CHAPTER VIII EXTERNAL CONTROL INTERFACE

8-1 GENERAL

Besides the GP-IB and RS-232-C interfaces, the instrument has an external control interface and relay drive output. The dedicated connector is provided on the rear panel. Given below is a general introduction of the basic function.

8-1-1 External control interface function

The following functions are available by using the *EXT CONTROL I/O* connector.

(a) Remote sequential recall

Memory sequential recall can be remotely controlled from the outside.

(b) Remote modify

Modification of an RF frequency or output level can be remotely controlled with an external rotary encoder.

(c) Remote direct recall

Memory direct recall can be remotely controlled from the outside.

(d) Control output

The TTL output signal of 8 bits × 2 ports for external device control is available.

(e) Print out of memory contents (list output)

The preset memory contents can be printed out to a printer.

(f) Data read

The 8-bit TTL signal externally applied can be read with the GP-IB controller.

8-1-2 Relay drive output function

A drive signal is obtained from the *DRIVE OUTPUT* connector, which reverses between HIGH and LOW according to whether the frequency is higher or lower than the preset reverse frequency.

If the drive output is HIGH, a signal of +5 V, 50 mA is obtained. The signal can be used to drive a small reed relay and control a signal switch or dummy antenna switch.

8-2 EXT CONTROL I/O CONNECTOR

Figure 8-1 shows the pin connection of the ***EXT CONTROL I/O*** connector and Table 8-1 shows the pin function.

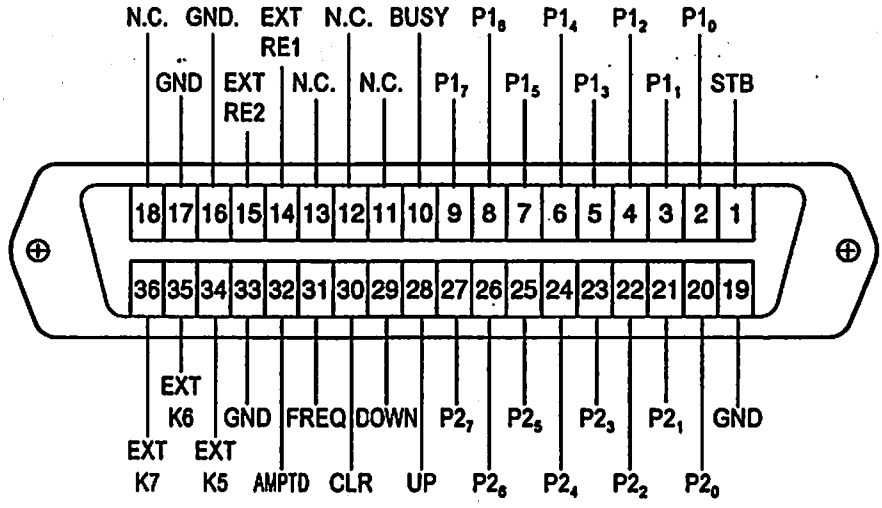


Figure 8-1 ***EXT CONTROL I/O*** connector pin assignment

■ NOTE

Use a shield-type 36-pin plug and cable for connection. An unshielded plug or cable may cause an error due to electrostatic interference.

Table 8-1 Pin function

Number	Name	Function
1	STB	Input terminal for a timing pulse to read address data in memory direct recall, or for a printer acknowledge signal in memory list output.
2 to 9	$P1_0$ to $P1_7$	Input / output terminal for 8-bit data used in control output, memory direct recall, and, memory list output functions. (port 1)
10	BUSY	Output terminal for a signal informing that the generator cannot receive data during memory direct recall, or for a strobe signal from the generator to the printer in memory list output.
11 to 13	N.C.	Not connected to the internal circuit.
14	EXT RE1	External rotary encoder terminal 1. (Corresponding to the ***MODIFY*** knob)
15	EXT RE2	External rotary encoder terminal 2. (Corresponding to the ***MODIFY*** knob)
16	GND	Frame ground
17	GND	Frame ground
18	N.C.	Not connected to the internal circuit.
19	GND	Frame ground
20 to 27	$P2_0$ to $P2_7$	Input / output terminal for 8-bit data used in control output and data read functions. (port 2)

Table 8-1 Pin function (cont'd)

Number	Name	Function
28	UP	AUTO/MANU [⇧] key input terminal for sequential recall.
29	DOWN	COPY [⇩] key input terminal for sequential recall.
30	CLR	*CLR* key input terminal for sequential recall.
31	FREQ	*FREQ* key of the *FUNCTION* block input terminal.
32	AMPTD	*AMPTD* key of the *FUNCTION* block input terminal.
33	GND	Frame ground
34 to 36	EXT K5 to K7	Spare pins. Do not connect to any external devices.

