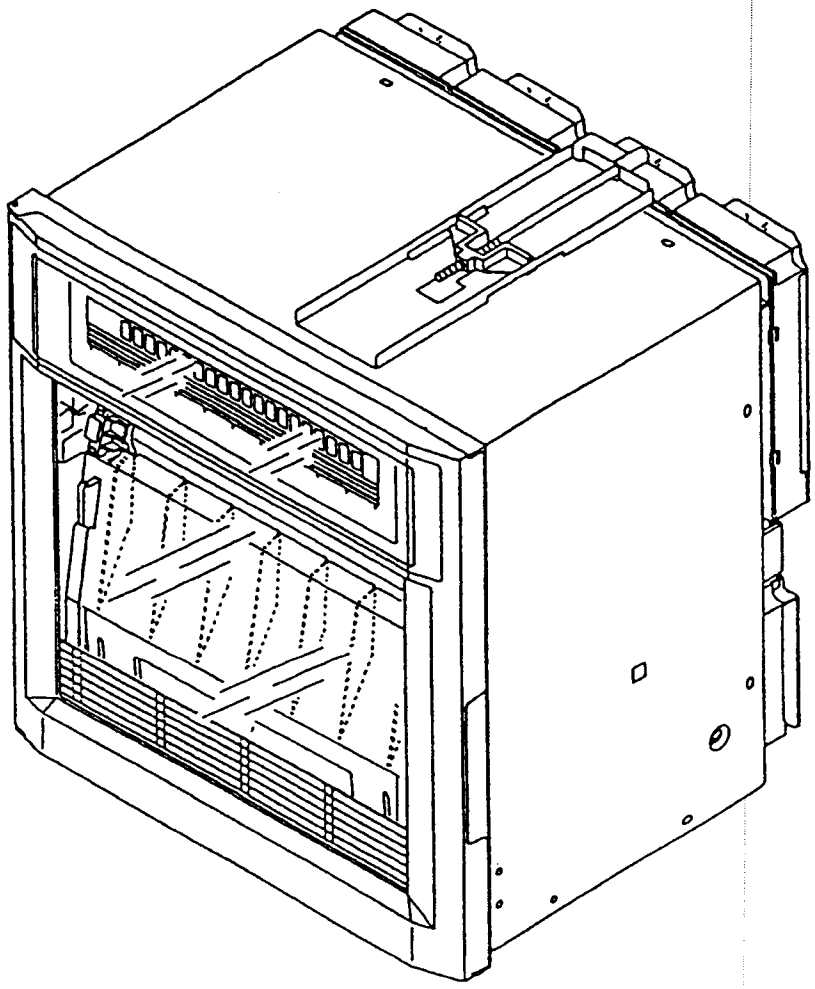
User's Guide



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RD100A/RD1800
Recorder S4 Option
(RS-422-A Communications)

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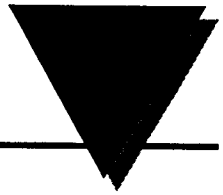

Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

- RS-422-A Interface (1)
- Operator's Manual (1).

If you have any questions about the shipment, please call the OMEGA Customer Service Department. When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

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Section Page

Section **Page**

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Introduction

This Instruction Manual describes the RS-422-A option for the RD100A/RD1800 pen and dot printing recorders. For details concerning the operation of the pen recorder or dot printing models, refer to the appropriate Operator's manuals (M2349 and M2353).

NOTES

- OMEGA Engineering reserves the right to change this manual at any time without notice.
- If you find any ambiguities or errors in this manual, please inform OMEGA Engineering.
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1 Installation of the RS-422-A Interface

The option-S4 includes EIA (Electronic Industries Association) RS-422-A communications interface to output measured values, read setting parameters, and change setting parameters. However, this interface does not include operations of the power switch, key-lock switch, and chart feed. Setting of SET UP Mode cannot be controlled.

1.1 Interface Functions

Communication system:	Four-wire, half-duplex, multi-drop connection 1:n (host computer: RD100A/RD1800 recorder) n=1 to 16 Start-stop system
Transmission speeds:	75, 150, 300, 600, 1200, 2400, 4800, and 9600 bits/second
Start bit:	One bit
Stop bit:	One or two bits
Parity:	Even, odd, or no parity
Word length:	Seven or eight bits

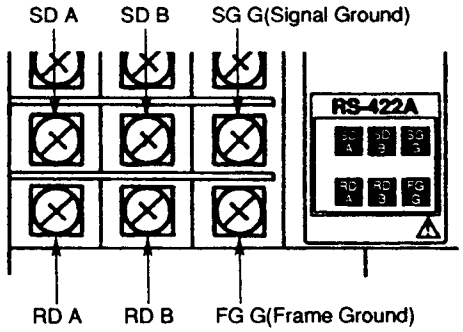
Electrical signal characteristics:	EIA-standard electrical characteristics for the interchange signals and associated circuitry. Functional isolation.
Communication distance:	Up to 500 meters (between an isolated line converter or an isolated computer and a RD100A/RD1800 recorder).

1.2 Interface Terminal

1.2.1 Terminal Arrangement

WARNING

To prevent an electric shock, ensure that the main power supply is turned OFF.



Connect RD to TD of computer, and connect SD to RD of computer.

Figure 1. Terminal Arrangement

1.2.2 Cable Termination

WARNING

To prevent an electric shock, ensure that the main power supply is turned OFF.

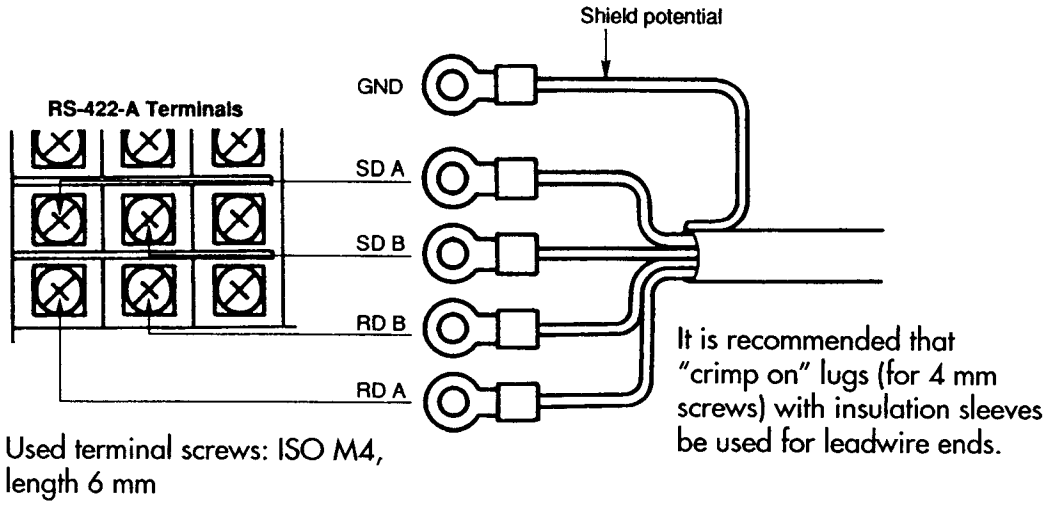


Figure 2. Cable Termination

1.3 Communication Wiring

If the host (PC) is equipped with a RS-422-A interface, the RD100A/RD1800 can be connected directly. If the host (PC) is equipped with a RS-232-C interface, the RD100A/RD1800 can be connected using a converter (CAT-285 or equivalent).

Shown in figure 3 are two wiring examples that are same except for the case shielding. If there is to be a connection between other panels, wiring should be done as shown in part b of Figure 3. (R in Figure 3 indicates a terminal resistance. R =100 Ω, 1/2 W min: adjust according to the impedance. The converter is of the inverter type. The + and – polarity depend on the type of converter.) In the wiring shown in Figure 3 a, use two pairs of 24 AWG (minimum) twisted shielded cables or equivalent.

In the case of wiring as shown in Figure 3 b, use three pairs of 24 AWG (minimum), twisted, shielded cables or equivalent. One pair is used for SG in the case of figure b. (Characteristic impedance: 100 Ω, capacitance 50 pF/m.) Keep the terminated, unshielded section to a minimum and be sure to keep it clear of the RD100A/RD1800 recorder ground line.

WARNING

To prevent an electric shock, ensure that the main power supply is turned OFF.

