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AM70A
2 c h AUDIO ANALYZER
Instruction Manual

ShibaSoku Co.,Ltd

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1 GENERAL

The model AM70A audio analyzer is designed to swiftly and accurately measure such audio equipment characteristics as frequency, level, phase difference, level difference and distortion factor, also enabling you to select various measuring items and filters.
The AM70A can measure two channels (Each channel is measured and the result is displayed independently). It assures simultaneous level measurement at high speed, making it ideal for audio-equipment manufacturing lines.

[**NOTE**]

By other channel is measured, and it is indicated separately.

2 FEATURES

- Measurement is processed in a short time thanks to DSP computation.
- High-speed measurement is possible. (Level measuring time is less than 100 ms)
  Conditions: 1. Frequency of measuring signal is over 1 kHz
  2. Single side measurement
  3. RANGE FAST setup
- All distortion factor measurements and total harmonic distortion (THD) measurement are possible, also enabling to analyze the 2nd to 5th harmonics.
- IMD measurement (frequency 60 Hz: 7 kHz, level 4:1) is possible.
- The memory function that can store 100 ways of panel setting is equipped.
- The judge function that can judge (GO/NG) the measured result by setting any designated allowable range.
- GP-IB is a standard equipment.
- Two types of optional filters can be inserted by customers.

3 SPECIFICATION

3.1. Oscillator Section

3.1.1. Output Impedance

- Balance/unbalance: 600 Ω terminator ON/OFF. Independently set for A and B channels.

3.1.2. Sine Wave Output

- Frequency range: 10.00 Hz to 100.0 kHz. Final digit is 0 or 5.
- Frequency accuracy: +/–0.5% of set value
- Frequency resolution
  10.00 Hz to 99.95 Hz:in: increments of 0.05 Hz
  100.0 Hz to 999.5 Hz:in: increments of 0.5 Hz
  1.000 kHz to 9.995 kHz:in: increments of 5 Hz
  10.00 kHz to 100.0 kHz:in: increments of 50 Hz
- Output level range
  Balance output (BALANCE):
  –82.39 dBm (58.82 µV) to +26.02 dBm (15.49 V).
  Output of 0Ω for the range of +20.01 dBm to +26.02 dBm.
  Unbalance output (UNBALANCE):
  –88.41 dBm (29.41 µV) to +20.00 dBm (7.745 V).
  Output of 0 Ω for the range of +13.99 dBm to +20.00 dBm.
- Frequency response
  Balance output 10.00 Hz to 100.0 kHz, within +/–0.5 dB
  Unbalance output 10.00 Hz to 100.0 kHz, within +/–0.5 dB
- Distortion factor
  Balance and unbalance outputs
  10 Hz to 10 kHz: less than 0.00032% (–110 dB)
  10 kHz to 50 kHz: less than 0.001% (–100 dB)
  50 kHz to 100 kHz: less than 0.003% (–90 dB)

3.1.3. IMD Measurement Output

- Frequency
  Low frequency: 60 Hz +/–0.5%
  High frequency: 7 kHz +/–2%
- Mixing ratio: 60 Hz:7 kHz = 4:1
- Output level: Balance output: –82.39 dBm to +26.02 dBm

3.2. Measuring Section

3.2.1. Measurable Items

- Level measurement
- S/N measurement
- Relative level measurement
- Distortion factor measurement (harmonic analysis)
- IMD measurement
- Frequency measurement
- Phase difference measurement

3.2.2. Measuring Filters

- 400 Hz HPF, 18 dB/OCT, with tertiary Butterworth response
- 30 kHz LPF, 18 dB/OCT, with tertiary Butterworth response
- 80 kHz LPF, 18 dB/OCT, with tertiary Butterworth response
- JIS A filter conforming to the JIS-C1502A standard
- CCIR/ARM DOLBY
- DIN conforming to the AUDIODIN45405 (AUDIO) 1978 standard
- 20 kHz LPF with 0.5 dB ripple/9-tandem Chebyshev response
- OPTION 1 (It can be added in the form of option board.)
- OPTION 2 (It can be added in the form of option board.)

[**NOTE**]

Filters except the 20 kHz, LPF and OPTION 1 are usable only in the channel A due to level-related restriction.

3.2.3. Input Impedance

- Balance: 200 kΩ or 600Ω is selectable. Within +/–5%.
- Unbalance: 100 kΩ or 600Ω is selectable. Within +/–5%.

3.2.4. Measurement Range

- AUTO/HOLD Switching
- RANGE SPEED
  - Slow: Available in 10 Hz to 100 kHz
  - FAST: Available in 1 kHz to 100 kHz

3.2.5. Level Measurement

- Frequency range: 10 Hz to 100 kHz, within +/–0.5 dB
- Measuring level range

  Simultaneous measurement for both A and B channels:

  10 μV to 100 V (–100 dB to +40 dB)
  100 μV to 100 V: within +/–0.5 dB
  30 μV to 10μV: within +/–1 dB

  Response: Rms value detection: RMS

  Average value detection and conversion to RMS value: AVG

  Measuring units: μV, mV, V, dB, dBm (600 Ω)

3.2.6. S/N Measurement

- Frequency range: 10 Hz to 100 kHz
- Measuring range: S component level: –100 dB to +40 dB (10.0 µV to 100 V)
  N component level: –100 dB to +40 dB (10.0 µV to 100 V)
- Measuring unit: dB

Table 3-1 S/N measurement

S component level	Limit value for S/N measurement
≥100 V (+40 dB)	>140 dB
≥31.6 V (+30 dB)	>130 dB
≥10.0 V (+20 dB)	>120 dB
≥3.16 V (+10 dB)	>110 dB
≥1.00 V (0 dB)	>100 dB
≥316 mV (–10 dB)	>90 dB
≥100 mV (–20 dB)	>80 dB
≥31.6 mV (–30 dB)	>70 dB
≥10.0 mV (40 dB)	>60 dB
≥3.16 mV (–50 dB)	>50 dB
≥1.00 mV (–60 dB)	>40 dB
≥316 µV (–70 dB)	>30 dB
≥100 µV (–80 dB)	>20 dB
≥31.6 µV (–90 dB)	>10 dB
≥10.0 µV (–100 dB)	>0 dB

3.2.7. Relative Level Measurement

- Fundamental Frequency range: 10 Hz to 100 kHz
- Measuring range: –100 dB to +40 dB in the form of input conversion
  When the "RELATIVE LEVEL" switch in level measurement, the succeeding measurement will be performed by making the level at that time as "0 dB reference".
- Unit: dB

3.2.8. Distortion Measurement

- Fundamental frequency range: 10 Hz to 100 kHz
- Input level range: 36 mV to 100 V
- Measuring range: 0.001% to 30% (–100 dB to –10 dB)
  When analysis is used: 0.0003% to 30% (–110 dB to –10 dB)
- Response: Rms value detection (RMS)
- Fundamental tuning: Automatic tuning based on the result of frequency counter

- Harmonic analysis (ANALYSIS)

THD:	Harmonic distortion factor is measured from the 2nd to the 10th. (This measurement is applied to 50 kHz or less. In case of other frequency range, the range is from the 2nd to the 5th.)
$2f_0$:	Only the 2nd harmonic is measured.
$3f_0$:	Only the 3rd harmonic is measured.
$4f_0$:	Only the 4th harmonic is measured.
$5f_0$:	Only the 5th harmonic is measured.
Unit:	dB, %

Table 3-2 All distortion factor

Input level / Input frequency	+20 dB	0 dB	-20 dB
10 Hz to 1 kHz	–105 dB	–105 dB	–92 dB
1 kHz to 10 kHz	–100 dB	–100 dB	–84 dB
10 kHz to 100 kHz	–85 dB	–85 dB	–82 dB

Table 3-3 Harmonic distortion factor (ANALYSIS)

Input level / Input frequency	+20 dB	0 dB	–20 dB
10 Hz to 1 kHz	–110 dB	–110 dB	–105 dB
1 kHz to 10 kHz	–100 dB	–102 dB	–90 dB
10 kHz to 100 kHz	–87dB	–87 dB	–85 dB

3.2.9. IMD Measurement

- Frequency: Low frequency: 60 Hz
  High frequency: 7 kHz
- Level ratio: Low frequency: high frequency = 4:1
- Input level range: 100 mVp-p to 282.8 Vp-p
- Measuring range: 0.001% to 100% (–100 dB to –6 dB)
  0.01% to 50% (–80 dB to –6 dB) +/–0.5 dB
  0.001% to 0.01% (–100 dB to –80 dB) +/–1 dB
- Measuring unit: dB, %

3.2.10. Phase Difference Measurement

- Frequency range: 10 Hz to 100 kHz
- Input level range: 36 mV to 100 V
- Measuring display range: 180 degrees with resolution of 0.1degrees +/–0.5 degrees

3.3. Memory Function

The memory, which can store 100 ways of panel setting, is incorporated.
The last memory function that can memorized the panel setting immediately before the power switch is turned OFF.

