends the specified text to the external device.

For an explanation of the use of the @ and percent sign before the device address, see the description of the SET TEXT DELIMITERS command. For a complete description of the PRINT command, see the Tektronix computer operator's manual.

NOTE

If a carriage return at the end of the text to be printed is undesirable, follow the parameter list in the PRINT command with a semicolon, or, if using an IMAGE statement, end the image string with an S.

INPUT

SYNTAX INPUT @P:list

INPUT %P:list

PARAMETERS The list contains target variables in which the data is to be input. They must match the type of data that is actually input when the statement is executed.

DESCRIPTION INPUT receives one line of data from the external device and transfers the data into the BASIC variables specified in the parameter list.

For an explanation of the use of the @ and percent sign before the device address, see the description of the SET TEXT DELIMITERS command. For a complete description of the INPUT command, see the Tektronix computer operator's manual.

In the 4051 version of the ROM pack (635-SIF), the routines CALL "INPUT\$" and CALL "INPUT%" are provided to allow data transfer to the 4051 when the baud rate is higher than 2400 baud and the line length of the data lines is longer than 72 characters.

CALL "INPUT\$",A\$ and CALL "INPUT%",A\$ cause the entire data line received from the serial interface in the 635-SIF to be placed in the string variable passed to it, in this example A\$. These routines are not provided in the 4052/4054 version of the ROM pack because the 4052 and 4054 computers are fast enough to capture data at speeds up to 19200 baud in the normal INPUT statement. When using these routines, be sure that the target string variable is dimensioned before CALL "INPUT\$" is executed. CALL "INPUT\$" uses the "at sign" delimiters, like INPUT @P in the 4051 BASIC; CALL "INPUT%" uses the "percent-sign" delimiters, like INPUT %P in the 4051 BASIC.

INPUT SINGLE CHARACTER

SYNTAX INPUT @P,15:A\$

PARAMETERS The parameter is the target variable to receive the character input. If the character is always a number, a numeric variable may be used.

DESCRIPTION INPUT @P,15:A\$ receives one character of data from the external device and transfers the data into the BASIC variable specified.

SAVE

SYNTAX

```
SAVE @P:  
SAVE @P:n1  
SAVE @P:n1,n2
```

```
SAVE %P:  
SAVE %P:n1  
SAVE %P:n1,n2
```

PARAMETERS

If included, the two numeric parameters specify the beginning and ending line numbers in the program to be saved. If no parameters are included, the entire program is saved. If only one parameter is included, only the line specified by that parameter is saved. All parameters in the SAVE command must be numeric constants.

DESCRIPTION SAVE sends the specified program lines to an external device. After the last line, a null line (an end of line character right after the last line's end of line character) is sent. This null line signals the end of the program and is used by the OLD command to determine when to stop receiving program lines.

For an explanation of the use of the @ and percent sign before the device address, see the description of the SET TEXT DELIMITERS command. For a complete description of the SAVE command, see the Tektronix computer operator's manual.

LIST

SYNTAX

LIST @P:
LIST @P:n1
LIST @P:n1,n2

LIST @P,1:
LIST @P,1:n1
LIST @P,1:n1,n2

LIST %P:
LIST %P:n1
LIST %P:n1,n2

PARAMETERS

If included, the two numeric parameters specify the beginning and ending line numbers in the program to be listed. If no parameters are included, the entire program is listed. If only one parameter is included, the single line specified by the parameter is listed. All parameters in the LIST command must be numeric constants.

DESCRIPTION LIST sends the specified program lines to an external device. Unlike SAVE, LIST changes all control characters present in the program lines to a printable character followed by a backspace and an underline. For example, control J (line feed) is changed by LIST to J+backspace+underline, which is printed as an underlined J on a device that interprets the backspace character. LIST normally precedes the listing with a form feed (control L). If the form feed is undesirable, use the LIST @P,1: form of the LIST command to suppress the form feed.

For an explanation of the use of the @ and percent sign before the device address, see the description of the SET TEXT DELIMITERS command. For a complete description of the LIST command, see the Tektronix computer operator's manual.