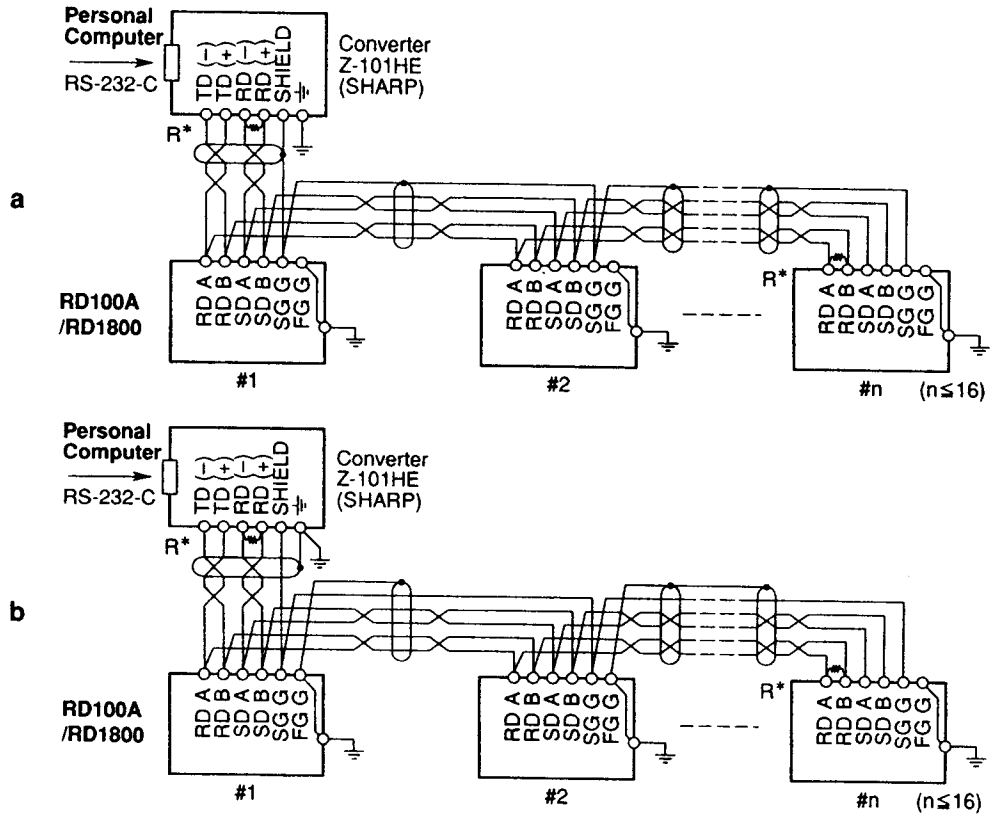


Figure 3. Communication Wiring

1.4 Data Configuration

The relation between the signal and the potential of the RS-422-A terminals is as follows: A<B: 1

A>B: 0

1.4.1 Start-Stop Communication

The RS-422-A interface communicates with the start-stop system. The start-stop system first adds the start bit to the head and then in turn adds the data bits (seven to eight bits), parity bit and stop bit(s) in every transmission of one character (see Figure 4). Specify the address, communication (baud) rate, data length, parity bit, and stop bit(s) in the SET UP Mode. The start bit is automatically added, and no setting is necessary.

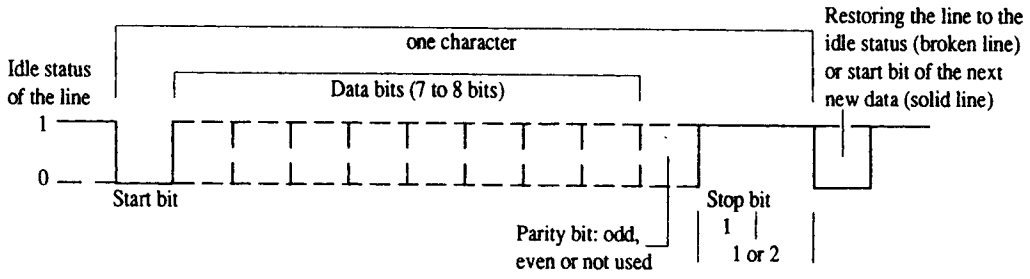


Figure 4. Start-Stop System for One Character

1.4.2 Text

Communication data usually takes the form of more than one character to which a terminator is added. This is called "text." (See also Figure 5.)

The RS-422-A interface identifies a text by regarding the reception of a terminator as the end of text. (See also Figure 6.)

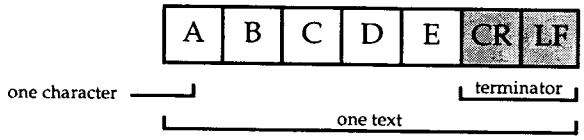


Figure 5. Structure of Text

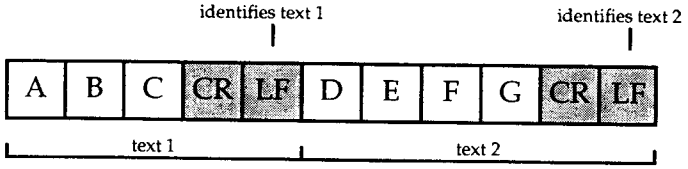


Figure 6. Example of Two Texts, Where the Terminator is CR-LF

NOTE

The RD100A/RD1800 identifies text by regarding "LF" or ";" as the terminator when receiving the data (and will send CR and LF as the terminator). As in the example shown in Figure 6, when CR and LF are used as the terminator, CR is ignored. Therefore, when communication is performed with a PC, the terminator LF might not be sent. Exercise care.

1.4.3 Input Buffer

The input buffer takes the form of rotary buffer (capacity of 256 bytes). The rotary buffer (see Figure 7) outputs a text on the first-in, first-out basis while storing data in turn. It is not necessary for the user to be aware of in the program, however, be

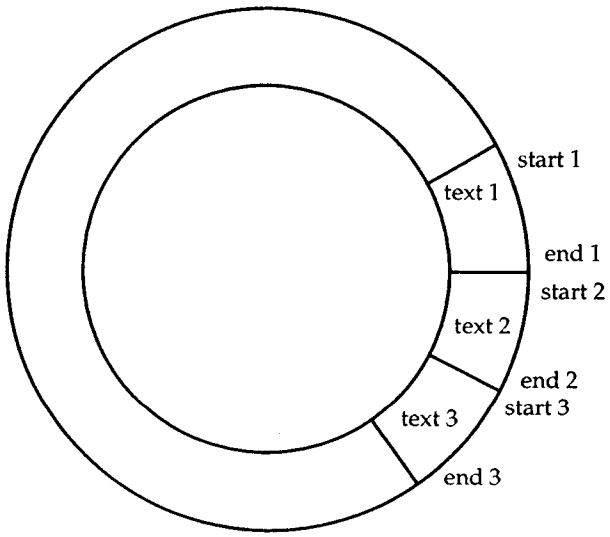


Figure 7. Rotary Buffer

careful to prevent buffer overflow. A merit of the rotary buffer is that it can flexibly cope with more than one text being sent contiguously because of low loss against variable text length.

1.4.4 Buffer Overflow

As described before, the input buffer is necessary for data communication. The capacity, however, is limited (256 bytes for the RD100A/RD1800). Thus, in the receiver, the buffer capacity may become shorted if large amounts of data are sent in a short time. These impair data communications (buffer overflow).

To prevent buffer overflow, it is recommended that you confirm the status of the RD100A/RD1800 using the ESC S command just after commands have been sent (from the PC). Note that you cannot send an ESC S command after having sent an LF or FM command.

After the RD100A/RD1800 receives the ESC S command, it will output its status to the PC. Actually, the RD100A/RD1800 will store the ESC S command in the input buffer, and this command will be read from this buffer. Then the status will be output to the PC.

If the computer sends other commands before the status of the RD100A/RD1800 has been received, the input buffer will not be empty (the ESC S command will be still in there), which means the RD100A/RD1800 cannot receive other commands yet.

1.5 How to Set the RS-422-A Interface Communications

Setting Procedure:

1. Remove the recorder packing material, as described in the Operator's Manuals of the RD100A/RD1800 and remove the lock screw.
2. Enter the SET UP Mode by turning ON the power while pressing the ENT key.
3. Use the UP/DOWN keys to select the display SETUP=OPT and press the ENT key.
4. Use the UP/DOWN keys to select the display OPT=COMM and press the ENT key.
5. Set the RS-422-A address (possibilities are from 01 to 16) using the UP/DOWN keys. The initial value is 01. 00 is invalid. Press the ENT key.
6. Select the transmission speed (baud rate). The speed is selectable from 75, 150, 300, 600, 1200, 2400, 4800, and 9600 bits/second using the UP/DOWN keys. After selection, press the ENT key. The initial value is 9600 bps.
7. Select the data length. The length is selectable from seven or eight bits using the UP/DOWN keys. After selection, press the ENT key. The initial value is eight bits.
8. Select the parity bit. This bit is selectable from ODD, EVEN, or NONE using the UP/DOWN keys. After selection, press the ENT key. The initial value is EVEN.
9. Select the number of stop bits. This is selectable from 1 or 2, using the UP/DOWN keys. After selection, press the ENT key. The initial value is one bit.
10. The display *COMM SET* will appear. The settings for the communication are completed, but have not been stored yet. You can now adjust other settings in the SET UP Mode, using the ESC key.