3.4. Judging Function

Judging function for the value obtained in each measurement.

- UPPER: Conforming to the measuring range of each measuring item.
- LOWER: Conforming to the measuring range of each measuring item.

[**NOTE**]
Value cannot be input when the UPPER limit is lower than LOWER limit. Value cannot also be input when the LOWER limit is higher than UPPER limit

3.5. EXT I/O

Panel setup numbers that have been set by the memory function using the external switches are sent in the normal or reverse order. Judged results of OVER NG and UNDER NG are output (Output from transistor arrays for lighting LED's).

3.6. GP-IB

GP-IB conforms to the IEEE std 488.1-1987.

3.7. Other Specifications

- Relay life: 50 million times of relay driving (catalog value)
- Operating temperature range: 0 to 40°C Relative humidity:10 to 90% RH (no condensation)
- Power voltage/frequency: AC 100/120/220/240V +/–10% (Voltage is selected by the switch.), 50/60 Hz
  Power consumption:Approx. 100 W
- Dimensions: 426 (W) x 149 (H) x 460 (D) mm
- Weight: Approx. 15 kg
- Standard accessories: Power cord (1),
  3P-2P conversion connector (1)

4 OPERATION

4.1. Controls on The Front Panel

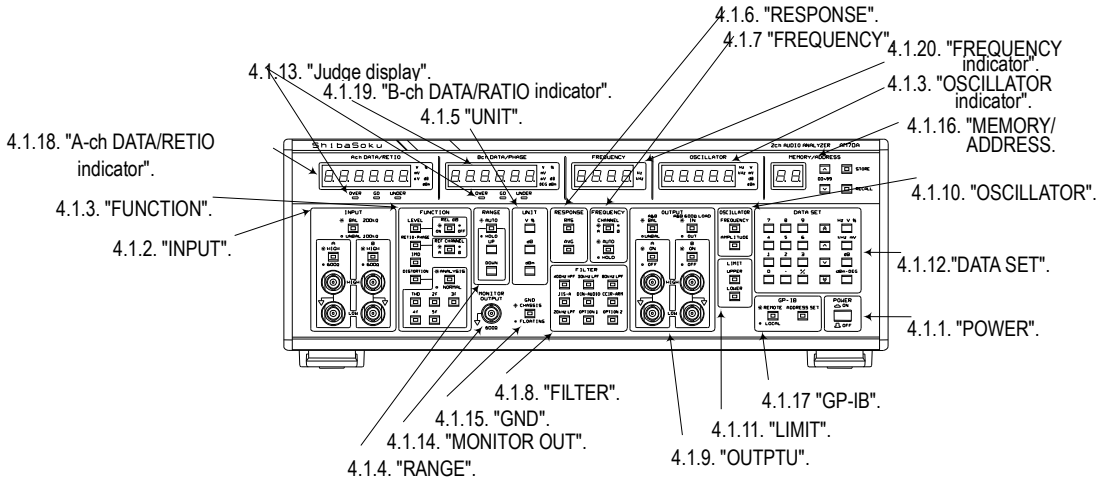


Fig. 4-1

4.1.1. POWER

Power switch. Depress the button for power ON. Push it again (the button comes out) for power OFF.

4.1.2. INPUT

Input connector can be set here.

- Push the BAL/UNBAL switch for turning ON/OFF (LED lights up and goes out alternately) to select BALANCE or UNBALANCE input for both channels.

[**NOTE**]

Connector at the LOW side becomes GND in the UNBALANCE mode.

- Push the HIGH/600Ω switch for turning ON/OFF (LED lights up and goes out alternately) to select high impedance or 60Ω for each of A and B.

[**NOTE**]

HIGH in the BALANCE mode is 200 kΩ. HIGH in UNBALANCE mode is 100 kΩ.

4.1.3. FUNCTION

These are switches to select the measuring item.

- Push the LEVEL switch for turning ON (LED lights) to perform level measurement. For measuring unit, refer to item 3.2.4.
- Push the "REL dB" switch for turning ON (LED lights). This status enables to perform S/N and signal ratio measurements.
- Push the RATIO•PHASE switch for turning ON (LED lights) to perform level difference and phase difference measurements.

- Push the EF CHANNEL switch for turning ON/OFF (LED lights up and goes out) to determine to use the reference for level difference and phase difference of which channel.
- Push the IMD switch for turning ON (LED lights) to perform intermodulation distortion measurement.
- Push the DIST switch for turning ON (LED lights) to perform all distortion factor measurements.
- Push the ANALYSIS switch for turning ON (LED lights) to turn ON the THD (LED lights) switch. This performs the measurement from the 2nd harmonic to the 10th harmonic.
  Each harmonic component is also measurable by pressing the corresponding switch — 2f, 3f, 4f or 5f.

[**NOTE**]

ANALYSIS, THD, 2f, 3f, 4f and 5f switches are usable only in the distortion factor-measuring mode.

4.1.4. RANGE

These are switches to automatically select the measuring range or to fix it.

- Push the AUTO switch for turning ON (LED lights) to automatically change the measuring range that corresponding to the measuring level.
- Push the AUTO switch for turning OFF (LED goes out), and the range is in the fixed status.
- Push the SLOW/FAST switch for turning ON (LED lights), and the range speed of each channel can be selected.

[**NOTE**]

SLOW Available in 10 Hz to 100 kHz
FARST Available in 1 kHz to 100 kHz

4.1.5. UNIT

These are switches to select the measuring unit for each measurement.

- Measuring range is selected by pressing he V•%, dB or dBm switch.

Measuring range can be set as shown in table below.

Table 4-1

Measuring item	Level measurement	Distortion factor measurement	Phase difference	Level difference	IMD measurement
Measuring unit	V	%	°	dB	dB
	dB	dB			%
	dBm				

4.1.6. RESPONSE

These are switches to select the response in measurement.

- Push the RMS switch for turning ON (LED lights) to perform measurement with the true RMS value.
- Push the AVG switch for turning ON (LED lights) to perform measurement in the form of average-to-RMS value conversion.

[**NOTE**]

These switches are effective on during level measurement.

4.1.7. FREQUENCY

These are switches to select the frequency.

- Push the CHANNEL switch for turning ON (LED lights) to measure the frequency of A channel. When it turns OFF (LED goes out), frequency of B channel is measured.
  During the distortion factor measurement, set the channel to be measured. MONITOR OUTPUT connector in level measurement is also switched.

- Push the AUTO/HOLD switch for turning ON (LED lights) to establish the AUTO mode, and the frequency is automatically measured. When it turns OFF (LED goes out) to establish he HOLD mode, frequency is fixed to the value displayed at present, and the frequency displaying the center frequency of BEF file is fixed.

4.1.8. FILTERS

These are switches for setting the filter used for each measurement.

- Push the 400 Hz HPF, 30 kHz LPF, 80 kHz LPF, JIS-A, DIN-AUDIO, CCIR-ARM and 20 kHz LPF switch for turning ON (Corresponding LED lights) to select the desired filters.

Please keep it in mind that some filters cannot be inserted simultaneously as shown in table below.

Table 4-2

→	Simultaneous setting is possible.		
↓ Simultaneous setting is impossible.	400 Hz HPF	30 kHz LPF	20 kHz LPF
		80 kHz LPF	OPTION 1
		JIS-A	
		DIN-AUDIO	
		CCIR-ARM	
		OPTION 2	

4.1.9. OUTPUT

Use these switches for setting the output connectors.

- Push the A&B switch for turning ON (LED lights) to select BALANCE output. Push it again for turning OFF (LED goes out) to select UNBALANCE output.
- Push the “A&B 600 Ω LOAD” switch for turning ON (LED lights) to terminate the output with a 600 Ω resistor. When it turns OFF (LED goes out), output resistance selected is 600 Ω.
- A (ON) and B (OFF) switches can set to output the signal from the output connector or not.

4.1.10. OSCILLATOR

Use these switches for setting the oscillation frequency.