OLD

SYNTAX OLD @P:

OLD %P:

DESCRIPTION OLD receives a program from the external device. Each line of the program must be an acceptable BASIC line in ASCII format with the proper end of line delimiter. The last line of the program must be followed by a null line (an end of line character immediately following the end of line character belonging to the last line). If the OLD statement is executed from a program line, the program will be run after it is received.

For an explanation of the use of the @ and percent sign before the device address, see the description of the SET TEXT DELIMITERS command. For a complete description of the OLD command, see the Tektronix computer operator's manual.

APPEND

SYNTAX	APPEND @P:n1 APPEND @P:n1,N APPEND %P:n1 APPEND %P:n1,N
PARAMETERS	The first parameter must be a numeric constant specifying the line to be overwritten by the new program lines. The optional second parameter specifies the renumbering increment to be used if the new program lines must be renumbered or if part of the existing program must be renumbered to accomodate the new program lines. The default for the second parameter is 10. The second parameter may be a numeric variable or a constant.
DESCRIPTION	APPEND receives a program segment from the external device. Each line of the program segment must be an acceptable BASIC line in ASCII format with the proper end of line delimiter. The last line of the program segment must be followed by a null line (an end of line character immediately following the end of line character belonging to the last line). For an explanation of the use of the @ and percent sign before the device address, see the description of the SET TEXT DELIMITERS command. For a complete description of the APPEND command, see the Tektronix computer operator's manual.

CONVERT NUMERICS TO ASCII CHARACTERS

SYNTAX CALL "FP\$",A\$,A

PARAMETERS A\$: String to receive characters
A: Simple numeric or array containing values

DESCRIPTION CALL "FP\$" converts the values in the array or simple numeric expression passed to it to a string whose elements are characters whose values correspond to the array elements. If the numeric parameter is a literal or a simple numeric, one character will be converted. If the numeric parameter is an array, all of the array elements must be defined and all will be converted and placed in order in the output string. The length of the output string after FP\$ has been called will be the size of the input array if one was used, or 1 if the input parameter was a literal or simple numeric expression. If the string dimension is too small to receive all of the values in the input parameter, an error will be given and no conversion will be done.

CONVERT ASCII CHARACTERS TO NUMERICS

SYNTAX CALL "\$FP",A\$,A

PARAMETERS A\$: String containing characters
 A: Simple numeric or array to receive values

DESCRIPTION CALL "\$FP" converts the characters in the input string to their ASCII equivalent numeric values and places the output in the target numeric variable. If the target is an undimensioned variable, the input string must be only one character long. In this case, CALL "\$FP" functions in a manner identical to the BASIC ASC function. If the array dimension is not long enough to receive all of the values in the input string, an error is produced.

LIST BYTES IN A STRING

SYNTAX CALL "LIST\$",A\$

PARAMETERS A\$: String containing characters

DESCRIPTION CALL "LIST\$" displays the characters in a string on the 4050 series screen. Control characters, except control-M (carriage return) are printed in the format used by the BASIC LIST command, as underlined characters. Thus, control-C is printed as C, etc. The carriage return character is printed as a carriage return. Characters whose ASCII values are above 128 are printed using characters whose ASCII values are 128 below the characters' actual ASCII values.

APPENDIX A

BAUD RATES AND CHARACTER FRAMING

BAUD RATES

The permissible baud rates in a PRINT @P,0:N statement are:

N= 50
 75
 110
134.5
150
300
600
1200
1800
2000
2400
3600
4800
7200
9600
19200

CHARACTER FRAMING

The table below explains the effect of the different values of N passed to the ROM pack in a PRINT @P,11:N statement:

Value of N	Character Framing
0	7 Bits + Even Parity + 2 Stop Bits
1	7 Bits + Odd Parity + 2 Stop Bits
2	7 Bits + Even Parity + 1 Stop Bit
3	7 Bits + Odd Parity + 1 Stop Bit
4	8 Bits + 2 Stop Bits
5	8 Bits + 1 Stop Bit
6	8 Bits + Even Parity + 1 Stop Bit
7	8 Bits + Odd Parity + 1 Stop Bit
8	7 Bits + No Parity + 2 Stop Bits
9	7 Bits + Space Parity + 2 Stop Bits
10	7 Bits + Space Parity + 1 Stop Bit

APPENDIX B

ROM PACK CONFIGURATION

Because implementations of the RS-232 standard interface vary widely, the 635 and 735-SIF ROM packs have been designed to allow the user to change the pinouts of the ROM pack to enable its use with a variety of devices. The pinouts are not totally flexible; some very nonstandard configurations may require the use of a special cable that changes the pinouts.