    Before leaving the SET UP Mode, you have to store your new settings. Press the ESC key to return to the SETUP=OPT display and then select the SETUP=END display. Press the ENT key. Select END=STORE to keep your new settings or END=ABORT and press the ENT key. After a few seconds, the Operation Mode will appear.

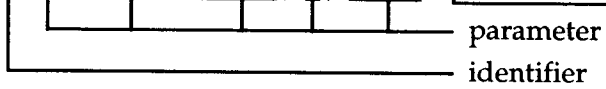
2 Receiving Functions

This section describes program set commands and program control commands. Remember first to open a device by the ESC 0 command before the set or control commands can be sent.

2.1 Program Set Commands

Commands are represented by ASCII codes and divided into an identifier, parameters, delimiters and a terminator.

Example: SR 01 , VOLT , 20mV , 0 , 10000 [terminator]



Identifier

- Defined by two alphabetical, capital characters.

Parameter

- Parameters are separated by a delimiter (comma).
- Numeric data are displayed by integers (e.g., +20, –240).
- When parameters are numeric, the effective setting ranges depend on these parameters.
- Spaces preceding and following a parameter, or a space within a parameter are ignored. Spaces within a parameter specified by ASCII character (units and messages) are valid.
- Parameters that do not need to be changed can be omitted. Delimiters, however, cannot be omitted. (e.g., SR01, , 20mV: mode is unchanged)
- A string of delimiters at the end of a command/parameter string may be omitted (see example below);

  (e.g., SR01, VOLT ,,,; can be omitted)
- The length of the following parameters is fixed. If the length differs, syntax errors will occur.

Date and time	YY/MM/DD (eight characters)
	HH:MM:SS (eight characters)
Channel	CC (two characters; e.g., channel 1 must be entered as 01)

Terminator

A command ends with one of the following terminators:

CR + LF

LF

; (semicolon).

2.1.1 Program Set Commands and Functions

Type	Command	Function
Set	SR	Range setting
	SA	Alarm setting
	SN	Unit setting
	SC	Chart speed setting
	SD	Clock setting
	SY	Copy channel setting
	SS	Trend recording format setting (dot model only)
	SZ	Zone setting
	SP	Partial expanded setting
	SF	Periodic printout setting
	ST	Tag setting
	SG	Message setting
	SE	Chart speed 2 setting
	SW	Daylight Savings Time setting (option)

NOTE

For restrictions concerning settings, refer to the RD100A/RD1800 Operator's Manual.

2.1.2 Range Setting

SKIP: Prevents the specified channel from being measured, recorded, and displayed.

Format: **SRp1, mode designation**

p1: channel number (CC)

mode designation: SKIP

Example: **SR01, SKIP**

VOLT, TC, RTD, and DELT

Format: **SRp1, mode designation, p2, p3, p4**

p1: channel number (CC)

mode designation: VOLT, TC, RTD
DELT (difference computation of measured values between set channel and reference channel)

p2: Range designation

In the case of VOLT: 20mV, 60mV, 200mV, 2V, 6V, 20V.

In the case of TC: R, S, B, K, E, J, T, N, W (C), L (JDIN), U (TDIN).

In the case of RTD: JPT, PT.

In the case of DELT: the reference channel number. Note that the reference channel number must be lower than the set channel.

p3: The minimum value of the recording span. Enter within five digits, regardless of the decimal point and + or –.

p4: The maximum value of the recording span. Enter within five digits, regardless of the decimal point and + or –.

Table 1. Input Ranges

Input type	Range	Input	Measurement range	Unit
DC Voltage	20mV	20mV	–20.00mV to 20.00mV	mV
	60mV	60mV	–60.00mV to 60.00mV	mV
	200mV	200mV	–200.0mV to 200.0mV	mV
	2V	2V	–2.000V to 2.000V	V
	6V	6V	–6.000V to 6.000V	V
	20V	20V	–20.00V to 20.00V	V

Input type	Range	Measurement range	Measurement range
TC	R	0.0 to 1760.0°C	32 to 3200°F
	S	0.0 to 1760.0°C	32 to 3200°F
	B	0.0 to 1820.0°C	32 to 3308°F
	K	–200.0 to 1370.0°C	–328.0 to 2498.0°F
	E	–200.0 to 800.0°C	–328.0 to 1472.0°F
	J	–200.0 to 1100.0°C	–328.0 to 2012.0°F
	T	–200.0 to 400.0°C	–328.0 to 752.0°F
	N	0.0 to 1300.0°C	32 to 2372°F
	W=C	0.0 to 2315.0°C	32 to 4199°F
	L=JDIN	–200.0 to 900.0°C	–328.0 to 1652.0°F
	U=TDIN	–200.0 to 400.0°C	–328.0 to 752.0°F

Input type	Range	Measurement range	Measurement range
RTD	JPT	–200.0 to 600.0°C	–328.0 to 1112.0°F
	PT	–200.0 to 550.0°C	–328.0 to 1022.0°F

DI (Digital Input)

Format: **SRp1, mode designation, p2**

p1:	Channel number (CC)
mode designation:	D1 (digital input)
p2:	Type designation selectable from LEVL (level) or CONT (contact)

Example: **SR01, DI, CONT**

SCL (Scaling)

Format: **SRpl, mode designation, p2, p3, p4, p5, p6, p7, p8**

p1:	Channel number (CC)
mode designation:	SCL
p2:	Mode designation selectable from VOLT, TC, or RTD.
p3:	Range designation.
p4:	The minimum value of the recording span (SPAN L). Enter five digits, regardless of the decimal point and + or –.
p5:	The maximum value of the recording span (SPAN R). Enter five digits, regardless of the decimal point and + or –.
p6:	The minimum value of the scale (SCL 1). Enter six digits, regardless of the decimal point and + or –.
p7:	The maximum value of the scale (SCL r). Enter six digits, regardless of the decimal point and + or –.
p8:	Decimal point position of scaling value (0 to 4, which stands for the number of digits after the decimal point).

Example: **SR01, SCL, VOLT, 20mV, 0, 1000, –1000, 1000, 1**

This example performs 0 to 10mV input in channel 01 and is scaled from –100.0 to 100.0.

NOTE

An error will occur if one of p6, p7, or p8 is omitted. However, it is possible to omit all three values in case you do not want to change them.

SQRT (Square Root)

Format: SRp1, mode designation, p2, p3, p4, p5, p6, p7

p1:	Channel number (CC)
mode designation:	SQRT
p2:	Range designation selectable from 20mV, 60mV, 200mV, 2V, 6V, 20V
p3:	The minimum value of the recording span (SPAN L). Enter five digits, regardless of the decimal point and + or –.
p4:	The maximum value of the recording span (SPAN R). Enter five digits, regardless of the decimal point and + or –.
p5:	The minimum value of the scale (SCL 1). Enter six digits, regardless of the decimal point and + or –.
p6:	The maximum value of the scale (SCL r). Enter six digits, regardless of the decimal point and + or –.
p7:	Decimal point position of scaling value (0 to 3, which stands for the number of digits after the decimal point).

Example: SR01, SQRT, 20mV, 0, 1000, –1000, 1000, 1

This example performs 0 to 10mV input in channel 01. From this value, the square root is taken and the value is scaled from –100.0 to 100.0.

NOTE

An error will occur if one of p5, p6, or p7 is omitted. However, it is possible to omit all three values in case you do not want to change them.

2.1.3 Alarm Setting

Format: SAp1, p2, ON/OFF, p3, p4, p5, p6

p1:	Channel number (CC)
p2:	Alarm level number (1 to 4)
ON/OFF:	Set alarm ON or OFF

p3:	The type of alarm, selectable from: H: high limit alarm L: low limit alarm R: rate-of-change limit on increasing signal r: rate-of-change limit on decreasing signal h: difference high limit alarm l: difference low limit alarm
p4:	The alarm set point. Enter within five digits, regardless of the decimal point and + or –. The decimal point position will be according to the range (or scaling) setting. Refer to the input range listing (Table 1).
p5:	Activating the alarm output relay ON/OFF.
p6:	The alarm output relay number. Selectable from I01 to I12, depending on your option.

Example: SA02, 1, ON, L, 1000, ON, I04

This example sets level 1, low limit, alarm to channel 2. The alarm set point is 10.00mV and if an alarm occurs, output relay number 4 will be activated.

2.1.4 Unit Setting

Format: SNp1, p2

p1:	Channel number (CC)
p2:	Unit characters (up to six)

Example: SN02, kg

This example assigns the unit "kg" to channel 2. Note that a unit can only be assigned to channels of the SCL or SQRT input.

