Instruction Manual

RS-422A Interface for Model μR100F Recorder

IM 4D4B1-10E
2nd Edition

YOKOGAWA ◆
Yokogawa Electric Corporation

CONTENTS

FD No. 1023R (Cld: 8335s)

1. OUTLINE

This instruction manual covers the RS-422A interface which is an optional function of the μR100F recorder.

To become familiarised and to fully utilise the RS-422A interface, refer to this manual and to those instruction manuals relating to both the μR100F recorder and the personal computer.

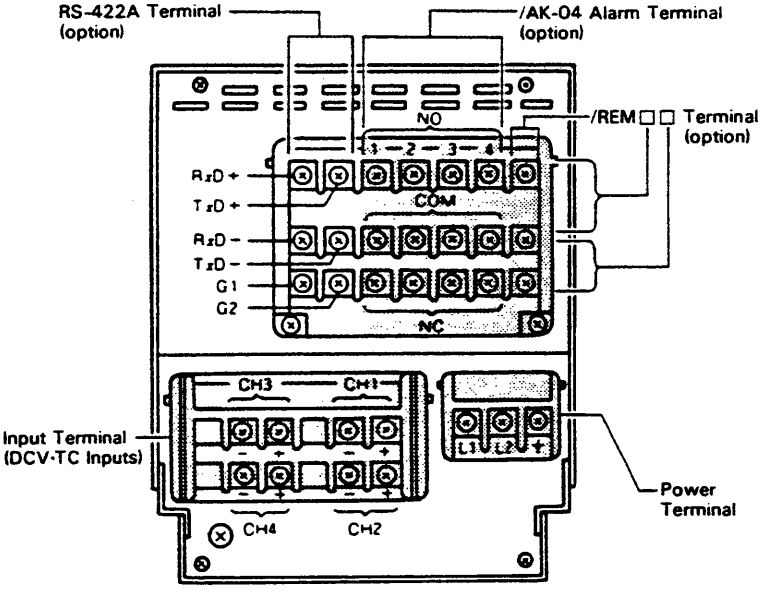
2. PREFACE

The RS-422A interface should be installed in the μR100F recorder. Upon receipt of the interface unit check the RS-422A terminal on the recorder rear panel.

If you have any questions, please contact the nearest YOKOGAWA service center or the dealer from whom the interface was purchased.

Terminal arrangement (rear panel)

Example: Model 4354 DC & TC Inputs



3. OUTLINE OF COMMUNICATION FUNCTIONS

Up to 16 μR100F recorders can be connected to a personal computer serial port (directly to a computer with an RS-422 interface or via a line converter for one with an RS-232C interface).

Data exchange may be made on a one-to-one communication basis using a μR100F recorder designated by the computer.

4. SPECIFICATIONS

Classification	Item	Specifications
Classification Specifications	Signal Level	Conforms to EIA RS-422A, Input/Output signal non-isolation
	Communication System	4-wire half-duplex multi-drop connection 1:N (host computer: μR100F recorder) N = 1 to 16 Start-stop system
	Communication Distance	Up to 500 m (between an isolated line converter or an isolated computer and a μR100F recorder)
	Transfer Rate	150, 300, 600, 1200, 2400, 4800, or 9600 BPS selectable.
	Communication Protocol Code	None
	Data Length	7/8 bits
	Parity	Even, Odd, none
	Stop Bits	1 or 2
	Code	ASCII code
Communication Items	Receive	Setting and operation items such as RCD and ON/OFF
	Send	Items, as described above, in addition to process data and status signals such as alarm outputs

5. CONFIGURATION

5.1 RS-422A (non-isolated) Communication Cable Wiring

When a μR100F is connected to a host computer or a personal computer, communication cable wiring is particularly important.

(1) Keep the electrical power supply cable (or any other noise producing cable) separate from the communication cable at all times. Avoid parallel cabling.

(2) Computers (other than a host computer) have device Nos. (addresses) and perform one-to-one communication with computers designated by the host. Instruments connected to the same RS-422A communication line must each have individual device numbers.
Use terminated cables for connection. (Refer to Figure 5.1 for each connection via a μR100F).

(3) Use two-pairs of 24WG (minimum) twisted shielded cables or equivalent. (Characteristic impedance: 100 Ω, capacitance 50 pF/m)
R in Figure 5.1 indicates a terminal resistance.
R = 100 Ω 1/2 W (adjust according to the impedance)
Keep the terminated un-shielded section to a minimum and clear of the μR100F recorder ground line.

(4) Ground voltages between devices should be identical as communication input/output signals are non-isolated (for best results installation should be done within the same panel).
When grounding is unstable, connect GND1 with thick wires (μR100F's GND1 communication terminals are directly connected to the casing's electrical potential, GND2s are connected to the casing potential via an internal logic common).

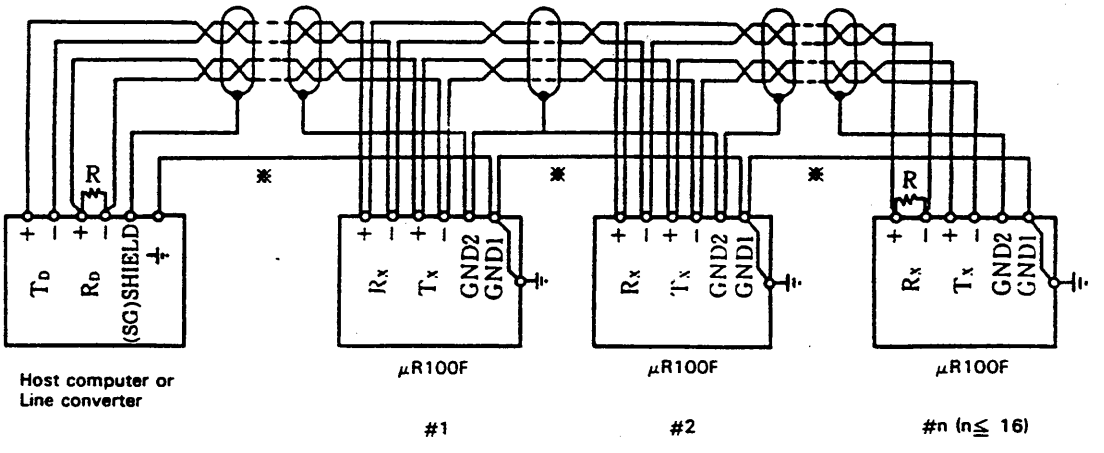


Figure 5.1 Communication Cable

(5) When the distance between a computer and a μR100F is excessively long (at least 10 m) causing the ground voltages to become unequal, use a input/output signal isolated interface computer. In this case, the computer's ground and GND1 on the μR100F should not be connected but a unilateral connection at the μR100F's GND2 should be carried out. On a computer or μR100F GND1 (see Figure 5.2) connect the shield to ground. When using a personal computer in connection with the RS-232C, use an isolated RS-232C/RS-422A (recommended) Line Converter. (For connection, refer to Fig 5.2).

