Instruction Manual

ＭＡＫ－６５８１

Audio Analyzer

Classification No. 1056-821-001

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PRECAUTIONS FOR USE

1. The AC line voltage of this unit is set using the line voltage selector located on the rear panel.
   Verify that this has been set properly before applying power.
2. Before turning the power switch ON, make sure that the meters are mechanically zeroed.
3. This unit uses a memory backup battery.
   Therefore, if the unit is not being used for a long period, the battery may become discharged.
   For this reason, the unit should be turned on occasionally to maintain the battery charge.
4. Since this instrument uses a high-sensitivity input circuit, its use near strong electric or electromagnetic fields should be avoided.
5. Since this unit uses reed relays, it should not be subjected to excessive shock.

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1 OUTLINE

1.1 General Description

The MAK-6581 is an audio analyzer which incorporates the functions of an audio oscillator, distortion meter, S/N meter and AC voltmeter in a single instrument. The oscillator frequency and distortion meter fundamental tuned frequency are linked automatically, making it into an effective linked distortion meter, and, with all its other functions, this instrument can replace a variety of individual audio measuring instruments.

In setting frequency and output levels, LED displays are used to indicate setting values and two meters are used to indicate the input level and measured values, thereby increasing measurement efficiency.

The use of microprocessor technology dramatically enhances ease of use, and a full range of memory/recall functions in addition to a remote control function and furthermore, the GPIB function is included.

1.2 Features

- The use of numerical and incrementing keys greatly simplifies the task of setting oscillator frequencies and output levels.
- The oscillator output level may be set in units of volts, dBV or dBm, and conversions between units can be made as desired.
- An input level meter and measurement meter are provided to enable independent displays of input levels and distortion or other measured values simultaneously.
- By using an input ALC circuit, the distortion measurement setting level is not adversely affected by residual noise caused by input level fluctuations.
- Fast-acting response in the fundamental elimination circuit ensures reduced measurement times.
- A variety of filters, namely, 400Hz highpass, 30/80kHz lowpass and WTD (weighted, JIS A), usable in all measuring mode are provided as standard.
- The indicating circuit of the measurement system uses an rms value response circuit with excellent frequency response, thus achieving accurate measured results.

- All panel operating functions may be stored in memory (up to 100 steps), these steps being recallable whenever desired. (10 memory address × 10 step numbers for a total of 100 steps. Step number expansion may be made up 100 steps.)
- In making S/N measurements, an automatic signal level hold function and signal off function operate to increase ease of operation.
- All panel key function may be operated by means of a rear panel remote control connector, enabling external control. (A remote control box is optional.)
- With the GPIB function provided, including data output, in addition to remote control, it is possible to use the A/D outputs of the two meter indications.

1.3 Accessories

Item	Model	Qty	Remarks
Input / Output cable	060-1800	1	BNC-to- alligator clips
Input / Output cable	MC-2051B	1	With 2 BNC connectors
Fuse		2	2A, or 1A ; slow-blow type
Power cable		1	with AC plug
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Option : BNC Adapter (Binding post / BNC plug) Model 1296

2 SPECIFICATIONS

2.1 Oscillator

Frequency	
Range	5.0Hz~199.9kHz
Accuracy	±2% of setting value
Output	
Level range	0.238mV~2.37Vrms into a 600Ω load
	0.238mV~0.999mVrms in 0.001mV steps
	1.00mV~9.99mVrms in 0.01mV steps
	10.0mV~99.9mVrms in 0.1mV steps
	100mV~999mVrms in 1mV steps
	1.00V~2.37Vrms in 0.01V steps
	-72.5dB~+7.5dB in 0.1dB steps
	-70.3dBm~+9.7dBm in 0.1dBm steps
Accuracy	At 1kHz：
	-32.5dB~+7.5dB： ±0.2dB
	-32.6dB and below： ±0.5dB
Flatness	20Hz~19.99kHz： ±0.2dB
	5.0Hz~1999.9kHz： ±0.5dB
Distortion	20Hz~10kHz
	-95dB (0.0018%), 80kHz BW
	5.0Hz~50kHz：
	-85dB (0.0056%), 600kHz BW
	50kHz~1999.9kHz：
	-75dB (0.018%), 600kHz BW
Impedance	600Ω ±1%, unbalanced (floating)

2.2 Voltage Setting

Measurement range	+40dB~-90dB (100Vrms~0.03mVrms) fullscale in 14 ranges
Frequency characteristics	20Hz~100kHz：±0.3dB 5.0Hz~300kHz：±1.0dB

2.3 Distortion Measurement

Measurement frequency	5.0Hz~199.9kHz
Distortion measurement range	-10dB~-90dB (30%~0.003%) fullscale with an input level of 1Vrms or greater.
Fundamental elimination ratio	20Hz~19.99kHz：100dB or greater 5.0Hz~50kHz 90dB or greater 50kHz~199.9kHz：80dB or greater
Residual distortion	For an input voltage of 1Vrms or greater： 20Hz~10kHz -95dB (0.0018%), 80kHz BW 6.0Hz~50kHz -85dB (0.0056%), 600kHz BW 5.0Hz~199.9kHz -75dB (0.018%), 600kHz BW
Input level range	0.1~100Vrms (0.3~100V fullscale) in six ranges

2.4 S/N Measurement

Measurement range	0dB~90dB fullscale (with an input level of 1Vrms or greater)
Signal level range	0.1V~100Vrms
Residual noise	-100dB (10 μ V) or less. 80kHz BW -90dB (32 μ V) or less, 600kHz BW

2.5 General Specifications

Input impedance	100kΩ ±1%, unbalanced
Input capacitance	100pF or less
Filters	400Hz highpass filter, 18dB / oct (all measurement modes) 30kHz lowpass filter, 18dB / oct (all measurement modes) 80kHz lowpass filter, 18dB / oct (all measurement modes) WTD (JIS A) (all measurement modes)
Meters	Input level meter : Average value response, rms value indication with V, db and dBm scales. Measurement meter : Rms value response, rms value indication (crest factor of 5 or below), with V, %, dB and dBm scales.
Oscillator frequency, distortion meter fundamental frequency and output level settings	Made by means of numerical entry in combination with a cursor and incrementing keys.
AC Output	1Vrms / meter fullscale Output impedance : 1kΩ, unbalanced
DC Output	1VDC / meter fullscale Output impedance : 1kΩ, unbalanced
Presets	10×10 memory, maximum of 100 steps. All panel functions storable.
Remote control	All panel functions may be controlled remotely. An optional remote control box is usable to perform memory recall, incrementing of frequencies and output levels and up / down shifting of meter ranges. A GP-IB function provided.
Backup battery	N-SB3

Power supply	100/115/215/230VAC ± 10% (voltage is selected by means of a line voltage selector on the rear panel), 50/60Hz, approx. 53VA.
Maximum dimensions	Approx. 430(W)×110（H）×380（D）mm
Weight	Approx. 9.5kg

3 PANEL DISTORTION

3.1 Front Panel Description

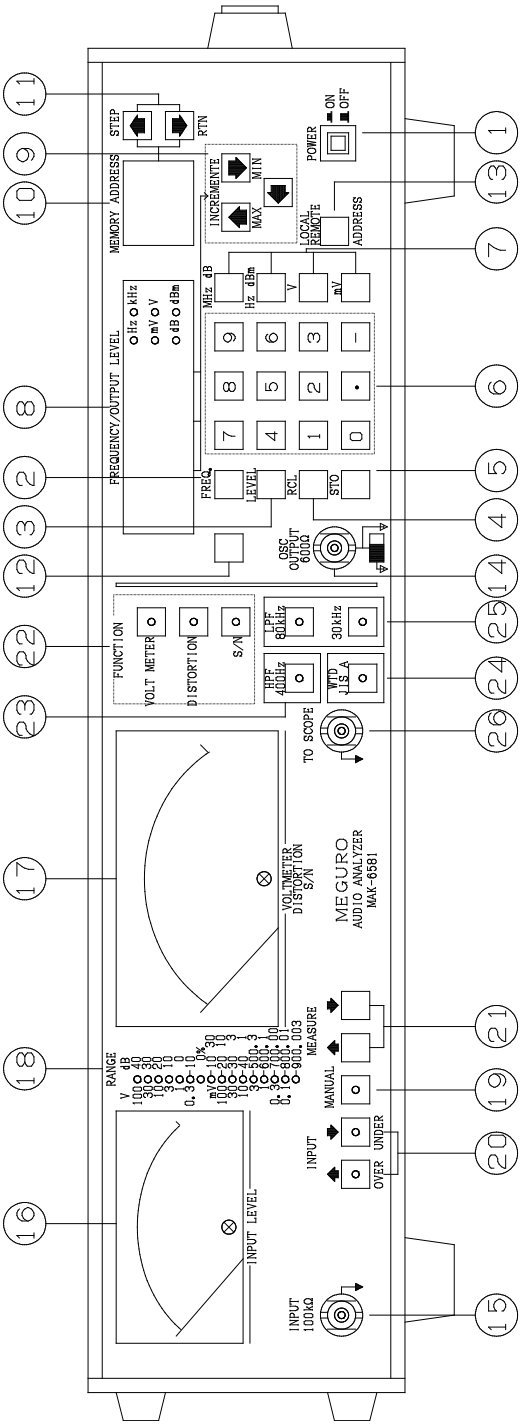


Fig. 1

① POWER Switch

This is the power switch of the MAK-6581

② FREQ.

This key is used to set the oscillator output frequency and, when setting the distortion meter fundamental frequency, is pressed to specify the frequency mode.

③ LEVEL

This key is pressed when setting the oscillator output level to specify the level mode.

④ RCL

This key is pressed to recall data from a desired memory address which has been previously stored.

⑤ STO

This key is pressed to store any desired panel measurement settings.

⑥ Numerical Keys

These numerical keys are used to specify oscillator frequency, output level, and address numbers for recall and storage.

⑦ Units Key

a) kHz/dB

This key is used to select the units as follows.

Frequency mode : kHz

Level mode : dB (dBV)

b) Hz / dBm

This key is pressed to select the units as follows.

Frequency mode : Hz

Level mode : dBm (600Ω)

c) V

This key is pressed in the level mode to specify units of volts.

d) mV

This key is pressed in the level mode to specify units of millivolts.

⑧ FREQUENCY / OUTPUT LEVEL

This display indicates the oscillator or distortion meter fundamental frequency or oscillator output level.

It consists of a 3.5-digit display, unit indicators, and a cursor function which is used to indicate the digit which will be incremented or decremented.

⑨ INCREMENT

These keys are used to increment or decrement the lower three digits of frequency and level values indicated on the display. The ㊷ key is used to bring the cursor to the desired digit and the ㉞ and ㉟ keys are used to increase and decrease the value, respectively.

⑩ MEMORY ADDRESS

This is the memory address and step number display.

⑪ STEP (RTN)

These keys are used to increment and decrement memory step numbers. They are also used in setting the end of a memory address cycle.

⑫ Blue Key

This key is used to obtain maximum and minimum displays of oscillator frequency and output level and is also used in performing maintenance. It enables secondary functions.

⑬ LOCAL (REMOTE ADDRESS)

When the REMOTE LED is lighted, the MAK-6581 is in the GP-IB external control mode. To enable the front panel controls, press the LOCAL key.

⑭ OSC OUTPUT

This is the oscillator output connector (BNC type).

⑮ INPUT

This is the measurement section single input connector (BNC type).

⑯ INPUT LEVEL

This meter indicates the level of the signal applied at the INPUT connector. dB (V), V and dBm scales are provided.

⑰ VOLTMETER, DISTORTION, S/N

This meter indicates the measured results from the various functions. It is provided with dB (dBV), V, % and dBm scales.

⑱ RANGE

These LEDs indicate the ranges of the INPUT LEVEL and VOLT METER DISTOETION S/N meters.

Using the DISTORTION and S/N functions, they indicate the 40dB –10dB (green LEDs) ranges for the input meter and the 0 –90dB (red LEDs) ranges for the measurement meter.

When using the VOLT METER function, however, the 40dB –90dB ranges are linked.

⑲ MANUAL

This key switch is used to select whether automatic or manual range switching will be used for the input and measurement meters. The associated LED lights when manual range switching has been selected.

⑳ INPUT (RANGE)

These key switches are used to raise or lower the input meter range. When in manual ranging mode, if the range setting is not proper, the OVER or UNDER LED will flash.

㉓ MEASURE

These key switches raise or lower the measurement meter range.

㉔ FUNCTION

These switches are used to select the AC voltmeter (VOLT METER), distortion meter (DISTORTION) and S/N meter (signal-to-noise meter) functions for the VOLT METER, DISTORTION, S/N meter.

㉕ HPF 400Hz

This is a highpass filter with its –3dB at 400Hz (18dB / octave rolloff). When the oscillator frequency (fundamental frequency) is 799Hz or below, the associated LED flashes and the filter is turned OFF.

㉕ WTD (JIS A)

This is an auditory weighting filter with JIS A curve characteristics.

㉖ LPF 30kHz, 80kHz

These are lowpass filters with –3dB points at 30kHz and 80kHz (18dB / octave rolloff). When the oscillator frequency (fundamental frequency) exceeds 10kHz or 25kHz, respectively, the associated LED lights and the filter is switched OFF.

㊾ TO SCOPE

A waveform observation output of measured of measured results is available at this BNC connector.

3.2 Rear Panel Description

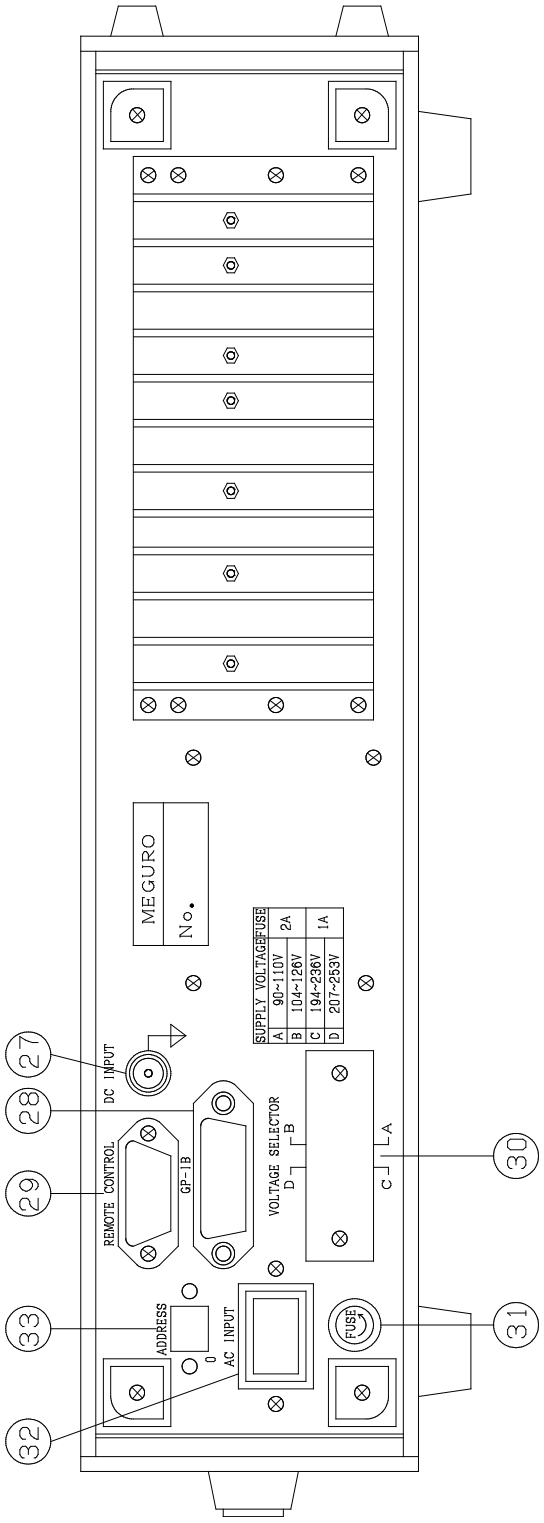


Fig. 2

⑯ DC OUTPUT

An output voltage of 1VDC for fullscale indication of the ⑰ front panel VOLTMETER, DISTORTION, S/N meter is available at this BNC connector. The output impedance is 1kΩ, unbalanced.