8-3 MODE SETTING

Use panel keys to set the mode for the EXT CONTROL I/O interface.

The selected mode for the EXT CONTROL I/O interface is displayed with other I/O mode parameters only during the setup and verification operations.

Given below are the relationship between the numeric values of P1 and P2 and modes.

P1	Mode
0	Control output
1	Memory direct recall
2	Memory list output

P2	Mode
0	Control output
1	Data read

Ex. Verifying the EXT CONTROL I/O interface mode

1 Press the SHIFT [O] key.

2 Press the I/O MODE [0] key.

SP A2 A1 TL P1 P2 AS

The digits P1 and P2 in the *FREQUENCY* readout display the modes of port 1 and 2 of the EXT CONTROL I/O interface, respectively.

■ NOTE

After pressing the I/O MODE [0] key, operating any key and knob other than the mentioned under turns the *I/O* light off; i.e. the generator returns to the normal setting state.

Ex. Setting the mode of P1 to memory direct recall "1"

1 Press the SHIFT [O] key.

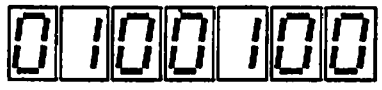
2 Press the I/O MODE [0] key.

3 Specify either P1 or P2 digit with the ΔF OFF [⇦] ΔdB OFF [⇨] keys.

The currently specified digit is displayed blinking.

4 Enter a mode number with *DATA* keys.

[1]



5 Press the ENTER [O] key.

6 Press the ***POWER*** switch.

Turn the power off.

7 Press the ***POWER*** switch.

Again turn the power on.

■ NOTE

The setting procedure is completed by turning the ***POWER*** switch off and then on. Note that if this step is omitted, the generator will maintain the previous setting.

8-4 COMMON ITEMS ON EVERY OPERATION

The external control interface is a TTL-logic control I/O. Described in this paragraph are signals common to every EXTERNAL CONTROL interface operation.

Input signal

An input signal is a TTL-level logic signal. Since each input connector pin is internally pulled up to +5 V, the applied signal is switched between HIGH and LOW by making the input connector pin and GND terminal open or short-circuited.

Output signal

An output signal is also a TTL-level logic signal. The output fan-out of each connector is 1 (LS-TTL).

8-5 REMOTE SEQUENTIAL RECALL

This function remotely controls UP (AUTO/MANU ⇧), DOWN (COPY ⇩), and CLR (LIST CLR) of assorted preset memory.

8-5-1 Connector pins used

Number	Name	Function
28	UP	Connects the UP (AUTO/MANU ⇧) signal.
29	DOWN	Connects the DOWN (COPY ⇩) signal.
30	CLR	Connects the CLR (LIST CLR) signal.
33	GND	Frame ground

8-5-2 Specifications for electrical operation

The UP, DOWN, or CLR operation of the memory is activated at the rising edge where the signal applied to the UP, DOWN, or CLR connector changes from LOW to HIGH. The timing condition is shown in Figure 8-2.

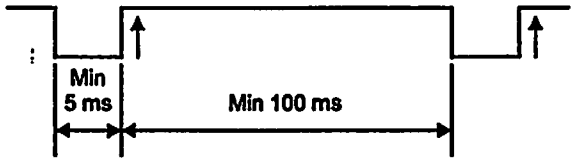


Figure 8-2 Timing diagram for the control signal of the preset memory

8-6 REMOTE MODIFY

This function remotely controls the modifying operation with the rotary encoder (***MODIFY***).

8-6-1 Connector pins used

Number	Name	Function
14	EXT RE1	External rotary encoder terminal 1 (Corresponding to the ***MODIFY*** knob).
15	EXT RE2	External rotary encoder terminal 2 (Corresponding to the ***MODIFY*** knob).
31	FREQ	***FREQ*** key input terminal.
32	AMPTD	***AMPTD*** key input terminal.
33	GND	Frame ground

8-6-2 Specifications for electrical operation

The external rotary encoder terminals 1 and 2 can be used for frequency (FREQ) control or output level (AMPTD) control.

