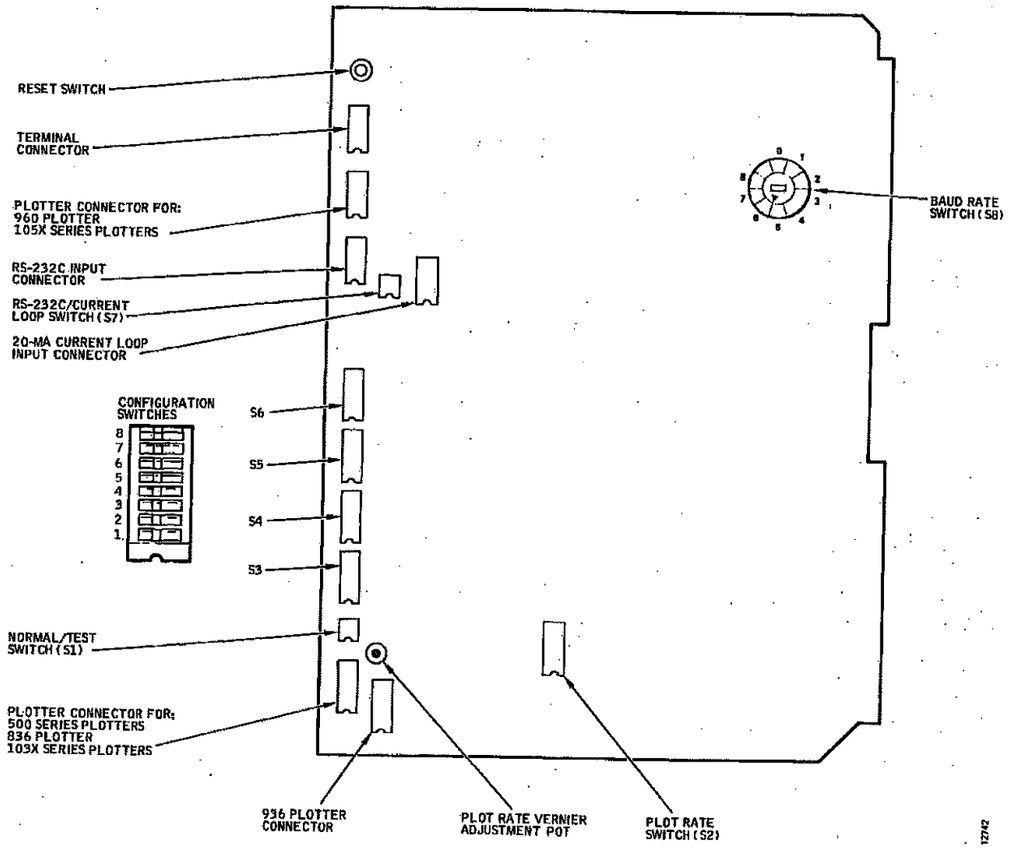
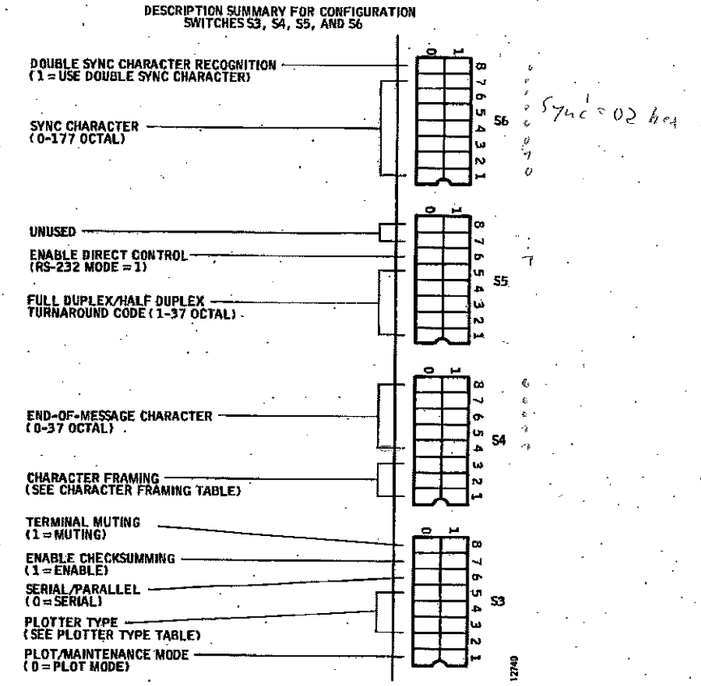



**Figure 4-1. CalComp 906 Controller Configuration Switches**






NOTE: Switch thrown toward the board edge (closed or ON) is in the 0 position.