2.1.5 Chart Speed Setting

Format: SCp1

p1:	The chart speed (in mm/h: 5 to 12000 mm/h for the pen model, 82 increments; 1 to 1500 mm/h for the dot printing model, 1.0 mm step).

Example: SC1000

This example changes the chart speed to 1000 mm/h.

2.1.6 Clock Setting

Format: SDp1, p2

p1:	Date (YY/MM/DD)
p2:	Time (HH:MM:SS)

Example: SD92/07/13, 15:02:00

2.1.7 Copy Channel Setting

Format: SYp1, p2

p1:	The channel number (CC) that you want to copy (origin).
p2:	The channel number (CC) to where you want to copy (destination).

Example: SY01, 03

This example copies all settings from channel 1 to channel 3.

You can only copy from a lower channel number to a higher channel number.

2.1.8 Trend Recording Format Setting

Format: SSp1

p1:	Selection of trend recording mode selectable from AUTO or FIX.

This setting applies only to the dot printing model.

2.1.9 Zone Recording Setting

Format: SZp1, p2, p3

p1:	The channel number (CC).
p2:	Left boundary value (0 to 95).
p3:	Right boundary value (5 to 100).

Example: SZ02, 30,50

This example results in zone recording for channel 2 in the band from 30 to 50 mm.

2.1.10 Partial Expanded Recording Setting

Format: SPp1, p2, p3, p4

p1:	The channel number (CC).
p2:	Partial expanded recording ON/OFF.
p3:	Percentage of the full recording span that will be compressed (1 to 99%).
p4:	Boundary value (recording span +1 to recording span –1).

Example: SP01, ON, 25, 0000

This example results in partial expanded recording for channel 1 where the value at 25% of the chart corresponds with 0.000V.

NOTE

The decimal point position will be according to the range (or scaling) setting. Refer to the input ranges (Table 1).

2.1.11 Periodic Printout Setting

Format: SFp1, p2

p1:	The channel number (CC) for which you want to specify the periodic printout ON or OFF.
p2:	ON or OFF

Example: SF01, OFF

This example results in no periodic printout for channel 1.

2.1.12 Tag Setting

Format: STp1, p2

p1:	The channel number (CC) for which you want to set a tag.
p2:	Tag characters (up to seven characters).

Example: STO1, TAG 1

2.1.13 Message Setting

Format: SGp1, p2

p1:	The message number (selectable from MSG1, MSG2, MSG3, MSG4, MSG5).
p2:	Message characters (up to 16 characters).

Example: SGMSG2, RD100A/RD1800 model

This example sets the message "RD100A/RD1800 model" as message number 2.

2.1.14 Chart Speed 2 Setting

Format: SEp1

p1:	The second chart speed (in mm/h) (5 to 12000 mm/h for the pen model [82 increments] 1 to 1500 mm/h for the dot printing model [1 mm step]).

Example: SE1000

This example sets the second chart speed to 1000 mm/h.

2.1.15 Setting of Daylight Savings Time (Option)

Format: SWp1, p2

p1:	The selection of summer or winter time, selectable from SUMMER or WINTER.
p2:	YY/MM/DD_HH

Example: SWSUMMER,92/04/01_03

This example has as a result that the summer time will go into effect on April 1, 1992 at 03:00.

NOTE

Be sure to enter the p2 parameter completely. Do not leave out any characters or space.

2.2 Program Control Commands

2.2.1 Program Control Commands and Functions

Type	Command	Function
Control	PS	Start/stop recording
	MP	Manual printout start/stop
	LS	List printout start/stop
	SU	SETUP list printout start/stop
	MS	Message printout start
	MC	Message buffer clear
	AK	Alarm acknowledge
	AC	Alarm buffer clear
	UD	Selection of display
	BO	Designation sequence of byte output (binary output)
	TS	Selection of output data
	FM	Selection of output format of measured data
	LF	Selection of output format for setting parameters

2.2.2 Start/Stop the Recording

Command	Function
PS0	Starts the recording
PS1	Stops the recording

2.2.3 Manual Printout Start/Stop

Command	Function
MP0	Starts the manual printout
MP1	Stops the manual printout

2.2.4 List Printout Start/Stop

Command	Function
LS0	Starts the list printout
LS1	Stops the list printout

2.2.5 SET UP List Printout Start/Stop

Command	Function
SU0	Starts the SET UP list printout
SU1	Stops the SET UP list printout

2.2.6 Message Printout Start

Command	Function
MSp1	Starts the message printout

Where p1 is the message number selectable from 1 (MSG1), 2 (MSG2), 3 (MSG3), 4 (MSG4), 5 (MSG5).

2.2.7 Message Buffer Clear

Command	Function
MC0	Clears the message buffer

2.2.8 Alarm Acknowledge

Command	Function
AK0	Starts the alarm acknowledge function

2.2.9 Alarm Buffer Clear

Command	Function
AC0	Clears the alarm buffer

2.2.10 Selection of Display

Command	Function
UD0	Selects AUTO display
UD1, p1	Selects MANUAL display
UD2	Selects DATE display
UD3	Selects TIME display
UD4	Selects VIEW display

Where pl is the channel number (CC).

2.2.11 Designation Sequence of Byte Output (Binary Output)

Command	Function
BO0	Outputs from MSB (upper byte)
BO1	Outputs from LSB (lower byte)

2.2.12 Selection of Output Data

Command	Function
TS0	Outputs measured values
TS1	Outputs values of setting parameters
TS2	Outputs unit and decimal point information

2.2.13 Selection of Output Format for Measured Data

Command	Function
FM0, p1, p2	Selects channels from which measured values are output in ASCII mode
FM1, p1, p2	Selects channels from which measured values are output in Binary mode

Where p1 is the channel number (CC) from where the output should start, and p2 is the channel number (CC) where the output should end.

NOTE

After you designated the output to be measured values (TS0 command), specify the format by this FM command.

2.2.14 Selection of Output Format for Setting Parameters, Unit/Decimal Point Information

Command	Function
LF, p1, p2	Selects channels from which values of setting parameters are output (TS1) Selects channels from which unit/decimal point information is output (TS2)

Where p1 is the channel number (CC) from where the output should start, and p2 is the channel number (CC) where the output should end.

NOTE

After you designated the output by a TS1 or TS2 command, specify the format by this LF command.

2.3 Escape Sequence

Communications can be controlled by using the following escape commands.

2.3.1 Execution of Trigger

ESC T executes triggering. If an ESC T command is received:

- Measured data (when TS0 is specified), or
- Setting parameters output (when TS1 is specified), or
- Units and decimal point information (when TS2 is specified) are stored in a buffer.

Data output will start only after the output format has been designated (using the FM or LF command). ESC T sends a character "T" following data of 1 byte (1B) H.

Example: If (ESC T) is output using PC 9801 Series:
PRINT #1 ,CHR$ (&1HB) +'T';
(In the case of the NEC PC 9801, the interface file number should be 1 and should be opened.)

2.3.2 Status Output – ESC S Outputs Status

If the ESC S command is received, statuses of the commands that have been sent so far are output. Output statuses range from ER00 to ER31. For the respective contents, refer to Figure 8 and Table 2, which follow.

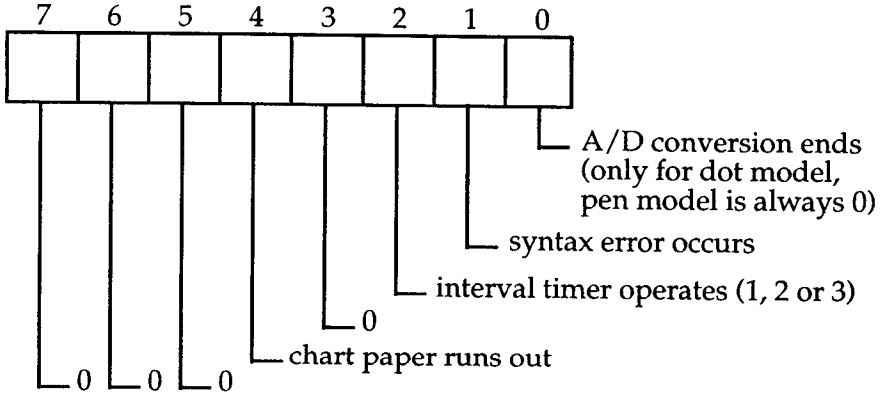


Figure 8. Output Format after ESC S Command Has Been Sent

NOTE

The error "chart paper runs out" will be only reset by entering new chart paper (level). In the case of all other errors: status will be reset (0) after the error message has been output.