(6) Short-circuiting the communication + and − terminals may damage the communication circuit.

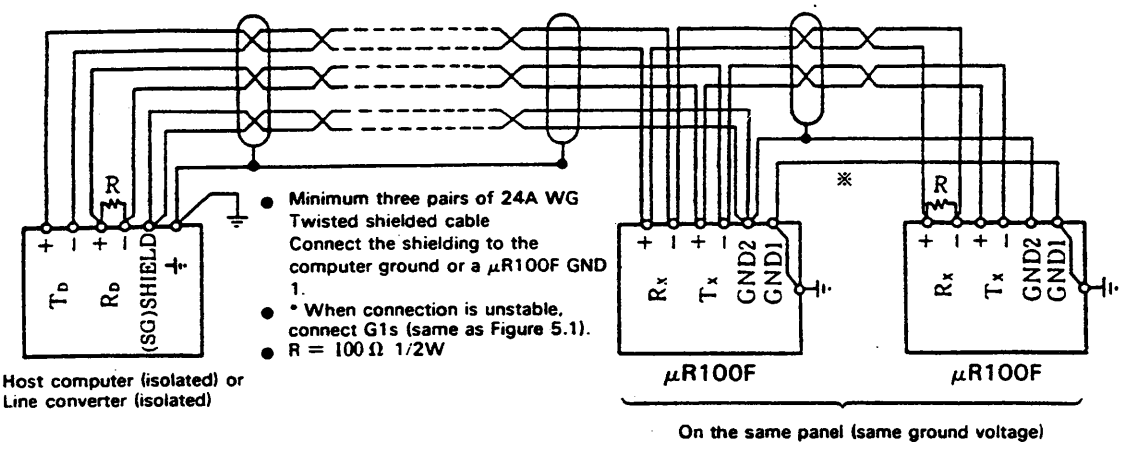
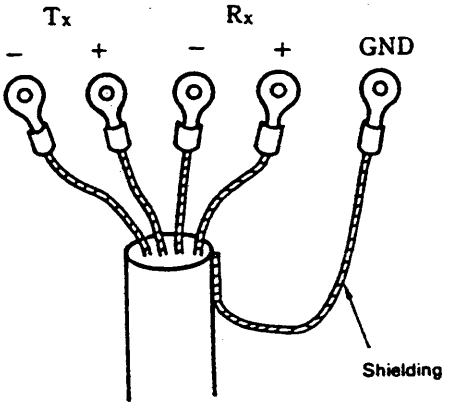


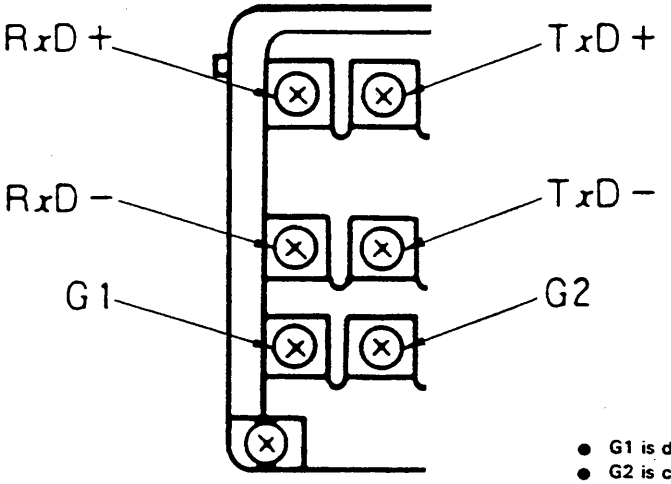
Figure 5.2 Communication Cable

5.2 Cable Termination



Connect instruments using shielded cable terminals (connect via each μR100F recorder).

5.3 Terminal Arrangement



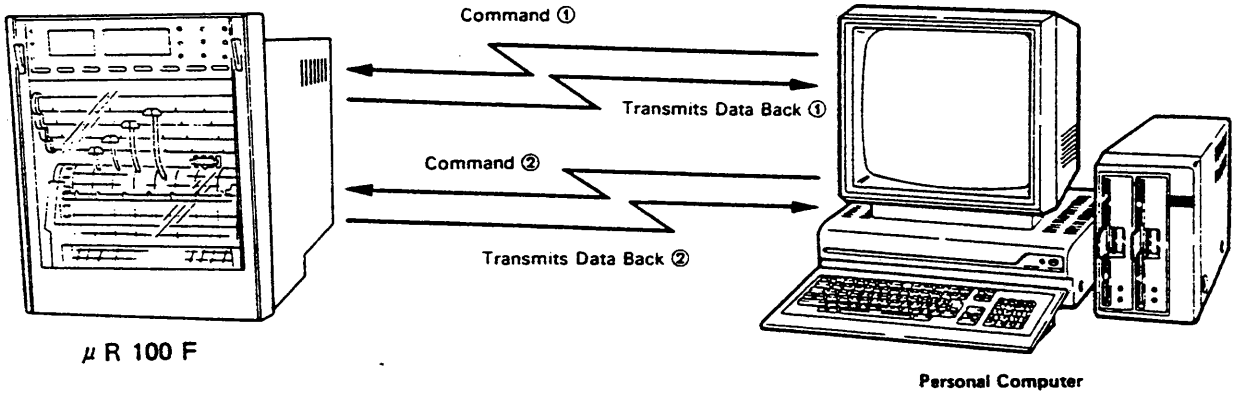
- G1 is directly connected to a case potential.
- G2 is connected to a case potential via an internal logic common.
- On a personal computer respectively connect Rx and Tx to TD and RD.