**Figure 4-2. Configuration Switches (S3 - S6)**

## NORMAL/TEST Switch (S1)

When the switch S1 is set to the NORMAL position, the 906 controller is disabled by the PLOT/STANDBY switch on the incremental plotters (5XX, 836 and 103X).

This switch should be left in the NORMAL position.

| S1 | FUNCTION |
|---|---|
| 0 | NORMAL |
| 1 | TEST |



## PLOT RATE Switch (S2)

The PLOT RATE switch is used by some plotters to specify the rate at which commands are transmitted to the plotter. The PLOT RATE switch specifies the duration of a pulse or command, thus controlling the plotting speed. Switch S2 can represent a cumulative value.

Models 936, 960, 9X5 and 105X plotters do not use the PLOT RATE switch. These plotters internally regulate their plotting rate and ignore the PLOT RATE switch and the plot rate vernier adjustment. Table 4-1 contains the appropriate settings for the plotters using the PLOT RATE switch.

**Table 4-1. PLOT RATE Switch Settings**

| S2 (8 7 6 5 4 3 2 1) | Plotter | Steps/Second | Plot Rate (ms) |
|---|---|---|---|
| 0 1 1 1 0 0 1 1 | 500 Series Plotters (0.01 inch/stepsize) | 175 | 5.71 |
| 1 0 1 1 1 0 1 1 | 500 Series Plotters (all others) | 295 | 3.63 |
| 1 1 0 1 1 1 1 1 | 836 Plotter | 500 | 2.0 |
| 1 1 1 0 1 1 1 1 | 1037 Plotter | 1000 | 1.0 |
| 1 1 1 1 1 0 0 1 | 1038 Plotter | 2250 | 0.44 |
| 1 1 1 1 1 0 0 1 | 1039 Plotter | 2250 | 0.44 |

Table 4-2 shows the pulse spacing obtained for each position of switch S2.

PLOT RATE Switch (S2)

(Cont.)

**Table 4-2. Switch S2 Pulse Spacing**

| Switch Position | Pulse Spacing (ms) |
|---|---|
| 1 | N/A |
| 2 | 0.20 |
| 3 | 0.25 |
| 4 | 0.50 |
| 5 | 1.00 |
| 6 | 2.00 |
| 7 | 3.40 |
| 8 | 5.00 |

The plot rate vernier adjustment potentiometer is used in conjunction with the PLOT RATE switch as a fine adjustment to obtain the best results for the plotter. This potentiometer is adjusted *only* by Field Service.



Plotter Type Switch (S3)

The plotter type positions of Switch S3, specify the plotter model to be operated (see Table 4-3). Switch S3 tells the controller on which plotter connector to send the plotter commands and how to send the commands. Table 4-3 indicates the switch settings for the CalComp plotters that can be operated from the controller.

**Table 4-3. Switch S3 Plotter Type Selection**

| S3 (8 7 6 5 4 3 2 1; 1 / 0) | Octal Value | Decimal Value | Plotter Model | Step Size | Number of Pens |
|---|---|---|---|---|---|
| 0 0 0 0 | 0 | 0 | 5XX | | 1 |
| 0 0 0 1 | 1 | 1 | 836 | | 1 |
| 0 0 1 0 | 2 | 2 | 1037 | | 1 |
| 0 0 1 1 | 3 | 3 | 1038 | | 1 |
| 0 1 0 0 | 4 | 4 | 1039 | | 3 |
| 0 1 0 1 | 5 | 5 | 936 (metric) | | 3 |
| 0 1 1 0 | 6 | 6 | 936 (inch) | | 3 |
| 0 1 1 1 | 7 | 7 | 1051 | | 4 |
| 1 0 0 0 | 10 | 8 | 1055, 1060, 1065 | | 4 |
| 1 0 0 1 | 11 | 9 | 960, 970 (960 char. set) | | 2 |
| 1 0 1 0 | 12 | 10 | 960, 970 (906 char. set) | | 2 |
| 1 0 1 1 | 13 | 11 | N/A | | |
| 1 1 0 0 | 14 | 12 | N/A | | |
| 1 1 0 1 | 15 | 13 | N/A | | |
| 1 1 1 0 | 16 | 14 | 9X5 | | |
| 1 1 1 1 | 17 | 15 | 925 P-34 | | |