⑬ GP-IB

For the interface connecting cable

⑯ REMOTE CONTROL

Panel key operations can be remotely controlled from this connector. An optional remote control box is connected at this connector and may be used to perform such functions as memory recall or any front panel functions.

⑰ VOLTAGE SELECTOR

This is the AC power line voltage selector. It should be inserted so that the arrow points to the letter which corresponds to the supply voltage as indicated on the table at the right of this selector.

⑱ FUSE

This is the protective AC fuse. When replacing the fuse, be sure to use a fuse rated in accordance with the AC line voltage.

⑬ AC INPUT

This is the AC line power cable.

⑮ ADDRESS

For setting the GPIB address of the instrument.

Please refer to Sect. 9.5.1 for details.

4 OPERATION

4.1 Preparations for Use

(1) Before applying power to the MAK-6581, verify that the meters have been mechanically zeroed. If they were not, turn the adjustment screws of each meter to adjust them.

(2) Verify that the VOLTAGE SELECTOR at the rear panel has been set to the voltage to be used in powering this unit.

(3) Connect the rear panel AC cable to the AC power line and press the POWER switch. After power is applied, the displays will appear exactly as they did immediately before power was removed.

4.2 Oscillator Operation

4.2.1 Frequency Setting

(1) Verification of the frequency setting range using the blue key

The frequency may be set to any value in the range 5.0Hz~199.9kHz and the blue key may be used to verify this range. First, after pressing the FREQ. key, press the blue key and then the INCREMENT MAX key. The upper frequency limit of 199.9kHz will be displayed.

Press the blue key once again and then the MIN key to display the minimum frequency of 5.0Hz.

(2) Direct setting of values of numerical keys

First, press the FREQ. key and then numerical keys 0~9, and ・ key to input a frequency setting.

When doing this, 3.5 digits may be set as a value and, it should be noted that digits other than this or frequencies outside of the frequency setting limits will be ignored.

If an error is made when pressing numerical keys, press the FREQ. key once more and reset the value using the numerical keys once again. When the setting using the numerical keys has been completed, terminate the setting sequence by pressing the frequency unit key kHz or Hz.

After setting a frequency, to reset the frequency, it is not necessary to press FREQ. once again. Simply press the numerical keys and the unit key.

Notes

1. The frequency display is not the measured value from a frequency counter. The actual frequency is within ±2% of the displayed frequency.
2. If the power is applied with the frequency set in the range 5.0Hz~10Hz, 5~10 seconds are required for the oscillation level to stabilize.

(Example 1)

Input 123.4Hz

Key operation	Frequency display	Remarks
FREQ.	×××× ××	× Indicates the previous display condition
1	1 ㉝㉝㉝ ㉝㉝	㉝ indicates the blanked condition
2	1 2 ㉝㉝ ㉝㉝	
3	1 2 3 ㉝㉝㉝㉝	
・	1 2 3 . ㉝㉝	
4	1 2 3 . 4 ㉝	
Hz	1 2 3 . 4 Hz	Setting completed

(Example 2)

Input 2kHz after the setting of Example 1 (in the FREQ. mode)

Key operation	Frequency display	Remarks
2	2 ㉝㉝㉝ ㉝㉝	
kHz	㉝2．0 0 kHz	Setting completed

(3) Frequency setting using the INCREMENT keys

It is possible to increase and decrease the values above the digit at which the cursor is flashing in the FREQUENCY / OUTPUT LEVEL display to change the frequency setting value.

First, use the INCREMENT ㊷ key to move the cursor to the desired digit and then use the ㉞ and ㉟ keys to increase or decrease the values. When doing this, pressing the up or down keys briefly changes the value in single steps, while pressing then continuously jogs them continuously using an internal clock.

Caution

When using the INCREMENT keys to change the frequency, when the display decimal point moves, the cursor position will also automatically move. However, this is only a physical move, and the display value to be changed does not actually change.

(Example)

In changing the 1Hz digit of the value 1.98.9Hz, when 200Hz is reached, the cursor moves.

Key operation	Displayed value and cursor	Remarks
㊷	1 9 8．9 Hz	Cursor moves to 1Hz place
㉞	1 9 9．9 Hz	Increment f by 1Hz.
㉟	2 0 0 Hz	Decimal point moves. (Cursor displayed at 1Hz place.)

4.2.2 Output Level Settings

(1) Verification of the output level range using the blue key

The output level range when using dB, dBm and the V units may be verified by using the blue key. Operation is in the following sequence.

(a) Verification of dB Units Level Range
LEVEL→dB→Blue Key→MAX→7.5dB (displayed value)→
Blue Key→MIN→－72.5dB(displayed value)

(b) Verification of dBm Units Level Range
LEVEL→dBm→Blue Key→MAX→9.7dBm (displayed value)→
Blue Key→MIN→－70.3dBm(displayed value)

(c) Verification of V Units Level Range
LEVEL→V→Blue Key→MAX→2.37V (displayed value)→
Blue Key→MIN→－0.238mV (displayed value)

Therefore, setting of the output level is possible anywhere in the ranges –72.5dB~7.5dB, －70.3dBm~9.7dBm and 0.238mV~2.37V.

(2) Direct Setting of Values of Numerical Keys

First, press the LEVEL key and then use numerical keys 0~9 and ・ to input the setting level. When doing this, the input level units may be selected as dB, dBm, V or mV.

(Example 1)
Input －12.3dB.

Key operation	Frequency display	Remarks
LEVEL	×××× ××	× Indicates the previous display condition.
－	－㉝㉝㉝ ㉝㉝	Indicates the blanked condition
1	－１㉝㉝ ㉝㉝	
2	－１２㉝ ㉝㉝	
・	－１２． ㉝㉝㉝	
3	－１２． ３㉝㉝	
ｄＢ	－１２． ３ｄＢ	Setting completed.

(Example 2)

After (Example 1) input 457mV.

Key operation	Output level display	Remarks
4	4 ㉝㉝㉝ ㉝㉝	Represents the blanked condition
5	4 5 ㉝㉝ ㉝㉝	
7	4 5 7 ㉝ ㉝㉝	
mV	4 5 7 mV	Setting completed.

(Example 3)

Units conversion.

Key operation	Output level display	Remarks
	㉝4 5 7 mV	Previous display condition.
dB	−㉝6．8 dB	Change mV to dB (V).
dBm	−㉝4．6 dBm	Change dB (V) to dBm.
V or mV	㉝4 5 7 mV	Return to mV.

(3) Setting Levels Using the INCREMENT Keys

It is possible to increase and decrease the values above the digit at which the cursor is flashing in the FREQUENCY / OUTPUT LEVEL display to change the frequency setting value.

First, use the INCREMENT ㊷ key to move the cursor to the desired digit and then use the ㉞ and ㉟ keys to increase or decrease the values. When doing this, pressing the up or down keys briefly changes the value in single steps, while pressing then continuously jogs them continuously using an internal clock.

Caution

The output level display is not a display of the level measurement. The maximum output is attenuated by an attenuator and the level converted to units of V, dB or dBm.

The accuracy of the displayed value is described in SECTION TWO.

4.3 Measurement Section Operation

4.3.1 Function Selection

（1）Voltmeter

When the VOLT METER function key is pressed, the associated LED lights and the unit begins operation as a voltmeter.

In this mode, the meter ranges 40dB~－90dB are linked and the HPF, LPF and WTD filters may be used.

（2）Distortion Meter

When the DISTORTION function key is pressed, the associated LED lights and the unit begins operation as a distortion meter.

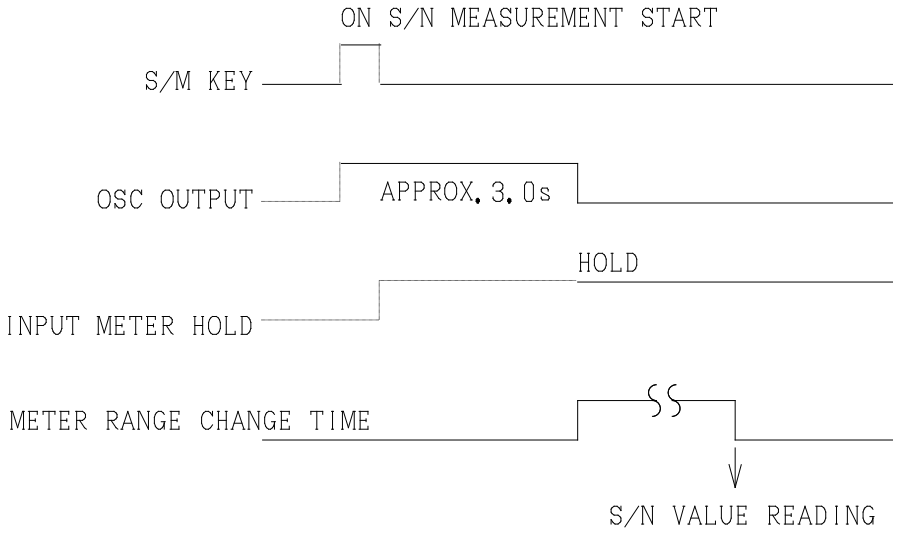
In this mode, the 40dB~－10dB green LED section indicates the meter range for the INPUT LEVEL meter while the 0dB~ － 90dB (30%~0.003%) red LED section indicates the measurement meter (VOLT METER, DISTORTION, S/N).

The HPF (highpass), LPF (lowpass) or WTD (weighted) filter can be used when required

（3）S/N Meter

When the S/N function key is pressed, the associated LED lights and the unit begins operating as a S/N meter.

To simplify S/N measurement operation, S/N measurement is completed by simply pressing the S/N key once. The timing illustrate below automatically on/off controls the oscillator output and holds the input level.



In addition to pressing the S/N key, start of S/N measurement is made automatically whenever the oscillator frequency or output level are changed and whenever the INPUT LEVEL meter range is changed.

4.3.2 Automatic and Manual Range Operation

The input range and measurement range may be selected automatically or manually.

(1) Automatic Ranging

If the LED associated with the MANUAL key below the range LEDs is not lighted, both the input range and the measurement range are being automatically switched.

Note that even in the automatic range, the range may be manually changed by using the INPUT MEASURE ㉞ and ㉞ keys. However, when using the instrument as a voltmeter, the INPUT range may not be manually changed.

(2) Manual Ranging

When the LED associated with the MANUAL key is lighted, both the input range and measurement range are in the manual range switching mode.

(a) Range Switching (DISTORTION, S/N Modes) Using the INPUT ㉞ ㉟ keys.

When the INPUT key OVER is lighted, the input signal is too high in level for the set range. In this case, press the OVER (㉞) key until the LED goes out.

If the INPUT key UNDER is lighted, the input signal is of an excessively low level. In such cases, press the UNDER (㉟) key until the LED goes out.

A proper range has been selected when both INPUT key LEDs go out.

(b) Measurement Range Switching Using the MEASURE Keys

When the MANUAL key LED is lighted and the VOLT METER, DISTORTION, S/N meter is indicating 1/3 or below fullscale, press the MEASURE (㉟) key to change the range to obtain a proper indication. If the meter has been pinned, conversely, press the MEASURE (㉞) key to obtain a proper meter indication.

Caution

In the DISTORTION, S/N modes, depending upon the selected range and lowpass filter used, the following listed limitations will exist on measurement ranges.

LPF Input range	LPF (30kHz or 80kHz) IN	LPF (30kHz or 80kHz) OUT
0~40dB	0~－90dB	0~－80dB
－10dB	0~－80dB	0~－70dB

Table 1 Measurement Range Limitations

4.4 Press Function

The preset function refers to the function which enables measurement items to be preset and recalled for use in measurement when desired. This function is provided to enhance the efficiency of measurements.

When repeatedly calling groups of continuous stored steps, a return function has been provided to enable looping from the last address to the first address.

4.4.1 Storage Operating Procedure

(1) Basic Storage Procedure

(a) Set the required measurement conditions (any desired panel function).

(b) Press the STO key to light the associated LED.

(c) Set the memory address for storage using the numerical keys or the STEP keys.

(d) Set any additional required measurement functions and repeat steps (b) and (c) to sequentially store these steps.

(2) Basic Storage Procedure Using the Numerical Keys

(Example 1)

1 Store 1kHz 1V distortion measurement at (00).

2 Store 10kHz 1V distortion measurement at (01).

3 Store 10kHz 2V voltage measurement at (10).

Key operation	Display	Memory address display	Remarks
DISTORTION	×××× ×	××	Previous display condition.
FREQ.	1××× ×	××	Frequency setting Preparation
1	×××× ×	××	
kHz	1．０００kHz		Set 1kHz
LEVEL	×××× ×	××	Level setting preparation.
1	1××× ×	××	
V	㉝1．００V	××	Set 1V
STO	㉝1．００V	××	Store preparation (LED lights).
・	㉝1．００V	××	Clear memory address
0	㉝1．００V	0㉝	
0	㉝1．００V	００	1kHz, 1V store complete.
FREQ.	1．０００kHz	００	Frequency setting preparation
1	1××× ×	００	
0	10×× ×	００	
kHz	10．００kHz	００	Set 10kHz
STO	10．００kHz	００	Store preparation (LED lights).
・	10．００kHz	㉝㉝	Clear memory address
0	10．００kHz	0㉝	

Key operation	Display	Memory address display	Remarks
1	１０．００kHz	０１	10kHz, 1V store complete.
VOLT METER	１０．００kHz	０１	Select voltage measurement mode.
LEVEL	×××× ×	０１	Level setting preparation.
2	２××× ×	０１	
V	㉝２．００Ｖ	０１	Set 2V output
STO	㉝１．００Ｖ	０１	Store preparation （LED light）.
・	㉝２．００Ｖ	㉝㉝	Clear memory address.
1	㉝２．００Ｖ	１㉝	
0	㉝２．００Ｖ	１０	10kHz, 2V store complete.

（３）Using the STEP and RTN Keys

(Example 2)
With a 0dB output, store voltage measurement at 20Hz, 2kHz and 20kHz at (10)~(20) addresses and use the return function.

Key operation	Display	Memory address display	Remarks
VOLT METER	×××× ×	××	Previous display condition
LEVEL	×××× ×	××	Level setting preparation.
0	０㉝㉝㉝ ×	××	
dB	㉝㉝０．００dB		Level setting complete.

