5. OPERATING WITH THE RS-232 INTERFACE

5.1 INTRODUCTION

This section tells you how to use the DP 100 RS-232 interface with a host computer, CRT terminal, or printer. It also describes the DP 100 command set. To calibrate the DP 100 using the RS-232 interface, see Section 6.9, REMOTE CALIBRATION.

The information presented here assumes that you are familiar with basic data communications theory and operation of the RS-232 interface.

5.2 USING THE RS-232 PORT

The RS-232 port enables you to use your DP 100 as a fully programmable instrument in an automated measuring system. The RS-232 port also allows you use the unit with a serial printer or CRT terminal in command-response or output-only modes. The RS-232 port communicates with ASCII-coded serial data formatted with 8 data bits, 2 stop bits, and no parity. The DP 100 accepts both upper and lower case characters.

5.2.1 The RS-232 Connector

The RS-232 port uses a male, 9-pin sub-miniature D connector (DE-9P) located on the rear panel. A diagram of the RS-232 connector pin assignments (see Figure 5-1) is printed on the rear panel to the right of the connector.

Note that the DP 100, like most computer ports, printers, and terminals, is defined as Data Terminal Equipment (DTE). This means that for most applications, DTE-to-DTE (null modem) cables are required.
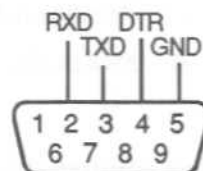

Figure 5-1. DP 100 RS-232 Connector Pins

5.2.2   Interfacing With a Host Computer

The signal connections between a DP 100 RS-232 port and an Apple Macintosh or an IBM PC/AT or compatible personal computer are shown in figures 5-2 and 5-3, respectively. DP 100-to-IBM PC cables (PC-MC) and DP 100-to-Macintosh cables (PC-AC) are available from Analogic. See Appendix B, ACCESSORIES.

To use a DP 100 with a host computer:

(1)   Connect the DP 100 to the host computer according to figures 5-2, 5-3, or other applicable information.

(2)   Set the computer's serial port to 8 data bits, no parity, and 2 stop bits. If this setting cannot be made, communications with the DP 100 will not be possible.

(3)   Using the BAUD auxiliary function, set the DP 100 data rate to match the data rate of the host computer. See Section 3.5.5.

(4)   Using the commands as described in Section 5.3, verify communications with the DP 100.

(5)   If when trying to communicate with the DP 100 the REM annunciator flashes consistently and cannot be cleared, perform the following steps:

a.   Switch the DP 100 to Standby.

b.   Check the RS-232 cable for correct wiring. The RXD and TXD signal lines might need to be interchanged.

c.   Reconnect the RS-232 cable.

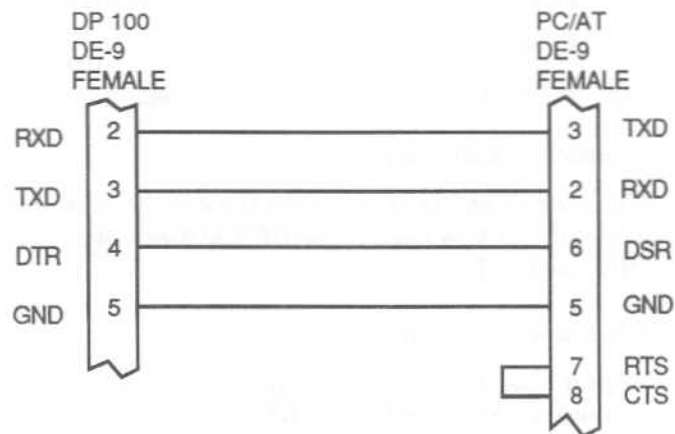d.   Switch the DP 100 to On and try again.

NOTE

For additional information, see the user's manual for your computer.