6. μR100F RECORDER COMMUNICATION DATA FORMAT

(1) ASCII codes are basically used for data communications.
(2) Maximum receivable data length: 254 bytes
(3) Maximum transmissionable data length: 254 bytes
(4) Delimiter: "C_R, L_F" sub-delimiter ";" DATA delimiter ","
[Example]
command 1 □data 1 (,) data 2 (;) command 2 data 3 data 4 (CRLF)

data delimiter　command delimiter　delimiter of communication

(5) Data exchange method with a μR100F recorder
The μR100F recorder receives a command via LINE1 (254 bytes or less) and transmits data back via LINE1 (254 bytes or less).



Command ① is transmitted to the μR100F recorder. The first data batch transmission is then sent back to the computer which then transmits a second command. The second data transmission is then sent back to the personal computer. This forms a close "handshake" or "answer-back" relationship.

Note:
1. Multiple commands can be executed by sub-delimiters (254 bytes or less). However, RESERVE/RELEASE commands must be individually executed.
2. Communication is possible, on a carriage point model, once the plotter is initialized after turning the power ON.

7. SETTING COMMUNICATION PARAMETERS

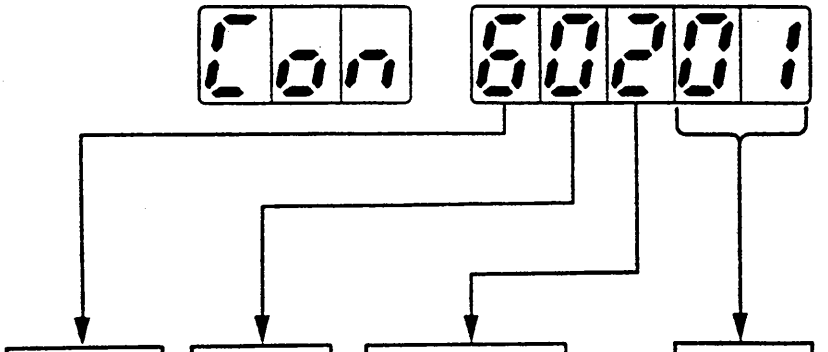
7.1 Setting Procedure

① Set the dip switches to the standard mode and turn ON the power supply switch, pressing the ▽ key on the μR100F keyboard.
② The display in Section 7.2 indicates the communication parameter setting mode.
③ Move the flashing cursor to a parameter that is to be changed with ▷ key.
④ Adjust the parameter using the ▽ key.
⑤ Memorize using the ENT key.
⑥ Upon memory completion, turn OFF the power.

Setting is now complete.

7.2 Parameter Display and Contents

(Memory protected by the μR100F recorder batteries)



0 : 150
1 : 300
2 : 600
3 : 1200
4 : 2400
5 : 4800
6 : 9600

0 : NONE
1 : EVEN
2 : ODD

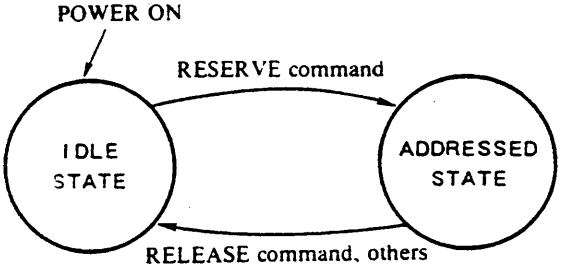
	Character bit	Stop bit
0	7 bit	1 bit
1	7	2
2	8	1
3	8	2

01 to 16

(Note) Displayed example indicates initial set values.

8. COMMUNICATION FACULTY OF THE μR100F FUNCTIONS

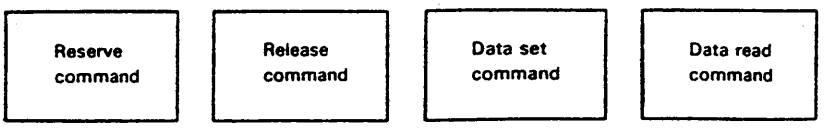
8.1 Communication Function Transitions



Data set · command and data read command are not accepted. ENTRY conditions in ADDRESSED STATE: when accepting the [ESC] O␣ address in the IDLE STATE, the device returns the [ESC] O␣ address and switches itself to the ADDRESSED STATE. When the POWER is turned ON, the device is switched to the IDLE STATE.	Data set command and data read command are accepted. EXIT from the ADDRESSED STATE condition a) When accepting a [ESC] C␣ self address in the ADDRESSED STATE, the device returns the [ESC] C␣ self address and then switches to the IDLE STATE. b) When accepting [ESC] O␣ other addresses are accepted in the ADDRESSED STATE. The device switches to the IDLE STATE without returning any data. c) When an error occurs in the ADDRESSED STATE (parity error, framing error, overrun error), ERR200 is sent back and the device switches to the IDLE STATE.

(Note) [ESC] = 1 BH

8.2 Communication Command Format



ESC O
Open command

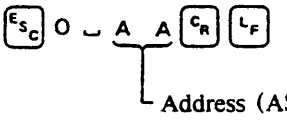
ESC C
Close command

8.2.1 RESERVE Command

- ESC O Open command

The open command is used to address a communication destination when a HOST (personal computer) is connected to multiple (up to 16) μR100F recorders.
This command always controls non-addressed devices.

- HOST — device



- Device — HOST (sent back from an addressed device)

When addressed

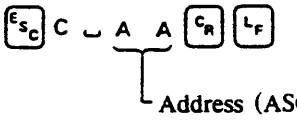
If the open command is issued by a HOST while another device is in the addressed state, the latter device switches to the idle state and does not echo back this or any further commands. Data is sent back from the newly addressed device.

8.2.2 RELEASE Command

- ESC C Close command

This command is used to close the addressed state of a device. Only the addressed device responds to this command.

- HOST — Device



- Device — HOST (sent back from a released device)

8.2.3 Data Set Command

This command is used to change set data (parameter) for devices from a HOST. Refer to the explanation of commands.

8.2.4 Data Read Command

This command is used to display the contents of the device's set data.

Refer to the command details.

9. COMMAND TABLE

All commands are introduced on the table when communications are carried out via an RS-422A interface by a μR100F recorder.