The pinouts of the 635 and 735-SIF are changed inside the ROM pack. To disassemble the ROM pack, remove the four small Phillips screws that hold the front of the ROM pack case. Remove the front and the circuit board in the ROM pack. Lay the ROM pack on a flat surface with the component side up and the blue shorting blocks toward the top as you view it. The ROM pack pinouts are changed by moving the blue shorting blocks.

The diagrams below show how the 635 or 735-SIF is shipped and other possible configurations for some applications. The rectangles in the diagram represent the blue shorting blocks in the ROM pack when it is viewed as explained in the preceding paragraph.

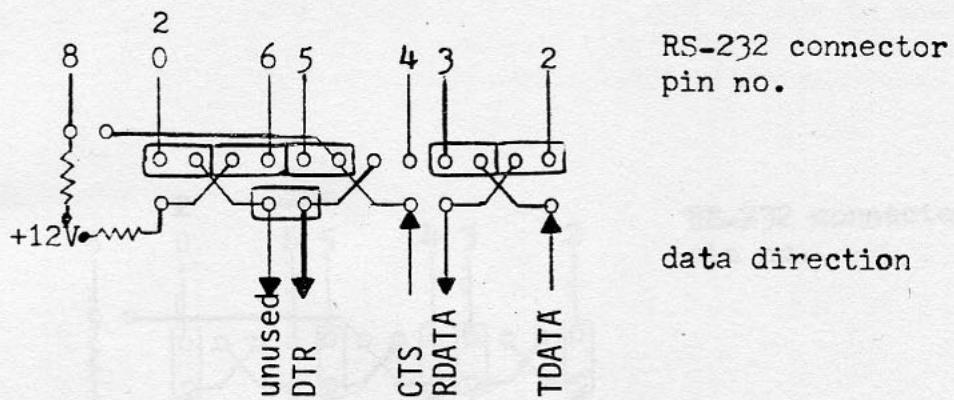


Fig. B-1. 635-SIF or 735-SIF configuration when shipped.
This configuration is used with
most RS-232 compatible printers.

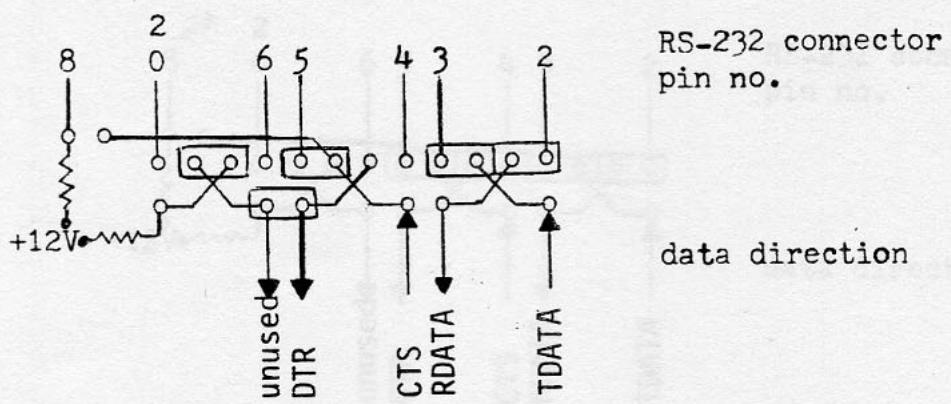


Fig. B-2. 635-SIF or 735-SIF configuration to disable data terminal ready control.