The FREQ control or AMPTD control is selected at the rising edge where the pulse applied to the each pin changes from LOW to HIGH. The timing condition is same as that shown in Figure 8-2.

Use a rotary encoder of contact type dual-phase output to connect to EXT RE1 and EXT RE2. Figure 8-3 shows the timing conditions for a modify signal.

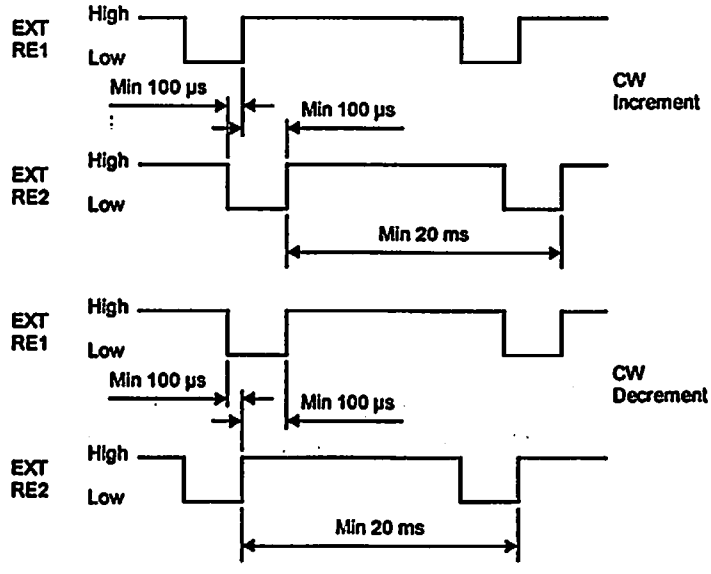


Figure 8-3 Timing diagram for a modify signal

8-7 REMOTE DIRECT RECALL

This function remotely controls the memory direct recall.

8-7-1 Connector pins used

Number	Name	Function
1	STB	Connects a timing pulse for reading data.
2 to 9	$P1_0$ to $P1_7$	Connects address data. (port 1)
10	BUSY	Outputs a signal informing the generator cannot receive data.
19	GND	Frame ground

8-7-2 Specifications for electrical operation

For the pins $P1_0$ to $P1_7$, set the address data of 00 to 99 in BCD code. Given below are the relationship between a signal to be applied to each connector pin and its address data.

Input signal								Address data
$P1_7$	$P1_6$	$P1_5$	$P1_4$	$P1_3$	$P1_2$	$P1_1$	$P1_0$	
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
0	0	0	0	1	0	0	1	9
0	0	0	1	0	0	0	0	10
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	0	0	1	1	0	0	1	99

0: Low (= 0 V) 1: High (= 5 V)

After the address data is set, applying a timing pulse to the STB pin causes the memory at the set address to be recalled. Figure 8-4 shows the timing condition for each connector.

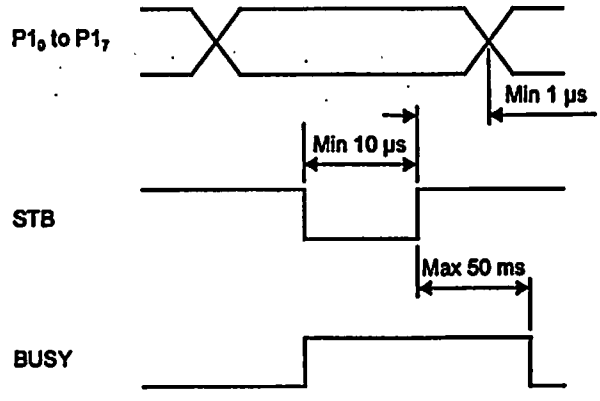


Figure 8-4 Timing diagram for address data

8-8 CONTROL OUTPUT

This function provides TLL signals of up to 8 bits × 2 ports for external device control.

8-8-1 Connector pins used

Number	Name	Function
2 to 9	$P1_0$ to $P1_7$	Outputs 8-bit data (port 1)
20 to 27	$P2_0$ to $P2_7$	Outputs 8-bit data (port 2)
19	GND	Frame ground

8-8-2 Readout

The set value for the control output signal is displayed in the *FREQUENCY* readout only during the setting and verifying operations. The readout value denotes the 8-bit data of port 1 or port2, which is expressed as decimal data of 0 to 255 with $P1_0$ or $P2_0$ considered as LSB and $P1_7$ or $P2_7$ as MSB. Given below are the set values and the signals obtained from the *EXT CONTROL I/O* connector.

