DIGITAL MASTER CONTROL

3-14 DISPLAY UNIT

3-14.1 General

The SDT-R26D Display Unit is designed to receive messages in serial form. A 20mA current loop is used to interface the unit while an 8751 INTEL microprocessor controls the unit. The unit is packaged in a 3.7 in. (98 mm) x 2 in. (50 mm) x 6.7 in (170 mm) enclosure.

Additional features of the Display Unit include:

- a three two-digit, seven segment LED display
- eight controllable 3.2 mm red LEDs
- the ability to blink the display and LEDs
- switches for selection of address, baud rate and control modes
- address recognition
- a 110 to 9600 Baud Rate Selection
- 3 control modes
- an optocoupled input stage for 20 mA current loop
- a splash-proof front panel on the display unit

3-14.2 Communications

The input stage for a serial current loop connection to the display card is shown in Figure 1.

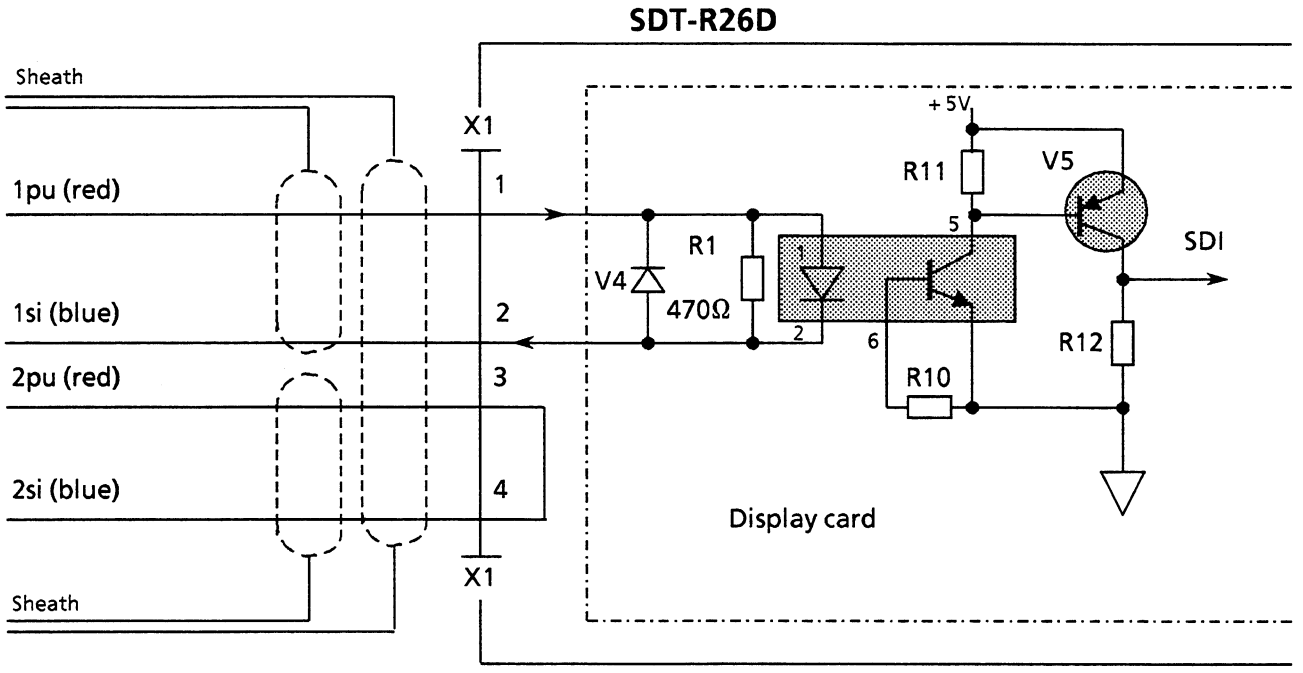

Figure 1. SDT-R26D Serial Current Loop Interface

The baud rate is selected with switches S1-S3 of microswitch SW2 (Figure 2). The switch positions are detailed in Table 1. The position of switch S4 is not important, as it has no effect on the baud rate (mode selection).