- Push the FREQUENCY switch for turning ON (LED lights), and frequency can be set using the DATA SET ten keys.
- Push the AMPLITUDE switch for turning ON (LED lights, and the A (ON) and B (OFF) switches blink, enabling to set the output level using he DATA SET ten keys. When setting the B channel, push the ON or OFF switches of B to blink it and set the output level using the DATA SET ten keys.

4.1.11. LIMIT

Use these switches to set the value for judgment.

- Select the function to be set.
- Push the UPPER switch to blink it, and set the upper limit value using the DATA SET ten keys.
- Push the LOWER switch to blink it, and set the lower limit value using the DATA SET ten keys.

4.1.12. DATA SET

Use these ten keys to set the value for output level and judge function.

4.1.13. Judge display

Judgment is made for the value set by the LIMIT switch.

- Lighting of the “OVER” LED means that the judged value surpassed the upper limit value.
- Lighting of the “GO” LED means that the measured value is between the upper and lower limit values.
- Lighting of the “UNDER” LED means that the judged value surpassed the lower limit value

4.1.14. Monitor Output

- Connector for monitoring waveforms of all functions.

4.1.15. GND

- Here, grounding of the internal electric circuits and cabinet (chassis ground) can be set.
- Push the CHASSIS/FLOATING switch for turning ON (LED lights) to establish the CHASSIS mode, and grounding of the internal electric circuits and that of the cabinet are connected. When it is turned OFF (LED goes out) to establish the FLOATING status, grounding of the internal electric circuits and that of the cabinet are separated.
  When hum and noise components are large in case of distortion factor or S/N measurement, turn ON/OFF this switch to select the good status.

4.1.16. Memory/Address

Use these switches to write the panel setting status into the built-in memory, or read the data from it.

- For writing the panel setting into the memory addresses, press the STORE switch, set the address using the and switches, or push the STORE switch again after having set the address using the DATA SET ten keys.

- When controlling the number for panel setting from the EXT I/O, available numbers are from 00 to 99. These numbers can be separated in several periods, in each of which number can be set. This period setting is registered by depressing the STORE switch for two seconds. On the address to which this setting was made, a decimal point lights up on two digits of the indicator. To release the setting, perform the same operation. Release of setting can be confirmed by that the decimal point goes out.

4.1.17. GP-IB

Use these switches for GP-IB setting.

- Push the ADDRESS SET switch for turning ON (LED lights), and determine the address using the DATA SET ten keys. Then, push the ADDRESS SET switch again to set the new address.
- REMOTE/LOCAL switch determines “panel controlling” or “GP-IB controlling”.

4.1.18. A-ch DATA/RATIO

Measured data of the A channel is displayed here. When RATIO•PHASE mode is selected, level difference is displayed.

4.1.19. B-ch DATA/PHASE

Measured data of the B channel is displayed here. When RATIO•PHASE mode is selected, level difference is displayed. During judge setting, the set value is displayed.

4.1.20. FREQUENCY

Measuring frequency is displayed here. Select the channel by the CHANNEL switch explained in 4.1.7 "FREQUENCY”

4.1.21. OSCILLATOR

Set values of oscillation frequency and output level are displayed here.

4.2. Controls on The Rear Panel

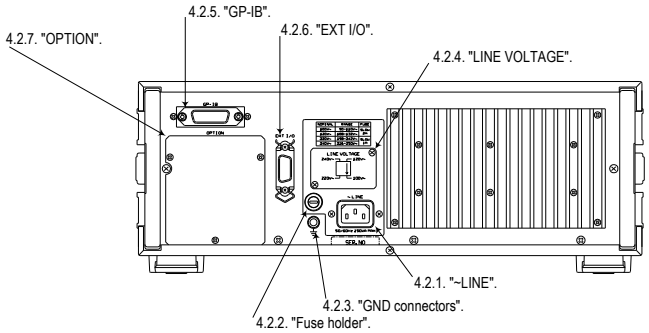


Fig. 4-2

4.2.1. ~LINE

AC power inlet. Plug the attached power cord in this inlet and plug the other end to the AC outlet whose voltage conforms to the AC line voltage shown. For increased safety, confirm that the POWER switch is turned OFF, and connect this power cord to this equipment. Then, connect the power plug to the AC line outlet.

4.2.2. Fuse holder

A protection fuse is fit. When the fuse blew, replace it with the one having the same amperage shown. If the new fuse also blows immediately, it may be caused by the abnormality in the equipment. Turn OFF the power switch, disconnect the power cable from the AC line outlet, then contact ShibaSoku's local sales office.

4.2.3. GND Connector

Grounding connector for the chassis. For increased operating safety, it must be grounded before starting to use this equipment.

4.2.4. Line Voltage

Selector to designate the AC line voltage supplied to this equipment. The AC line voltage value pointed by the downward arrow (Ø) is the AC voltage that can be supplied. Before connecting the AC power cable to the AC line outlet, confirm the selected AC voltage. When changing the voltage setting, disconnect the AC power cable from the AC line inlet on the rear panel to increase safety.

4.2.5. GP-IB

When controlling the AM70A audio analyzer from the external controller such as a personal computer, connect this BP-IB connector with the GP-IB board of a personal computer.

4.2.6. EXT I/O

This is the connector to input the signals when controlling the memory number setup on the front panel from the external switches. In addition to switch input for normal/reverse address number sending, NG judgment (OVER or UNDER) of both A and B channels is output from this connector. (Transistor array output for lighting LED's.)

4.2.7. OPTION

Slots on which option filters are mounted. Filters can be mounted by customers. The AM70A can accommodate two option filters. Concerning the positions of additional filters, refer to the block diagram.

5 GB-IB EXTI/O

5.1. GP-IB

The AM70A audio analyzer is equipped with the GP-IB interface as a standard equipment, enabling to remotely control various functions.

5.1.1. GP-IB Interface Functions

The AM70A has the following interface functions.

Function	Sorting	Contents of function
Transmission handshake	SH 1	All functions
Reception handshake	AH 1	All functions
Talker	T 6	Basic talker, serial poll, talker release by MLA command
Listener	L 4	Basic listener, listener release by MTA
Service request	SR 1	All functions
Remote/local	RL 1	All functions
Parallel poll	PP 0	No function
Device clear	DC 0	No function
Device trigger	DT 1	All functions
Controller	C 0	No function

Sorting of each function is explained below.

(1) Transmission handshake

Display	No function	Necessary sub set
SH0	No function	Not required.
SH1	All functions	T1 to T8, C5 to C28

(2) Reception handshake

Display	No function	Necessary sub set
AH0	No function	Not required.
AH1	All functions	Not required.

(3) Talker

Display	Contents				Necessary sub set
	Talk Basic Talker	Serial Poll	Only Mode	Unaddress If MLA	
T0	N	N	N	N	Not required.
T1	Y	Y	Y	N	SH1 and AH1
T2	Y	Y	N	N	SH1 and AH1
T3	Y	N	Y	N	SH1 and AH1
T4	Y	N	N	N	SH1 and AH1
T5	Y	Y	Y	Y	SH1 and L1 to L4
T6	Y	Y	N	Y	SH1 and L1 to L4
T7	Y	N	Y	Y	SH1 and L1 to L4
T8	Y	N	N	Y	SH1 and L1 to L4

(4) Listener

Display	Contents			Necessary sub set
	Talk Basic Talker	Only Mode	Unaddress If MLA	
L0	N	N	N	Not required.
L1	Y	Y	N	SH1 and T1 to T8
L2	Y	N	N	SH1 and T1 to T8
L3	Y	Y	Y	SH1 and T1 to T8
L4	Y	N	Y	SH1 and T1 to T8

(5) Service request

Display	Contents	Necessary sub set
SR0	No function	Not required.
SR1	All functions	T1, T2, T5, T6

(6) Remote local

Display	Contents	Necessary sub set
RL0	No function	Not required.
RL1	All functions	L1 to L4
RL2	LLO function not provided.	L1 to L4

(7) Parallel poll

Display	Contents	Necessary sub set
PP0	No function	Not required.
PP1	Remote configuration	L1 to L4
PP2	Local configuration	Not required.