9.1 Operation Mode Communication

Command	Function	Reference Page
RC	Sets the μR100F to its recording or non-recording status.	14
DS	Selects display mode for a μR100F.	14
LS	Prints a list of setting information for a μR100F.	15
CS	Sets chart speed for a μR100F.	15
SA	Sets an alarm point for a μR100F program.	16
SC	Sets time and date in a μR100F internal timer.	18
MG	Sets a message in a μR100F program.	19
MS	Prints a μR100F message.	20
DT	Holds newest MV data and time/date data in a μR100F internal memory.	20
DR	1. Outputs the MV data of a designated channel from the μR100F with DR□CH No. 2. Outputs date and time from the μR100F in DR□T.	21 22

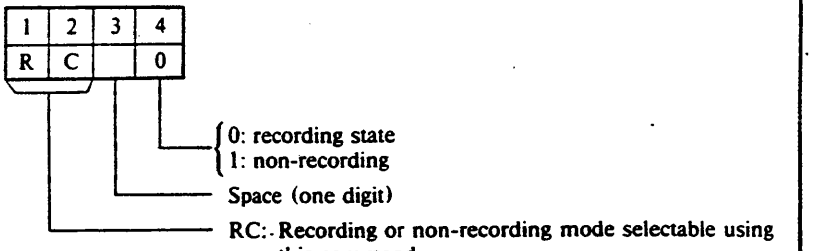
9.2 Setup Mode Communication

Command	Function	Reference Page
ST	Sets a measuring range.	23
UN	Sets engineering units.	24
PC	Sets periodical printout or alarm printout ON/OFF.	25
SR	Stores the measured and recorded data, engineering units, and set data in printout mode in the built-in memory.	25

10. COMMANDS

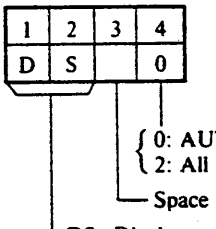
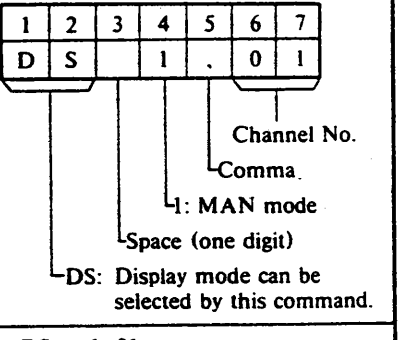
10.1 Operation Mode Communication

RC (Record. ON/OFF)

Function		Sets either a recording or non-recording state. Functions in the same way as the RCD key on a μR100F.
Data format		
Receive format	When setting	RC ␣ 0
	When reading	RC
Send format		RC ␣ 0

The setting receive format is used as a data set command. The reading receive format is used as a data read command. The send format exhibits an example of data format sent back from the μR100F. This example shows that both setting and sending are in the recording mode: 0.

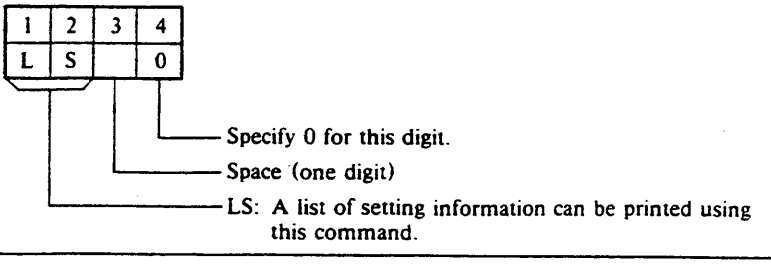
DS (Display Select)

Function		Select display mode of μR100F. Functions in the same way as μR100F re- DISPLAY mode.	
		AUTO mode	MAN mode
Data format			
Receive format	When setting	DS ␣ 0	DS ␣ 1, 01
	When reading	DS	DS
Send format		DS ␣ 0	DS ␣ 1, 01

The example shows that setting and sending are carried out in MAN mode.

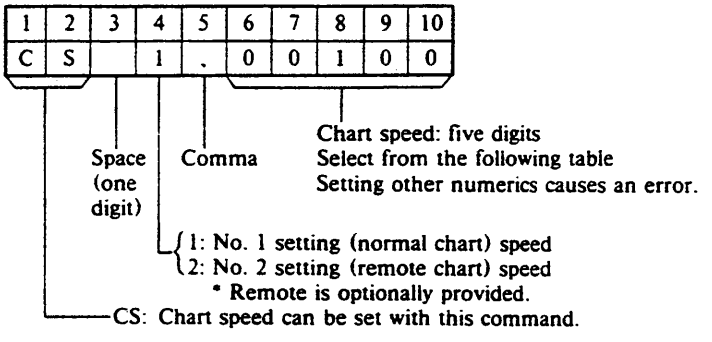
The example shows that setting and sending are in MAN mode and channel 1 is specified.

LS (List Start)

Function		Prints list of setting information for a μR100F.
Data format		
Receive format	When setting	LS ␣ 0
	When reading	None
Send format		LS ␣ 0

(Note) Even if LS␣0 is accepted during list printing, printing does not stop.

CS (Chart Speed)

Function		Sets chart speed of a μR100F (pen model).
Data format		
Receive format	When setting	CS ␣ 1,00100
	When reading	CS ␣ 1
Send format		CS ␣ 1,00100

unit: mm/h

00005	00030	00080	00240	00600	01500	04320
00006	00032	00090	00250	00675	01600	04500
00008	00036	00096	00270	00720	01800	04800
00009	00040	00100	00300	00750	02000	05400
00010	00045	00120	00320	00800	02160	06000
00012	00048	00125	00360	00900	02250	07200
00015	00050	00135	00375	00960	02400	08000
00016	00054	00150	00400	01000	02700	09000
00018	00060	00160	00450	01080	02880	10800
00020	00064	00180	00480	01200	03000	12000
00024	00072	00200	00500	01350	03600	
00025	00075	00225	00540	01440	04000	

The example shows that normal chart speed is 100 mm/h for both setting and sending.