SERIAL/PARALLEL MODE (Switch S3)

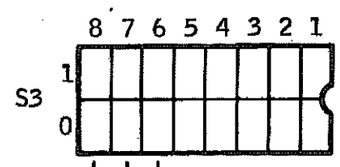
The serial or parallel mode switch (S3) selects the type of interface from the host computer. Serial mode is selected by setting switch (S3 - bit 6) to the 0 position (see Table 4-4).

**NOTE**

***Only** the serial mode of operation will be discussed.*

Switches S3, S4, S5 and S6 have different functions when using the serial mode interface as compared to the parallel mode interface.

**Table 4-4. Serial/Parallel Mode Settings**

|   | **Function** |
|---|---|
| 0 | Serial Interface |
| 1 | Parallel Interface |
| 0 | Disable Checksumming |
| 1 | Enable Checksumming |
| 0 | No Terminal Muting |
| 1 | Terminal Muting |



**Enable Checksumming** (Switch S3)

Switch S3 (bit 7) enables or disables the checksumming error detection feature. Checksumming is enabled when bit 7 (S3) is set for a 1 output (see Table 4-4). When checksumming is enabled, the character before end-of-message character must be the checksum character. See Section 3 for additional information regarding the checksumming error detection feature.

**Terminal Muting** (Switch S3)

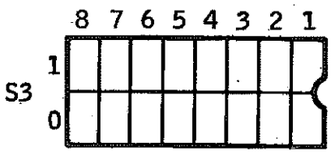
When Switch S3 (bit 8) is set for a 1 output, a message of plotting data will not be displayed on the terminal (see Table 4-4). Plotting data appears as random characters. See Section 3 for additional information about terminal muting (starts and stops). If Switch S3 is properly set, no characters should reach the terminal that are a result of a message of plotting data. When terminal muting is set for 0, messages are displayed at the terminal as they are received by the controller. The message and the resulting plot can be observed concurrently to aid in software debugging.

**Plot/Maintenance Mode** (Switch S3)

The plot and maintenance modes select either a normal plotting mode or a maintenance mode of operation for the controller. Configuration switches S3, S4, S5 and S6 have different functions when the maintenance mode is selected. These functions include internal diagnostics which allow Field Service Engineers to evaluate the operation of the 906 controller.

The controller will operate as an online or remote plotter controller only when the plot mode is selected.

**Table 4-5 Plot/Maintenance Mode Settings**

|   | **Function** |
|---|---|
| 1 | Maintenance Mode |
| 0 | Plot Mode |

Character Framing Switch (S4)

The character framing switch (S4) determines how the controller will interpret the bits it receives to form characters. This defines the asynchronous communications framing of each character with regard to:

— the number of bits

— the parity

— the number of stop bits

The operator should determine the requirements of the host computer and set switch S4 for the character framing according to Table 4-6.

**Table 4-6. Switch S4 Character Framing**

| S4 (8 7 6 5 4 3 2 1; 1/0) | Octal Value | Bits/ Char. | Parity | Stop Bits |
|---|---|---|---|---|
| 0 0 0 | 0 | 7 | Even | 2 |
| 0 0 1 | 1 | 7 | Odd | 2 |
| 0 1 0 | 2 | 7 | Even | 1 |
| 0 1 1 | 3 | 7 | Odd | 1 |
| 1 0 0 | 4 | 8 | None | 2 |
| 1 0 1 | 5 | 8 | None | 1 |
| 1 1 0 | 6 | 8 | Even | 1 |
| 1 1 1 | 7 | 8 | Odd | 1 |