Example:

A/D conversion ends

Status of error "A/D conversion ends"

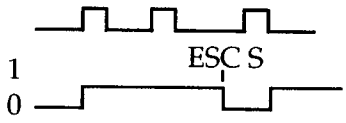


Table 2. Status Output

Status Output	Status		
	A/D END	Syntax Error	Interval Timer Operation
ER00C_RL_F			
ER01C_RL_F	●		
ER02C_RL_F		●	
ER03C_RL_F	●	●	
ER04C_RL_F			●
ER05C_RL_F			●
ER06C_RL_F		●	●
ER07C_RL_F	●	●	●
ER09C_RL_F	●		
ER10C_RL_F		●	
ER11C_RL_F	●	●	
ER12C_RL_F			●
ER13C_RL_F	●		●
ER14C_RL_F		●	●
ER15C_RL_F	●	●	●
ER17C_RL_F	●		
ER18C_RL_F		●	
ER19C_RL_F	●	●	
ER20C_RL_F			●
ER21C_RL_F	●		●
ER22C_RL_F		●	●
ER23C_RL_F	●	●	●
ER25C_RL_F	●		
ER26C_RL_F		●	
ER27C_RL_F	●	●	
ER28C_RL_F			●
ER29C_RL_F	●		●
ER30C_RL_F		●	●
ER31C_RL_F	●	●	●

● : Enabled status

If an error message is output, all error statuses will be reset, except for the error "chart paper runs out." This error will not be reset. If there are no statuses to be output when the ESC S command is received, ER00 will be output.

Data from the recorder is output using an FM or LF command. To allow time to output these data, do not send an ESC S command immediately after sending the FM or LF command. ESC S sends a character "S" following data of one byte (1B) H.

Example: If (ESC S) is output using PC 9801 Series:
PRINT #1,CHR$ (&1HB) +'S';
LINE INPUT #1, D$
PRINT D$
(In the case of NEC PC 9801, the interface file number should be 1 and should be opened.)

2.3.3 Open Command

(ESC 0)_ ☐ ☐ C_RL_F where ☐ ☐ is the address (ASCII code 01 to 16)

The open command is to address a communication destination when a HOST (PC) is connected to more than one (up to 15) RD100A/RD1800 recorders.

This command always controls non-addressed devices. Before issuing an open command, make sure that the previous address device is closed by a close command. All commands (including ESC T) are valid for the addressed (after ESC 0) device only.

2.3.4 Close Command

(ESC C)_ ☐ ☐ C_RL_F where ☐ ☐ is the address (ASCII code 01 to 16)

The close command is to close the addressed state of a device. Only the addressed device will respond to this command.

3 Transmitting Functions

This section describes different output formats.

3.1 Introduction to Output Data Formats

The format to output data can be specified by the following commands:

- TS0
- TS1
- TS2

NOTE

When you specify a TS command and send an ESC T command, the TS command will be reset. If you resend an ESC T command, the TS command will be set to the previous value.

3.1.1 TS0

After sending the TS0 and the ESC T command, you must specify the output format using an FM command. Data cannot be output when an FM command is omitted. However, after the FM command has been sent, data within the same sample can be output again by specifying the output format once more using an FM command. If the next FM command is sent before the specified data have been output completely, the newly requested data will be output.

Sequence

TS0

ESC T

FMx, xx, xx
(read data completely)

FMx, xx, xx
(read data completely)

NOTE

Do not send any FM or LF commands until the data have been sent completely. After sending an ESC T command, data will be stored in a buffer and the system will wait for FM or LF commands. (Regardless of whether the ESC T command is sent without executing FM or LF command, or whether data have been sent completely.) The ASCII code for ESC is (1B)H.

3.1.2 TS1, TS2

After sending the TS1 (or TS2) and the ESC T command, you must specify the output channel using an LF command. It is possible, after data have been output completely, to output data from another channel by specifying an LF command again.

Sequence

TS1

ESC T

LFxx, xx
(read data (end data))

LFxx, xx
(read data (end data))

NOTE

Do not send any FM or LF commands until the data have been sent completely. After sending an ESC T command, data will be stored in a buffer and the system will wait for FM or LF commands.

3.2 Output Data Formats

There are four formats that can be used to output data:

- TS0 + ESC T + FM0 (outputs measured values in ASCII mode)
- TS0 + ESC T + FM1 (outputs measured values in Binary mode)
- TS1 + ESC T + LF (outputs values of setting parameters)
- TS2 + ESC T + LF (outputs information on unit and decimal point).

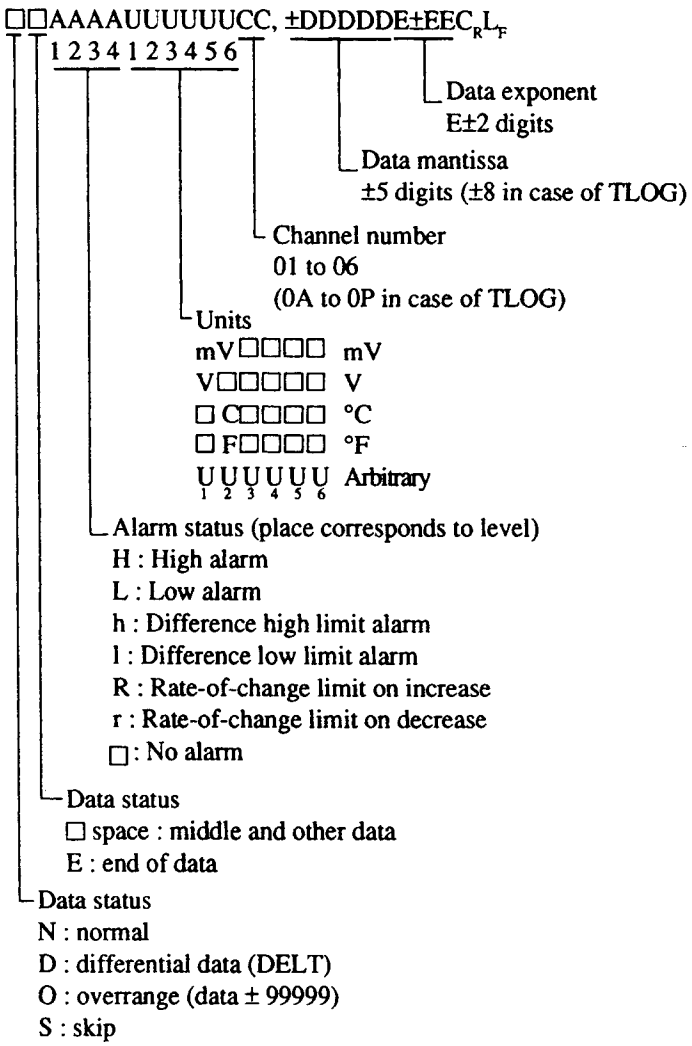
3.2.1 Output Format of Measured Values in the ASCII Mode

When the TS0, ESC T, and FM0 commands are received, the measured value and the computed result are output in ASCII mode. When the ESC T command is received immediately after the TS0 command, the recorder data will be transferred to a buffer.

Output format:

DATEYYMMDD$C_R L_F$ (year, month, day)

TIMEHHMMSS$C_R L_F$ (hour, minute, second)



3.2.2 Output Format of Measured Values in the Binary Mode

When the TS0, ESC T, and FM1 commands are received, the measured value and computed result are output in the Binary mode.

Output format

Transfer order

Output byte number	2 byte
Date and time	6 byte
Measured data (1)	5 byte (7 byte in case of TLOG channel)
Measured data (n)	5 byte

Output byte number

Output byte number = 5 x n+6 (order of output byte can be selected).
(Output byte number in case of TLOG channel = 7 x n+6)

The output byte number is output from the most significant byte (MSB) or least significant byte (LSB) according to the output sequence (BO command). Note that in the mentioned formula the above mentioned, two bytes are not included.

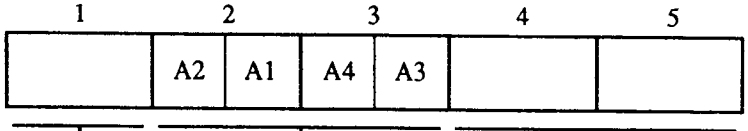
Date and time

Year, Month, Day, Hour, Minute, Second

Year:	0 to 99 (00H to 63H)*
Month:	1 to 12 (01H to 0CH)*
Day:	1 to 31 (01H to 1FH)*
Hour:	0 to 23 (00H to 17H)*
Minute:	0 to 59 (00H to 3BH)*
Second:	0 to 59 (00H to 3BH)*

* Output is hexadecimal; therefore, numeric output needs to be converted.