(8) Device clear

Display	Contents	Necessary sub set
DC0	No function	Not required.
DC1	All functions	L1 to L4
DC2	SDC function not provided.	AH1

(9) Device trigger

Display	Contents	Necessary sub set
DC0	No function	Not required.
DC1	All functions	L1 to L4

(10) Controller

Display		Contents										Necessary sub set				
		System Controller	Send IFC and Take Change	SEND REN	Respond to SRQ	Send I.F. Messages	Received Control	Pass Control	Pass Control to Self	Parallel Poll	Take Control Synchronously	C1	C2	AH1, L1 to L4	SH1	T1 to T8
C	0	N	N	N	N	N	N	N	N	N	N	0	–	–	–	–
C	1	Y	–	–	–	–	–	–	–	–	–	–	–	–	–	–
C	2	–	Y	–	–	–	–	–	–	–	–	R	–	–	–	–
C	3	–	–	Y	–	–	–	–	–	–	–	R	–	–	–	–
C	4	–	–	–	Y	–	–	–	–	–	–	–	–	–	–	–
C	5	–	–	–	–	Y	Y	Y	Y	Y	Y	–	–	R	R	R
C	6	–	–	–	–	Y	Y	Y	Y	Y	N	–	–	–	R	R
C	7	–	–	–	–	Y	Y	Y	Y	N	Y	–	–	R	R	R
C	8	–	–	–	–	Y	Y	Y	Y	N	N	–	–	–	R	R
C	9	–	–	–	–	Y	Y	Y	N	Y	Y	–	–	R	R	R
C	10	–	–	–	–	Y	Y	Y	N	Y	N	–	–	–	R	R
C	11	–	–	–	–	Y	Y	Y	N	N	Y	–	–	R	R	R
C	12	–	–	–	–	Y	Y	Y	N	N	N	–	–	–	R	R
C	13	–	–	–	–	Y	Y	N	N	Y	Y	–	R	R	R	–
C	14	–	–	–	–	Y	Y	N	N	Y	N	–	R	–	R	–
C	15	–	–	–	–	Y	Y	N	N	N	Y	–	R	R	R	–
C	16	–	–	–	–	Y	Y	N	N	N	N	–	R	–	R	–
C	17	–	–	–	–	Y	N	Y	Y	Y	Y	–	–	R	R	R
C	18	–	–	–	–	Y	N	Y	Y	Y	N	–	–	–	R	R
C	19	–	–	–	–	Y	N	Y	Y	N	Y	–	–	R	R	R
C	20	–	–	–	–	Y	N	Y	Y	N	N	–	–	–	R	R
C	21	–	–	–	–	Y	N	Y	N	Y	Y	–	–	R	R	R
C	22	–	–	–	–	Y	N	Y	N	Y	N	–	–	–	R	R
C	23	–	–	–	–	Y	N	Y	N	N	Y	–	–	R	R	R
C	24	–	–	–	–	Y	N	Y	N	N	N	–	–	–	R	R
C	25	–	–	–	–	Y	N	N	N	Y	Y	–	–	R	R	–
C	26	–	–	–	–	Y	N	N	N	Y	N	–	–	–	R	–
C	27	–	–	–	–	Y	N	N	N	N	Y	–	–	R	R	–
C	28	–	–	–	–	Y	N	N	N	N	N	–	–	–	R	–

Combine one or more sub sets chosen from C1 to C4 and one sub set chosen from C5 to C28.
0 = unnecessary, R = necessary, hyphen = unnecessary or not applicable, Y = yes, N = no

5.1.2. GP-IB Address Setting

When setting the GP-IB address, follow the method explained in item 4.1.17 "GP-IB"

5.1.3. Input format of control commands

When controlling the AM70A using the listener function of GP-IB interface function, transmit control commands from the host computer in accordance with directions shown below.

(1) Characters must be input in the ASCII code.
(2) Both upper- and lowercase characters can be input.
(3) When transmitting two or more control commands simultaneously, be attentive to following cautions.
- Maximum number of characters that can be transmitted simultaneously are 256 excluding delimiters. If the number of characters transmitted surpassed 256, it is regarded as an error and those command are not processed.
- Separate one command from the other by using a comma (,).
- Only correctly written commands are processed, but incorrect commands are ignored.

(4) When transmitting a control command, attach a delimiter at its end. The AM07A judges one of following three as delimiter.
- LF
- CR+RF
- EOI

5.1.4. Control Commands

Control commands employed in the AM70A audio analyzer are explained here. Each command is consisted of the combination of a header (alphabet) and data (numeric). Header and data can be transmitted continuously or by inserting a space between them. In each case, they are recognized. However, if a characters besides the space is placed between them, that command is regarded as an error and ignored.

(1) Measuring items and ranges
Select the measuring item and set the measuring range.

Header	Data	Contents
M	1	Level/voltage measurement (V, dB, dBm–600Ω)
	2	Level difference measurement (dB), phase difference measurement (degrees)
	3	Distortion factor measurement (%, dB)
	4	IMD measurement (%, dB)
MLR	0	Relative level measurement OFF
	1	Relative level measurement ON
MR	0	Measuring range is automatically selected.
	1	Measuring range is fixed to the currently selected range.
MAS	0	A channel range speed: FAST
	1	A channel range speed: SLOW
MBS	0	B channel range speed: FAST
	1	B channel range speed: SLOW

(2) Reference channel for level-difference and phase-difference measurements
Select the channel used as the reference when performing level-difference and phase-difference measurements.

Header	Data	Contents
REF	1	Reference channel: A channel
	2	Reference channel: B channel

(3) Input to the measuring unit
Select balance/unbalance, impedance and others for the input.

Header	Data	Contents
IBAL	0	Input: unbalance
	1	Input: balance
IA6	0	A channel input: 600 Ω terminated output
	1	A channel input: 600 Ω terminated input
IB6	0	B channel input: 600 Ω terminated output
	1	B channel input: 600 Ω terminated input

(4) Measurement units
Select the unit for measurement.

Header	Data	Contents
LU	1	Level/voltage measurement unit: V
	2	Level/voltage measurement unit: dB
	3	Level/voltage measurement unit: dBm-600Ω
DU	1	Distortion factor measurement unit: %
	2	Distortion factor measurement unit: dB
IU	1	IMD measurement unit: %
	2	IMD measurement unit: dB

(5) Response
Select the response for measurement.

Header	Data	Contents
R	1	RMS value detection: RMS
	2	Average value detection: AVG

(6) Filters
Set up filters.

Header	Data	Contents
FH	0	400 Hz HPF OUT
	1	400 Hz HPF IN
FL	0	All LPF IN
	1	30 kHz LPF IN
	2	80 kHz LPF IN
	4	20 kHz LPF IN
FA	0	JIS-A filter OUT
	1	JIS-A filter IN
FC	0	CCIR-ARM filter OUT
	1	CCIR-ARM filter IN
FD	0	DIN-AUDIO filter OUT
	1	DIN-AUDIO filter IN
FO	0	OPTION filter OUT
	1	OPTION filter 1 IN
	2	OPTION filter 2 IN
F	0	All filters OUT

(7) Distortion factor measurement and harmonic analysis
Perform setup for harmonic distortion factor measurement.

Header	Data	Contents
A	0	Harmonic analysis (ANALYSIS) OFF (All distortion factor measurement)
	1	Harmonic analysis (ANALYSIS) ON
H	1	Harmonic selected: All harmonics (from 2nd to 10th harmonics)
	2	Harmonic selected: 2nd harmonic
	3	Harmonic selected: 3rd harmonic
	4	Harmonic selected: 4th harmonic
	5	Harmonic selected: 5th harmonic
NRA*	0	Average time of noise reduction: 1 time
	1	Average time of noise reduction: 4 times
	2	Average time of noise reduction: 8 times
	3	Average time of noise reduction: 16 times
	4	Average time of noise reduction: 32 times

[**NOTE**]
Average time setting for noise reduction is possible via GP-IB, but impossible via key operation on the front panel. When the power switch is turned ON, average time is automatically reset to “4 times”.

(8) Frequency counter
Perform setup for frequency counter.

Header	Data	Contents
FRC	1	Frequency counter input: A channel
	2	Frequency counter input: B channel
FM	0	Frequency counter and BEF filter: Automatically selected.
	1	Frequency counter and BEF filter: Fixed.
	2	Frequency counter and BEF filter. Tuned with oscillation frequency of OSC

[NOTE]
Do not transmit “FM2” (frequency counter: fixed), “FRC1” and “FRC2” (change the channel) at once

(9) Oscillation frequency
Perform setup for output frequency of built-in oscillator.

Header	Data		Contents
FR	10.00 to 100000	Hz	Oscillation frequency setup: 10.00 Hz to 100.0 kHz
	0.01 to 100.0	Kz	

(10) Oscillation level
Perform setup for output level of built-in oscillator.