Key operation	Memory Display	address display	Remarks
FREQ.	×××× ×	××	Previous display condition.
2	2㉝㉝㉝ ㉝	××	
0	20㉝㉝ ㉝	××	
Hz	㉝20．0Hz	××	20Hz setting complete.
STO	㉝20．0Hz	××	Store complete (LED light).
・	㉝20．0Hz	㉝㉝	Clear memory address.
1	㉝20．0Hz	1㉝	
0	㉝20．0Hz	10	Store 20Hz at (10)
2	2㉝㉝ ㉝	10	
kHz	㉝2．00kHz	10	
STO	㉝2．00kHz	10	Store preparation (LED lights).
STEP ㉞	㉝2．00kHz	11	Store 2kHz at (11)
2	2㉝㉝㉝ ㉝	11	
0	20㉝㉝㉝	11	
kHz	㉝20．0kHz	11	20kHz setting complete.
STO	㉝20．0kHz	11	Store preparation (LED lights)
STEP ㉞	㉝20．0kHz	12	Store 20kHz at (12)
STO	㉝20．0kHz	12	Return preparation
RTN	㉝20．0kHz	13	Store return command. No storage at (13)

Notes

1. In Example 2, after setting 20Hz and pressing the STO key, the ・ key is pressed and storage made by pressing the 1, 0 keys. When doing this, the ・ key and 0 key may be left out. To do this, use the following key sequence.

   FREQ. → 2 → 0 → Hz → STO → 1

2. In Example 2, when the RTN key is pressed at the end to use the return function, although the memory address is displayed as (13), there is actually nothing stored in address (13). After this, if the STEP ㉞ key is pressed continuously, after incrementing up to (19), return is made to (10), after which the cycle of (10)~(12) is recalled.

4.4.2 Recall Operating Procedure

The procedure for recalling items which have been stored in memory is as follows.

(1)Recall using the Numerical Keys

(a) Press the RCL key.
(b) Press the numerical ・ key.
(c) Recall the desired address using the numerical keys.

(Example 3)
Recall the memory contents stored in Example 1.

Key operation	Display	Memory address display	Remarks
RCL	×××　××	××	Previous display condition
・	×××　××	㉝㉝	Clear memory address.
0	×××　××	0㉝	
0	１．０００kHz	００	Recall memory (00)
・	１．０００kHz	㉝㉝	Clear memory address.
0	１．０００kHz	0㉝	
1	１０．００kHz	０１	Recall memory (01)
・	１０．００kHz	㉝㉝	
1	１０．００kHz	１㉝	
0	２．００V	１０	Recall memory (10)

Caution
After pressing the RCL key, to perform a continuous recall, it is not necessary to press the RCL key once again. After pressing the ・ key, an address may be recalled by simply entering the address number alone.

(2)Recalling Using the STEP ㉞ and ㉟ Keys

This procedure is used to recall memory locations which have been stored in consecutive addresses.

(Example 4)

Recall the memory addresses stored in Example 2.

Key operation	Display	Memory address display	Remarks
RCL	××××　×	××	Previous display condition
・	××××　×	㉝㉝	(or abbreviate to RCL→1)
1	××××　×	1㉝	
0	20.　0Hz	10	
STEP ㉞	2.　00kHz	11	Recall memory (11)
STEP ㉞	20.　0kHz	12	Recall memory (12)
STEP ㉞	20.　0Hz	10	Return to first address.

Notes

1. If the memory address displayed is not one that is desired for recall, when recall is being performed using the STEP and ㉞ ㉟ keys, after pressing the RCL key, perform recall by pressing the ・ key and numerical keys or use the RCL key and numerical keys (one digit) to perform recall.
2. In Example 4, after recalling address (12), when the STEP ㉞ key is pressed, address (10) is recalled once again because of the return function which was stored.
3. After the RTN key is pressed and the STEP ㉟ key is pressed successively, the address number will begin decrementing by 1 and stop at (×0). The × indicates any number from 1 through 9.

4.4.3 Correction of Erroneous Value Inputs

When making frequency or level value inputs, if a numerical key error is made, press the setting item FREQ. or LEVEL key and reinput the value using the numerical keys. If a unit key such as kHz or V has already been pressed, it is not necessary to press the FREQ. or LEVEL key and the correction may be started immediately using the numerical keys.

(Example 5)

200 is input erroneously when inputting a frequency of 20Hz.

Key operation	Display	Address display	Remarks
FREQ.	××××　×	××	Previous display condition.
2	2㉝㉝㉝　㉝	××	
0	2 0㉝㉝　㉝	××	
0	2 0 0㉝　㉝	××	200 input instead of 20.
FREQ.	2 0 0㉝　㉝	××	
2	2㉝㉝㉝　㉝	××	
0	2 0㉝㉝　㉝	××	
Hz	㉝2 0．0Hz	××	Setting complete.

(Example 6)

1dB is erroneously input instead of 1V.

Key operation	Display	Address display	Remarks
LEVEL	××××　×	××	Previous display condition.
1	1㉝㉝㉝　×	××	
dB	㉝㉝1．0dB	××	dB input instead of V.
1	1㉝㉝㉝　×	××	Beginning of correction.
V	㉝1．00V	××	End of correction.

5 MEASUREMENT METHOD

Caution

Fig. 3 shows the connections to the panel 1 and 2. 1 is connected to the MAK-6581 chassis and the 2 is connected to 1 by a panel switch that is normally floating from the chassis.

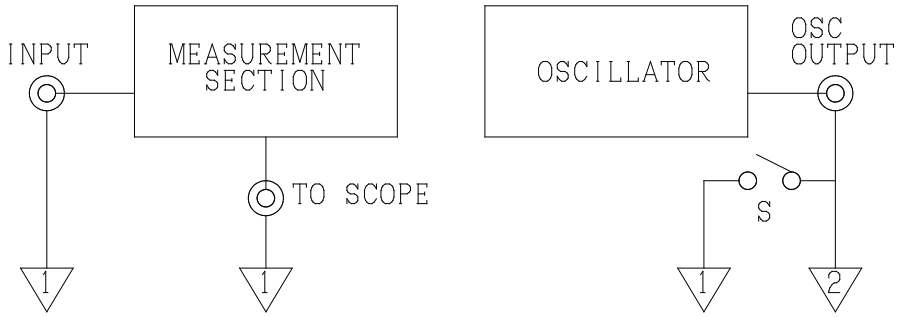


Fig. 3 Ground system connections

In normal measurements, the switch is kept in the OFF condition. However, if the oscillator is to be used alone, it should be switched ON.

5.1 Distortion Measurement Using the Internal Oscillator

Since the oscillator and distortion measurement section of the MAK-6581 are linked, the use of this measurement method enables the unit to be used as a highly efficient and simple linked distortion meter.

(1)Connect the MAK-6581 to the device under test as shown in Fig. 4.

(2)To measure in units of dBm, it is necessary to terminate the input of the device under measurement with 600Ω.

For dB and V measurement also, if the input impedance of the device under test is made 600Ω, the display readings may be read as levels directly. If the device under test has a high impedance and is not terminated with 600 Ω, the actual signal applied will be approximately 6dB higher in level than the indicated value.

(3)Frequency and level settings and oscillator section operation should be made in accordance with Section 4.2. If the preset function is to be used, refer to Section 4.4.

(4)Care should be taken as the measurement performance of the MAK-6581 is affected by residual noise and distortion as shown in Table 2.

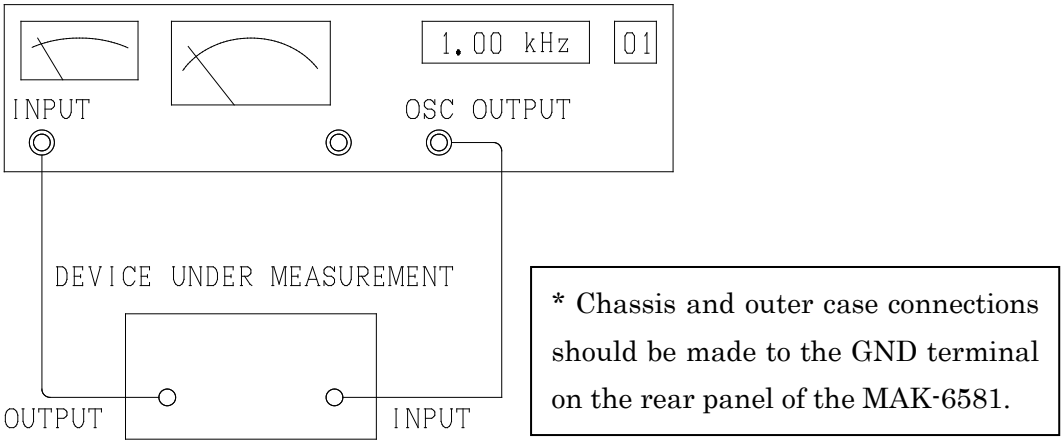


Fig. 4 Distortion measurements using the internal oscillator

INPUT RANGE Input frequency	>0dB	>−10dB	Harmonic bandwidth
20Hz~ 10kHz	<−95dB	<−85dB	80kHz BW
6Hz~ 50kHz	<−85dB	<−75dB	600kHz BW
5Hz~199.9kHz	<−75dB	<−65dB	600kHz BW

Table 2 Residual Noise and Distortion

Caution

The 600kHz harmonic bandwidth is the inherent MAK-6581 bandwidth (i・e., without the highpass, lowpass or weighted, JISA filter in the cuicuit).

5.2 Distortion Measurement Using an External Signal

(1) Using the distortion measurement section of the MAK-6581 to measure distortion using an external signal, connections should be made as shown in Fig. 5, without regard to the internal oscillator of the MAK-6581.

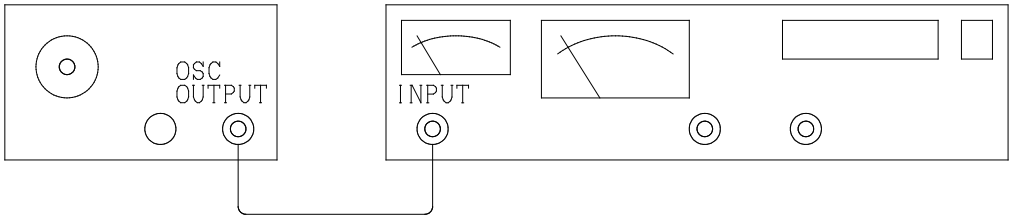


Fig. 5 Distortion measurement using an external oscillator

(2) Set the frequency and output levels of the external signal source to the desired measurement values.
Set the MAK-6581 fundamental tuning frequency to the frequency of the device under test using the FREQ. , numerical and frequency unit keys (Hz or kHz) and set the range switching to automatic mode.

(3) When the DISTORTION function key is pressed, the input range and distortion meter range will be automatically selected and the distortion will be displayed on the meter.

(4) Use the INCREMENT keys to change the fundamental tuning frequency slightly to find the frequency point of minimum distortion value.

5.3 Level Measurements

The MAK-6581 can be used as an AC level meter in the frequency range 5.0Hz~300kHz.
To make connections for use as a level meter, refer to Fig. 4 and Fig. 5 describing distortion measurement using the internal oscillator and external signal source, respectively.
For operation, refer to Section 4.3 on measurement section operation.

5.4 S/N Measurement

For S/N measurement, make connections as shown in Fig. 4.
For operation, refer to Section 4.3 on measurement section operation.
The input ranges are as shown in Table 1.

6 REMOTE CONTROL (OPTION)

6.1 Remote Control Function

By using the optional Remote Control Unit, the following remote control functions are possible.

(1)Auto/manual switching of the INPUT and MEASURE meters and up/down modification of the ranges of these meters.
(2)DISPLAY FREQ. (frequency) and LEVEL display switching.
(3)Frequency and level value setting (within specified limits) using the INCREMENT key functions.
(4)Memory recall using the MEMORY RCL key.

6.2 Connections

The remote control unit cable is connected at the 14-pin REMOTE CONTROL connector at the rear panel of the MAK-6581.

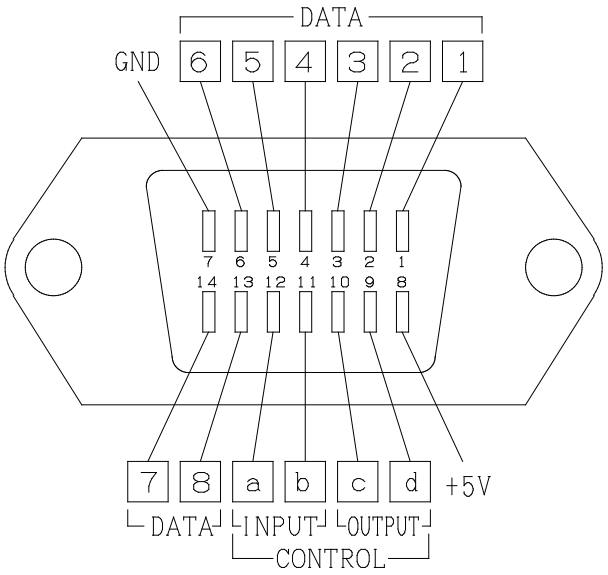
6.3 Operation

The keys located on the Remote Control Unit panel have the same functions as the corresponding keys on the MAK-6581 front panel. Therefore, operation is the same as described in Section 4, and that section should be referred to for operation using the Remote Control Unit as well.

Note
The LOCAL/REMOTE key in the lower right portion of the MAK-6581 panel is used only with the GP-IB interface and has no relation to remote control.

6.4 Remote Control (Without Using an Option)

The MAK-6581 is provided with a 14-pin connector for use in remote control. The pin arrangement, as seen from the rear panel, is shown in Fig. 6.



Pin No.	Signal Name
1	DATA 1
2	DATA 2
3	DATA 3
4	DATA 4
5	DATA 5
6	DATA 6
7	GND
8	+5 [V]
9	OUT c (ADRS./DATA)
10	OUT d (CLOCK)
11	INPUT b (INT.)
12	INPUT a (R/W)
13	DATA 8
14	DATA 7

Fig. 6

DATA Pins……Pins 1~6, 13, 14

These DATA pins form a bidirectional input / output bus. An internal CPU bus is used to drive the MAK-6581 panel bus, and the MAK-6581 panel bus is connected to the remote control pins.

Note

Since the DATA pins constitute a bidirectional bus, directly connecting “0” or “1” to lines DATA 1~8 will prevent operation.

INPUT Control Pins……Pins 11,12

READ / WRITE Control Pin ……Pin 12

This pin is “0” for reading and “1” for writing.

INTERRUPT Input Pin……Pin 11

A request is made to temporarily transfer control to the remote mode.

OUTPUT Control Pins……Pins 9, 10

CLOCK Output……Pin 10

This clock signal provides the timing used for data output.

ADRS. DATA Control Pin……Pin 9

When “1” address and “0” data is output

+5V Pin……Pin 8

This is the remote control power supply (maximum 100mA, capable of driving two digits of LEDs).

GROUND Pin……Pin 7

6.4.1 Using Remote Control From an External Device

Since the data lines at the remote control connector constitute a bidirectional bus, when performing external control, a circuit such as shown in Fig. 7 is recommended.