Measured data:



channel number (1 to 6)

Alarm status
An=1: H
An=2: L
An=3: h
An=4: l
An=5: R
An=6: r
An=0: No alarm or set to OFF
Outputs for each level:
A1 = level 1
|
A4 = level 4

measured value (order of output byte can be selected, using BO command)
data + over: 7E7E is output
data – over: 8181 is output
skip: 8080 is output

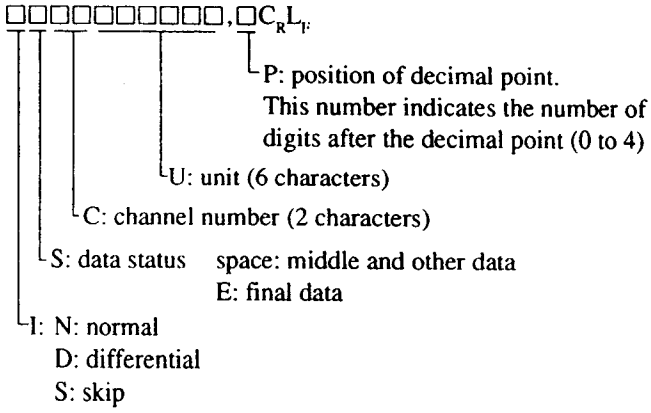
3.2.3 Output Format of Setting Parameters

When the TS1, ESC T, and LF commands are received, setting parameters are output in the following order (the set values are output in the same format as input):

Communication	Set Value Output
PS	Start/stop recording
SR	Range setting
SN	Unit setting
SA	Alarm setting
SC	Chart speed setting
SS	Trend recording format setting
SZ	Zone setting
SP	Partial expanded setting
SF	Periodic printout setting
ST	Tag setting
SG	Message setting
SE	Chart speed 2 setting
UD	Selection of display
EN	End of setting parameter output

3.2.4 Output Format of Information on Unit and Decimal Point

When the TS2, ESC T, and LF commands are received, information on units and decimal points are output in the following format. Channel numbers can be specified with the LF command.



3.3 Status Byte Format

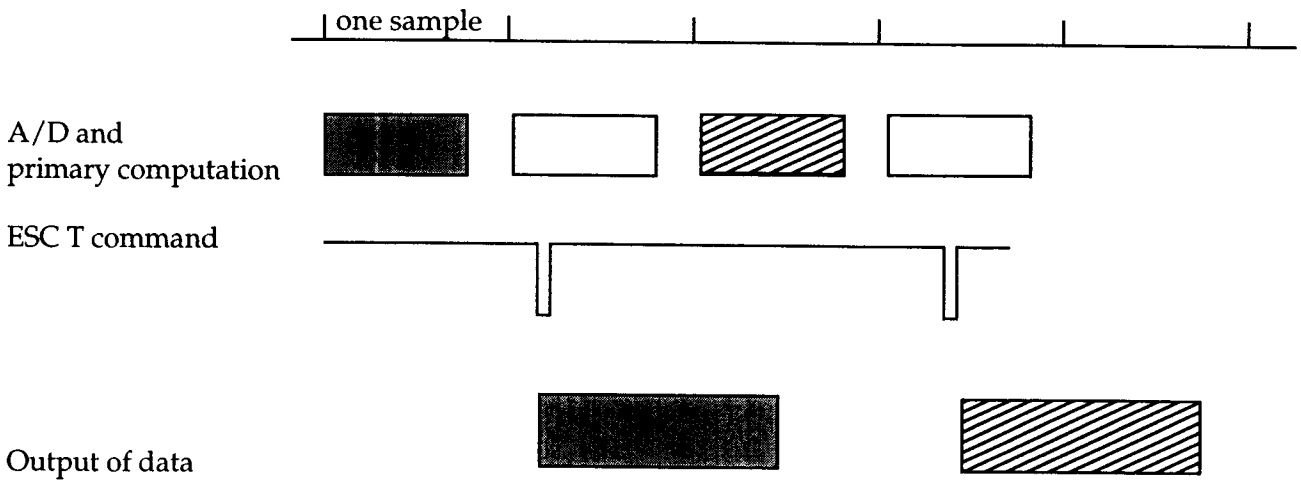
When an ESC S command is received, status is output in the following format:
ER □ □ C_RL_F

Status Output	Status		
	A/D END Error	Syntax	Interval Timer Operation
ER00C_RL_F			
ER01C_RL_F	●		
ER02C_RL_F		●	
ER03C_RL_F	●	●	
ER04C_RL_F			●
ER05C_RL_F			●
ER06C_RL_F		●	●
ER07C_RL_F	●	●	●
ER09C_RL_F	●		
ER10C_RL_F		●	
ER11C_RL_F	●	●	
ER12C_RL_F			●
ER13C_RL_F	●		●
ER14C_RL_F		●	●
ER15C_RL_F	●	●	●
ER17C_RL_F	●		
ER18C_RL_F		●	
ER19C_RL_F	●	●	
ER20C_RL_F			●
ER21C_RL_F	●		●
ER22C_RL_F		●	●
ER23C_RL_F	●	●	●
ER25C_RL_F	●		
ER26C_RL_F		●	
ER27C_RL_F	●	●	
ER28C_RL_F			●
ER29C_RL_F	●		●
ER30C_RL_F		●	●
ER31C_RL_F	●	●	●

● : Enabled status

4 Time Chart

The sample period is 125 ms for the pen model and 2.5 s for the dot printing model. When the ESC T command is received to output data before data is updated, the previous sample data will be output.



5 Initial Status

The initial status after turning the power ON is shown below.

TS0	Output format is designated to be measured values
FM0, 01, 06*	Output format is designated to be measured values in the ASCII mode
	Output start channel: 01
	Output end channel: 06
LF 01, 06*	Set channels to be output
	Start channel: 01
	End channel: 06
BO0	From most significant byte (MSB)

* Depending on the recorder model, the highest channel number will be the initial status.

NOTE

The contents of RS-422-A cannot be backed up by a battery.

ASCII Code Table

First digit

Second digit	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			S/P	0		P		p								
1				1	A	Q	a	q							°	
2				2	B	R	b	r							Ω	
3			#	3	C	S	c	s							μ	
4				4	D	T	d	t								
5			%	5	E	U	e	u								
6				6	F	V	f	v							Ü	
7				7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
A	L/F		*	:	J	Z	j	z								
B		ESC	+		K		k									
C					L		l									
D	C/R		–		M		m									
E			.		N		n									
F			/		O		o									

NOTE

The degree symbol (°) of °C or °F, should be selected as follows:

- In the case of Measured values output (TS0) and Unit, Decimal point output (TS2): ° = space (20H)
- In case of setting parameter output (TS1): ° = E1H
- In case of recorder setting: ° = E1H

6 Errors During RS-422-A Output

6.1 Preventing Errors

Do not send an FM or LF command until the measured data or set point data in the specified channel is output. If an FM or LF command is sent during data output, the communication will be interrupted.

If an LF command (to set TS0) or an FM command (to set TS1 or TS2) is sent, the communication will be interrupted.

If an ESC T command was already sent when TS0 is set, data (even in other formats) in any channel can be output with an FM command. Data received with the last ESC T is output.

If an ESC T command was already sent when TS1 or TS2 is set, data set in any channel can be output with an LF command. If an ESC T command was already sent, the measured data and set point data can be output on a channel-by-channel.

If and ESC T command has already been sent, the measured value and set value can be output over more than one time.

NOTE

When data are to be sent from the PC to the recorder, use the ESC S command to avoid buffer overflow. The RD100A/RD1800 recorder receives an ESC S request, and saves it in the buffer memory. This request is retrieved from the buffer memory and, after command acknowledgment, the status is sent to the PC. Do not send any other commands between sending the ESC S command to the recorder and reading the status from the recorder. Commands can be only received by the recorder when its input buffer is empty.

Example:

```
10   OPEN "COM1:N81N" AS #1
20   '
30   PRINT #1,CHR$(&H1B) +"O 01"
40   PRINT #1,"SR01,VOLT,20mV,-2000,2000"
50   GOSUB *HANDSHAKE
60   PRINT #1,"PS0"
70   GOSUB *HANDSHAKE
```

```
80   PRINT #1,"UD0"
90   PRINT #1,CHR$(&H1B)+"C 01"
100  CLOSE
110  END
120  *HANDSHAKE
130  PRINT #1,CHR$(&H1B)+"S"; (sending ESC S)   } to prevent buffer
140  LINE INPUT #1,STS$       (reading status)  } overflow
150  RETURN
```

Command length of input buffer of the RD100A/RD1800 is 256 bytes.

NOTE

When the PC9801 receives binary data from the recorder, set the memory switches so that the PC9801 can use a DEL mode as a BS(08) code. For memory setting, refer to the PC9801 Instruction Manual.

Binary data cannot use a LINE INPUT statement. To read binary data, use an INPUT$ statement.