Set value	Output signal							
	$P1_7/P2_7$	$P1_6/P2_6$	$P1_5/P2_5$	$P1_4/P2_4$	$P1_3/P2_3$	$P1_2/P2_2$	$P1_1/P2_1$	$P1_0/P2_0$
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
254	1	1	1	1	1	1	1	0
255	1	1	1	1	1	1	1	1

0: Low (= 0 V) 1: High (= 5 V)

8-8-3 Operating procedure

Ex. Setting control for port 1 and 2

1 Press the SHIFT [O] key.

2 Press the PORT 1 [2] key.

3 Enter a numeric value with *DATA* keys.

[1] [2]

■ NOTE

You cannot enter numerical values when the *I/O* light goes out.

4 Press the ENTER key.

5 Press the SHIFT key.

6 Press the PORT 2 key.

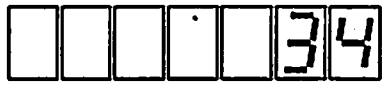
7 Enter a numeric value with *DATA* keys.

3 4

■ NOTE

You cannot enter numerical values when the *I/O* light goes out.

8 Press the ENTER key.



■ NOTE

Operating any key and knob other than the ΔF OFF ΔdB OFF key turns the *I/O* light off; i.e. the generator returns to the normal setting mode.

8-8-4 GP-IB program code

The setup of a control output signal can be controlled through the GP-IB. Table 8-2 gives the GP-IB program codes for control output.

Table 8-2 GP-IB program codes for control output

Header code	Data code	Unit code	Description
P1 or P2	B00000000 to B11111111		Sets control output for port 1 / port 2 in binary data.
	H00 to HFF		Sets control output for port 1 / port 2 in hexadecimal data.
	D0 to D255		Sets control output for port 1 / port 2 in decimal data.
	S0 to S7		Sets (to 1) the specified bit of port 1 / port 2.
	R0 to R7		Resets (to 0) the specified bit of port 1 / port 2.

8-9 PRINT OUT OF MEMORY CONTENTS (LIST OUTPUT)

This function can output all or part of the assorted preset memory contents to a Centronics printer.

8-9-1 Connector pins used

Number	Name	Function
1	STB	Connects an acknowledge signal from a printer.
2 to 9	$P1_0$ to $P1_7$	Outputs data to a printer. (port 1)
10	BUSY	Outputs a strobe signal to a printer
19	GND	Frame ground

	Connector pin assignment										
Printer	1	2	3	4	5	6	7	8	9	10	19
The signal generator	10	2	3	4	5	6	7	8	9	1	19

The other pins are N.C.

8-9-2 Operating procedure

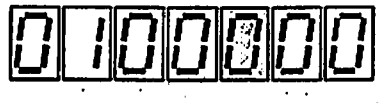
EX. Memory list output

1 Press the SHIFT [O] key.

2 Press the I/O MODE [0] key.

The digits P1 and P2 display the modes of port 1 and 2 of the EXT CONTROL I/O interface, respectively.

3 Specify P1 digit with the ⊿F OFF [⇦] ⊿dB OFF [⇨] keys.



The currently specified digit is displayed blinking.

4 Press the [2] key.

5 Press the ENTER [O] key.

6 Press the *POWER* switch.

Turn the power off.

7 Press the *POWER* switch.

Again turn the power on.

8 Press the SHIFT [O] key.

9 Press the STO [RCL] key.

10 Press the PORT 2 [.] key.

11 Enter a start address with *DATA* keys.

[1] [2]

12 Press the PORT 2 [.] key.

13 Enter an end address with *DATA* keys.

[3] [4]

14 Press the ENTER [O] key.

15 Press the SHIFT [O] key.

16 Press the LIST [CLR] key.

■ NOTE

During the execution of listing, the SHIFT [O] key light is turned on and every panel operation is disabled. Upon completion of the listing, the key light is turned off and the panel operation will be enabled again.