SA (Set Alarm)

<table>
<tr><td>Function</td><td colspan="2">Alarm point of a μR100F can be set.</td></tr>
<tr><td>Data format</td><td colspan="2">
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr>
<tr><td>S</td><td>A</td><td></td><td>0</td><td>1</td><td>,</td><td>1</td><td>,</td><td>H</td><td>,</td><td>0</td><td>1</td><td>,</td><td>+</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
</table>
Space (one digit)
Comma
Comma
Comma
Comma
Alarm setting No: Specify 1 to 4.
CH No: Specify channel No. to be set (varies with the model)
Output relay No; Specify two digits
For the μR 100T, 01 to 04: (/AK-04)
- -: for none specification
Alarm set value:
Since the decimal point position varies with the measuring range, refer to the measuring range code table when setting. For example, when the measuring range is −20 to 20 V (range code 04), specify 01550 to set + 15.5 V.
Polarity: specify + or −. (This specification is the same when an alarm value is 0.)
Alarm mode:
H: High limit alarm
L: Low limit alarm
−: Alarm release
SA: Alarm set and release are carried out with this command. Alarm setting must be carried out for each measuring channel.
</td></tr>
<tr><td rowspan="2">Receive format</td><td>When setting</td><td>SA ␣ 01, 1, H, 01, −01000</td></tr>
<tr><td>When reading</td><td>SA ␣ 01, 1</td></tr>
<tr><td>Send format</td><td colspan="2">SA ␣ 01, 1, H, 01, −01000</td></tr>
</table>

The example shows that channel No.1, 1 output, high limit alarm and output relay no.1 alarm value + 1000 (decimal point varies with the range) are set for both setting and transmitting.

Refer to the Measuring Range Table (Table 10.1).

Measuring Range Table

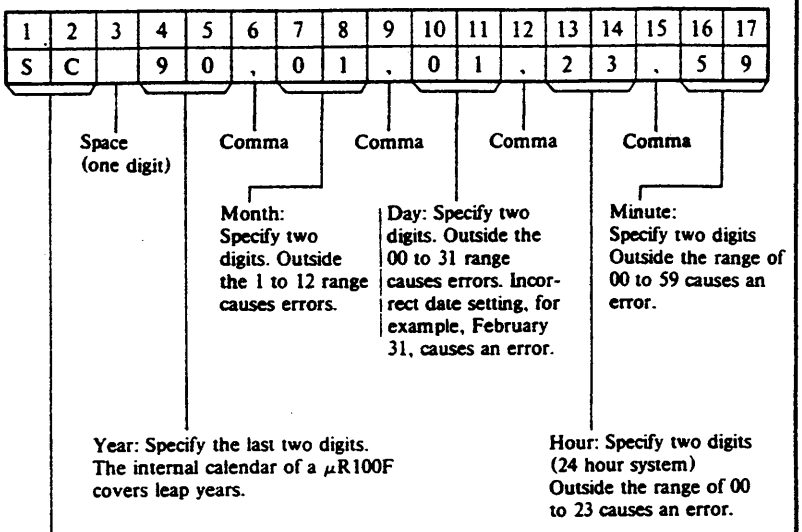
Table 10.1

Input type	Measuring range code	Measuring range (Measuring range indicates maximum value for each range code. Actually, it is set as specified (recording span).)		Decimal point position
DC voltage (Same voltage is applied for both linear scaling and square root scaling.)	□0	−20 to +20 mV		□□□.□□
	□1	−200 to +200 mV		□□□□.□
	□2	−2 to +2 V		□□.□□□
	□3	−6 to +6 V		□□.□□□
	□4	−20 to +20 V		□□□.□□
	□5	−50 to +50 V		□□□.□□
TC	10	Type R	0 to 1760°C 32 to 3200°F	□□□□.□ □□□□
	11	Type S	0 to 1760°C 32 to 3200°F	□□□□.□ □□□□
	12	Type B	400 to 1820°C 752 to 3308°F	□□□□.□ □□□□
	13	Type K	−200 to 1370°C −328 to 2498°F	□□□□.□ □□□□
	14	Type E	−200 to 800°C −328 to 1472°F	□□□□.□ □□□□.□
	15	Type J	−200 to 1100°C −328 to 2012°F	□□□□.□ □□□□.□
	16	Type T	−200 to 400°C −328 to 752°F	□□□□.□ □□□□.□
	17	Type N	0 to 1300°C 32 to 2372°F	□□□□.□ □□□□
	18	Type W	0 to 2315°C 32 to 4200°F	□□□□.□ □□□□
	19	Type L	−200 to 900°C −328 to 1652°F	□□□□.□ □□□□.□
	1A	Type U	−200 to 400°C −328 to 752°F	□□□□.□ □□□□.□
RTD	20	JPt 100	−200 to 550°C −328 to 1022°F	□□□□.□ □□□□.□
	21	Pt 100	−200 to 550°C −328 to 1022°F	□□□□.□ □□□□.□

(Note)

1. □ of measuring range code indicates
   - DC voltage range 0
   - DC voltage linear scaling range 3
   - DC voltage square root scaling range 4
2. Make sure that decimal point positions of linear scaling and square root scaling vary with the scaling value.
3. JPt 100 : JIS C 1604-1989, JIS C 1606-1989
   Pt 100 : JIS C 1604-1989, JIS C 1606-1989, DIN IEC 751, IEC 751

SC (Set Clock)

Function		Sets date and time in internal timer of a μR100F.
Data format		
Receive format	When setting	SC ␣ 90, 01, 01, 23, 59
	When reading	SC
Send format		SC ␣ 90, 01, 01, 23, 59

The example indicates that both setting and sending times are '90; 01; 01; 23; 59.

MG (MessaGe)

Function

Sets a message in a μR100F recorder.

Data format

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
M	G		M	E	S	S	A	G	E									

Message: Set one to sixteen digits
Setting seventeen digits or more causes an error. Valid alphanumerics and marks are listed on the following ASCII code table. Make certain that the ASCII code format is different from that of the personal computer that is to be used.

Space (one digit)

MG: Messages can be set with this command

ASCII Code

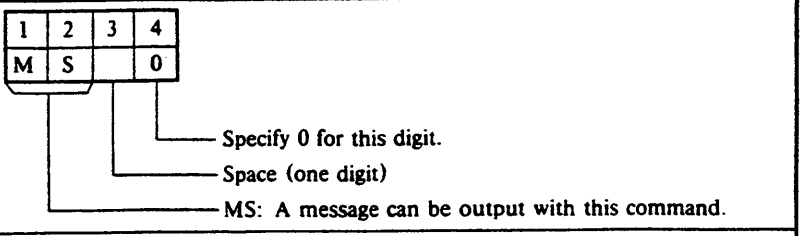
b \ a	2	3	4	5	6	7
0		0	@	P	'	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	°
C	,	<	L	△	l	Ω
D	−	=	M	]	m	μ
E	.	>	N	▽	n	−
F	/	?	O	_	o	Ω

(Note)
① When a sub-delimiter (;) is placed at the third (space), the next command can follow.
② When the setting is done with the MG, a command cannot follow with a sub-delimiter (;).