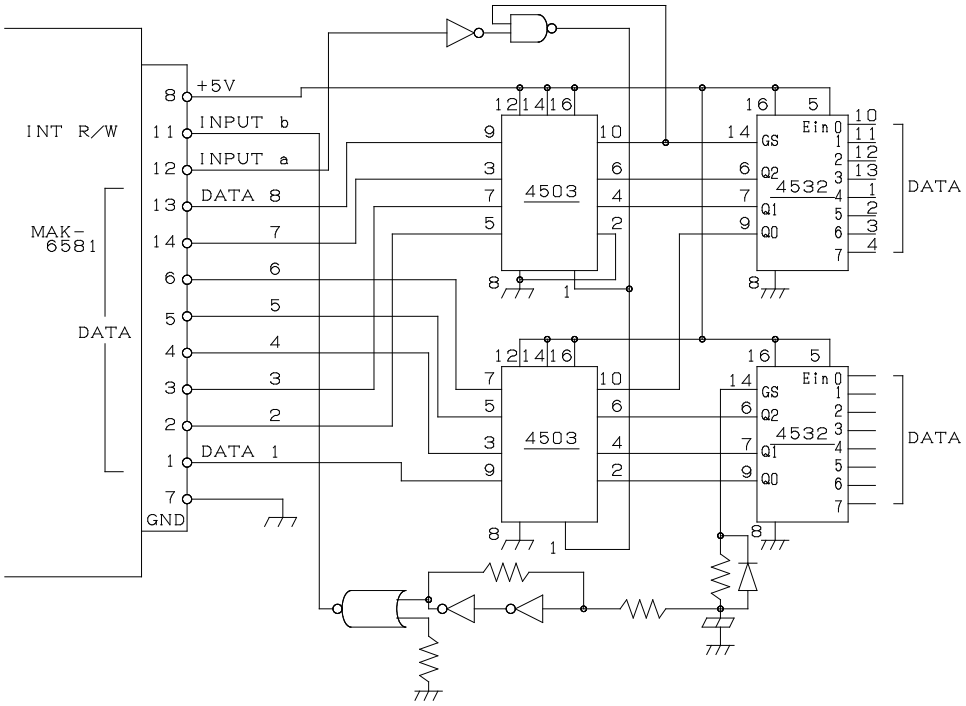


Fig. 7

Although the external control pins consist of eight input lines, the 7th line (pin 14) is made "0" and the 8th bit (pin 13) is made "1" through a CMOS 4503B.

"0" and "1" data are applied to the Key Code DATA inputs of Fig. 7 using the key codes in the tables that follow, according to the input data timing shown in Fig. 8 and data is sent by applying "0" to DATA VALID.

Input Data Timing

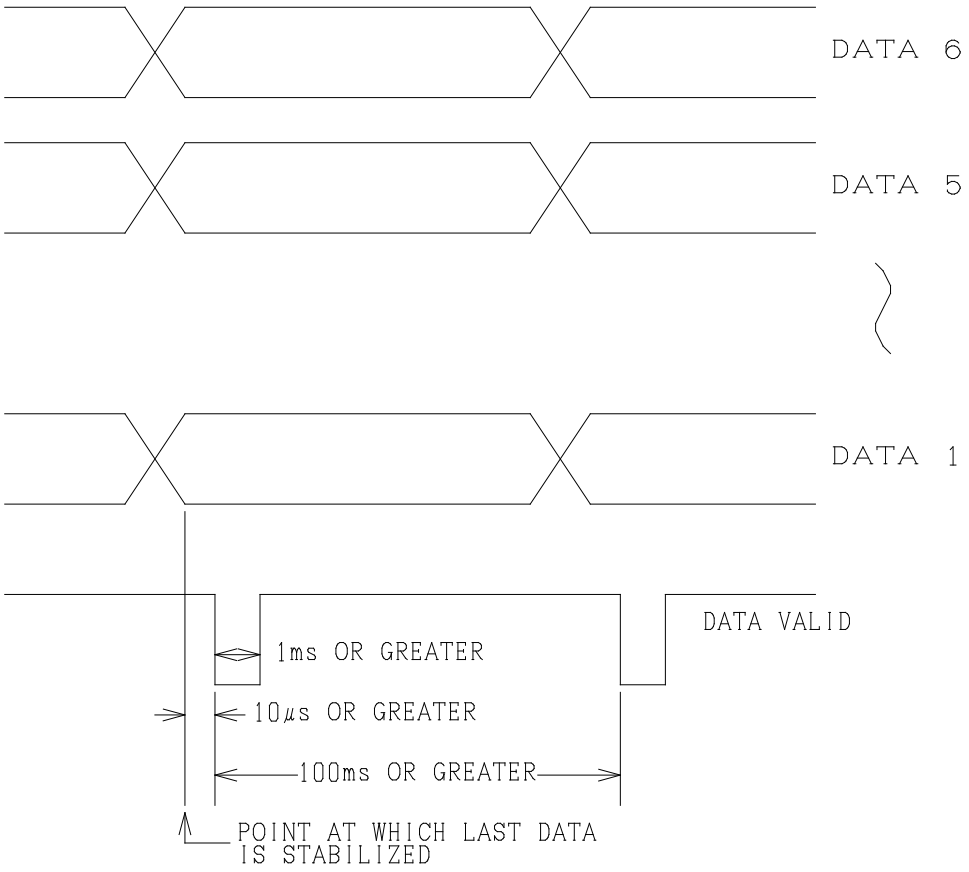


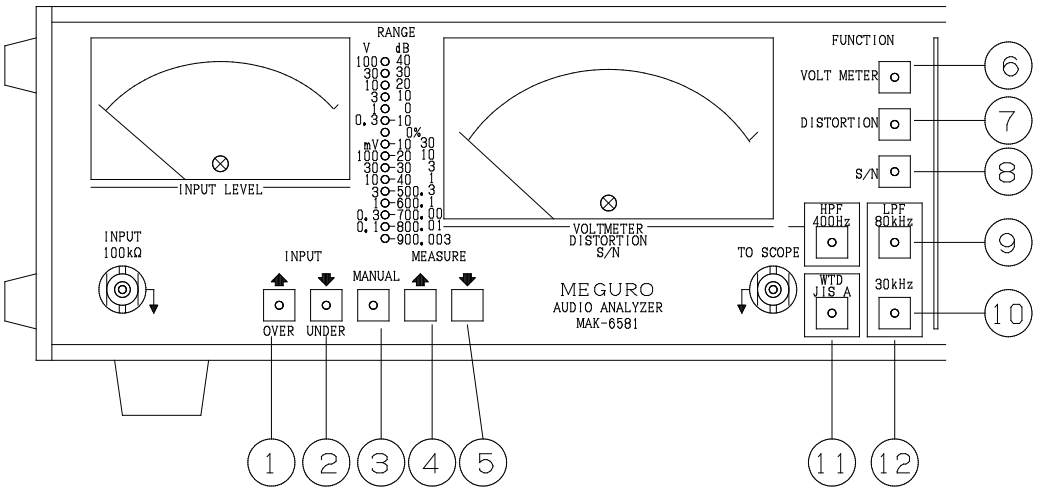
Fig. 8

As is shown in Fig. 8, DATA 1~6 are setup and after the last data of this group has stabilized, a wait of 10 μs or greater is provided and the DATA VALID signal is driven low ("0") for at least 1ms.

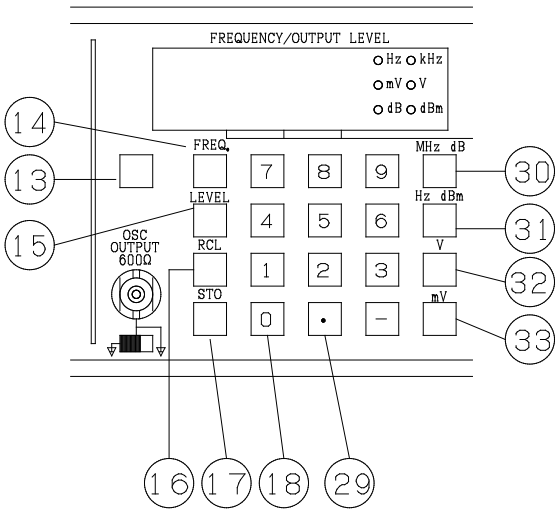
The next data is applied and DATA VALID is sent after a wait of 100ms.

Key Codes Corresponding to Panel Controls

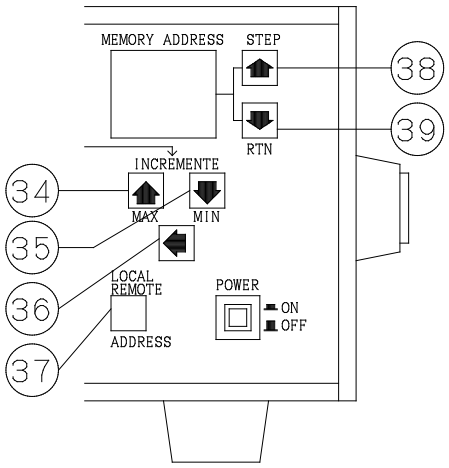
All panels keys are coded according to the key codes shown in the following table. These codes are set and the DATA VALID is sent to perform the same function as if the corresponding panel key were pressed.



		Key Code Input Pin No.					
		6	5	4	3	2	1
Key No.	Function	MSB←Key Code→LSB					
1	INPUT ㉞	1	0	0	1	0	0
2	INPUT ㉟	1	0	0	1	0	1
3	MANUAL	0	0	1	1	1	1
4	MEASURE ㉞	1	0	0	0	0	0
5	MEASURE ㉟	1	0	0	0	0	1
6	VOLT METER	0	1	1	1	0	1
7	DISTORTION	0	1	1	1	1	0
8	S/N	0	1	1	1	1	1
9	LPF 80kHz	0	1	1	0	1	0
10	LPF 30kHz	0	1	1	0	0	1
11	HPF 400Hz	0	1	1	0	0	0
12	WTD JIS A	0	1	1	0	1	1



Key No	Function	MSB←Key Code→LSB					
13	BLUE KEY	1	0	1	1	1	1
14	FREQ.	1	0	1	0	0	0
15	LEVEL	1	0	1	0	0	1
16	RCL	1	0	1	1	0	1
17	STO	1	0	1	0	1	0
18	·	1	1	1	0	1	0
19	0	1	1	0	0	0	0
20	1	1	1	0	0	0	1
21	2	1	1	0	0	1	0
22	3	1	1	0	0	1	1
23	4	1	1	0	1	0	0
24	5	1	1	0	1	0	1
25	6	1	1	0	1	1	0
26	7	1	1	0	1	1	1
27	8	1	1	1	0	0	0
28	9	1	1	1	0	0	1
29	−	1	1	1	0	1	1
30	kHz/dB	1	1	1	1	0	0
31	Hz/dBm	1	1	1	1	0	1
32	V	1	1	1	1	1	0
33	mV	1	1	1	1	1	1



Key No	Function	MSB←Key Code→LSB					
34	INCREMENTE ㉞	0	0	1	0	1	0
35	INCREMENTE ㉟	0	0	1	0	1	1
36	INCREMENTE ㊷	0	0	1	0	0	0
37	LOCAL	1	0	0	1	1	1
38	STEP ㉞	1	0	1	1	1	0
39	STEP ㉟	0	1	0	1	0	1

External Control Example

This is a simple example of external control of the MEMORY ADDRESS STEP ㉞ function.
Referring to the key code table, the MEMORY ADDRESS STEP ㉞ key data of "101110" is applied to the Key Code DATA 1~6 of Fig. 7 as shown in Fig. 9, and DATA VALID is sent.

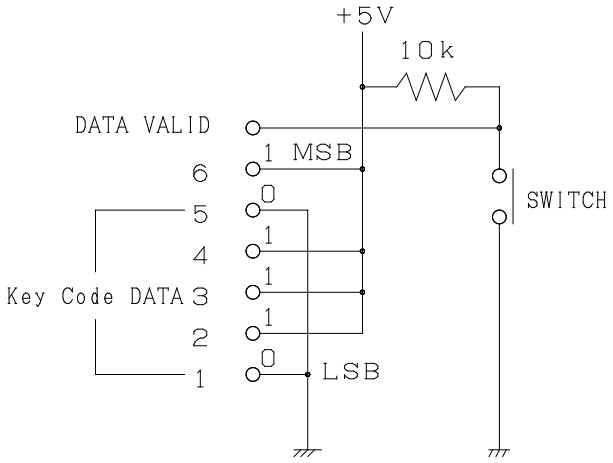


Fig. 9 Chattering Prevention Circuit Not Shown

Each time the switch in Fig. 9 is pressed, the MEMORY ADDRESS display increments by 1, and by using other key code data, it is similarly possible to control any other panel switch.

External Frequency Setting Control Example

This example sets the frequency of 12.55kHz

- Using the panel key code table, set the data “101000” for FREQUENCY (see code table).
- Send DATA VALID for a period of at least 1ms an shown in the data timing diagram.
- As shown in Fig. 10, set the data for 12.5 from the code table and send DATA VALID for at least 1ms.

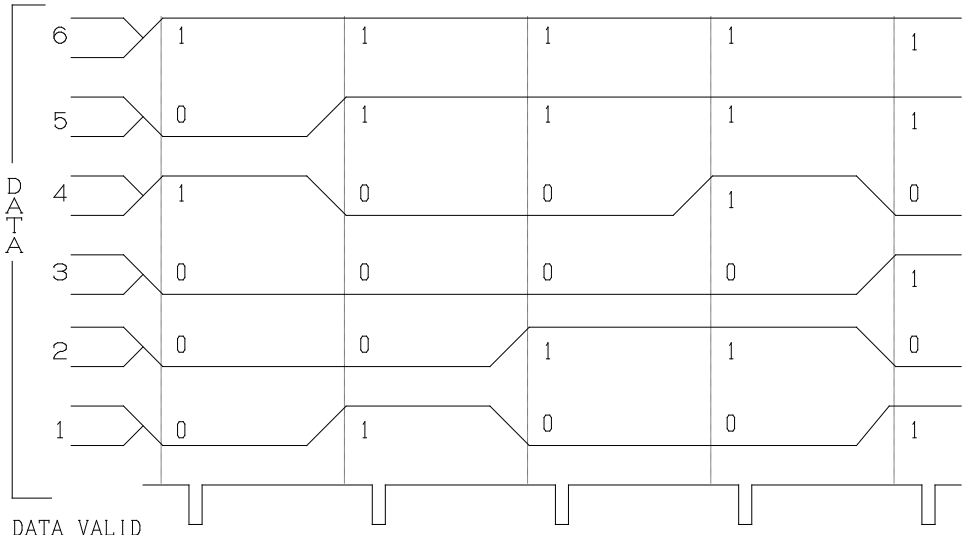


Fig. 10

- Next, data “110101” for 5 and DATA VALID are sent.
- Finally, data “111100” for kHz and DATA VALID are sent to terminate the data transmission.
- From the point at which the last kHz data “111100” and DATA VALID are sent, internal processing within the MAK-6581 begins.

6.4.2 Method of Outputting MAK-6581 Internal Memory Address

Refer to Fig. 11.