[VP-8192A list output example]

Memory address: 00, Frequency: 140 MHz, RF Amplitude: 126 dBμV, AM: 10 % (INT 1 kHz / OFF), FM: 75 kHz (INT 1 kHz / ON), Drive output inversion frequency: 100 MHz, FUNCTION block: FREQ, EXT I/O P1 output data: 100, P2 output data: 200.

```
ADDRESS        00
FREQUENCY      : 140.000 0 MHz        dF :  0.000 0 MHz
AMPLITUDE      : 126 dBuV             ddB :  0.0 dB
AM             : 10.0 %           SOURCE :  1 k OFF
FM             : 75.0 kHz         SOURCE :  1 k ON
DRIVE OUTPUT   : 100 MHz
FUNCTION       : FREQ
I/O MODE       PORT1 : 100        PORT 2 :  200
```

[VP-8193A list output example]

Memory address: 00, Frequency: 140 MHz, RF Amplitude: 126 dBμV, AM: 10 % (INT 1 kHz / OFF), FM: 75 kHz (INT 1 kHz / ON), Drive output inversion frequency: 100 MHz, FUNCTION block: FREQ, Modulation mode: MONO, Pilot level: 15 % (OFF), Pre-emphasis: 75 μs, EXT I/O P1 output data: 100, P2 output data: 200.

```
ADDRESS          00
FREQUENCY        : 140.000 0 MHz          dF :  0.000 0 MHz
AMPLITUDE        : 126 dBuV               ddB :  0.0 dB
AM               : 10.0 %            SOURCE :  1 k OFF
FM               : 75.0 kHz          SOURCE :  1 k ON
DDS FREQUENCY    : 20.000 kHz
DRIVE OUTPUT     : 100 MHz
FUNCTION         : FREQ
STEREO MODE      : MONO
PILOT LEVEL      : 15.0 %   OFF
PRE EMPHASIS     : 75 us
I/O MODE         PORT1 : 100          PORT 2 :  200
```

[VP-8194A list output example]

Memory address: 00, Frequency: 140 MHz, RF Amplitude: 126 dBμV, AM: 10 % (INT 400 Hz / OFF), FM modulation ratio: 127 % (INT 400 Hz / ON), DDS frequency: 20 kHz, Drive output inversion frequency: 100 MHz, FUNCTION block: FREQ, Modulation mode: L=R, Pilot level: 15 % (OFF), Pre-emphasis: 75 μs, EXT I/O P1 output data: 100, P2 output data: 200, RDS level: 9.9 % (OFF), RDS pattern: F、RDS sub carrier phase: 90°, ARI SK level 9.9 % (OFF), ARI BK modulation ratio: 80 % (OFF), ARI BK code: F、ARI DK modulation ratio: 40 % (OFF).

```
ADDRESS          00
FREQUENCY        : 140.000 0 MHz          dF :  0.000 0 MHz
AMPLITUDE        : 126 dBuV               ddB :  0.0 dB
AM               : 10.0 %            SOURCE :  400 OFF
FM               : 127 %             SOURCE :  400 ON
DDS FREQUENCY    : 20.000 kHz
DRIVE OUTPUT     : 100 MHz
FUNCTION         : FREQ
STEREO MODE      : L=R
PILOT LEVEL      : 15.0 %   OFF
PRE EMPHASIS     : 75 us
I/O MODE         PORT1 : 100          PORT 2 :  200
RDS              : 9.9 %    OFF    PAT : F   PHASE : 90 deg
ARI_SK           : 9.9 %    OFF
ARI_BK           : 80 %     OFF   CODE : F
ARI_DK           : 40 %     OFF
```

8-10 DATA READ

The GP-IB allows reading the 8-bit TTL-level data supplied to the *EXT CONTROL I/O* connector.

8-10-1 Connector pins used

Number	Name	Function
20 to 27	$P2_0$ to $P2_7$	Connects 8-bit data (port 2)
19	GND	Frame ground

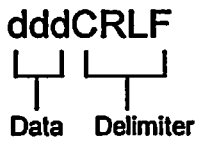
8-10-2 Data output format

Data sent out over the GP-IB bus is obtained by converting the 8-bit signal applied to port 2 into decimal notation with $P2_0$ regarded as LSB and $P2_7$ as MSB. Given below are input signals at port 2 and the data sent out.