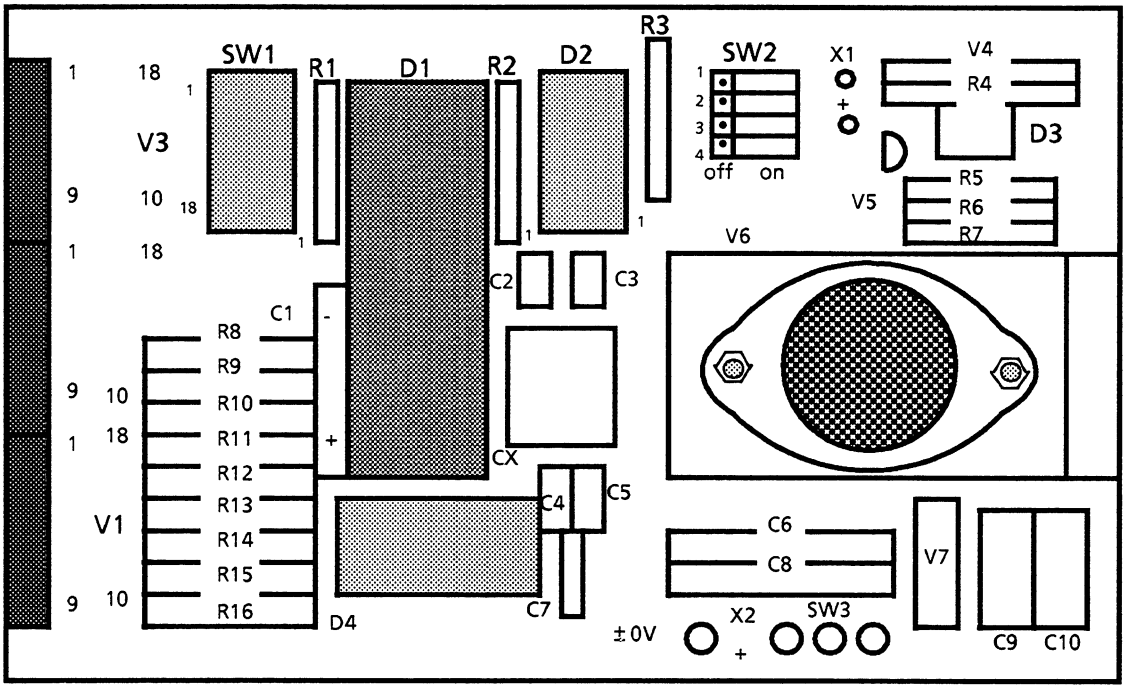

Figure 2. SDT-R26D Display Board

Table 1. Baud Rate Selection Settings (Switch SW1)

Baud rate Bd	S3	S2	S1	S4-S8
110	OPEN (OFF)	OPEN	OPEN	X
150	ON	OPEN	OPEN	X
300	OPEN	ON	OPEN	X
600	ON	ON	OPEN	X
1200	OPEN	OPEN	ON	X
2400	ON	OPEN	ON	X
4800	OPEN	ON	ON	X
9600	ON	ON	ON	X

X = Non Position Sensitive

The message transmitted to the display terminal must be in the form of 11 bits/character as follows:

- start bit
- 7 data bits (Data = 00H-7FH)
- parity bit (maybe odd, even or fixed)
- 2 stop bits

It is possible to connect several display units in series. When display units are connected in series as shown in Figure 3, a 3/4 foot (2.5 meters) cable with a Molex type 3191-4R terminal should be used between units.

NOTE: If a display unit is removed, the short circuit connector supplied with the connection cable may be used to prevent interruption of the data line.