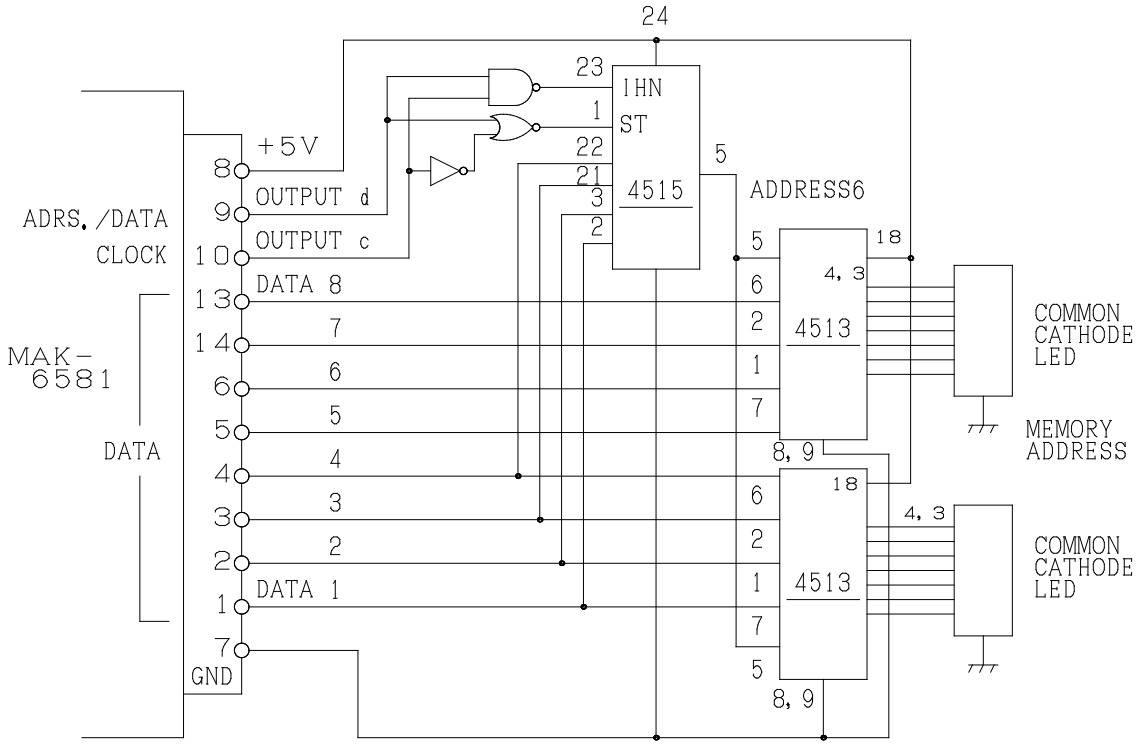


Fig. 11

Since the remote control pins constitute a bidirectional bus, an output circuit shown in Fig. 11 may be used, as is the case with the MEMORY ADDRESS.

If a 1atch is used in place of the CMOS 4513, it is possible to use the MEMORY ADDRESS display value as data.

If the connector parts of Fig. 7 and Fig. 11 are connected in parallel, in addition to external control, the MEMORY ADDRESS or other display data may be verified.

7 GP-IB

7.1 General Description

This GP-IB interface enables control of the MAK-6581 Audio Analyzer by means of an interface conforming to the IEEE-488 GP-IB standard.
Since this document chiefly covers the GP-IB interface functions, information regarding operation and specifications of the MAK-6581 itself should be found by referring to the instruction manual for this product.

7.2 Features

- Listen and talker function control by means of the IEEE-488 standard interface bus.
- REMOTE indicator gives clear indication of the remote/local status.
- Pressing the LOCAL button enables local settings at any time except when the local lockout function has been enabled, thus enabling manual control from the front panel.
- The set GP-IB address is indicated on the memory address display.

8 INTERFACE

This interface conforms to the IEEE-488-1975 standards.

8.1 Interface Functions

SH1	: Send handshake function·····	Provided
AH1	: Receive handshake function·····	Provided
T8	: Basic talker function·····	Provided
	Talker only mode·····	Not provided
L2	: Basic listener function·····	Provided
	Listen only mode·····	Not provided
TE0	: Expanded talker function·····	Not Provided
LE0	: Expanded listener function·····	Not provided
SR1	: Service request function·····	Provided
RL1	: Remote control function·····	Provided
	Switching·····	Provided
	Local lockout function·····	Provided
PP0	: Parallel poll function·····	Not provided
DC1	: Device clear function·····	Provided
DT0	: Device trigger function·····	Not provided
C0	: Control function·····	Not provided

8.2 Interface Electrical Specifications

Electrical specifications conform to IEEE standard 488-1975.

9 OPERATION

9.1 Front Panel Controls and Corresponding Commands

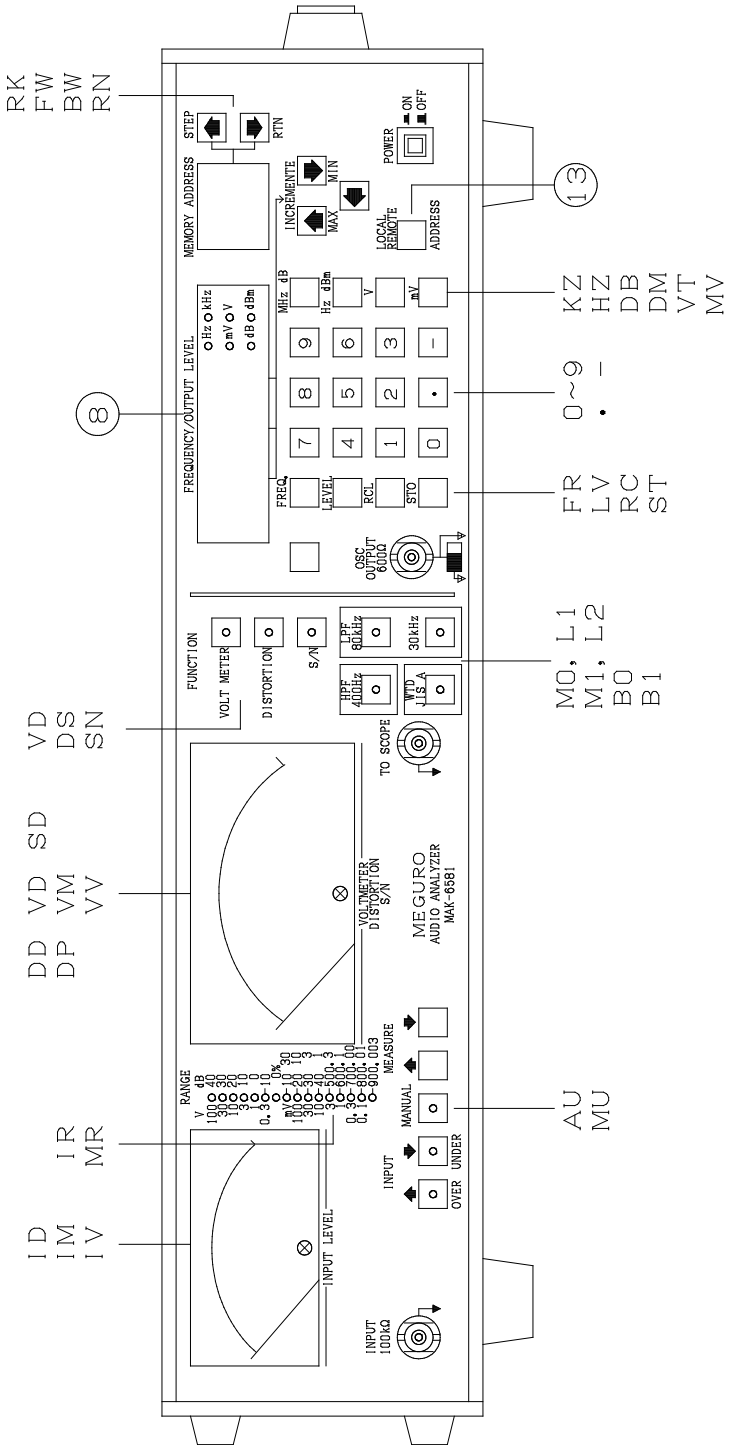


Fig. 12

9.2 GP-IB Interface Related Rear Panel Locations

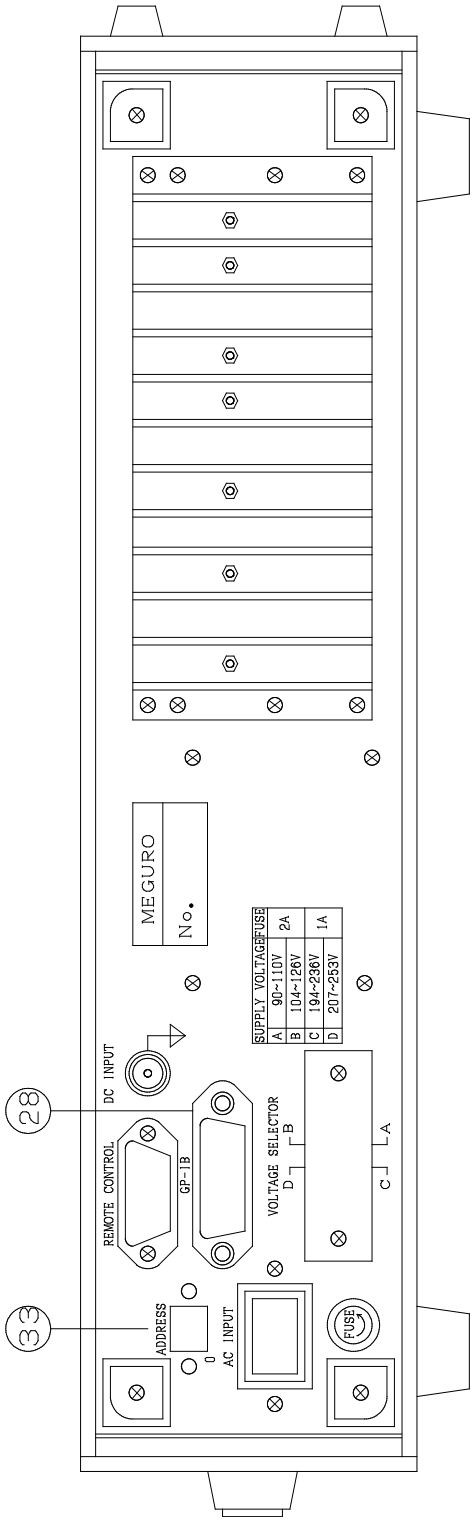


Fig. 13

9.3 Panel Descriptions

For panel descriptions other than those given below, refer to the MAK-6581 main instruction manual.

9.3.1 Front Panel (See Fig. 12)

⑬LOCAL, ADRS Key

When using the GP-IB, this key serves to switch the unit into the local mode. In the local mode, when the blue key and ADRS key are depressed, the GPIB bus device address is displayed on the FREQ. display.

In the remote mode, the REMOTE red lamp lights.

In this condition, it is possible to return to the local mode using the front panel LOCAL key.

However, this is not possible if the LOCAL LOCKOUT command has been issued.

9.3.2 Rear panel (See Fig. 13)

⑬ GPIB Connector

The GPIB connector is inserted at this location.

The pin arrangement is given in SECTION FOUR.

⑮ ADDRESS Switches

These switches are used to set the GPIB address of the MAK-6581.

For details, refer to Section 9.5.1 on address setting.

9.4 Precautions Before Use

Apply power and verify the GP-IB address setting.

(1)Note that the GP-IB address is displayed on the FREQ.
ADDRESS display as “12” only while the BLUE key and ADRS keys are depressed.

(2)To change the address setting, remove power and follow the instructions for address switch settings given in Section 9.5.1.

(3)With the power removed, connect the GP-IB cable.

(4)For information on preparing the MAK-6581 itself, refer to the instruction manual for this product.

Caution

1. When using the GP-IB, avoid using the TO SCOPE connector if possible. When monitoring with an oscilloscope, perform this operation separately.
2. Since the GP-IB is not isolated from the analog section of the MAK-6581, sufficient care should be taken to avoid ground loops when implementing the control system.
3. Provide a good ground.
4. During GP-IB operation, the filter alarm (flashing display) is not operative.

9.5 Operation Procedure

9.5.1 Address Setting Method

The GP-IB address of the MAK-6581 is set to “12” at time of shipping.
The address switches used for setting this address are located on the rear panel and these switches (DIP) may be set to the desired address.

(1)The relationship of the DIP switch settings to the set address value is shown in Table 1.
(2)Sliding a DIP switch to the ON side (1), sets a 1 level.
(3)In the condition shown below, the address (12) is set.

Device address setting

$$value = 2^2 + 2^3 = 12$$

Note
In examples which follow in this document, program coding is that which would be used in Hewlett-Packard BASIC language.

Table 3

LISTEN ADDRESS		ADDRESS SWITCH BITS				
DEVICE №.	ASCII	1	2	3	4	5
00	(SPACE)	0	0	0	0	0
01	!	1	0	0	0	0
02	=	0	1	0	0	0
03	#	1	1	0	0	0
04	$	0	0	1	0	0
05	%	1	0	1	0	0
06	&	0	1	1	0	0
07	‘	1	1	1	0	0
08	(	0	0	0	1	0
09	)	1	0	0	1	0
10	*	0	1	0	1	0
11	+	1	1	0	1	0
12	‘	0	0	1	1	0
13	—	1	0	1	1	0
14	・	0	1	1	1	0
15	/	1	1	1	1	0
16	0	0	0	0	0	1
17	1	1	0	0	0	1
18	2	0	1	0	0	1
19	3	1	1	0	0	1
20	4	0	0	1	0	1
21	5	1	0	1	0	1
22	6	0	1	1	0	1
23	7	1	1	1	0	1
24	8	0	0	0	1	1
25	9	1	0	0	1	1
26	:	0	1	0	1	1
27	;	1	1	0	1	1
28	<	0	0	1	1	1

Setting at time of shipment

LISTEN ADDRESS		ADDRESS SWITCH BITS				
DEVICE №.	ASCII	1	2	3	4	5
29	=	1	0	1	1	1
30	>	0	1	1	1	

32 is added to obtain the talker address.

DIP Switch……1 : ON, 0 : OFF

9.5.2 Usable Bus Line Commands

GP-IB Command (BACIC)	Description
OUTPUT	Sends program codes and data to a specified listener address.
ENTER	Receives data from a specified talker address.
REMOTE	Specifies a listener address. The MAK-6581 REMOTE 1amp lights and preparations for data receive are completed. When the LOCAL key is pressed, the lamp goes out, return is made to the local mode and all panel controls are operative.
LOCAL LOCKOUT	This is a universal command which is given to all devices on the GP-IB. If LOCAL LOCKOUT is given after REMOTE, to manual operation is possible from the MAK-6581 front panel.
LOCAL	The REMOTE 1amp goes out, return is made to the local mode and manual operation is possible.

Note

Since approximately 10ms is required for internal processing before execution of this command, a 50ms wait period (WAIT) should be inserted.

9.5.3 Measurement Condition Setting Method

The MAK-6581 measurement conditions are set by using the codes described in Table 4.
Characters not specified in this table are ignored.
Also, codes with no corresponding functions are ignored.