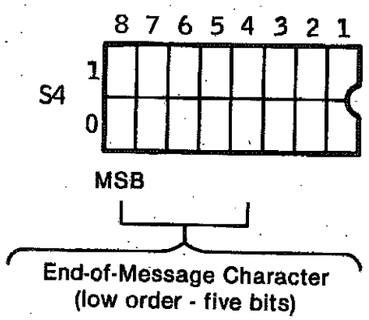


**End-of-Message Character** (Switch S4)

The end-of-message character is used to indicate the end of the data sequence. The end-of-message character can be any of the first 32 ASCII characters (0 octal - 37 octal). It must be a unique character in the set of characters used in the messages of plotting data. The end-of message character is set by placing the low order five bits of the character into positions 4 thru 8 of switch S4 (see Table 4-7). Position 8 is the most significant bit (MSB) of the five bits of the character.

A carriage return (0D hex) or a line feed (0A hex) can be used as the end-of-message character (on most computers). When setting the end-of-message character on switch S4, reference should be made to the table of ASCII characters (Appendix A).

**Table 4-7. Switch S4 End-of-Message Character**



Serial Line Control Switch (S5)

The serial line control switch (S5) is used to indicate a full or half-duplex *data set*. This switch defines the turnaround code for half-duplex lines.

The least-significant bit is bit 1 (S5) and the most significant bit is position 5 (S5). Table 4-8 gives the data set and turnaround codes together with the binary output of bits 1 thru 5 of switch S5. Observe that bits 6 thru 8 of switch S5 are not used.

**Table 4-8. Switch S5 Serial Line Control**

| S5 (8 7 6 5 4 3 2 1; 1/0) Bit Switch Position | Octal Value | Turnaround Codes | Description |
|---|---|---|---|
| NOTE: For codes 10000 thru 11111, the serial line is half duplex data set with a specified turnaround code. | | | |
| 0 0 0 0 0 | 0 | SERIAL LINE IS FULL DUPLEX-NO TURNAROUND CODE | |
| 0 0 0 0 1 | 1 | SOH | START OF HEADING |
| 0 0 0 1 0 | 2 | STX | START OF TEXT |
| 0 0 0 1 1 | 3 | ETX | END OF TEXT |
| 0 0 1 0 0 | 4 | EOT | END OF TRANSMISSION |
| 0 0 1 0 1 | 5 | ENQ | ENQUIRY |
| 0 0 1 1 0 | 6 | ACK | ACKNOWLEDGE |
| 0 0 1 1 1 | 7 | BEL | BELL (AUDIBLE SIGNAL) |
| 0 1 0 0 0 | 10 | BS | BACKSPACE |
| 0 1 0 0 1 | 11 | HT | HORIZONTAL TABULATION (PUNCH CARD SKIP) |
| 0 1 0 1 0 | 12 | LF | LINE FEED |
| 0 1 0 1 1 | 13 | VT | VERTICAL TABULATION |
| 0 1 1 0 0 | 14 | FF | FORM FEED |
| 0 1 1 0 1 | 15 | CR | CARRIAGE RETURN |
| 0 1 1 1 0 | 16 | SO | SHIFT OUT |
| 0 1 1 1 1 | 17 | SI | SHIFT IN |
| 1 0 0 0 0 | 20 | DLE | DATA LINK ESCAPE |





**Table 4-8. Switch S5 Serial Line Control (Continued)**

| S5 (8 7 6 5 4 3 2 1; 1/0) Bit Switch Position | Octal Value | Turnaround Codes | Description |
|---|---|---|---|
| NOTE: For codes 10000 thru 11111, the serial line is half duplex data set with a specified turnaround code. | | | |
| 1 0 0 0 1 | 21 | DC1 | DEVICE CONTROL 1 |
| 1 0 0 1 0 | 22 | DC2 | DEVICE CONTROL 2 |
| 1 0 0 1 1 | 23 | DC3 | DEVICE CONTROL 3 |
| 1 0 1 0 0 | 24 | DC4 | DEVICE CONTROL 4 |
| 1 0 1 0 1 | 25 | NAK | NEGATIVE ACKNOWLEDGE |
| 1 0 1 1 0 | 26 | SYN | SYNCHRONOUS IDLE |
| 1 0 1 1 1 | 27 | ETB | END OF TRANSMISSION BLOCK |
| 1 1 0 0 0 | 30 | CAN | CANCEL |
| 1 1 0 0 1 | 31 | EM | END OF MEDIUM |
| 1 1 0 1 0 | 32 | SUB | SUBSTITUTE |
| 1 1 0 1 1 | 33 | ESC | ESCAPE |
| 1 1 1 0 0 | 34 | FS | FILE SEPARATION |
| 1 1 1 0 1 | 35 | GS | GROUP SEPARATION |
| 1 1 1 1 0 | 36 | RS | RECORD SEPARATION |
| 1 1 1 1 1 | 37 | US | UNIT SEPARATION |