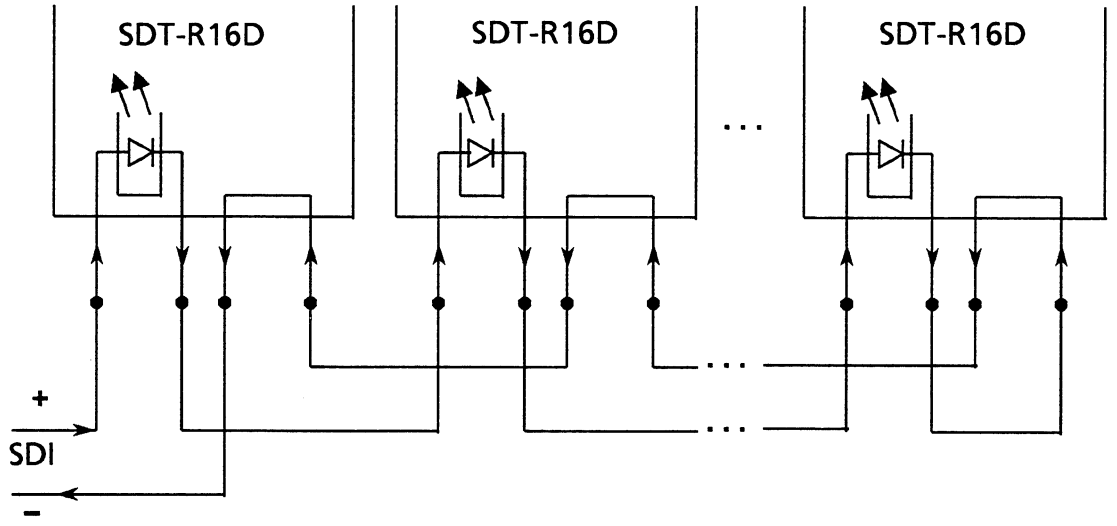

Figure 3. Series Connection of Display Units

3-14.3 Power Supply

The display unit operates on 8V DC to 13V DC or 5 ± 0.25V DC at 0.4A utilizing a power cord 7-1/2 ft (2.5 m) in length. The operating voltage is selected by means of SW3 on the Display Board (Figure 3).

The Power Supply for the Display Board is shown in Figure 4.