Example:

```
10   OPEN "COM1:N81N" AS #1
20   '
30   PRINT #1,CHR$(&H1B)+"O 01"
40   PRINT #1,"BO1"
50   PRINT #1,"TS0"
60   PRINT #1,CHR$(&H1B)+"T";
70   PRINT #1,"FM1,01,04"
80   D$=INPUT$(2,#1)          (to designate data length of read data)
90   CNT=CVI(D$)
100  D$=INPUT$(CNT,#1)
110  CLOSE
120  END
```

Execution of the above program may result in the following: After line 100 has been executed, binary data will be stored in D$. If the output data length "CNT" in line 90 exceeds 255, the read-data is separated into several parts. When binary data is handled in an integer array on a two-byte basis, the least significant byte is followed by the most significant byte, so an FM command should specify an output byts from the LSB (least significant byte) (line 40).

6.2 How to Request for Error Message Output

If an error occurs when a supervisory computer sends a setting or control command to the recorder via the RS-422-A communication interface, an error message can be output from the RD100A/RD1800 upon receipt of a command from the computer.

1 Request to output error message number
Command: ESC S
(1B) H (53) H

2 Error message output from RD100A/RD1800 when ESC S is received.
Output format: ERxx (CR) (LF) (xx = 00 to 31)

NOTE

An error message is only output when an ESC S command is sent. If an ESC S command (request to send error message) is sent to the RD100A/RD1800 while data is being output due to the receipt of a TS0, TS1, or TS2 command, communication will be interrupted. When data is transmitted between a supervisory computer and the RD100A/RD1800, it is possible to monitor the errors during communication through the ESC S command.

6.3 Timing of Resetting Error Status

When the RD100A/RD1800 receives an ESC S command following the occurrence of an error, the recorder outputs the corresponding error message, and the error status is simultaneously reset.

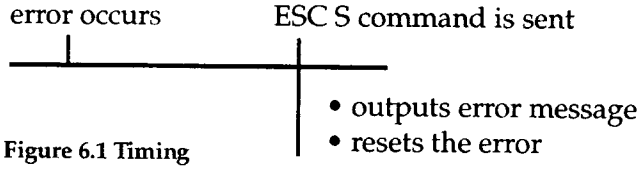


Figure 6.1 Timing

7 Sample Programs

7.1 Sample Programs for the NEC PC 9801

Computer Used: NEC PC 9801
Mode: Eight-bit, NONE parity, stop bit 1, baud rate 9600 bps
Handshake: NONE

The file name used for writing to and reading from the disc is TEST.DAT.

7.1.1 Program to Read Setting Parameters from the RD100A/RD1800 Display on Screen and Write to Disc

```
10  OPEN "COM1:N81N" AS #1
20  OPEN "TEST.DAT" FOR OUTPUT AS #2
30  '
40  PRINT #1,CHR$(&H1B)+"O 01"
50  PRINT #1,"TS1"
60  PRINT #1,CHR$(&H1B)+"T";
70  PRINT #1,"LF01,04"
80  LINE INPUT #1,D$
90  PRINT D$
100 PRINT #2,D$
110 IF LEFT$(D$,2)<>"EN" THEN GOTO 70
120 '
130 PRINT #1, CHR$(&H1B)+"C 01"
140 CLOSE
150 END
```

7.1.2 Program to Read Setting Parameters from Disc, Display on Screen and Set the RD100A/RD1800

```
10  OPEN "COM1:N81N" AS #1
20  OPEN "TEST.DAT" FOR INPUT AS #2
30  '
40  PRINT #1,CHR$(&H1B)+"O 01"
50  LINE INPUT #2,D$
60  PRINT D$
70  IF LEFT$(D$,2)="EN" THEN GOTO 130
80  PRINT #1,D$
90  PRINT #1,CHR$(&H1B)+"S";
100 LINE INPUT #1,D$
```

```
110  PRINT D$
120  GOTO 50
130  '
140  PRINT #1,CHR$(&H1B)+"C 01"
150  CLOSE
160  END
```

7.1.3 Program to Read Information on Unit and Decimal Point from the RD100A/RD1800, Display on Screen and Write to Disc

```
10   OPEN "COM1:N81N" AS #1
20   OPEN "TEST.DAT" FOR OUTPUT AS #2
30   '
40   PRINT #1,CHR$(&H1B)+"O 01"
50   PRINT #1,"TS2"
60   PRINT #1,CHR$(&H1B)+"T";
70   PRINT #1,"LF01,04"
80   LINE INPUT #1,D$
90   PRINT D$
100  PRINT #2,D$
110  IF MID$(D$,2,1)<>"E" THEN GOTO 80
120  '
130  PRINT #1,CHR$(&H1B)+"C 01"
140  CLOSE
150  END
```

7.1.4 Program to Output Measured Data (ASCII Code) from the RD100A/RD1800 and Write to Disc

```
10   OPEN "COM1:N81N" AS #1
20   OPEN "TEST.DAT" FOR OUTPUT AS #2
30   '
40   PRINT #1,CHR$(&H1B)+"0 01"
50   PRINT #1,"TS0"
60   PRINT #1,CHR$(&H1B)+"T";
70   PRINT #1,"FM0,01,04"
80   LINE INPUT #1,D$
90   PRINT D$
100  PRINT #2,D$
110  IF MID$(D$,2,1)<>"E" THEN GOTO 80
120  '
130  PRINT #1,CHR$(&H1B)+"C 01"
140  CLOSE
150  END
```

7.1.5 Program to Output Measured Data (Binary Code) from the RD100A/RD1800 and Write to Disc

```
10   OPEN "COM1:N81N" AS #1
20   OPEN "TEST.DAT" FOR OUTPUT AS #2
30   '
40   PRINT #1,CHR$(&H1B)+"0 01"
50   PRINT #1,"TS0"
60   PRINT #1,"BO1"
70   '
80   PRINT #1,CHRS(&H1B)+"T";
90   PRINT #1,"FM1,01,04"
100  D$=INPUT$(2, #1)
110  PRINT #2,D$
120  A=CVI(MID$(D$,1,2))
130  PRINT A
140  D$=INPUT$(A,#1)
150  PRINT #2,D$
160  PRINT ASC(MID$(D$,1,1));     :PRINT "/";
170  PRINT ASC(MID$(D$,2,1));     :PRINT "/";
180  PRINT ASC(MID$(D$,3,1));     :PRINT
190  PRINT ASC(MID$(D$,4,1));     :PRINT ":";
200  PRINT ASC(MID$(D$,5,1));     :PRINT ":";
210  PRINT ASC(MID$(D$,6,1))
220  '
230  L=0
240  FOR I=7 TO A
250    PRINT RIGHT$("0"+HEX$(ASC(MID$(D$,I,1))),2)+" ";
260    L=L+1
270    IF L=5 THEN L=0 :PRINT
280  NEXT I
290  '
300  PRINT #1,CHR$(&H1B)+"C 01"
310  CLOSE
320  END
```

7.2 Sample Programs for YEWMAC

Computer Used:	YEWMAC with RS 3 card installed (serial interface card) to line controller slot 3 and using port 1
Mode:	Eight-bit, NONE parity, stop bit 1, baud rate 9600 bps
Handshake:	NONE

7.2.1 Program to Read Setting Parameters from the RD100A/RD1800 and Display on Screen

```
10   ASSIGN RS3=3
20   RESET 3
30   CONTROL 3,105;1            :! DATA LENGTH 8 bit
40   CONTROL 3,106;0            :! STOP BIT 1
50   CONTROL 3,107;0            :! PARITY NONE
60   CONTROL 3,108;13           :! 9600 BAUD
70   !
80   DIM D$128
90   OUTPUT 3,1;CHR$(27) +"O 01"
100  OUTPUT 3,1;"TS1"
110  OUTPUT 3,1;CHR$(27)+"T";
120  OUTPUT 3,1;"LF01,04"
130  ENTER 3,1;D$
140  PRINT D$
150  IF LEFT$(D$,2)<>"EN" THEN GOTO 130
160  OUTPUT 3,1;CHR$(27)+"C 01"
170  END
```

7.2.2 Program to Read Information on Unit and Decimal Point from the RD100A/RD1800 and Display on Screen

```
10   ASSIGN RS3=3
20   RESET 3
30   CONTROL 3,105;1            :! DATA LENGTH 8 bit
10   CONTROL 3,106;0            :! STOP BIT 1
50   CONTROL 3,107;0            :! PARITY NONE
60   CONTROL 3,108;13           :! 9600 BAUD
70   !
80   DIM D$128
90   OUTPUT 3,1;CHR$(27)+"O 01"
100  OUTPUT 3,1;"TS2"
110  OUTPUT 3,1;CHR$(27)+"T";
120  OUTPUT 3,1;"LF01,04"
130  ENTER 3,1;D$
```

```
140  PRINT D$
150  IF MID$(D$,2,1) <>"E" THEN GOTO 130
160  OUTPUT 3,1;CHR$(27)+"C 01"
170  END
```