DIRECT CONTROL MODE (Switch S5 - Bit 6)

When this mode is selected (S5 - Bit 6 = 1), the modem control lines are used differently than when in the NORMAL mode. When Switch S5 is set for the NORMAL mode, the

— Request-To-Send (RTS)

— Clear-To-Send (CTS)

— Carrier Detect (CD)

lines are used as apporpriate for either a full duplex direct connection to the host, a full duplex modem, or a half-duplex modem (if specified by S5 - Bits 1 thru 5 = 0).

The 906 controller will raise clear-to-send (CTS on pin 5) when it is ready for data in direct control mode, when used with the special "direct control serial input" internal cable. When the sync sequence of a plot data message is recognized, the data will be buffered until the end-of-message character is recognized. At this point the protocol will differ from normal. If the controller has a buffer available, it will begin looking for the sync sequence of the next plot data message and ignore all characters until the sync sequence is received.

If a buffer is not available at the time the end-of-message character is received, the 906 controller will drop the clear-to-send line (CTS - pin 5) until a buffer is available.

**NOTE**

*No response messages will be sent when the 906 contoller is in the "direct control" mode. Errors will cause the 906 to ignore the plot data message, but the host will not know that a retransmission is required.* ***The direct control mode should not be used if errors are likely (or in critical plotting environments).***

*The escape sequence "set I/O parameter" commands are legal in the direct control mode and are processed as commands (if present, they must have a valid syntax), however, these commands will have no effect.*

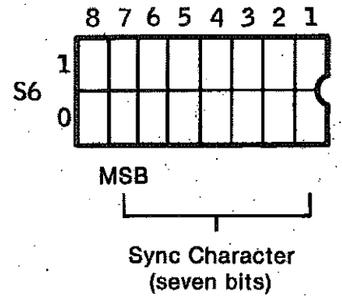


## Sync Character Switch (S6)

The sync character switch (S6) is used to define the sync character which identifies the beginning of a message of plotting data. This character can be any ASCII character (0 octal - 127 octal).

The value of the sync character is determined and set in the Host Computer Basic Software (via a data statement) and set in the 906 controller (via switch S6). Once the sync character is set for an installation, it should not be changed. Refer to the table of ASCII characters (Table 4-13) and set the sync character using bits 1 thru 7 of switch S6 as shown in Table 4-9.

**Table 4-9. Switch S6 Sync Character**




**Double Sync Character Recognition** (Switch S6 - Bit 8)

The double sync character recognition feature allows one or two sync characters to identify the beginning of a message of plotting data, Double sync character recognition is recommended when the 906 controller is used as a remote plotter controller. This prevents the accidental beginning of a message of plotting data with terminal bound information.

## Sync Character Switch (S6)

(Cont.)

**Table 4-10. Switch S6 Single Sync/Double Sync Character Recognition**

| S6 (8 7 6 5 4 3 2 1 1; 1 / 0) | Function |
|---|---|
| 0 | Single Sync Character Recognition |
| 1 | Double Sync Character Recognition |



## RS-232C/Current Loop Switch (S7)

Switch S7 selects the serial input interface. When the switch selects the RS-232C interface, the internal cable connected to the host computer must be in the RS-232C input connector.

When switch S7 selects the 20 ma current loop interface, the internal cable must be in the 20 ma current loop connector and the appropriate connector must be in the RS-232C interface connector socket.