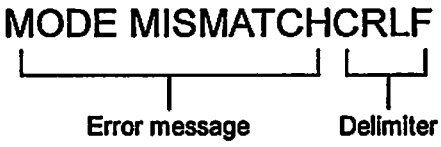
Input signal								Data sent out
$P2_7$	$P2_6$	$P2_5$	$P2_4$	$P2_3$	$P2_2$	$P2_1$	$P2_0$	
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	1	1	1	1	1	1	0	254
1	1	1	1	1	1	1	1	255

0: Low (= 0 V) 1: High (= 5 V)

Data are sent out in 7-bit ASCII code with the delimiters EOI and LF simultaneously. The output format is:



If port 2 is not in the data read mode and the generator has been assigned a talker, the following error message will be sent out.



8-10-3 Operating procedure

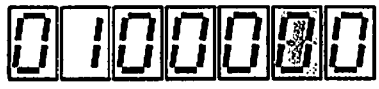
Ex. Operation in the data read mode

1 Press the SHIFT [0] key.

2 Press the I/O MODE [0] key.

The digits P1 and P2 display the modes of port 1 and 2 of the EXT CONTROL I/O interface, respectively.

3 Specify P2 digit with the ⊿F OFF [⇦] ⊿dB OFF [⇨] keys.



The currently specified digit is displayed blinking.

4 Press the [1] key.

5 Press the ENTER [0] key.

6 Press the *POWER* switch.

Turn the power off.

7 Press the *POWER* switch.

Again turn the power on.

8 Connect the desired signal to be read to $P2_0$ to $P2_7$ of the generator's *EXT CONTROL I/O* connector.

9 Connect the generator to the controller with the GP-IB interface.

10 Send the program code TM1 from the controller to the generator.

11 On the controller, assign the generator a talker.

The data of current P2o to $P2_7$ will be sent out to the controller.

8-11 RELAY DRIVE OUTPUT

A drive output signal can be obtained from the ***DRIVE OUTPUT*** connector on the rear panel. The signal reverses between HIGH and LOW according to whether the frequency (F) is higher or lower than the preset reverse frequency (FR).

When the drive output is HIGH, a +5 V / 50 mA signal can be obtained to drive a small reed relay.

The signal is used for controlling a signal switch or dummy antenna switch. The setting range / resolution of the reverse frequency are:

0 MHz to 140 MHz / 1 MHz

The reverse frequency can be set with a minus (-) sign for an action reverse to that obtained when the reverse frequency is set without a minus sign.

Table 8-3 show the relationship among a reverse frequency set value, RF frequency condition, and drive output signal obtained.

Table 8-3 Frequency and drive signal

Reverse frequency	Condition set value	Drive output
set value Fr without a minus sign	F<Fr	Low
	F≧Fr	High
Set value Fr with a minus sign	F<Fr	High
	F≧Fr	Low

8-11-1 Output connector

A drive output signal is obtained from the ***DRIVE OUTPUT*** connector on the rear panel. The connector is an RCA-type pin connector whose center conductor provides an output signal and outer conductor is connected to the frame ground. Connect the center conductor of the ***DRIVE OUTPUT*** connector with the + terminal of the coil of the relay to be controlled. Also connect the outer conductor with the − terminal of the coil. If the coil of the relay to be controlled has no polarity, connect the center conductor of the ***DRIVE OUTPUT*** connector with one terminal of the coil, and the outer conductor with the other terminal.

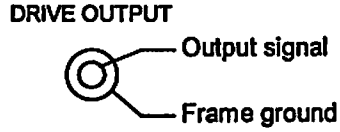


Figure 8-5 Drive output connector

8-11-2 Operating procedure

Ex. Setting a reverse frequency

1 Press the SHIFT [O] key.

2 Press the DRIVE [4] key.

3 Enter an RF frequency value with *DATA* keys.

[−] [1] [2] [3]

> ■ NOTE
> You cannot enter numerical values when the *I/O* light goes out.

4 Press the ENTER [O] key.

8-11-3 GP-IB program code

The GP-IB control is available for setting the reverse frequency of the relay drive output. Table 8-4 gives the GP-IB program codes for setting the reverse frequency.

Table 8-4 GP-IB program codes for reverse frequency setting

Header code	Data code	Unit code	Description
DR	0 to 140		When RF frequency < reverse frequency, drive output is Low. When RF frequency ≧ reverse frequency, drive output is High.
	−0 to −140		Ignoring a minus sign, When RF frequency < reverse frequency, drive output is High. When RF frequency ≧ reverse frequency, drive output is Low.