Header	Data		Contents
AA	–84.61 to 23.80 –90.63 to 17.78	DB	A channel output level BALANCE: –84.61 to 23.80 dBV UNBALANCE: –90.63 to 17.78 dBV
	–82.39 to 26.02 –88.41 to 20.00	DM	A channel output level BALANCE: –82.39 to 26.02dBm UNBALANCE: –88.41 to 20.00 dBm
	1.000 to 15.49 1.000 to 7.745	V	A channel output level BALANCE: 58.8 μV to 15.49 μV UNBALANCE: 29.4 μV to 7.745 μV
	1.000 to 999.9 1.000 to 999.9	MV	
	58.8 to 999.9 29.4 to 999.9	UV	
BA	–84.61 to 23.80 –90.63 to 17.78	DB	B channel output level BALANCE: –84.61 to 23.80 dBV UNBALANCE: –90.63 to 17.78 dBV
	–82.39 to 26.02 –88.41 to 20.00	DM	B channel output level BALANCE: –82.39 to 26.02dBm UNBALANCE: –88.41 to 20.00 dBm
	1.000 to 15.49 1.000 to 7.745	V	B channel output level BALANCE: 58.8 μV to 15.49 μV UNBALANCE: 29.4 μV to 7.745 μV
	1.000 to 999.9 1.000 to 999.9	MV	
	58.8 to 999.9 29.4 to 999.9	UV	

(11) Oscillator output
Select output ON/OFF, BALANCE/UNBALANCE impedance and others.

Header	Data	Contents
OA	0	A channel output: OFF
	1	A channel output: ON
OB	0	B channel output: OFF
	1	B channel output: ON
OBAL	0	Both A and B channel outputs: Unbalance
	1	Both A and B channel outputs: Balance
O6	0	Both A and B channel outputs: 600 Ω terminated output
	1	Both A and B channel outputs: 600 Ω terminated input

(12) Memory function
For memorizing the data into the memory and read it from the memory.

Header	Data	Contents
ST	00 to 99	Panel setting data is memorized in addresses 00 to 99.
RC	00 to 99	Memory content saved in addresses 00 to 99 is read out.

(13) GND
For grounding the selection.

Header	Data	Contents
G	0	Floating status is established.
	1	Chassis is grounded.

(14) Commands for GP-IB controlling
For setting the service request when the Am70A is controlled via GP-IB.

Header	Data	Contents
SR	0	SRQ is not generated.
	1	SRQ is generated when the measured data is settled.
	2	SRQ is generated when a wrong command is received.
	3	SRT is generated both when the measured data is settle and when a wrong command is received.

[**NOTE**]
When the power switch is turned ON, “SR0” is automatically set.

(15) Judging reference values for level measurement
Set the reference values to judge the measured results obtained in level measurement.

Header	Data	Contents
LMU	0.01 to 100000	Upper limit value: mV
LML	0.01 to 100000	Lower limit value: mV
LVU	0.00001 to 100	Upper limit value: V
LVL	0.00001 to 100	Lower limit value: V
LBU	–100 to 40.0	Upper limit value: dB
LBL	–100 to 40.0	Lower limit value: dB
LPU	–97.78 to 42.21	Upper limit value: dBm
LPL	–97.78 to 42.21	Lower limit value: dBm

(16) Judging reference values for relative level measurement
Set the reference values to judge the measured results obtained in relative level measurement.

Header	Data	Contents
RBU	0.01 to 100000	Upper limit value: dB
RBL	0.01 to 100000	Lower limit value: dB

(17) Judging reference values for level-difference/phase-difference measurements
Set the reference values to judge the measured results obtained in level-difference/phase-difference measurements.

Header	Data	Contents
DBU	–140 to 140	Upper limit value of level difference measurement: dB
DBL	0.01 to 140	Lower limit value of level difference measurement: dB
PDU	–180 to 180	Upper limit value of phase difference measurement: degrees
PDL	–180 to 180	Lower limit value of phase difference measurement: degree

(18) Judging reference values for IMD measurements
Set the reference values to judge the measured results obtained in IMD measurements.

Header	Data	Contents
IBU	–100 to 0	Upper limit value: dB
IBL	–100 to 0	Lower limit value: dB
IPU	0.001 to 100	Upper limit value: degrees
IPL	0.001 to 100	Lower limit value: degrees

(19) Judging reference values for all distortion factor measurements
Set the reference values to judge the measured results obtained in all distortion factor measurements.

Header	Data	Contents
ABU	–120 to 0	Upper limit value: dB
ABL	–120 to 0	Lower limit value: dB
APU	0.0001 to 100	Upper limit value: degrees
APL	0.0001 to 100	Lower limit value: degrees

(20) Judging reference values for harmonic distortion factor measurement (ANALYSIS)
Set the reference values to judge the measured results obtained in harmonic distortion factor measurements.

Header	Data	Contents
HBU	–120 to 0	Upper limit value: dB
HBL	–120 to 0	Lower limit value: dB
HPU	0.0001 to 100	Upper limit value: degrees
HPL	0.0001 to 100	Lower limit value: degrees

5.1.5. Measured Data Transmission Format

Measured data are transmitted from the AM70A in accordance with the following format.
Measuring frequency, A-channel judgment, A-channel data, unit, B-channel judgment, B-channel data, unit, CR+LF

Item	Code	Contents (transmission example)
Measuring frequency	Displayed in exponent format. O. O O O E+□O	Example: 1.234E+2 is 123.4 Hz Measured result of the designated channel is displayed.
Judgment	UN	NG exceeding the upper limit value
	GO	Within judging reference value
	LN	NG below the lower limit value
	NO	No measured data
Data	Displayed in exponent format. O. O O O E+ O O. O O O E–O –O. O O O E+□O –O. O O O E– O	Example: 1.234E+2 is 123.4 1.234E–2 is 0.01234 –1.234E+2 is –123.4. –1.234E–2 is –0.01234.
Unit	1	V
	2	%
	3	dB
	4	dBm
	5	degrees

(1) All characters are transmitted in ASCII code.
(2) Data transmitted includes codes, numeric values and characters.
(3) Data is separated by comma (,).
(4) CR (0 DH) + LF (0AH) is transmitted at the end of data as the delimiter, and EOI and LF are simultaneously turned ON.
(5) the AM70A always prepares the latest measured data as transmitted data whenever GP-IB remote status is established.
(6) Since either of A and B channel is measured in case of distortion factor/IMD measurement, the data output from the unmeasured channel becomes 9999 (9.999E+3 in exponent format) and “NO” judgment is output.

5.1.6. Service Request

Equipped with service request function, the AM70A can inform you of measured data reading, measurement errors, setup errors and other abnormality generation. To use the service request, transmit one of three program commands (SR1, 2 or 3) for initial setup. When error generation or measured data has been fixed, a service request is generated and it sets SRQ of the control bus line to “TRUE (LOW)”. SRQ of the control bus line is cleared by reading the status byte of the AM70A by serial polling.

Method to use status byte and SR commands are explained below.

(1) Status byte

Upon the reception of serial poll from the host computer, each bit of the status byte, which is output from the AM70A, is allotted as shown in the table below.

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Data	0	1	0	0	0	0	0	0

Bit
- D7: Not used
- D6: This bet shows the status whether service request is received or not. It corresponds to SRQ of the control bus line.
- D5: 0: No error 1: Command error
- D4: 0: No error 1: Measuring range error
- D3: Not used
- D2: Not used
- D1: 0: No error 1: Oscillator setup error
- D0: 0: No error 1: Error found

(2) How to use SR commands

Program commands SR0 ~ SR3 available on the AM70A are commands to notice such status as measured data reading and program command error by using the service request. Once these command have been set, they will be effective until another SR commands are set.

Usage of these commands is as follows.

a) SR0

After having received this command, the AM70A does not generate a service request for the host computer. When the power switch is turned ON, the AM70A is set to this “SR0” status.

b) SR1

After having received this command, the AM70A becomes enable to inform the host computer of the determination of measured data by utilizing a service request command.
To use service request, first send the “SR1” from the host computer to the AM70A. Then, send the GP-IB address command “GET” (08H) to the AM70A. Upon the reception of the “GET”, the measured data is fixed, a status but is set when the preparation to transmit the data has been completed, then service request is generated. When service request is generated, the host computer reads out he status byte in serial polling and confirms it, then the host computer reads out the measured result from the AM70A.

c) SR2
After having received this command, the AM70A becomes possible to inform the host computer of the error in the program command that was received, by using the service request.
To use the service request, fist send “SR” from the host computer to the AM70A. Thereafter, every when an error is found in the received program command, a service request is generated. Error content can be confirmed by reading out the status command. (Refer to the aforementioned item (1) “Status byte”)

d) SR3
This command combines functions of “SR1” and “SR2”. After having received this command, the AM70A generates a service request both when the measured data is fixed and when an error is found in the program command.