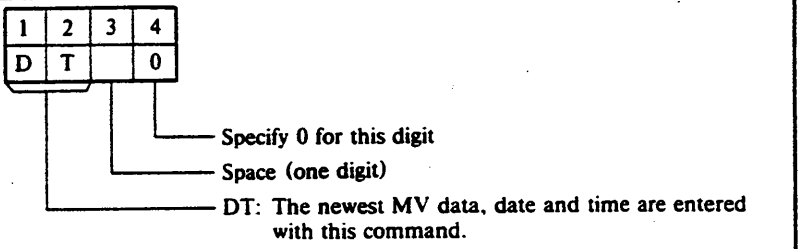
Receive format	When setting	MG ␣ MESSAGE
	When reading	MG
Send format		MG ␣ MESSAGE

The example shows that message contents are MESSAGE for both setting and transmitting.

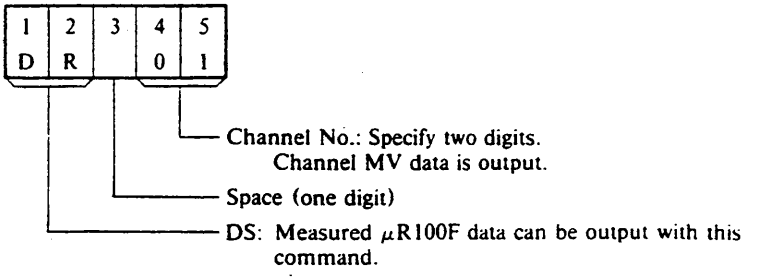
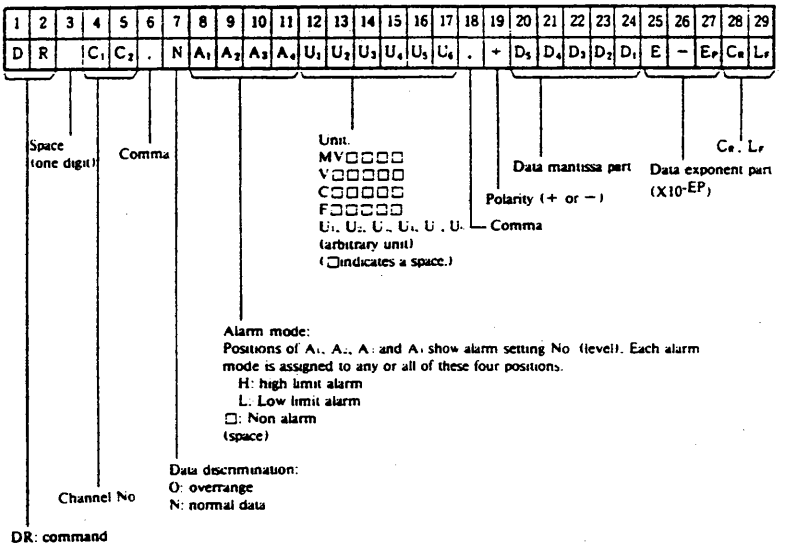
MS (MeSsage)

Function		Prints messages on a μR100F. Same as the message print out (option) by remote control
Data format		
Receive format	When setting	MS ␣ 0
	When reading	None
Send format		MS ␣ 0

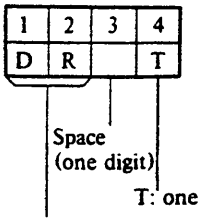
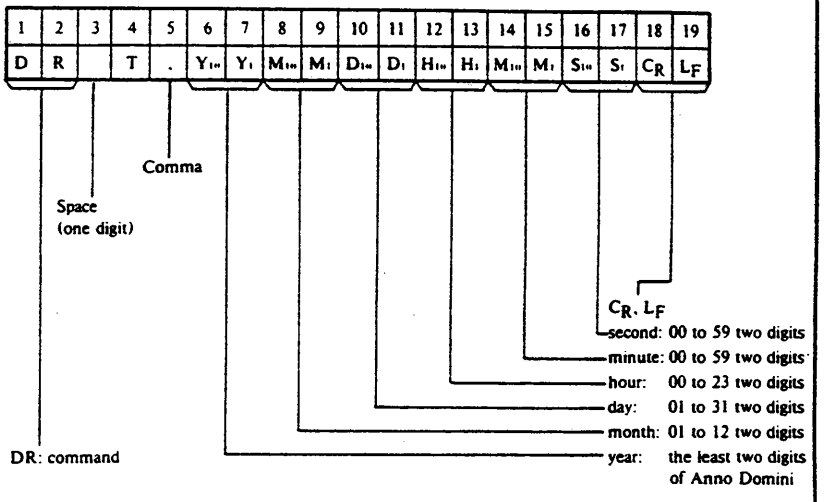
DT (Data Trigger)

Function		Enters newest MV data, date and time into the internal memory for μR100F communication.
Data format		 (Note) Data held with DT command is output to HOST with the DR command.
Receive format	When setting	DT ␣ 0
	When reading	None
Send format		DT ␣ 0

DR ..... (I) (MV data output)