CHAPTER IX MAINTENANCE

9-1 CLEANING

Clean panels and covers with a dry soft cloth. For stubborn dirt, use a cloth moistened with a small amount of neutral detergent and then wipe with a dry cloth.

Do not use a chemically treated cloth or an organic solvent such as lacquer thinner or benzene.

9-2 JUDGMENT FOR MEMORY BACKUP

If the operation panel fails to have the same settings as when the power was last turned off, the memory backup function may be defective. For remedy, contact the dealer or representative from which you purchased the product.

9-3 CALIBRATION OR SERVICE

If inspection or calibration to maintain the specified performance is desired contact the dealer or representative from which you purchased the product.

Any problems with operation breakdowns should also be immediately reported to the dealer or representative.

9-4 DAILY MAINTENANCE

This instrument has no moving parts that require lubrication or inspection, so no daily maintenance is necessary.

9-5 TRANSPORTATION AND STORAGE

When transporting the instrument, protect it with a package comparable to the one in which it was delivered.

If it is not going to be used for a long time, wrap it in a plastic sheet to prevent dust intrusion and store it away from heat and humidity.

APPENDIX

Given below are the GP-IB program codes and VP-8174A compatible commands.

APPENDIX 1 GP-IB PROGRAM CODE LIST

Header code	Data code	Unit code	Description
FR	0.100 0 to 140.000 0		Specifies an RF frequency.
AP or LE	−20.0 to 126.0		Specifies an output level.
	ON		Turns the output signal ON.
	OF		Turns the output signal OFF.
AM			Selects amplitude modulation.
	ON		Turns amplitude modulation ON.
	OF		Turns amplitude modulation OFF.
	TO		Sets an amplitude modulation signal to INT.
	XD		Sets an amplitude modulation signal to EXT.
	TD		Sets an amplitude modulation signal to DDS.
	0.0 to 100		Specifies an amplitude modulation degree.
FM			Selects frequency modulation.
	ON		FM-related settings are reset.
	OF		FM-related settings are all turned OFF.
	TO		Sets a frequency modulation signal to INT.
	XD		Sets a frequency modulation signal to EXT.
	TD		Sets a frequency modulation signal to DDS.
	0.0 to 100	(KZ)	Specifies an FM deviation.
	0.0 to 127	(PC)	Specifies a frequency modulation ratio.
TO	1		Sets the frequency of the internal RC oscillator to 1 kHz.
	4		Sets the frequency of the internal RC oscillator to 400 Hz.
MS	1		Sets a modulation mode to FM MONO.
	2		Sets a modulation mode to FM stereo L=R.
	3		Sets a modulation mode to FM stereo L.
	4		Sets a modulation mode to FM stereo R.
	5		Sets a modulation mode to FM stereo L=−R.
	ON		Turns FM modulation ON. (Same feature as *FM-SIG* key)
	OF		Turns FM modulation OFF. (Same feature as *FM-SIG* key)
PL	ON		Turns a pilot signal ON.
	OF		Turns a pilot signal OFF.
	0.0 to 15.0		Sets a pilot signal level to 0.0% to 15.0 %.
PR	0		Turns pre-emphasis OFF.
	1		Sets a time constant to 25 µs.
	2		Sets a time constant to 50 µs.
	3		Sets a time constant to 75 µs.

The unit codes in parentheses can be omitted.