5.1.7. Sample Programs

Sample programs (1) to (3) for the N88 BASIC are introduced on the next and succeeding pages. (1) describes the setup of the AM70A and readout example of measured results. (2) is a readout example of measured results using a service request. (3) is the program to generate a service request wen an error is found in the input program command.

```
1000
                        '*****************************************
**********************************
1010 '
1020 '                  AM70A sample program (1)
1030 '                  Program to receive measured data
1040 '                  ----- N88 BASIC -----
1050 '
1060
    '*************************************************************
***************
1070 '
1080 '
1090
    '////////////////////////////////////////////////////////////
///////////////
1100 '        Initial setup
1110
    '////////////////////////////////////////////////////////////
///////////////
1120 '  AM70A.ADR=7     For setting the device address of 'AM70A.
1130 '  CPU.ADR=0       For setting the device address of 'PC9801.
1140    '
1150
    '////////////////////////////////////////////////////////////
///////////////
1160         'The PC9801 is set in the GP-IB mode.
1170
    '////////////////////////////////////////////////////////////
///////////////
1180 '  ISET IFC        ' GP-IB interface is initialized.
1190 '  ISET REN        ' Remote status is established.
1200 '  CMD DELIM=0     ' Delimiter is set to "CL,LF".
1210 '  CMD TIMEOUT=5   ' Timeout is set to 5 seconds.
1220    '
1230
    '////////////////////////////////////////////////////////////
///////////////
1240 '        Local lockout is set.
1250
    '////////////////////////////////////////////////////////////
///////////////
1260 '  WBYTE&H11;      ' Local lockout control becomes unable.
1270    '
1280
    '////////////////////////////////////////////////////////////
///////////////
1290 '        AM70A is set up.
1300
    '////////////////////////////////////////////////////////////
///////////////
1310 '  PRINT@ AM70A.ADR;"M3"       ' Measured item = distortion factor
1320 '  PRINT@ AM70A.ADR;"DU1"            ' Measuring unit = %
1330 '  PRINT@ AM70A.ADR;"FL1"      ' Filter = 30 kHz LPF IN
```

```
1340 '   PRINT@ AM70A.ADR;"FRC1"          ' Frequency counter input = A ch
1350 '   PRINT@ AM70A.ADR;"FR1000HZ"  ' Oscillation frequency = 1000 Hz
1360 '   PRINT@ AM70A.ADR;"AA1.000V"  ' Output level channel A = 1,000V
1370 '   PRINT@ AM70A.ADR;"BA-10.00DB"    '  Output  level  channel  B  =
-10.00dB
1380     '                '
1390 '   PRINT@ AM70A.ADR;"SR0"       ' SRQ mode = OFF
1400     '
1410
     '////////////////////////////////////////////////////////////////
///////////////
1420 '         Start of measurement
1430
     '////////////////////////////////////////////////////////////////
///////////////
1440     '(((((((( Measurement wait time: about 2 seconds ))))))))))
1450     T$=TIME$
1460     SS=VAL(RIGHT$(T$,2))
1470     S=SS+3
1480                       IF S>59 THEN S=S-60
1490 *WAIT.TIME
1500     T$=TIME$
1510     SS=VAL(RIGHT$(TS$,2))
1520     IF SS<>S THEN*WAIT.TIME
1530     '
1540     '(((((((( Measured data is read. ))))))))))))))))))))
1550     INPUT@ AM70Z.ADR;FR$,A1$,A2$,A3$,B1$,B2$,B3$
1560     '
1570     '(((((((( Measured data is displayed. ))))))))))))))))
1580     IF A3$="1"THEN A3$="V" :GOTO*UNIT  ' Measuring unit is judged.
1590     IF A3$="2"THEN A3$="%" :GOTO*UNIT
1600     IF A3$="3"THEN A3$="dB" :GOTO*UNIT
1610     IF A3$="4"THEN A3$="dBm" :GOTO*UNIT
1620     IF A3$="5"THEN A3$="°":GOTO*UNIT
1630     '
1640 *UNIT
1650     IF B3$="1"THEN B3$="V":GOTO*DISPLAY
1660     IF B3$="2"THEN B3$="%" :GOTO*DISPLAY
1670     IF B3$="3"THEN B3$="dB" :GOTO*DISPLAY
1680     IF B3$="4"THEN B3$="dBm" :GOTO*DISPLAY
1690     IF B3$="5"THEN B3$="°":GOTO*DISPLAY
1700     '
1710 *DISPLAY
1720     PRINT "FREQUENCY",FR$          ' Frequency data
1730    PRINT "Ach DATA",A1$:"":A2$:"":A3$ ' Ach judgment, data, measuring
unit
1740    PRINT "Bch DATA",B1$:"":B2$:"":B3$ ' Bch judgment, data, measuring
unit
1750     '
1760
     '////////////////////////////////////////////////////////////////
///////////////
1770 '         End of program
1780
```

```
    '////////////////////////////////////////////////////////////////
///////////////
1790    WBYTE&H40+CPU.ADR,&H20+AM70A.ADR,&H1;     '   Local   status   is
established.
1800    '
1810    END                                       Program is quit.


1000
    '****************************************************************
********
1010 '
1020 '                    AM70A sample program (2)
1030 '                    Program to receive measured data by using SRQ
1040 '                    ——— N88 BASIC ———
1050 '
1060 '
****************************************************************
***
1070 '
1080 '
1090
    '////////////////////////////////////////////////////////////////
///////////////
1100 '        Initial setup
1110
    '////////////////////////////////////////////////////////////////
///////////////
1120 '  AM70A.ADR=7       For setting the device address of 'AM70A.
1130 '  CPU.ADR=0         For setting the device address of 'PC9801.
1140    '
1150
    '////////////////////////////////////////////////////////////////
///////////////
1160 '        The PC9801 is set in the GP-IB mode.
1170
    '////////////////////////////////////////////////////////////////
///////////////
1180 '  ISET IFC          ' GP-IB interface is initialized.
1190 '  ISE REN           ' Remote status is established.
1200 '  CMD DELIM=0       ' Delimiter is set to "CL,LF".
1210 '  CMD TIMEOUT=5     ' Timeout is set to 5 seconds.
1220    '
1230
    '////////////////////////////////////////////////////////////////
///////////////
1240 '        Local lockout is set.
1250
    '////////////////////////////////////////////////////////////////
///////////////
1260 '  WBYTE&HI1;        ' Local lockout control becomes unable.
1270    '
1280
    '////////////////////////////////////////////////////////////////
///////////////
```

```
1290 ’        AM70A is set up.
1300
     ’////////////////////////////////////////////////////////////////
///////////////
1310 ’   PRINT@ AM70A.ADR;”M3”        ’ Measured item = distortion factor
1320 ’   PRINT@ AM70A.ADR;”DU1”         ’ Measuring unit = %
1330 ’   PRINT@ AM70A.ADR;”FL1”       ’ Filter = 30 kHz LPF IN
1340 ’   PRINT@ AM70A.ADR;”FRC1”         ’ Frequency counter input = Ach
1350 ’   PRINT@ AM70A.ADR;”FR1000HZ”  ’ Oscillation frequency = 1000 Hz
1360 ’   PRINT@ AM70A.ADR;”AA1.000V”  ’ Output level channel A = 1,000V
1370 ’   PRINT@ AM70A.ADR;”BA-10.00DB”    ’  Output  level  channel  B  =
-10.00dB
1380     ’                            ’
1390 ’   PRINT@ AM70A.ADR;”SR1”       ’ SRQ mode = data output mode
1400     ON SRQ GOSUB*INTR            ’ The location for SRQ interruption
is *INTR.
1410
     ’////////////////////////////////////////////////////////////////
///////////////
1420 ’        Start of measurement
1430
     ’////////////////////////////////////////////////////////////////
///////////////
1440 *TRIGGER
1450     SP=0                         ’ Flag for SRQ checking is cleared.
1460     SRQ ON                       ’ Interruption of SRQ is permitted.
1470     WBYTE64;CPU.ADR,32+AM70A.ADR,8:  ’Trigger is sent.
1480     ’0
1490 *LOOP
1500     IF SP=0 THEN*LOOP                ’ Waiting for SRQ interruption.
1510     IF SP=1 THEN*GET             ’ Trigger is sent again.
1520     ’
1530     GOTO*END.PROGRAM ’ Program is quit.
1540     ’
1550     ’
1560
     ’////////////////////////////////////////////////////////////////
///////////////
1570          Processing of interruption
1580
     ’////////////////////////////////////////////////////////////////
///////////////
1590 *INTR
1600     POLL AM70A.ADR,SP            ’ Status byte is read.
1610     IF (SP AND 80)=64 THEN*INTR1 ’ Status byte is judged.
1620     ’
1630     ’(((((((( When measured data has not been fixed ))))))))))))))))
1640     SR=1
1650     RETURN
1660     ’
1670     ’(((((((( When measured data has been fixed ))))))))))))))))))))
1680 *ITR1
1690     ’
1700     ’(((((((( Reading of measured data ))))))))))))))))))))))))))))
```

```
1710    INPUT@AM70A.ADR;FR$,A1$,A3$,B1$,B2$,B3$
1720    '
1730    '((((((( Display of measured data ))))))))))))))))))))))))))))
1740    IF A3$="1"THEN A3$="V":GOTO*UNIT
1750    IF A3$="2"THEN A3$="%":GOTO*UNIT
1760    IF A3$="3"THEN A3$="dB":GOTO*UNIT
1770    IF A3$="4"THEN A3$="dBm":GOTO*UNIT
1780    IF A3$="5"THEN A3$="°":GOTO*UNIT
1790    '
1800 *UNIT
1810    IF B3$="1"THEN B3$="V":GOTO*DISPLAY
1820    IF B3$="2"THEN B3$="%":GOTO*DISPLAY
1830    IF B3$="3"THEN B3$="dB":GOTO*DISPLAY
1840    IF B3$="4"THEN B3$="dBm":GOTO*DISPLAY
1850    IF B3$="5"THEN B3$="°":GOTO*DISPLAY
1860    '
1870    '
1880 *DISPLAY
1890    PRINT "FREQUENCY",FR$           ' Frequency data
1900    PRINT "Ach DATA",A1$:"":A2$:"":A3$ ' Ach judgment, data, measuring
unit
1910    PRINT "Bch DATA",B1$:"":B2$:"":B3$ ' Bch judgment, data, measuring
unit
1920    RETIUN
1930    '
1940
    '////////////////////////////////////////////////////////////////
///////////////
1950 '        End of program
1960
    '////////////////////////////////////////////////////////////////
///////////////
1970 :END.PROGRAM
1980    PRINT@AM70A.ADR;"SR0"               ' SRQ mode = OFF
1990    WBYTE&H40+CPU.ADR,&H20+AM70A.ADR,&H1;     '   Local   status   is
established.
2000    '
2010    END                                              Program is quit.


1000
    '****************************************************************
********
1010 '
1020 '                  AM70A sample program (3)
1030 '                  Program to confirm commands
1040 '                  ——— N88 BASIC ———
1050 '
1060 '
****************************************************************
***
1070 '
1080 '
1090
    '////////////////////////////////////////////////////////////////
```

```
///////////////
1100 '        Initial setup
1110
     '////////////////////////////////////////////////////////////////
///////////////
1120 '  SP=0             ' Flag for checking SRQ is cleared.
1130     '
1140     AM70A.ADR=7      ' Device address of AM70a is set.
1150     CPU.ADR=0        ' Device address of PC9801 is set.
1160     '
1170
     '////////////////////////////////////////////////////////////////
///////////////
1180 '       The PC9801 is set in the GP-IB mode.
1190
     '////////////////////////////////////////////////////////////////
///////////////1200     '   ISET IFC      '    GP-IB    interface    is
initialized.
1210     ISET REN         ' Remote status is established.
1220 '  CMD DELIM=0      ' Delimiter is set to "CL,LF".
1230 '  CMD TIMEOUT=5    ' Timeout is set to 5 seconds.
1240     '
1250
     '////////////////////////////////////////////////////////////////
///////////////
1260 '        Local lockout is set.
1270
     '////////////////////////////////////////////////////////////////
///////////////
1280 '  WBYTE&HI1;       ' Local lockout control becomes unable.
1290     '
1300
     '////////////////////////////////////////////////////////////////
///////////////
1310 '        AM70A is set up.
1320
     '////////////////////////////////////////////////////////////////
///////////////
1330 '  PRINT@ AM70A.ADR;"SR2"       ' SRQ mode = command judging mode
1340 '  ON SRQ GOSUB*INTR            ' Location of SRQ interruption is set
to *INTR.
1350
     '////////////////////////////////////////////////////////////////
///////////////
1360 '        Input of command
1370
     '////////////////////////////////////////////////////////////////
///////////////
1380 *INPUT.COMMAND
1390     SRQ ON                       ' Interruption of SRQ is permitted.
1400     INPUT @COMMAND OR END":CM$   ' Command is input.
1410
1420     IF CM$="END" THEN *END.PROGRAM   'Program is quit when "END" is
input.
```

```
1430    '
1440    PRINT@ AM70A.ADR;CM$          ' Command is sent.
1450    '
1460    FOR 1=0 TO 100:NEXT1          ' Wait time to confirm SRQ
1470    '
1480    GOTO *INPUT.COMMAND
1490    '
1500
     '////////////////////////////////////////////////////////////////
///////////////
1510          Processing of interruption
1520
     '////////////////////////////////////////////////////////////////
///////////////
1530    *INTR
1540    POLL AM70A.ADR,SP             ' Status byte is read.
1550    '
1560    ' Content of the error is displayed.
1570    '
1580    IF (SP AND 97)=97 THEN PRINT "COMMAND ERROR!"
1590    IF (SP AND 67)=67 THEN PRINT "OSC SET ERROR!"
1600    '
1610    RETURN
1620    '
1630
     '////////////////////////////////////////////////////////////////
///////////////
1640 *END.PRGRAM
1650
     '////////////////////////////////////////////////////////////////
///////////////
1660 *END.PROGRAM
1670    PRINT@ AM70A.ADR:"SR0"             ' SRQ mode = OFF
1680    WBYTE&H40+CPU.ADR,&H20+AM70A.ADR,&H1;     '   Local   status   is
established.
1690    '
1700    END                                        Program is quit.
```