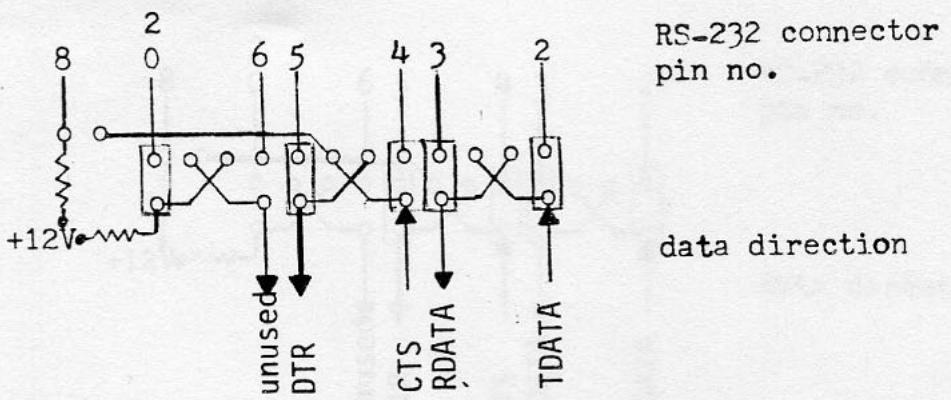


Fig. B-3. 635-SIF or 735-SIF configuration to communicate with some host computers.

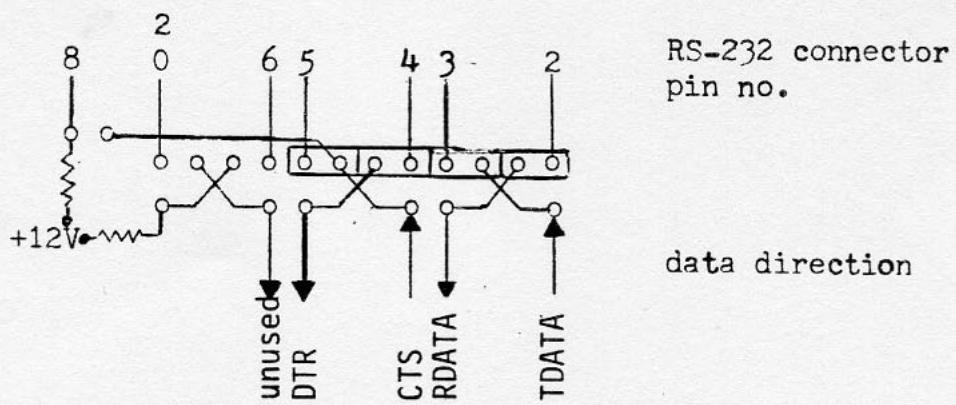


Fig. B-4. 635-SIF or 735-SIF configuration to allow communication between two computers with 735-SIF's. A 9-pin null modem cable (a cable that crosses pins 2 and 3, 4 and 5, and 20 and 6) should be used to connect the the 635 or 735-SIF's when they are both configured as shown here.

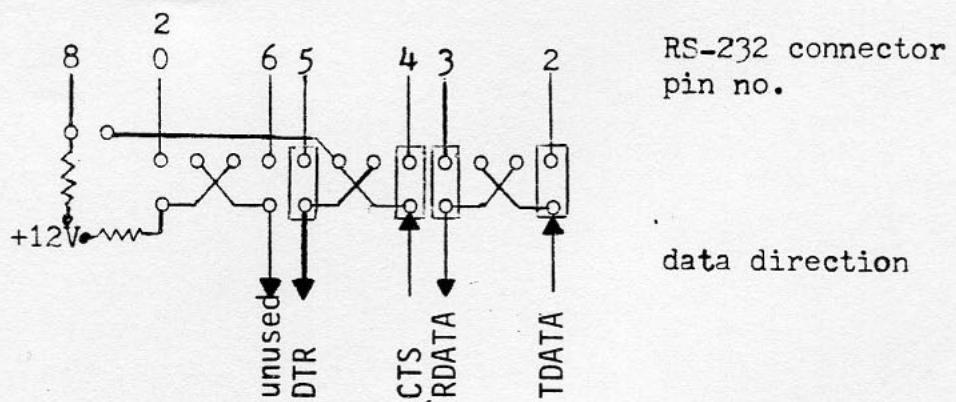


Fig. B-5. 635-SIF or 735-SIF configuration to allow communication between two computers with 635 or 735-SIF's. A standard (straight-through) cable should be used to connect this 635 or 735-SIF with another 635 or 735-SIF configured as shown in Fig. B-4.