Table 4 GP-IB Program Code Table

Program code	Function	Comment
AU	Autorange	
B0	JIS-A Filter OFF	
B1	JIS-A Filter ON	WTD JIS A
BW	Memory step down	
DB	(dB)	kHz/dB
DD	Distortion data output(dB)	
DP	Distortion data output(%)	
DM	Distortion data output (dBm)	Hz/dBm
DS	Distortion measurement mode	DISTORTION
FW	Memory step up	
FR	Oscillation frequency	
H0	400Hz HP filter OFF	
H1	400Hz HP filter ON	HP filter 400Hz
HZ	(Hz)	Hz/dBm
ID	Input level data output (dB)	
IM	Input level data output (dBm)	
IV	Input level data output (V) or (mV)	
IR	Input range setting	
KZ	(kHz)	kHz/dB
L1	30kHz LP filter	LPF 30kHz
L2	80kHz LP filter	LPF 80kHz

Program code	Function	Comment
L3	600kHz LP filter	
LV	Oscillator output level	LEVEL
MR	Meter range setting	
MU	Manual ranging	MANUAL
MV	(mV)	mV
RC	Memory recall	
RN	RTN (Memory store)	
SD	S/N Data output (dB)	
SN	S/N Measurement mode	S/N
ST	Memory store	
T1	Data ready check	
T2	Data ready check	
U0	Unit output OFF	
U1	Unit output ON	
VD	Level data output (dB)	
VM	Level data output (dBm)	
VV	Level data output (V) or (mV)	
V0	Voltage measurement mode (V)	
0~9	Numerical value	V
－	Minus sign	VOLT METER
・	Decimal point	

Command List by Functions

Setting item	Command	Data	Terminator	Remarks
Oscillation frequency	FR	××××. ×	HZ	5.0Hz～1999Hz
		×××. ×××	KZ	0.005kHz～199.9kHz
Output level	LEVEL	(−)××. ×	DB	7.5dB～－72.5dBm
		(−)××. ×	DM	9.7dBm～－70.3dB
		×. ×××	VT	2.37V～0.001V
		××. ××	MV	999mV～0.238mV
Measurement mode	V0			VOLTMETER
	DS			DISTORTION
	SN			S/N
JIS-A Filter	B0			JIS-A Filter OFF
	B1			JIS-A Filter ON
400Hz HP Filter	H0			400Hz HP Filter OFF
	H1			400Hz HP Filter ON
LP Filter	L1			30kHz LP Filter
	L2			80kHz LP Filter
	L3			600kHz LP Filter
Input range	1R	×		Valid only for DS and SN 5 : +40dBV 4 : +30dBV 3 : +20dBV 2 : +10dBV 1 : 0dBV 0 : -10dBV

Setting item	Command	Data	Terminator	Remarks
Meter range	MR	×		DS, SN V0
		××		9： 0dB 13：+40dB
				8：-10dB 12：+30dB
				7：-20dB 11：+20dB
				6：-30dB 10：+10dB
				5：-40dB 09： 0dB
				4：-50dB 08：-10dB
				3：-60dB 07：-20dB
				2：-70dB 06：-30dB
				1：-80dB 05：-40dB
				0：-90dB 04：-50dB
				03：-60dB
				02：-70dB
				01：-80dB
				00：-90dB
				No –90dB range for the 600kHz LP filter.
Range mode	MU			IR and MR are valid
	AU			Autorange
Memory	RC	××		00～99
	ST	××		00～99
	FW			Memory address step up
	BW			Memory address step down
	RN			RTN Setting
	RK			Clear RTN at ×9 address

Command List by Functions (Continued)

Setting item		Command	Returned data or remarks
Data output	VOLT	VD	(−)×. ×dB CR LF (dBm for VM)
send request	METER		
		VM	−××. × "
		VV	××. × (E-3) V CR LF
			×. ××
			0. ×××
	DISTORTION	DD	Same as VD
		DP	××. × % CR LF
			×. ×× "
			0. ××× "
			0. 0××× "
			0. 00××× "
	S/N	SD	Same as VD
	INPUT LEVEL	ID	Same as VD
		IM	Same as VM
		IV	Sane as VV
Data output units		U0	Eliminate units from the data output.
		U1	Add units to the data output.
Data stability check		T1	Hold until data stabilizes (within 10%)
		T2	Hold until data stabilizes (within 5%)

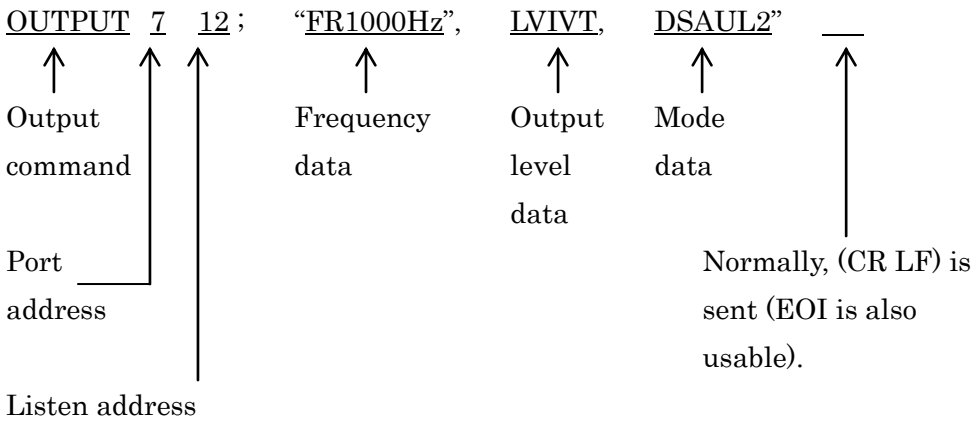
Note

Characters not and combinations not listed in the tables above are ignored.

9.5.4 Basic Control

Set the oscillation frequency to 1000Hz, output level to 1.00V, select the distortion measurement mode, autoranging and select the 80kHz lowpass filter.

(Example 1)



(Example 2)

Sending of various data.

OUTPUT 712; "FR1000HZ" (CR LF) or EOI
OUTPUT 712; "LV0.0DB" (CR LF) or EOI
OUTPUT 712; "DSAUL2" (CR LF) or EOI

The following are examples of various functions.

(a) Frequency Setting

The function code, data code and units code are sent continuously.

Function code	Data code	Units code
FR	3.5 Digits and decimal point within frequency range	KZ (Hz) KZ (kHz)

(Example a)

Set frequency to 100.5Hz

"FR100.5HZ"

(Example b)

Set frequency to 100kHz

"FR1000KZ"

(b) Output Level Setting

The function code, data code and units code are sent continuously.

Function code	Data code	Units code
LV	Value up to 3 digits minus a sign may be used.	DB, DM, VT, MV

"LV2.37VT" 2.37Vrms

"LV153MV" 153mVrms

"LV6.5DB" 6.5dBV

"LV－72.5DM" －72.5dBm

(c) Setting of Measurement Mode and Filter

Function code	Setting
V0	Voltmeter
DS	Distortion meter
SN	S/N Meter
B0	JIS-A OFF
B1	JIS-A ON
H0	400Hz HP filter OFF
H1	400Hz HP filter ON
L1	30kHz LP filter
L2	80kHz LP filter
L3	600kHz LP filter

(Example 1)

Set voltage measurement, 600kHz band and 400Hz HP filter OFF.

"V0, H0, L3"

(Example 2)

Set distortion measurement, 80kHz LP filter and 400Hz ON.

"DS, H1, L2"

(Example 3)

Set S/N measurement and JIS-A ON.

"SN, B1"

Filter settings are made for each measurement mode separately.

(d) Range Setting

・Voltage Measurement

Function	Setting	
MR13	100V	+40dB
12	30V	+30
11	10V	+20
10	3V	+10
09	1V	0
08	0.3V	-10
07	0.1V	-20
06	0.03V	-30
05	0.01V	-40
04	3mV	-50
03	1mV	-60
02	300μV	-70
01	100μV	-80
00	30μV	-90

(Example)

5V Range

"V0, MU, MR11"

・Distortion Measurement and S/N Measurement

Input Range

Function code	Setting
IR5	+40dB
4	+30dB
3	+20dB
2	+10dB
1	0dB
0	−10dB

Meter Ranges

Function	Setting	
MR9	0dB	
8	-10dB	
7	-20dB	
6	-30dB	
5	-40dB	
4	-50dB	
3	-60dB	
2	-70dB	
1	-80dB	
0	-90dB	←Not usable with the 600kHz LP filter

(Example 1)

Distortion measurement 5V, 0.002%, 1kHz

"DS, L2, MU, IR3, MR0"

(Example 2)

S/N Measurement, S=1Vrms, S/N –90dB

"SN, B1, MU, IR2, MR0

(e) Data Output

When data is read in, the data transfer request command is sent first, after which data is read in immediately.
Data values are the data values at the time the command is received and in actual measurements there should be a waiting time allowed for the meter indication to stabilize.

Command Table

Mode \ Unit	dB	dBm	V	%
VOLT METER	VD	VM	VV	
DISTORTION	DD			DP
S/N	SD			
INPUT LEVEL	ID	IM	IV	

(CR LF) or EOI is required after the commands.

Data formats are indicated below.

dB, dBm
（−）××．××(CR LF)
−××．××(CR LF)
V
××．××(E-3) (CR LF)　　××．××(E-3) (CR LF)
×．×××(E-3) (CR LF)　　××　(E-3) (CR LF)
0．×××(E-3) (CR LF)　　×××(E-3) (CR LF)
%
××．×× (CR LF)
×．××× (CR LF)
0．×××× (CR LF)
0．0×××× (CR LF)
0．00×××× (CR LF)

The U0 and U1 commands may be used to specify whether the units are to be inserted before the CR.

(f) Memory Recall and Store

・Memory Recall

The function code and data code are sent continuously.

Function code	Data code
RC	2-Digit value

(Example)

Recall data at memory address 01

“RC01”

・Recall Step Number Increment and Decrement (㉞ ㉟)

Function code	Setting
FW	㉞
BW	㉟

(Example 1)

Increment the current memory step.

“FW”

(Example 2)

Decrement the current memory step.

・Memory Store

Function code and data code are sent continuously.

Function code	Data code
ST	2-Digit value

For memory addresses other than *9, stored RTNs are deleted.

(Example)

Store at memory address 06.

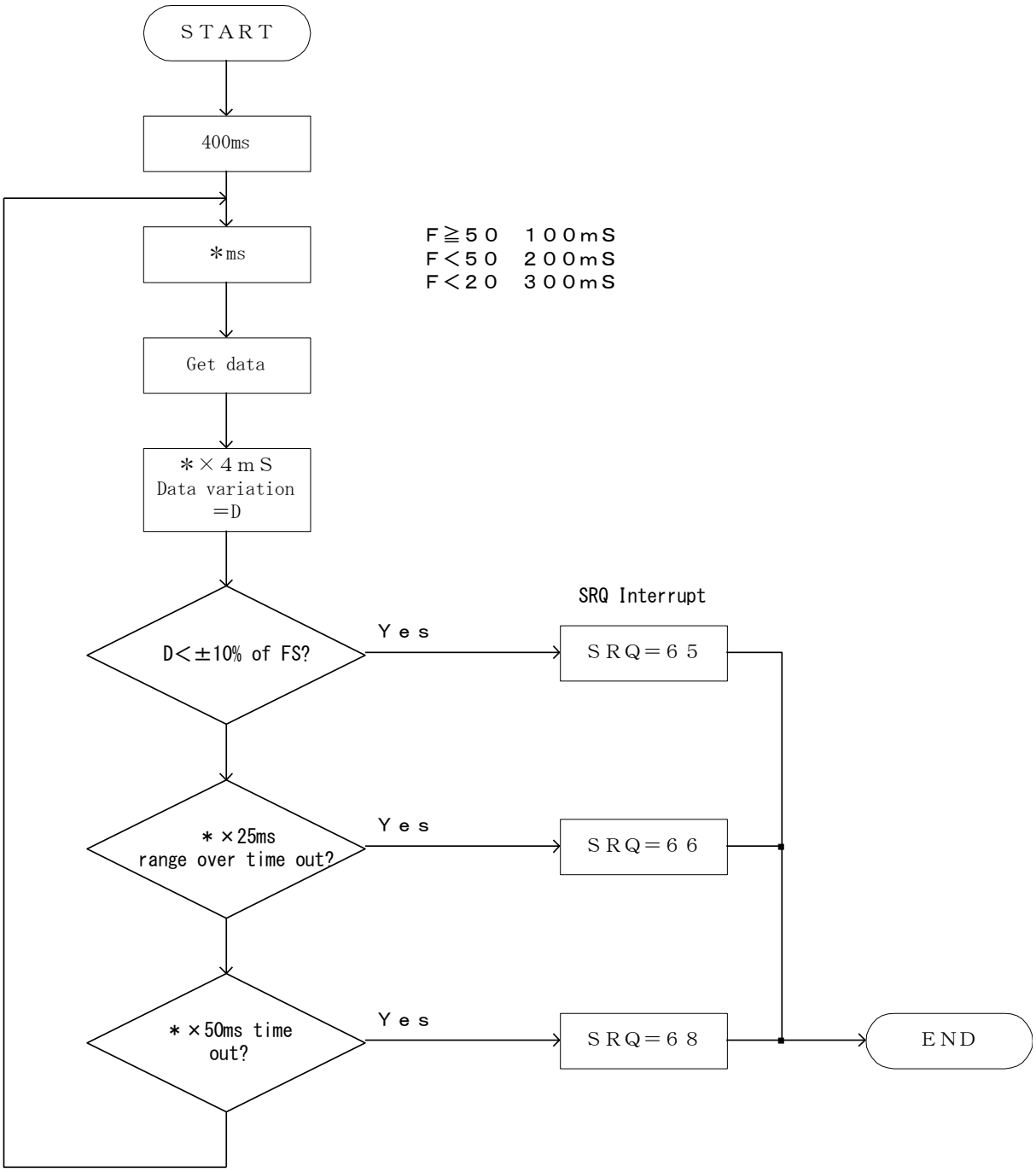
“ST06”

Function code	Setting
RK	Clear the RTN stored at memory address *9.
RN	Store RTN at the current memory address.

Refer to the program example in P65

Data Stability Check Command (T1)

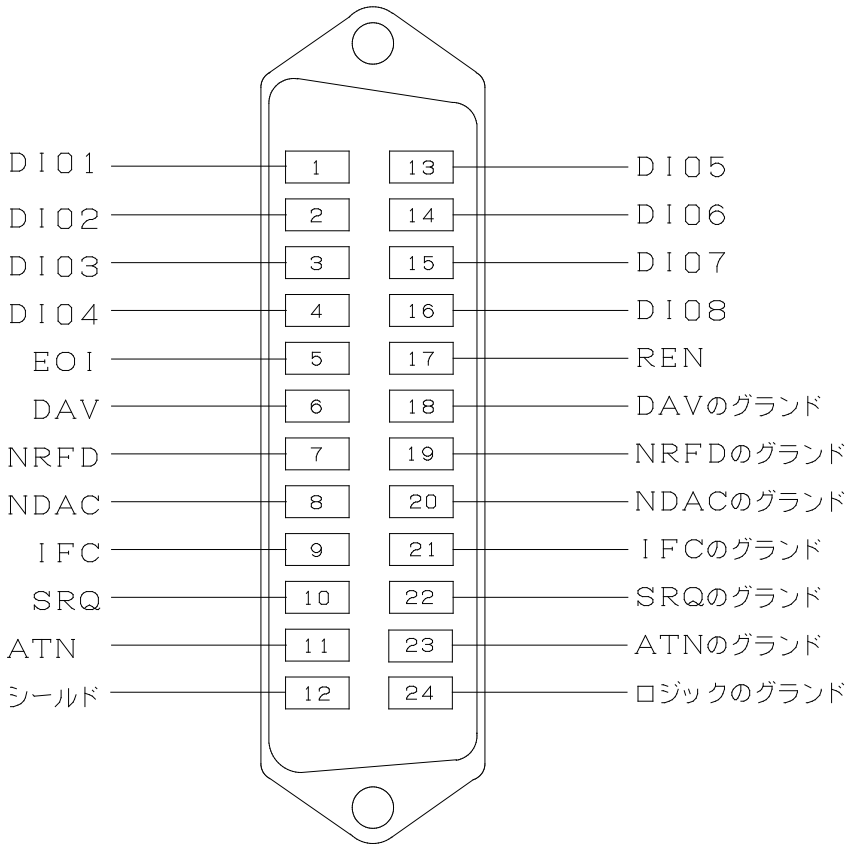
This command can be used to check whether a data value has settled to within a fixed range after such transient phenomena as switching.
The algorithm that makes this determination is as follows.