5.2. Operating Method of EXT I/O

The AM70A is equipped with the function to memorize the settings of measuring conditions and judgment reference values. Set several measuring processes sequentially in the memory using this function, then perform measurement by selecting the memory numbers. This enables you to efficiently complete a series of measurements.

This memory switching operation can be controlled by the external switches through this EXT I/O. It also has the function for repeatedly controlling a period of the set memory numbers.

As the external switches can be set on the easy-to-control and the display for judged value of EXT I/O on the easy-to-read, space utility will be enhanced.

The EXT I/O has four inputs and four outputs for judged results. A total of four external switch inputs are necessary — one for selecting the normal measurement and remote measurement via this EXT I/O; one for resetting to the initial number of memory numbers in the measuring period; one for the switch that advances the memory number to the next; and one for the switch to return the number back to the previous one.

External switches and connectors needed for connection are procured by customers. Recommended connectors are Amphenol connector (model name: 57-30140) made by DDK (Dai-ichi Denshi Kogyo).

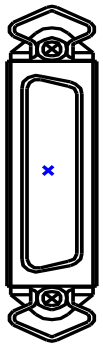
Switches required are one push-pull type switch to maintain the status for remote selection and three momentary-type (non-lock) push switches for advancing/reversing the memory number.

It is designed that judged results lights up the LED. Since judgment contents (OVER and UNDER) are independently output for each of channels A and B, a total of four outputs are provided.

When both OVER and UNDER are not output, it means that judgment is same as “GO”, therefore, judgment output for “GO” is not available. Since OVER and UNDER of one channel are not output during the other channel is being measured, judgment is same as “GO”.

5.2.1. Connection of EXT I/O

EXT I/OF connector terminals are as follows.