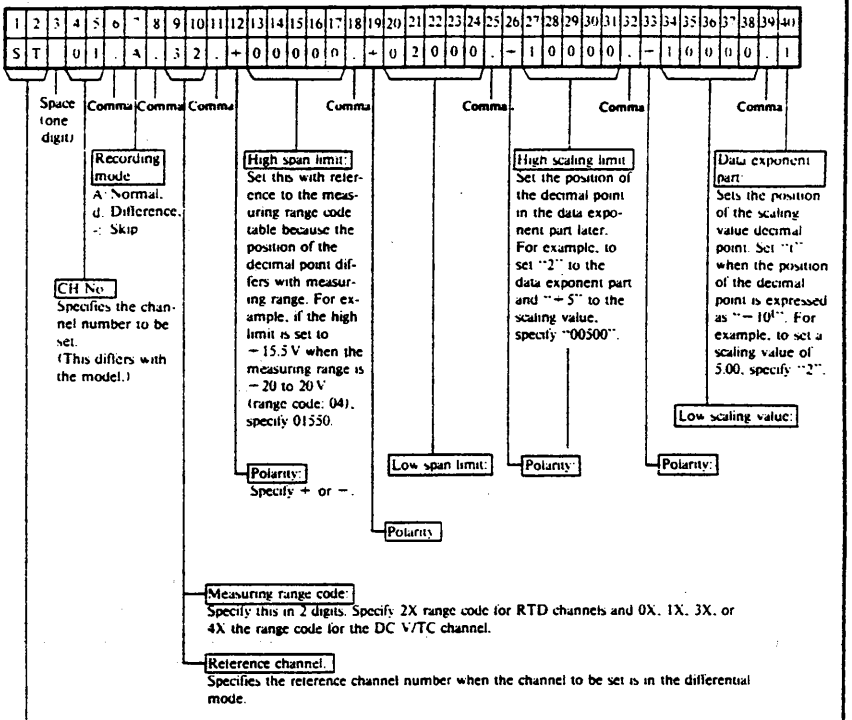
Function		MV data can be output from a μR100F.
Data format		 (Note) ① When the DT command is not executed after turning power ON and there is no send back data, DR␣ERR is sent back.
Receive format	When setting	None
	When reading	DR ␣ 01
Send format		

DR ..... (II) (date and time output)

Function		Outputs date and time data
Data format		 DR: Date and time data can be output from the μR100F with this command. (Note) Since there is no send back data when the DT command is not executed, DR␣ERR is sent back.
Receive format	When setting	None
	When reading	DR ␣ T
Send format		

10.2 Setup Mode

ST (Set Range)

<table>
<tr><td colspan="2">Function</td><td>Sets the μR100F measuring range. (Refer to Table 10.1 Measuring Range on page 18.)</td></tr>
<tr><td colspan="2">Data format</td><td> 
</td></tr>
<tr><td rowspan="2">Receive format</td><td>When setting</td><td>With scaling (range code 3□, 4□) ST ␣ 01, A, 32, +00000, +02000, +10000, −10000, 1
Without scaling ST ␣ 01, A, 02, −02000, +02000
For no measurement (skip mode) ST ␣ 01, −</td></tr>
<tr><td>When reading</td><td>ST ␣ 01</td></tr>
<tr><td colspan="2">Send format</td><td>With scaling (range code 3□, 4□) ST ␣ 01, A, 32, −01000, +01000, +10000, −10000, 1
Without scaling ST ␣ 01, A, 02, −02000, +02000
For skip mode ST ␣ 01, -</td></tr>
</table>

The above examples with scaling for both the setting and transmission indicate channel No.1, normal mode, range code 32, a span of +0.000 to +2.000 V, and a scaling value of +1000.0 to −1000.0, while the examples without scaling indicate channel No.1, normal mode, range code 02, and a span of −2.000 to +2.000 V. The examples for the skip mode show channel No.1 and skip mode. See Table 10.1 "Measuring Range."

UN (Unit)

Function

Sets engineering units in the channel set to the linear and square root extraction scaling.

Data format

1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	N		0	1	,	*	,	a	b	c	D	E	F

Space (one digit)

Comma

Comma

CH No.: Specifies the channel number to be set. Even though this function allows you to set a channel other than that for linear or square root extraction scaling, the unit is maintained to the standard (°C, mV, or V).

Fixed: Enter "*". Any other entry causes an error.

Unit: Set this with 1 to 6 digits. Setting 7 digits or more causes an error. The alphanumeric characters are limited to those shown in the ASCII Code Table below.

UN: This command sets engineering units. Set engineering units per channel.

ASCII Code

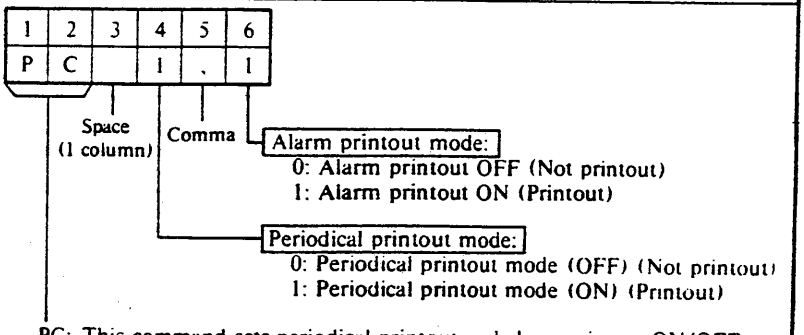
b \ a	2	3	4	5	6	7
0		0	@	P	`	p
1	!	1	A	Q	a	q
2	"	2	B	R	b	r
3	#	3	C	S	c	s
4	$	4	D	T	d	t
5	%	5	E	U	e	u
6	&	6	F	V	f	v
7	'	7	G	W	g	w
8	(	8	H	X	h	x
9	)	9	I	Y	i	y
A	*	:	J	Z	j	z
B	+	;	K	[	k	°
C	,	<	L	△	l	Ω
D	−	=	M	]	m	μ
E	.	>	N	▽	n	−
F	/	?	O	_	o	Ω

(Note)
Setting a sub-delimiter (;) to the 6th or 8th column above allows the next command to be continued. Setting a sub-delimiter (;) to the 9th or 14th column causes the function to decide that it is a unit setting, and does not allow the next command to be continued.

Receive format	When setting	UN _ 01, *, abc DEF
	When reading	UN _ 01
Send format		With unit setting: UN _ 01, *, GHIjkl Without unit setting: UN _ 01, *

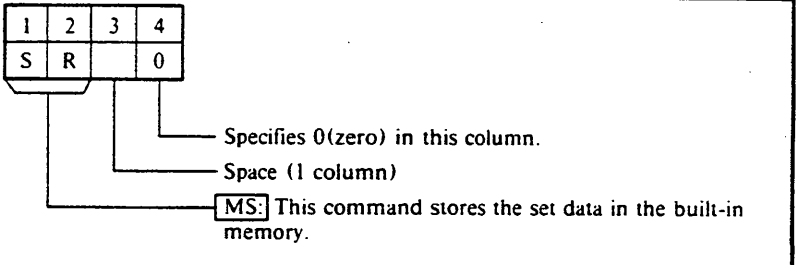
The above example shows that unit "abc DEF" has been set to channel No.1. The example of the send format with unit setting shows that unit "GHIjkl" has been set to channel No. 1. Even if a unit is set to a channel other than that for linear or square root extraction scaling, setting will be invalid and the unit to be printed out and displayed will correspond to the unit meeting each range.