NOTE

Connector pins not specified in figures 5-2 and 5-3
are not connected.
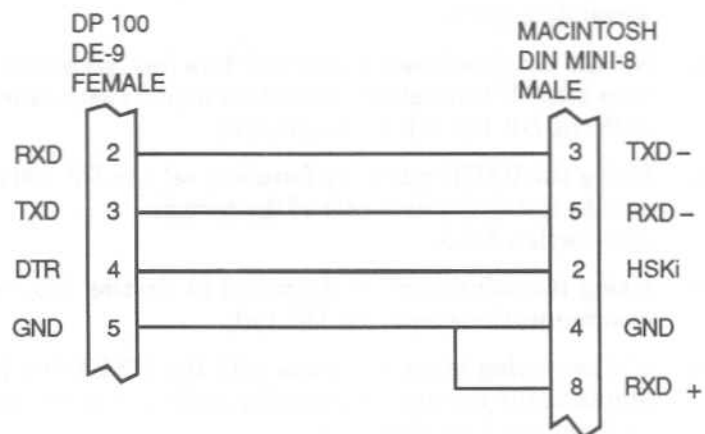
Figure 5-2. DP 100-to-Macintosh RS-232 Cable

Figure 5-3. DP 100-to-PC/AT RS-232 Cable

5.2.3   Interfacing With a CRT Terminal

To use a DP 100 with a CRT terminal:

(1)   Using Figure 5-1 and the wiring information for your terminal, connect the DP 100 RS-232 port to the terminal's serial data port.

(2)   Set the terminal's serial port to 8 data bits, no parity, and 2 stop bits. If this setting cannot be made, communications with the DP 100 will not be possible.

(3)   Using the BAUD auxiliary function, set the DP 100 data rate to match the data rate of the terminal. See Section 3.5.5.

(4)   Using the commands as described in Section 5.3, verify communications with the DP 100.

(5)   If when trying to communicate with the DP 100 the REM annunciator flashes consistently and cannot be cleared, perform the following steps:

   a.   Switch the DP 100 to Standby.

   b.   Check the RS-232 cable for correct wiring. The RXD and TXD signal lines might need to be interchanged.

   c.   Reconnect the RS-232 cable.

   d.   Switch the DP 100 to On and try again.

5.2.4   Interfacing With a Printer

Typical character rates are well within the capabilities of most modern printers. For this reason, the DP 100 does not support the X-ON/X-OFF protocol.

To use a DP 100 with a serial printer:

(1)   Using Figure 5-1 and the wiring information for your printer, connect the DP 100 RS-232 port to the printer's serial data port.

(2)   Set the printer's serial port to 8 data bits, no parity, and 2 stop bits. If this setting cannot be made, communications with the DP 100 will not be possible.

(3)   Using the BAUD auxiliary function, set the DP 100 data rate to match the data rate of the printer. See Section 3.5.5.

(4)   Using the PRINT auxiliary function, enter the parameter for the desired print interval. See Section 3.5.3.

5.3 USING THE DP100 COMMANDS

DP 100 commands transmitted by a host computer or entered on a terminal keyboard are serially transmitted to the DP 100 via the RS-232 connection.

The DP 100 command set consists of two types of commands: function commands and query commands.

The CAL auxiliary function commands are not listed here. See Section 6, MAINTENANCE.

When using the DP 100 command set, follow these guidelines:

(1)   Know the meaning of the command line prompts:

=>   A valid command was successfully executed. The DP 100 is ready for the next command.

?>   An invalid command was received by the DP 100. Check the command format.

!>   A valid command was received by the DP 100, but it cannot be executed (*e.g.*, a nonexistent range was specified).

*>   A communications error was detected. Enter the command again.

(2)   More than one command is allowed per line except for the measurement function commands: VDC, VAC, ADC, AAC, OHMS, OHMS4, RTD, and FREQ. Commands that follow these commands are ignored.

(3) Terminate each command string with a carriage return <CR> or a line feed <LF> or a <CR><LF> pair.

(4) Within a string of commands, terminate each command, except the last, with a semicolon.

(5) Enter a space between commands and their arguments.

(6) Response to a successful function command is:

=> <CR> <LF>

(7) Response to a successful query command is:

data <CR> <LF>
=> <CR> <LF>

5.3.1 Function Commands

The function commands are listed in Table 5-1. Function commands activate a measurement function or perform some other specific operation. Enter the commands on your keyboard just as they are listed in the mnemonic column, followed by a carriage return (CR). The normal command line prompt (=>) is returned after a successful command entry.