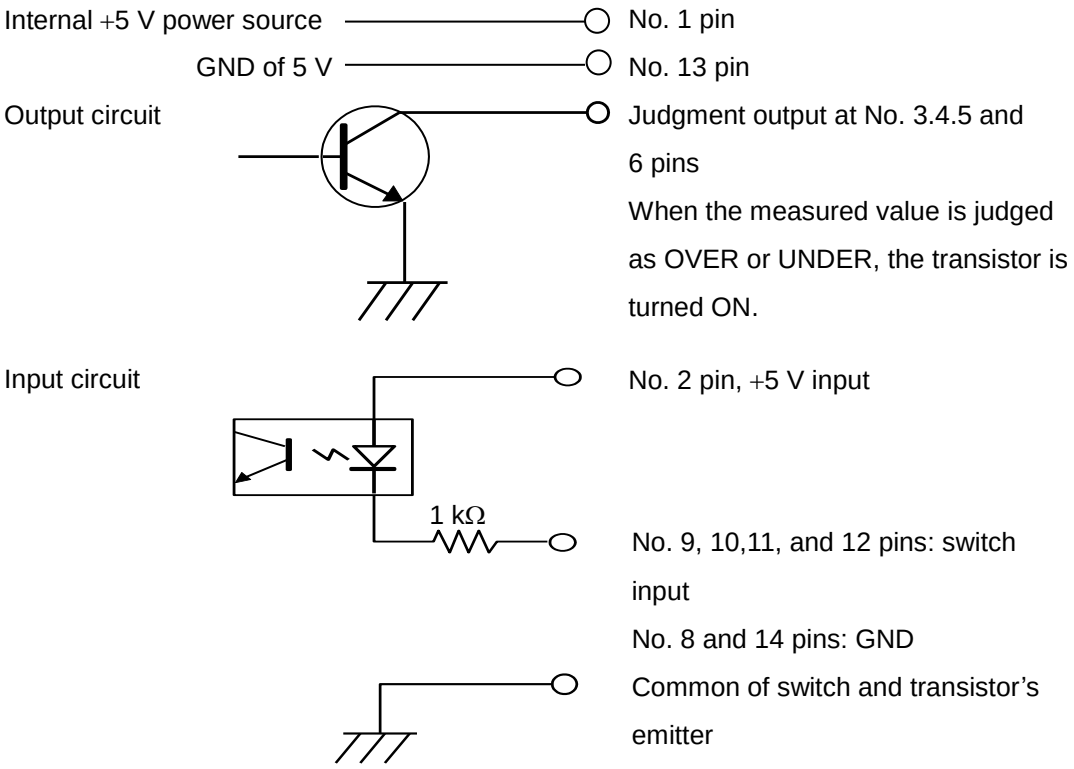


No.	Signal name	No.	Signal name
1	Internal power supply + 5V output	8	GND
2	+5V input Power input for EXT I/O	9	Remote ON input
3	Ach UNDER output	10	Reset input
4	Ach OVER output	11	Measurement sequential advance input
5	Bch UNDER output	12	Measurement reverse input
6	Bch OVER output	13	GND for +5V output
7	No used	14	GND

5.2.2. Internal Connection of EXT I/O

The EXT I/O circuit is separated by a photo-coupler to prevent the invasion of noise into the analog measuring circuits. Therefore, the power source to drive the photo-coupler is necessary. But it is possible to use the 5V power source which drives the GP-IB control circuit and is output between the No. 1 and No. 10 pins of the connector. However, its capacity is 200 mA. If you want to light up the LED or lamp for displaying judgment outputs whose required amperage is larger than 200 mA, please prepare the separate power source.

The output circuit is transistor array output and not equipped with a current limit resistor. So, please attach a suitable resistor to meet your required LED. Since 1 kΩ resistors are attached in series on the photo-couple in the input circuit, connect it to the switch as it is. By short-circuiting GND of the No. 8 pin or No. 14 pin and the input connector, the signal is accepted as an input signal.



The internal circuit of the AM70A is as shown in the circuitry above. Normal LED requiring a lighting current of approx. 20 mA for displaying the judged result can be p:l
owered by the internal power supply. Since the +5V of the internal power supply is output to the No. 1 pin, connect it to the No. 2 pin. In the same way, since the GNDF of the internal power supply is output to the No. 13 pin, connect it to the GND of the No. 14 pin.

Connect the anode end of LED to +5V and its cathode end to No. 3, 4, 5 and 6 pins of transistor array through the current limiting resistor of about 500Ω. When the measured result is OVER or UNDER, this transistor turns ON to light up the LED. Connect input connectors of each switch with GND of the No. 8 pin and the No. 14 pin. When the switch is turned ON, each operation is commenced.

5.2.3. Setup of memory function and operation of external switches

A total of 100 types memory numbers (00 - 99) are usable. It can be separated into several periods. It is also possible to repeat the measurement in a separated period. (When measurement is performed by the switch on the front panel, these separated periods are ignored.) To set up the period, depress the STORE switch for two seconds with the currently displayed address. The address to which this setting has been done is confirmed by lighting of the decimal point on the second digit of the indicator. To release the setting, proceed the same operation and confirm that the decimal point goes out.

For instance, assume to perform measurement by setting five kinds of measuring items/judging reference values to memory numbers 1 to 5. To set a measuring period, display the memory No. 1 and depress the STORE switch for two seconds to light up the decimal point, then press the UP arrow switch to set the memory number to 5, and perform the same operation. In this way, the measuring period from the memory No. 1 to 5 can be set.

If the measuring period was set in the memory No. 10, that the No. 5 functions as the memory number for measurement end and the memory number to start the measurement.
To perform measurement from the EXT I/O within the measuring period, it is necessary to set the “Remote ON input” external switch under the status that the memory number of the front panel have been set to the number within the period. When this status has been established, key switch on the front panel does not function. (However, if GP-IB was controlled simultaneously, GP-IB supersedes.)

Turn the “Measurement reset input” switch ON, the first memory number of the measuring period is selected and measurement is commenced. Turn ON the “Measurement forward” switch ON, the next memory number is selected, and the “Measurement reverse” switch displays the previous number. In this operation, if simultaneous turning ON of switches besides the REMOTE switch is not accepted. They must be turned ON one by one. To change the measuring period, turn on the “Remote ON input” external switch OFF once, then change the memory numbers for the new measuring period using the arrow switches and ten-keys on the front panel.

6 MAINTENANCE AND CALIBRATION

6.1. Introduction

The AM70A Audio Analyzer does not have any adjusting points where customers can freely set. If you have any question, please contact the sales representative of ShibaSoku Co., Ltd.

6.2. Troubleshooting

Please check and confirm following items before concluding that the AM70A malfunctioned.

	Status	Please confirm	Measure
	Power does not turn ON.	Is the power plug loosened or disconnected from the AC line outlet?	Insert the power plug to the AC line outlet securely.
		Is the fuse blown?	Replace it with the new fuse having the same amperage.
	Signals are not output.	Are output signal cables disconnected or broken?	Securely connect output cables to the corresponding connectors.
	Measurement is not performed.	Are input signal cables disconnected or broken?	Securely connect input cables to the corresponding connectors.
	Output and input levels are not equal.	Are output impedance is same? Is measuring unit correct?	Adjust output impedance and measuring unit correctly.
	Measured values are not equal.	Is the function to be measured selected?	Set to the function for desired measurement.
	Distortion factor is not measured.	Is the frequency counter set to the “AUTO” mode? Is the measuring channel set correctly?	Set the frequency counter to the “AUTO” mode. Set the measuring channel correctly.
	Distortion factor is worse than the previously measured value.	Have the power environment and grounding environment been changed?	Set the power and grounding environment same as the previous measurement, then perform measurement.

6.3. Fuse Replacement

a) For increased safety, turn OFF the power switch of the AM70A and disconnect the power cable from it.
b) Lightly depress the fuse cap on the rear panel with a minus screw driver or other tool, rotate it counterclockwise, then remove the fuse cap and fuse.
c) Mount the new fuse having the designated amperage and fuse cap in accordance with the AC line voltage.
d) Mount the fuse and fuse cap in the reverse order of item b).
e) Connect the AC power cable of the AM70A, turn ON the power switch, and confirm that it operates normally.

6.4. Inspection

Measuring instruments required for inspection.

a) Oscilloscope

b) AC level meter

6.4.1. Confirmation of Oscillator

- Connect the output signal to the oscilloscope, and check that the resulting sine wave is not distorted.
- Connect the output to the AC level meter, and check that the correct level is output.

6.4.2. Confirmation of Measuring Section

- Connect the oscillator output of the AM70A to the measuring section, measure the level, and confirm that the measured value is correct.
- Connect the oscillator output of the AM70A to the measuring section, measure the distortion factor, and confirm that distortion factor is within the rated value.

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