**Table 4-11. Switch S7 RS-232C/Current Loop Functions**

| S7 | Function |
|---|---|
| 0 | 20 ma Current Loop Interface |
| 1 | RS-232C Interface |

**Baud Rate Switch (S8)**

Switch S8 selects the communication rate (baud rate) between the 906 controller and the host computer. Eight selectable baud rates are available by rotating the arrow to the desired baud rate.

**Table 4-12. Switch S8 Baud Rates**

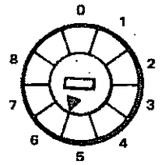
| Baud Rate SWITCH (S8) | Baud Rate |
|---|---|
|  | |
| Position 1 | 110 |
| Position 2 | 150 |
| Position 3 | 300 |
| Position 4 | 600 |
| Position 5 | 1200 |
| Position 6 | 2400 |
| Position 7 | 4800 |
| Position 8 | 9600 |

**Table 4-12a. PCI Baud Clock Selection**

| TERMINAL | | INPUT | |
|---|---|---|---|
| **Jumper** | **Baud** | **Jumper** | **Baud** |
| W10 | 19.2k | W18 | 19.2k |
| W9 | 9600 | W17 | 9600 |
| W8 | 7200 | W16 | 7200 |
| W7 | 4800 | W15 | 4800 |
| W6 | 2400 | W14 | 2400 |
| W5 | 1200 | W13 | 1200 |
| W4 | 600 | W12 | 600 |
| W3 | 300 | W11 | 300 |



| $b_7$ $b_6$ $b_5$ / BITS / $b_4$ $b_3$ $b_2$ $b_1$ | 0 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1 0 0 | 1 0 1 | 1 1 0 | 1 1 1 |
|---|---|---|---|---|---|---|---|---|
| | CONTROL | | | | | | | |
| 0 0 0 0 | NUL 0 | DLE 16 | SP 32 | ø 48 | @ 64 | P 80 | ` 96 | p 112 |
| 0 0 0 1 | SOH 1 | DC1 17 | ! 33 | 1 49 | A 65 | Q 81 | a 97 | q 113 |
| 0 0 1 0 | STX 2 | DC2 18 | " 34 | 2 50 | B 66 | R 82 | b 98 | r 114 |
| 0 0 1 1 | ETX 3 | DC3 19 | # 35 | 3 51 | C 67 | S 83 | c 99 | s 115 |
| 0 1 0 0 | EOT 4 | DCA 20 | $ 36 | 4 52 | D 68 | T 84 | d 100 | t 116 |
| 0 1 0 1 | ENQ 5 | NAK 21 | % 37 | 5 53 | E 69 | U 85 | e 101 | u 117 |
| 0 1 1 0 | ACK 6 | SYN 22 | & 38 | 6 54 | F 70 | V 86 | f 102 | v 118 |
| 0 1 1 1 | BEL 7 BELL | ETB 23 | ' 39 | 7 55 | G 71 | W 87 | g 103 | w 119 |
| 1 0 0 0 | BS 8 BACK SPACE | CAN 24 | ( 40 | 8 56 | H 72 | X 88 | h 104 | x 120 |
| 1 0 0 1 | HT 9 | EM 25 | ) 41 | 9 57 | I 73 | Y 89 | i 105 | y 121 |
| 1 0 1 0 | LF 10 LINE FEED | SUB 26 | * 42 | : 58 | J 74 | Z 90 | j 106 | z 122 |
| 1 0 1 1 | VT 11 | ESC 27 | + 43 | ; 59 | K 75 | [ 91 | k 107 | { 123 |
| 1 1 0 0 | FF 12 NEW PAGE | FS 28 | , 44 | < 60 | L 76 | \ 92 | l 108 | \| 124 |
| 1 1 0 1 | CR 13 RETURN | GS 29 | - 45 | = 61 | M 77 | ] 93 | m 109 | } 125 |
| 1 1 1 0 | SO 14 | RS 30 | . 46 | > 62 | N 78 | ^ 94 | n 110 | ~ 126 |
| 1 1 1 1 | SI 15 | US 31 | / 47 | ? 63 | O 79 | _ 95 | o 111 | DEL 127 RUB OUT |

**Table 4-13. ASCII Code Chart**