(Example)

```
OUTPUT 712; “DSMUIR2MR0”        OUTPUT 712; “SNAU”
OUTPUT 712; “T1”                WAIT 2
OUTPUT 712; “DP”                OUTPUT 712; “T1SD”
ENTER 712; Dist$                ENTER 712; Sn$
```

10 CONNECTOR PIN ARRANGEMENT



11 PROGRAM EXAMPLE

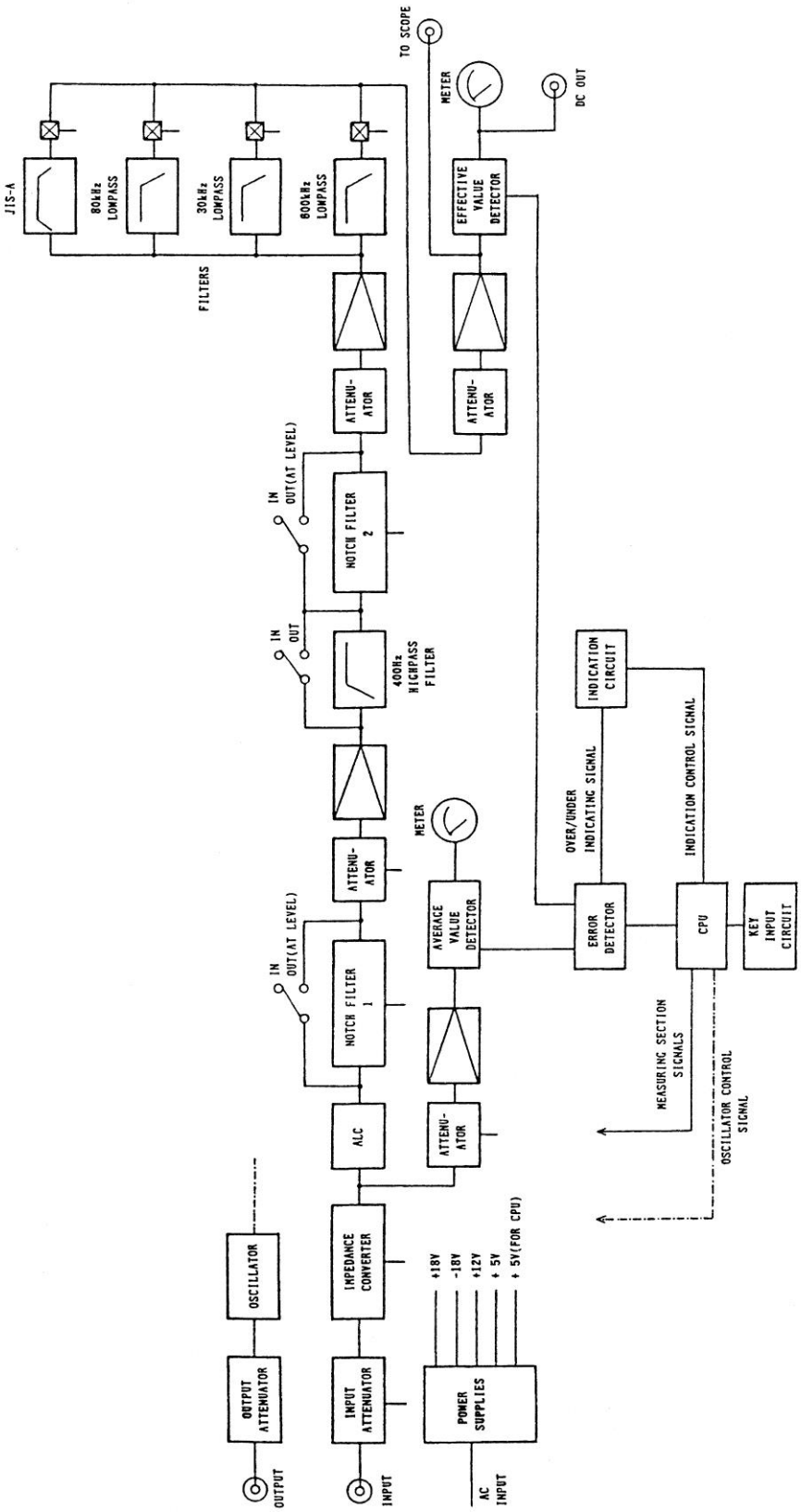
As a reference, a program example is given which uses the PC-8801 computer to first make frequency, output level and measurement mode settings and store these in memory, after which recall is made. The material on the subsequent pages represents a program which performs a distortion self check using the HP9845B. This program should not be assumed to be the optimum program. Depending upon the control system used, the method of coding will differ and control should be made using the optimum method for your particular system.

(Example)

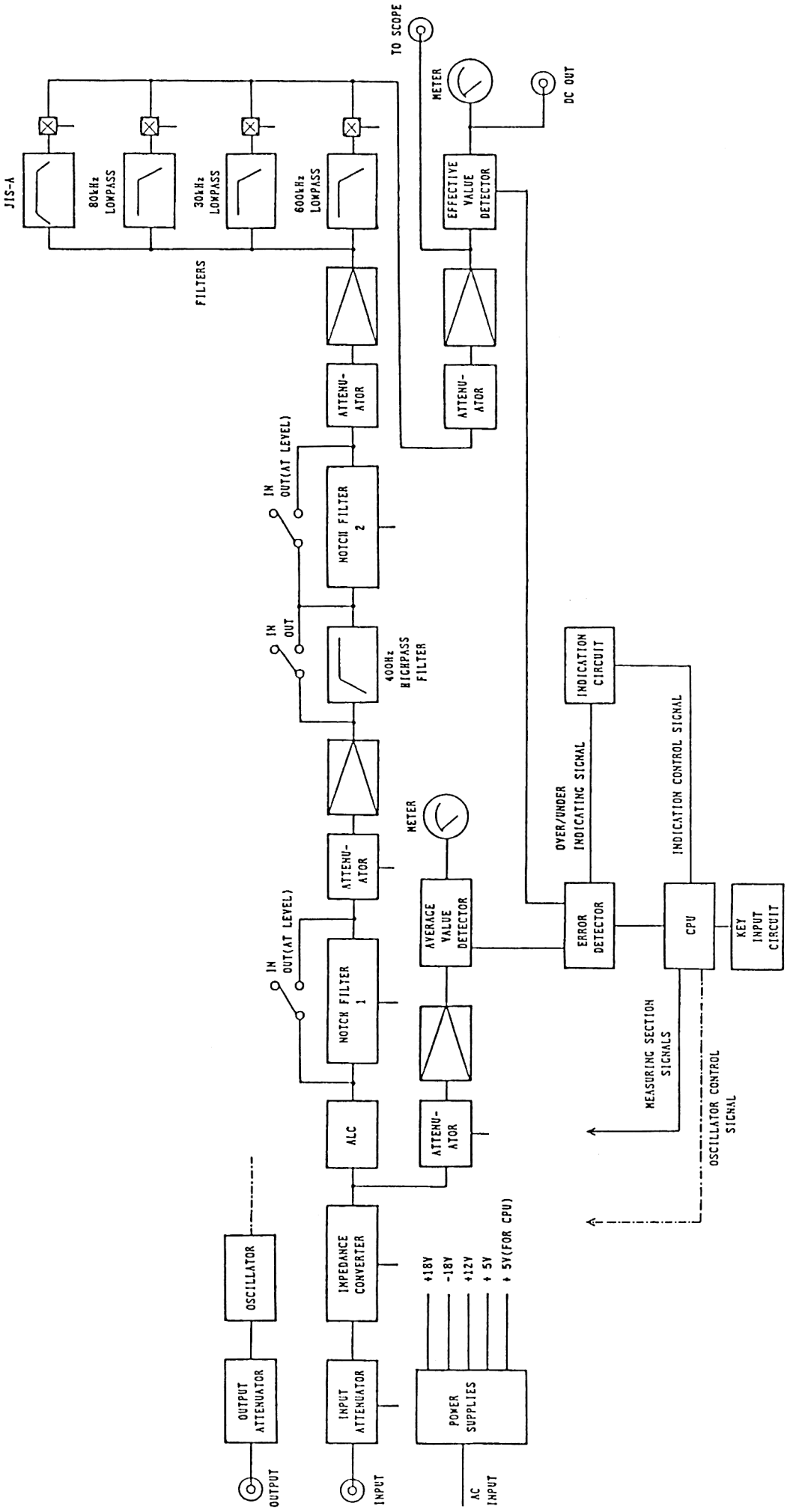
```
100  ISET   REN
110  PRINT @12: "RK"                                        ! Clear RTN at address *9
120  PRINT @12; "VO  LV-40DB   FR20HZ   H0   L1   B0   MU   MR10   ST00"
130  PRINT @12; "VO  LV-40DB   FR50HZ   H0   L1   B0   MU   MR10   ST01"
140  PRINT @12; "VO  LV-40DB   FR100HZ  H0   L1   B0   MU   MR10   ST02"
150  PRINT @12; "VO  LV-40DB   FR400HZ  H0   L1   B0   MU   MR10   ST03"
160  PRINT @12; "VO  LV-40DB   FR1KZ    H0   L1   B0   MU   MR10   ST04"
170  PRINT @12; "VO  LV-40DB   FR3KZ    H0   L1   B0   MU   MR10   ST05"
180  PRINT @12; "VO  LV-40DB   FR10KZ   H0   L2   B0   MU   MR10   ST06"
190  PRINT @12; "VO  LV-40DB   FR15KZ   H0   L2   B0   MU   MR10   ST07"
200  PRINT @12; "VO  LV-40DB   FR20KZ   H0   L2   B0   MU   MR10   ST08"
210  PRINT @12; "DS  LV-20DB   FR20HZ   H0   L1   B0   IR2  MR1    ST09"
220  PRINT @12; "DS  LV-20DB   FR1KZ    H0   L1   B0   IR2  MR1    ST10"
230  PRINT @12; "DS  LV-20DB   FR10KZ   H0   L2   B0   IR2  MR1    ST11"
240  PRINT @12; "DS  LV-20DB   FR20KZ   H0   L2   B0   IR2  MR1    ST12"
250  PRINT @12; "SN  LV-20DB   FR1KZ             B1   MU   MR0    ST13"
260  PRINT @12: "RN"                                        ! Set RTN at address 13
```

```
10   !*****  MAK-6581  Test  Program  (by HP9826 or 9816)  *****
20   Add=712
30   OUTPUT Add;"U1AUDSLV1VTL2"
40   DATA 20HZ, 100HZ, 400HZ, 1KZ, 10KZ, 20KZ
50   FOR I=1 TO 6
60       READ A$
70       OUTPUT Add; "FR"&A$
80       OUTPUT Add; "T1"
90       OUTPUT Add; "IV"
100      ENTER Add ; B$
110      OUTPUT Add ; "DP"
120      ENTER Add;C$
130      PRINT USING "5X, 5A, 2A, 10A, 10A " ;A$, " : " ,B$,C$
140  NEXT I
150  END
```