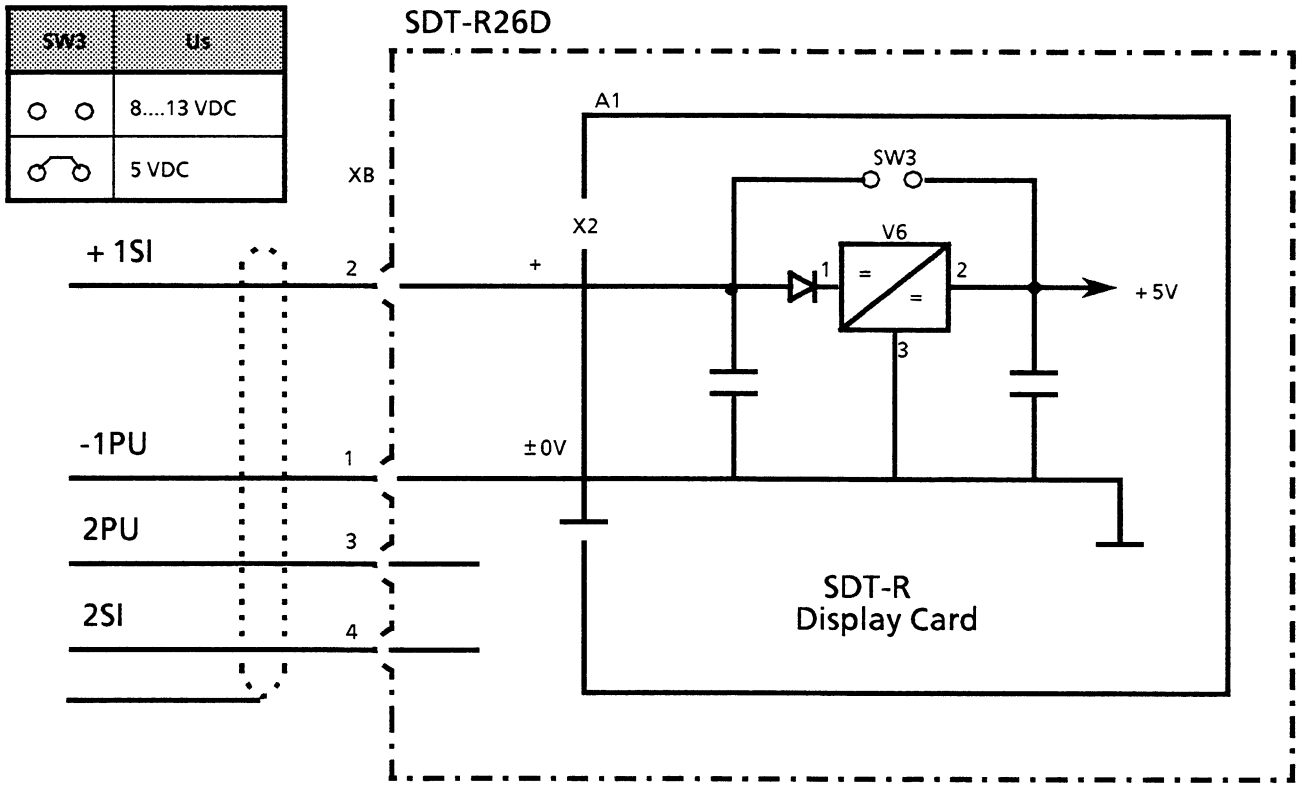

Figure 4. Power Supply on the SDT-R26D Board.

3-14.4 Control Modes

3-14.4.1 Mode 1

In this mode, the display unit does not recognize the address but accepts and displays all incoming data. This mode is selected with dipswitch S8 on microswitch SW1 in the ON position. (Positions of switches S1-S7 of the microswitch SW1 are not significant.)

3-14.4.2 Mode 2

In this mode, the display unit recognizes its address, which is selected with dipswitches S1-S7 on the SW1 microswitch (table 2). Switch S8 of SW1 must be OPEN and switch S4 of SW1 also in the OPEN position. Switch position ON corresponds to bit value 1 in the address, and position OPEN to bit value 0. S1 is the least significant bit (LSB) of the address and S7 the most significant bit (MSB) of the address.

Address space 0H-7FH recognized by the display unit is divided into four separate address blocks which are set with switches S6 and S7 of SW1 as shown in table 2. In each address block there are 32 different addresses which are set with switches S1-S5 of SW1 (S5 is MSB). The display unit interprets all characters within its address area as device addresses.

The display unit starts to read the message when it has recognized its address on the line, and continues reading until a new address arrives or more than 0.13 seconds has elapsed since a character was received. When a 0.13 seconds lapse occurs or a new address is received, the last six characters (including the decimal point) that the unit received are displayed.

Table 2. Selection of device address in mode 2

SW1	SW2								Address block
S4	S8	S7	S6	S5	S4	S3	S2	S1	
OPEN	OPEN	OPEN	OPEN						0H-1FH
OPEN	OPEN	OPEN	ON						20H-3FH *
OPEN	OPEN	ON	OPEN						40H-5FH **
OPEN	OPEN	ON	ON						60H-7FH

MSB LSB

Mode 2 — Address block — Internal address of the address block

"1" = ON
"0" = OPEN

* Not in use as the ASCII characters corresponding to numbers 0-9 are on this block.

** The upper case letters are in this block. If they are to be displayed, the block cannot be used as an address block.

The following is an example of Table 2 switch positions when the address is 7BH (the address block is 60H-7FH).

SW1	SW2							
S4	S8	S7	S6	S5	S4	S3	S2	S1
OPEN	OPEN	ON	ON	ON	ON	OPEN	ON	ON
	Mode 2	Address 7BH						

3-14.4.3 Mode 3

In this mode, the display unit receives framed messages. Mode selection is established with switch S8 of SW2 in the OPEN position and switch S4 of SW1 in the ON position (see example of Table 2 switch positions). The device address is set with switches S1-S7 of SW2 as shown in Table 3. The address range is 0H-7FH (no division into different address blocks), of mode 2.