Header code	Data code	Unit code	Description
DF	0.020 to 20.000	(KZ)	Sets DDS frequency.
RD	ON		Turns an RDS signal ON.
	OF		Turns an RDS signal OFF.
	0.0 to 10	PC	Specifies an RDS signal level
	NULL		Selects the pattern data Null.
	SC		Selects the pattern data Sc.
	0 to F		Selects a registered pattern data. (among the pattern 0 to 15)
	P0		Sets a sub-carrier phase to 0°.
	P9		Sets a sub-carrier phase to 90°.
SK	ON		Turns ARI SK signal ON.
	OF		Turns ARI SK signal OFF.
	0.0 to 10	(PC)	Specifies an ARI SK signal level.
DK	ON		Turns ARI DK signal ON.
	OF		Turns ARI DK signal OFF.
	0 to 40	(PC)	Specifies the AM degree of an ARI DK signal
BK	ON		Turns ARI BK signal ON.
	OF		Turns ARI BK signal OFF.
	0 to 80	(PC)	Specifies the AM degree of an ARI BK signal
	A to F		Specifies the code data of an ARI BK signal.
RC	00 to 99		Recalls a preset memory.
ST	00 to 99		Stores settings in the preset memory.
NT	t		Specifies an interval time for the currently displayed address to t (s).
	t-a1-a2		Specifies an interval time for the addresses a1 to a2 to t (s).
	t- -		Specifies an interval time for the start to stop addresses to t (s).
AS	0		Sets the operation mode to Repeat up.
	1		Sets the operation mode to Single up.
	2		Sets the operation mode to Repeat down.
	3		Sets the operation mode to Single down.
P1 or P2	B00000000 to B11111111		Sets control output for port 1 or 2 in binary data.
	H00 to HFF		Sets control output for port 1 or 2 in hexa-decimal data.
	D0 to D255		Sets control output for port 1 or 2 in decimal data.
	S0 to S7		Sets (to 1) the specified bit of port 1 or 2.
	R0 to R7		Resets (to 0) the specified bit of port 1 or 2.
DR	0 to 140		Sets the reverse frequency of the relay drive.
	−0 to −140		Sets the reverse frequency of the relay drive.
TM	0		Sends out the operation setup.
	1		Sends out the port 2 input data.
PI	1		Turns LEDs OFF.
	0		Turns LEDs ON.

The unit codes in parentheses can be omitted.

APPENDIX 2 VP-8174A COMPATIBLE COMMANDS (VP-8193A only)

Header code	Data code	Unit code	Description
FR	0.100 0 to 140.000 0		Specifies an RF frequency.
AP or LE	−20.0 to 126.0		Specifies an output level.
	ON		Turns the output signal ON.
	OF		Turns the output signal OFF.
AM			Selects amplitude modulation.
	0.0 to 100		Specifies an amplitude modulation degree.
FM			Selects frequency modulation.
	0.0 to 100	(KZ)	Specifies an FM deviation.
	0.0 to 127	(PC)	Specifies a frequency modulation ratio.
TO	0		Modulation signal: external
	1		Sets the frequency of the internal RC oscillator to 1 kHz.
	4		Sets the frequency of the internal RC oscillator to 400 Hz.
	D		Modulation signal: DDS (option)
MO	0		Turns a modulation signal OFF.
	1		Turns a modulation signal ON.
MS	1		Sets a modulation mode to FM MONO.
	2		Sets a modulation mode to FM stereo L=R.
	3		Sets a modulation mode to FM stereo L.
	4		Sets a modulation mode to FM stereo R.
	5		Sets a modulation mode to FM stereo L=−R.
PL	ON		Turns a pilot signal ON.
	OF		Turns a pilot signal OFF.
	0.0 to 15.0		Sets a pilot signal level to 0.0% to 15.0 %.
PR	0		Turns pre-emphasis OFF.
	1		Sets a time constant to 25 µs.
	2		Sets a time constant to 50 µs.
	3		Sets a time constant to 75 µs.
DF	0.020 to 20.000	(KZ)	Sets DDS frequency.
RC	00 to 99		Recalls a preset memory.
ST	00 to 99		Stores settings in the preset memory.
NT	t		Specifies an interval time for the currently displayed address to t (s).
	t-a1-a2		Specifies an interval time for the addresses a1 to a2 to t (s).
	t- -		Specifies an interval time for the start to stop addresses to t (s).
AS	0		Sets the operation mode to Repeat up.
	1		Sets the operation mode to Single up.
	2		Sets the operation mode to Repeat down.
	3		Sets the operation mode to Single down.

The unit codes in parentheses can be omitted.

Header code	Data code	Unit code	Description
P1 or P2	B00000000 toB11111111		Sets control output for port 1 or 2 in binary data.
	H00 to HFF		Sets control output for port 1 or 2 in hexa-decimal data.
	D0 to D255		Sets control output for port 1 or 2 in decimal data.
	S0 to S7		Sets (to 1) the specified bit of port 1 or 2.
	R0 to R7		Resets (to 0) the specified bit of port 1 or 2.
DR	0 to 140		Sets the reverse frequency of the relay drive.
	−0 to −140		Sets the reverse frequency of the relay drive.
TM	0		Sends out the operation setup.
	1		Sends out the port 2 input data.
PI	1		Turns LEDs OFF.
	0		Turns LEDs ON.

The unit codes in parentheses can be omitted.