The RANGE, FORMAT, and FILTER commands include an argument, <n>, which selects a particular measurement range, output format, or filter setting.

For the RANGE command, <n> selects a valid range for the selected measurement function. Table 5-2 lists <n> as a function of measurement range.

For the FORMAT command, <n> selects the output format for the RANGE? and VAL? query commands. Table 5-3 lists <n> as a function of format.

For the FILTER command, <n> determines the number of measurements the DP 100 averages for each reading. Table 5-4 lists <n> as a function of the number of measurements averaged.

Table 5-1. Function Commands

Mnemonic	Function
VDC	Selects dc voltage measurement.
VAC	Selects ac voltage measurement.
ADC	Selects dc current measurement.
AAC	Selects ac current measurement.
OHMS	Selects resistance measurement.
OHMS 4	Selects 4-terminal resistance measurement.
RTD	Selects RTD temperature measurement.
FREQ	Selects frequency measurement.
RANGE <n>	Selects range <n> (see Table 5-2).
AUTO	Selects the AUTO range mode.
FIXED	Selects the FIXED range mode.
FORMAT <n>	Selects output format <n> for the VAL? and RANGE? commands (see Table 5-3).
FILTER <n>	Selects the number of samples averaged, as indicated by <n> in Table 5-4.
RWLS	Locks out front panel operation (the REM annunciator is on).
LOCS	Enables front panel operation (the REM annunciator is off).

Table 5-2. Measurement Range Argument Chart

<n>	DC V	AC V	AC/DC I	R/R(4T)	T	F
0	20mV*	200mV	200mA	200Ω	°C	200kHz
1	200mV	2V	2A	2KΩ	°F	2MHz
2	2V	20V		20kΩ		20MHz
3	20V	200V		200kΩ		25MHz
4	200V	450V		2MΩ		
5	450V			20MΩ†		

* Not within scope of AUTO Range.   † Two-terminal only.

Table 5-3. FORMAT Argument Chart

<n>	Output Format	Example
1	Scientific notation	-1.23456e + 0
2	Same as 1 with label	-1.23456e + 0 VDC
3	As displayed on LCD	-1.23456
4	Same as 3 with label	-1.23456 VDC

Table 5-4. FILTER Argument Chart

<n>	# Averaged
0	1 (*OFF*)
1	2
2	4
3	8
4	16

5.3.2   Query Commands

The query commands are listed in Table 5-5. Query commands
request some data from the DP 100 and always end with a question
mark (?). After a successful query command entry, the response
is returned on the next line and a normal prompt is returned on the
following line.

For example, entering a CALDUE? would look like this:

```
CALDUE?
01/01/90
=>
```

The format of the response to the RANGE? and VAL? commands
is determined by the last FORMAT command.

For the RANGE? command there are two output formats. When
the DP 100 format is 1, 2, or 3, RANGE? returns the numeric
measurement range as listed in Table 5-2. When the format is 4,
RANGE? returns the actual literal expression of the range.

For the VAL? command, the response is the value displayed on
the front panel expressed according to the present format
(see Table 5-3). When reading voltage on the 20mV dc range, we
recommend that you send the VAL? command no less than every
three seconds. This gives the measurement time to settle and yields
the most accurate results from your DP 100.

Table 5-5. Query Commands

Mnemonic	Output
FUNC? or FUNC1?	The mnemonic of the active measurement function: VDC, VAC, ADC, AAC, OHMS, OHMS4, RTD, or FREQ.
RANGE? or RANGE1?	The numeric measurement range (see Table 5-2), when FORMAT<n> = 1-3.
	The actual measurement range (e.g., 200.000 VDC), when FORMAT<n> = 4.
AUTO?	0 for FIXED range.
	1 for AUTO range.
VAL? or VAL1?	Displayed measurement expressed as specified by the last FORMAT command.
FORMAT?	The format specified by the last FORMAT command (see Table 5-3).
FILTER?	The filter argument followed by the number of measurements averaged [n(# samples)] as specified by the last FILTER command (see Table 5-4).
CALDUE?	Calibration due date mm/dd/yy where: mm = 00-12, dd = 00-31, and yy = 00-99.
*IDN?	Model number and software revision code: "Analogic DP 100 Ver. X.X".