Table 3. Selection of device address in mode 3.

SW1	SW2							
S4	S8	S7	S6	S5	S4	S3	S2	S1
OPEN	OPEN							
		MSB						LSB
	Mode 3	Device address 0H-7FH						

"1" = ON
"0" = OPEN

The message begins with the character STX (2H), with the second character being interpreted as the Address. The data begins from the third character and terminates with the character ETX (3H), which is shown in example A in Figure 5. The data may contain an arbitrary number of control codes and control characters.

Control codes are: control of display 5H (CTRL E),
blinking of display 6H (CTRL F)

Within the frame, the preceding control is valid until a new control code is received. If the character following the address at the beginning of the frame is not a control code, the display unit assumes that the display control is on (example B, Figure 5).

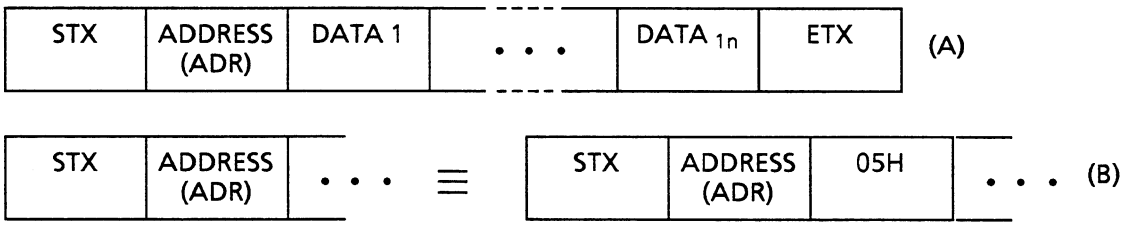

Figure 5. Examples of Framed Messages

3-14.4.3.1 Control of Display (5H)

If the data consists of less than 6 characters, the display begins with blanks (the desired display is blanked by supplying a frame: STX, address, 20H, ETX). If the data consists of more than 6 characters, only the last six (6) characters are displayed (including the decimal point).

3-14.4.3.2 Blinking of Display (6H)

A display blink control code, followed by a control character will cause the digits that are displayed to blink. The six display digits are controlled by the six least significant bits of the blink control character (1 = blinking, 0 = not blinking) The blink control is valid until a new instruction is given. The blink control character is of the form $01D_6D_5D_4D_3D_2D_1$ (= 40H-7FH), where D_6 corresponds to the digit on the extreme left and D_1 to the digit on the extreme right.

3-14.5 **ASCII Characters**

A summary of the ASCII characters recognized by the display unit is shown in Table 4.

Table 4 ASCII Character Functions

Character	Function
* 02H	STX
* 03H	ETX
* 05H	control of display
* 06H	blinking of display
* 07H	control of LEDs
* 08H	blinking of LEDs
* 09H	display character remains unchanged
10H-1FH	LED (blink) control characters
20H	blank (recomm. to be used)
21H	! (□)
22H	" (')
23H	# (=)
25H	% ( )
28H	(( )
29H	) ( )
2AH	minus
2CH	decimal point
2DH	minus
2EH	decimal point
2FH	blank
30H - 39H	0 - 9
3AH	minus
3BH	E ( )
3CH	H ( )
3DH	L ; in Mode 3, (=)
3EH	P ( )

Table 4 ASCII Character Functions (cont.)

Character	Function	
3FH	blank	; in Mode 3, ( )
40H	@	( )
41H	A	( )
42H	b	( )
43H	C	( )
44H	d	( )
45H	E	( )
46H	F	( )
47H	G	( )
48H	H	( )
49H	I	( )
4AH	J	( )
4CH	L	( )
4EH	N	( )
4FH	O	( )
50H	P	( )
53H	S	( )
54H	T	( )
55H	U	( )
59H	Y	( )
5DH	Ö	( )

40H through 7FH are display blink control characters

* = used in Mode 3 only