7.2.3 Program to Output Measured Data (ASCII Code) from the RD100A/RD1800 and Display on Screen

```
10   ASSIGN RS3=3
20   RESET 3
30   CONTROL 3,105;1            :! DATA LENGTH 8 bit
40   CONTROL 3,106;0            :! STOP BIT 1
50   CONTROL 3,107;0            :! PARITY NONE
60   CONTROL 3,108;13           :! 9600 BAUD
70   !
80   DIM D$128
90   OUTPUT 3,1;CHR$(27)+"O 01"
100  OUTPUT 3,1;"TS0"
110  OUTPUT 3,1;CHR$(27)+"T";
120  OUTPUT 3,1;"FM0,01,04"
130  ENTER 3,1;D$
140  PRINT D$
150  IF MID$(D$,2,1)<>"E" THEN GOTO 130
160  OUTPUT 3,1;CHR$(27)+"C 01"
170  END
```

7.2.4 Program to Output Measured Data (Binary Code) from the RD100A/RD1800 and Display on Screen

```
10   ASSIGN RS3=3
20   RESET 3
30   CONTROL 3,105;1            :! DATA LENGTH 8 bit
40   CONTROL 3,106;0            :! STOP BIT 1
50   CONTROL 3,107;0            :! PARITY NONE
60   CONTROL 3,108;13           :! 9600 BAUD
70   CONTROL 3,118;0            :! NO TERMINATOR
80   CONTROL 3,119;1            :! RECEIVE 1 BYTE
90   !
100  DIM D$1(128)
110  CR$=CHR$ (13)
120  LF$=CHR$ (10)
130  !
140  OUTPUT 3,1;CHR$(27)+"O 01"+CR$+LF$
150  OUTPUT 3,1;"TS0"+CR$+LF$
```

```
160  OUTPUT 3,1;"BO1"+CR$+LF$
170  OUTPUT 3,1;(CHR$(27)+"T"
180  OUTPUT 3,1;"FM1,01,04"+CR$+LF$
190  !
200  ENTER 3,1 NOFORMAT ; D$(*)   :! DATA BYTE QTY
210  A=ASC(D$(0))
220  ENTER 3,1 NOFORMAT ; D$(*)
230  A=A + ASC(D$(0))*256
240  PRINT A
250  !
260  ENTER 3,1 NOFORMAT ; D$(*)   :! YEAR
270  PRINT ASC(D$(0));      :PRINT "/";
280  ENTER 3,1 NOFORMAT ; D$(*)   :! MONTH
290  PRINT ASC(D$(0));      :PRINT "/";
300  ENTER 3,1 NOFORMAT ; D$(*)   :! DAY
310  PRINT ASC(D$(0));      :PRINT
320  ENTER 3,1 NOFORMAT ; D$(*)   :! HOUR
330  PRINT ASC(D$(0));      :PRINT ":";
340  ENTER 3,1 NOFORMAT ; D$(*)   :! MINUTE
350  PRINT ASC(D$(0));      :PRINT ":";
360  ENTER 3,1 NOFORMAT ; D$(*)   :! SECOND
370  PRINT ASC(D$(0))
380  !
390  L=0
400    FOR I=7 TO A
410    ENTER 3,1 NOFORMAT ; D$(*)
420    PRINT RIGHT$("0"+HEX$(ASC(D$(0))),2); : PRINT " ";
430    L=L+1
440    IF L=5 THEN L=0 : PRINT : ENDIF
450  NEXT I
460  !
470  OUTPUT 3,1;CHR$(27)+"C 01"
480  END
```

7.3 Sample Programs for IBM PC

Computer Used: IBM PC

Mode: eight-bit, NONE parity, stop bit 1, baud rate 9600 bps

Handshake: NONE

The file name used for writing to and reading from the disc is TEST.DAT.

7.3.1 Program to Read Setting Parameters from the RD100A/RD1800, Display on Screen and Write to Disc

```
10   OPEN "COM1:1200,N,8,1,LF" AS #1
20   OPEN "TEST.DAT" FOR OUTPUT AS #2
30   '
40   LF$=CHR$(&HA)          :' Line feed = 0AH
50   PRINT #1,CHR$(27)+"O 01"
60   PRINT #1,"TS1"
70   PRINT #1,CHR$(27)+"T";
80   PRINT #1,"LF01,04"
90   LINE INPUT #1,D$
100  IF LEFT$(D$,1)=LF$ THEN D$=MID$(D$,2)
     :' Remove "LF" of head string
110  PRINT D$
120  PRINT #2,D$
130  IF LEFT$(D$,2)<>"EN" THEN GOTO 90
140  '
150  PRINT #1, CHR$(27)+"C 01"
160  CLOSE
170  END
```

7.3.2 Program to Read Setting Parameters from Disc, Display on Screen and Set the RD100A/RD1800

```
10   OPEN "COM1:1200,N,8,1,LF" AS #1
20   OPEN "TEST.DAT" FOR INPUT AS #2
30   '
40   PRINT #1,CHR$(27)+"O 01"
50   LINE INPUT #2,D$: PRINT D$
60   IF LEFT$(D$,2)="EN" THEN GOTO 130   :' Watch data end
70   PRINT #1,D$
80   PRINT #1,CHR$(27)+"S";   :' For protect receive buffer overflow
90   LINE INPUT #1,D$
100  PRINT D$
110  GOTO 50
120  '
130  PRINT #1,CHR$(27)+"C 01"
140  CLOSE
150  END
```

7.3.3 Program to Read Information on Unit and Decimal Point from the RD100A/RD1800, Display on Screen and Write to Disc

```
10  OPEN "COM1:1200,N,8,1,LF" AS #1
20  OPEN "TEST.DAT" FOR OUTPUT AS #2
30  '
40  LF$=CHR$(&HA)    :' Line feed = 0AH
50  PRINT #1,CHR$(27)+"O 01"
60  PRINT #1,"TS2"
70  PRINT #1,CHR$(27)+"T";
80  PRINT #1,"LF01,04"
90  LINE INPUT #1,D$
100 IF LEFT$(D$,I)=LF$ THEN D$=MID$(D$,2)
    :' Remove "LF" of head string
110 PRINT D$
120 PRINT #2,D$
130 IF MID$(D$,2,1)<>"E" THEN GOTO 90
140 '
150 PRINT #1,CHR$(27)+"C 01"
160 CLOSE
170 END
```

7.3.4 Program to Output Measured Data (ASCII Code) from the RD100A/RD1800 and Write to Disc

```
10  OPEN "COM1:1200,N,8,1,LF" AS #1
20  OPEN "TEST.DAT" FOR OUTPUT AS #2
30  '
40  LF$=CHR$(&HA)    :' Line feed = 0AH
50  PRINT #1,CHR$(27)+"O 01"
60  PRINT #1,"TS0"
70  PRINT #1,CHR$(27)+'"P";
80  PRINT #1,"FM0,01,04"
90  LINE INPUT #1,D$
100 IF LEFT$(D$,1)=LF$ THEN D$=MID$(D$,2)
    :' Remove "LF" of head string
110 PRINT D$
120 PRINT #2,D$
130 IF MID$(D$,2,1)<>"E" THEN GOTO 90
140 '
150 PRINT #1,CHR$(27)+"C 01"
160 CLOSE
170 END
```

7.3.5 Program to Output Measured Data (Binary code) from the RD100A/RD1800 and Write to Disc

```
10   OPEN "COM1:1200,N,8,1,LF" AS #1
20   OPEN "TEST.DAT" FOR OUTPUT AS #2
30   '
40   PRINT #1,CHR$(27)+"O 01"
50   PRINT #1,"TS0"
60   PRINT #1,"BO1"
70   '
80   PRINT #1,CHR$(27)+"T";
90   PRINT #1,"FM1,01,04"
100  D$=INPUT$(2,#1)
110  PRINT #2,D$
120  A=CVI(MID$(D$,1,2))
130  PRINT A
140  D$=INPUT$(A,#1)
150  PRINT #2,D$
160  PRINT ASC(MID$(D$,1,1));:PRINT "/";
170  PRINT ASC(MID$(D$,2,1));:PRINT "/";
180  PRINT ASC(MID$(D$,3,1));:PRINT
190  PRINT ASC(MID$(D$,4,1));:PRINT ":";
200  PRINT ASC(MID$(D$,5,1));:PRINT ":";
210  PRINT ASC(MID$(D$,6,1))
220  '
230  L=0
240     FOR I=7 TO A
250     PRINT RIGHT$("0"+HEX$(ASC(MID$(D$,I,1))),2)+" ";
260     L=L+1
270     IF L=5 THEN L=0 : PRINT
280  NEXT I
290  '
300  PRINT #1,CHR$(27)+"C 01"
310  CLOSE
320  END
```

Notes

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3. Repair instructions and/or specific problems relative to the product.

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