PC (Print Control)

Function		Sets μR100F periodical printout and alarm printout ON/OFF.
Data format		
Receive format	When setting	PC ␣ 1, 1
	When reading	PC
Send format		PC ␣ 1, 1

(Note) Both the above setting and transmission examples show periodical printout and alarm printout ON.

SR (Store)

Function		Stores the contents set in measuring/recording setting, unit setting and printout mode setting.
Data format		
Receive format	When setting	SR ␣ 0
	When reading	None
Send format		When data has been stored in the built-in memory. SR ␣ 0 When data has not been stored in the built-in memory. SR ␣ ERR

(Note) Use this command by setting μR100F DIP switch No. 6 to ON.
If an invalid DIP switch is set, data cannot be stored in the built-in memory and "SR ERR" will be sent. In this case, set the DIP switch correctly before executing this command again. After data has been stored in the built-in memory, return the DIP switch to its original position.

11. ERROR MESSAGE

Error Message	Error	Contents
ERR□101	Format error	Third byte of a communication frame is neither SPC or CR.
ERR□102	Illegal command	A command (two bytes) is not defined.
ERR□103	Data error	Invalid character is placed in the data (others than 2H to 7FH)
ERR□104	Data over	Number of data exceeds the restriction.
ERR□105	Digits over	More than sixteen characters are entered for one data.
ERR□106	Command frame over	More than 254 characters are entered.
ERR□200	Connection error	Framing error such as parity and number of bits (only displayed in ADDRESSED STATE).
ERR□900	Response overflow	Since the response character string exceeds 254 characters, response is impossible. Commands are valid.

12. PROGRAM EXAMPLE

PC 9801 (NEC) is used.

1. Data trigger, reading time and data

```
100 OPEN "COM:N81NN" AS #1
110 '
120 A$=CHR$(&H1B)+"O 01"
130 PRINT #1,A$
140 LINE INPUT #1,D$
150 '
160 PRINT #1,"DT 0"
170 LINE INPUT #1,D$
180 PRINT D$
190 '
200 PRINT #1,"DR T"
210 LINE INPUT #1,D$
220 PRINT D$
230 '
240 PRINT #1,"DR 01"
250 LINE INPUT #1,D$
260 PRINT D$
270 '
280 A$=CHR$(&H1B)+"C 01"
290 PRINT #1,A$
300 LINE INPUT #1,D$
310 CLOSE
```

OPEN a communication file

} Send " ESC 0␣01": Start communication
Receive send back data

Send "DT␣0": Trigger data

{ Receive send back data
{ Display receive data

Send "DR␣T": Read time data

{ Receive send back data
{ Display receive data

Send "DR␣01": Read data of 1 channel

{ Receive send back data
{ Display receive data

} Send " ESC C␣01": Ends communication
Receive send back data
Close communication file

2. Setting · 1 Recording mode ON

```
100 OPEN "COM:N81NN" AS #1
110 '
120 A$=CHR$(&H1B)+"O 01"
130 PRINT #1,A$
140 LINE INPUT #1,D$
150 '
160 PRINT #1,"RC 0"
170 LINE INPUT #1,D$
180 PRINT D$
190 '
200 A$=CHR$(&H1B)+"C 01"
210 PRINT #1,A$
220 LINE INPUT #1,D$
230 CLOSE
```

Send "RC␣0": Send record ON instruction

{ Receive send back data
{ Display receive data

3. Setting · Time setting

```
100 OPEN "COM:N81NN" AS #1
110 '
120 A$=CHR$(&H1B)+"O 01"
130 PRINT #1,A$
140 LINE INPUT #1,D$
150 '
160 PRINT #1,"SC 90,01,01,23,59"
170 LINE INPUT #1,D$
180 PRINT D$
190 '
200 A$=CHR$(&H1B)+"C 01"
210 PRINT #1,A$
220 LINE INPUT #1,D$
230 CLOSE
```

Send "SC␣90, 01, 01, 23, 59":
' Receive send back data
Display receive data

4. Reading time

```
100 OPEN "COM:N81NN" AS #1
110 '
120 A$=CHR$(&H1B)+"O 01"
130 PRINT #1,A$
140 LINE INPUT #1,D$
150 '
160 PRINT #1,"SC"
170 LINE INPUT #1,D$
180 PRINT D$
190 '
200 A$=CHR$(&H1B)+"C 01"
210 PRINT #1,A$
220 LINE INPUT #1,D$
230 CLOSE
```

Send "SC": Send time reading data
Receive send back data
Display receive data

5. Example of a program to which timeout

When send back data does not return, the whole system stops. The following is an example of a program to which time out handling is added to prevent the above from occurring.

When send back data does not return after a period of time, "TIME OUT" is displayed and the system proceeds to the next statement.

A re-attempt system, whichs resends the same command again, is also possible.

```
10 '=================================================================
20 'URT  COMMUNICATUON PROGRAM if time out then print "TIME OUT" & end
30 '=================================================================
40 ON COM GOSUB *INTCOM :COM ON :FLAG=0
50 A$=CHR$(&H1B)+"O 01"
60 PRINT #1,A$
70 GOSUB *INPWAIT
80 IF FLAG=1 THEN GOTO 90  ELSE PRINT "TIME OUT":GOTO 210
90 LINE INPUT #1,D$:FLAG=0
100  C$="DS 0"
110 PRINT #1,C$
120 GOSUB *INPWAIT
130 IF FLAG=1 THEN GOTO 140  ELSE PRINT "TIME OUT":GOTO 210
140 LINE INPUT #1,D$:FLAG=0
150 PRINT D$
160 A$=CHR$(&H1B)+"C 01"
170 PRINT #1,A$
180 GOSUB *INPWAIT
190 IF FLAG=1 THEN GOTO 200  ELSE PRINT "TIME OUT":GOTO 210
200 LINE INPUT #1,D$:FLAG=0
210 CLOSE
220 END
230 *INPWAIT
240   FOR I=0 TO 10000
250     IF FLAG=1 THEN RETURN
260   NEXT
270  RETURN
280 *INTCOM
290   BEEP 1
300   I=9950
310   FLAG=1
320   BEEP 0
330  RETURN
```