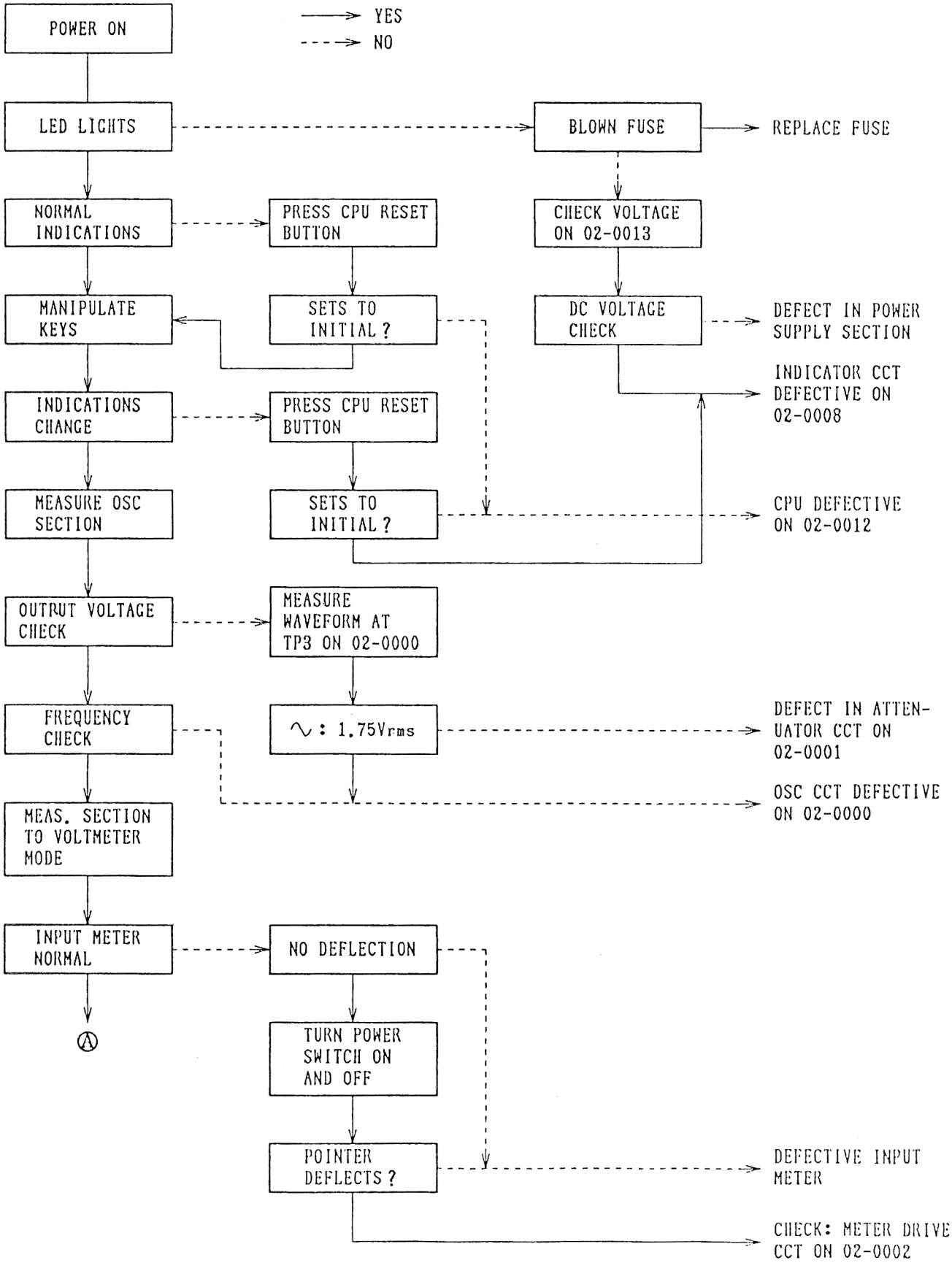
BLOCK DIAGRAM : MAK-6581

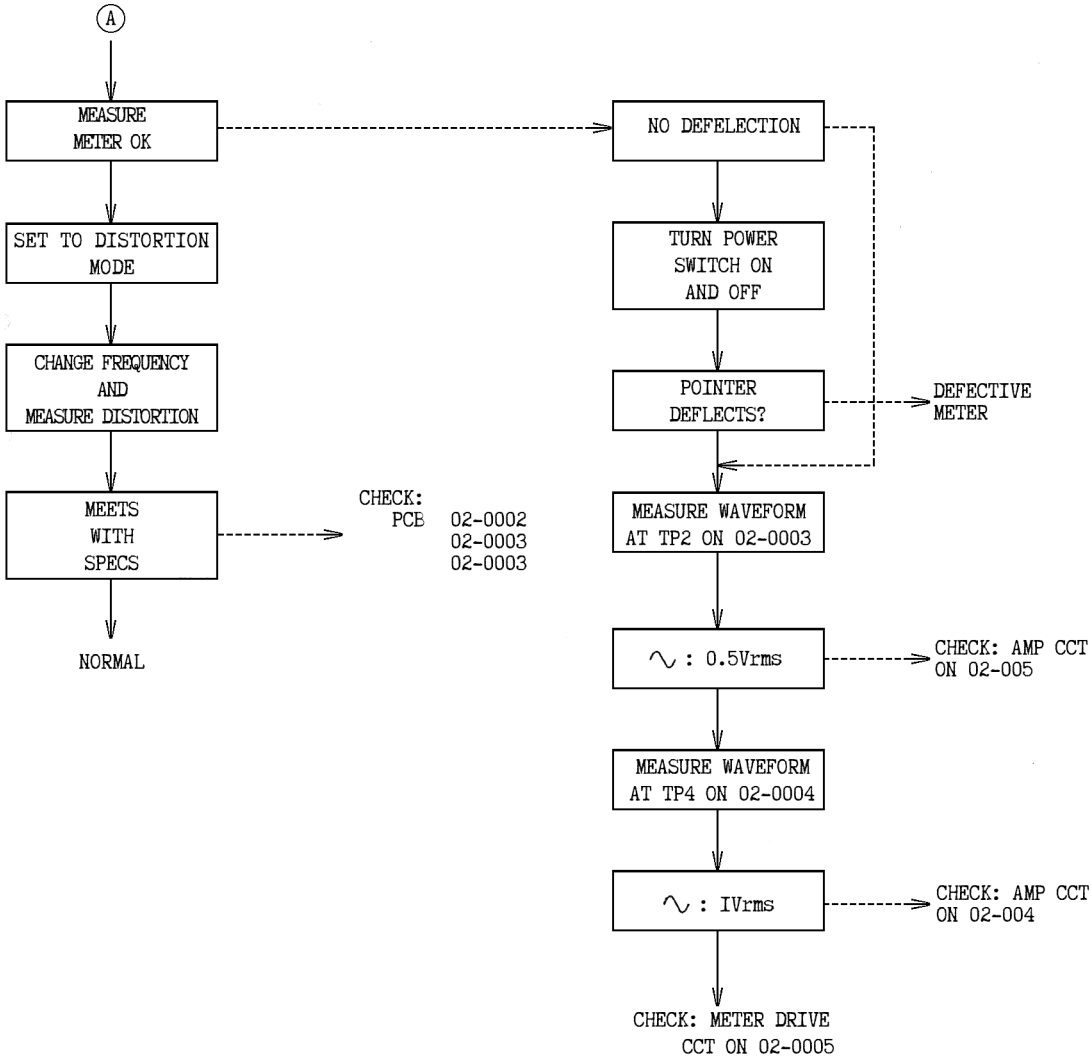


BLOCK DIAGRAM : MAK-6581

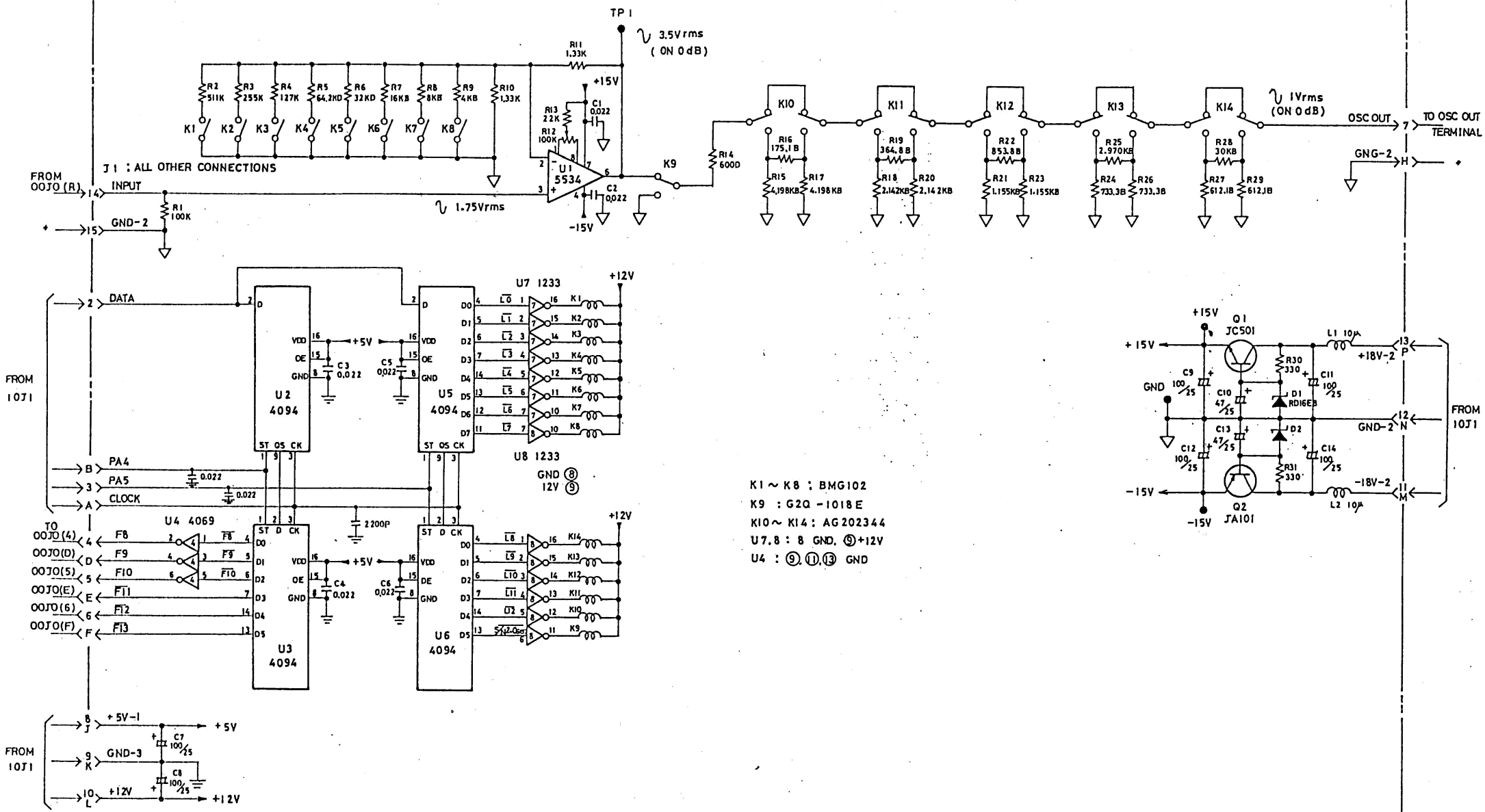


MAK-6581 TROUBLESHOOTING




A
MEASURE METER OK
SET TO DISTORTION MODE
CHANGE FREQUENCY AND MEASURE DISTORTION
MEETS WITH SPECS
NORMAL
CHECK: PCB 02-0002 02-0003 02-0003
NO DEFELECTION
TURN POWER SWITCH ON AND OFF
POINTER DEFLECTS?
DEFECTIVE METER
MEASURE WAVEFORM AT TP2 ON 02-0003
∿ : 0.5Vrms
CHECK: AMP CCT ON 02-005
MEASURE WAVEFORM AT TP4 ON 02-0004
∿ : IVrms
CHECK: AMP CCT ON 02-004
CHECK: METER DRIVE CCT ON 02-0005

MAK-6581



02-0001-2

SCHEMATIC DIAGRAM MAK-6581

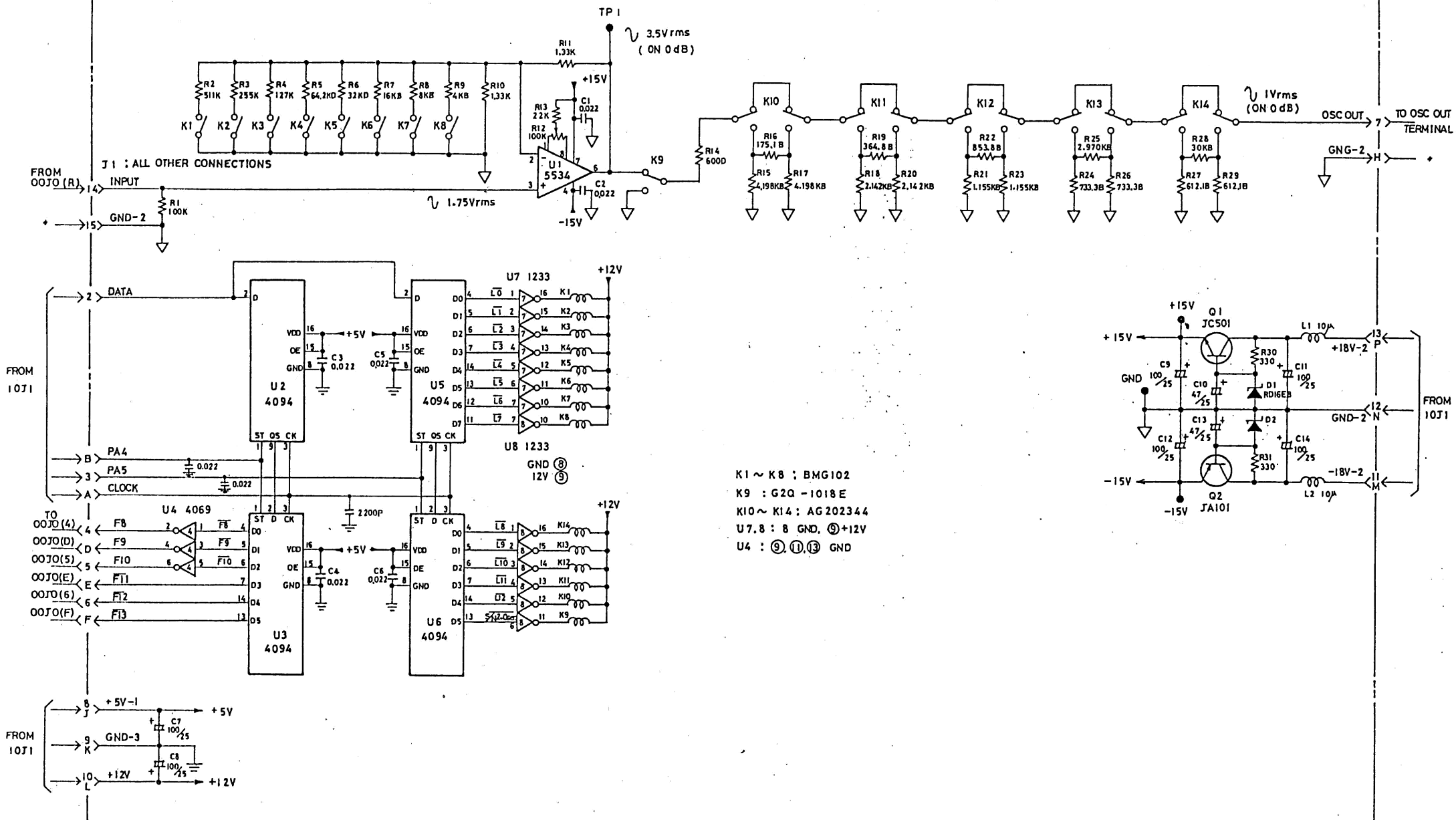
2

NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
(2)——Connector or Terminal number

CHANGES: 1985.8, 1988.7
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

MAK-6581



02-0001-2

SCHEMATIC DIAGRAM MAK-6581

2

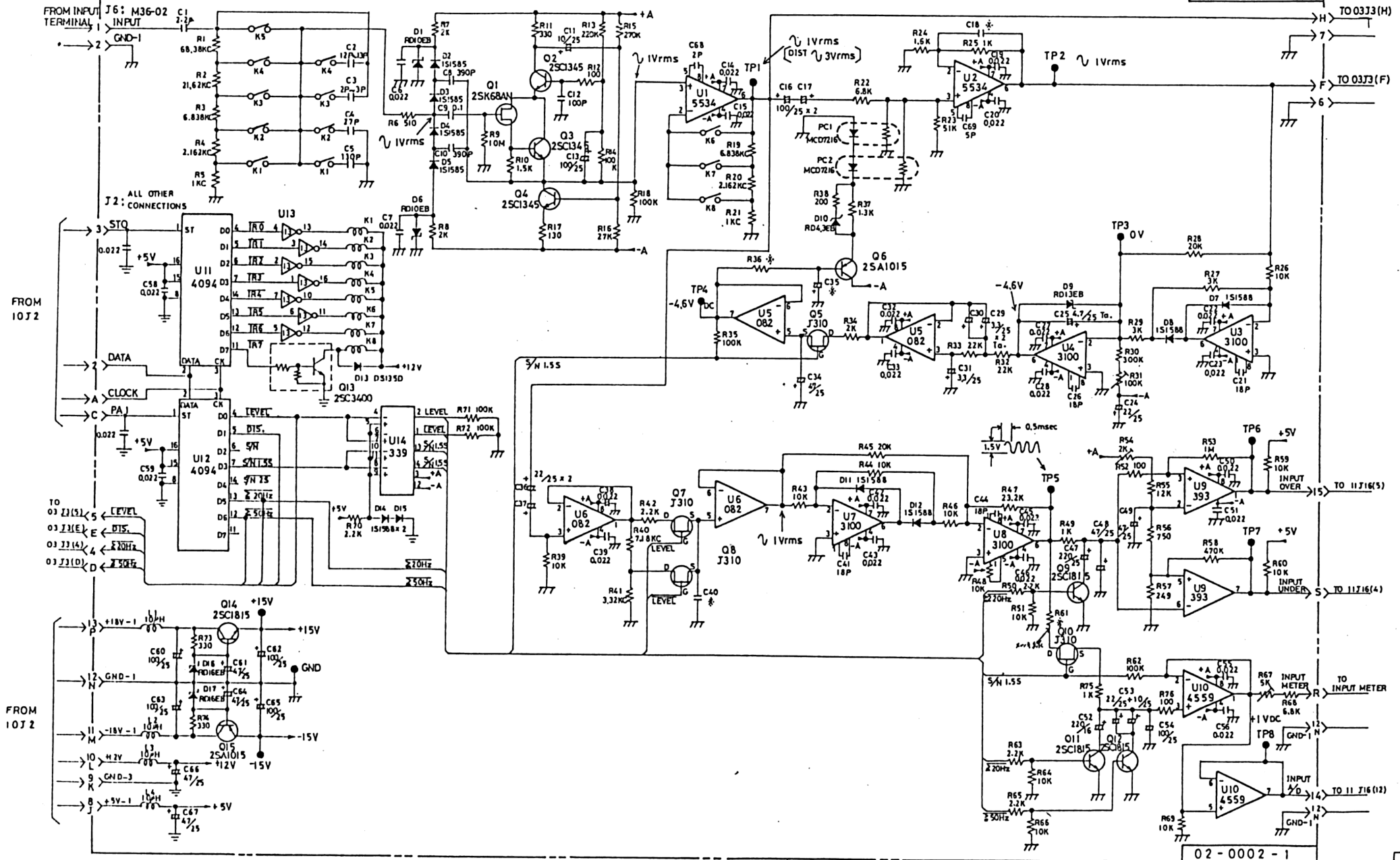
NOTES

Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacitance in pF μ=μF
NAME Screwdriver adjustment in case
[NAME] Screwdriver adjustment on panel
[NAME] Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
[PCB] Printed Circuit Board
(2)——○——Connector or Terminal number

CHANGES: 1985.8, 1988.7
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

MAK-6581



NOTES

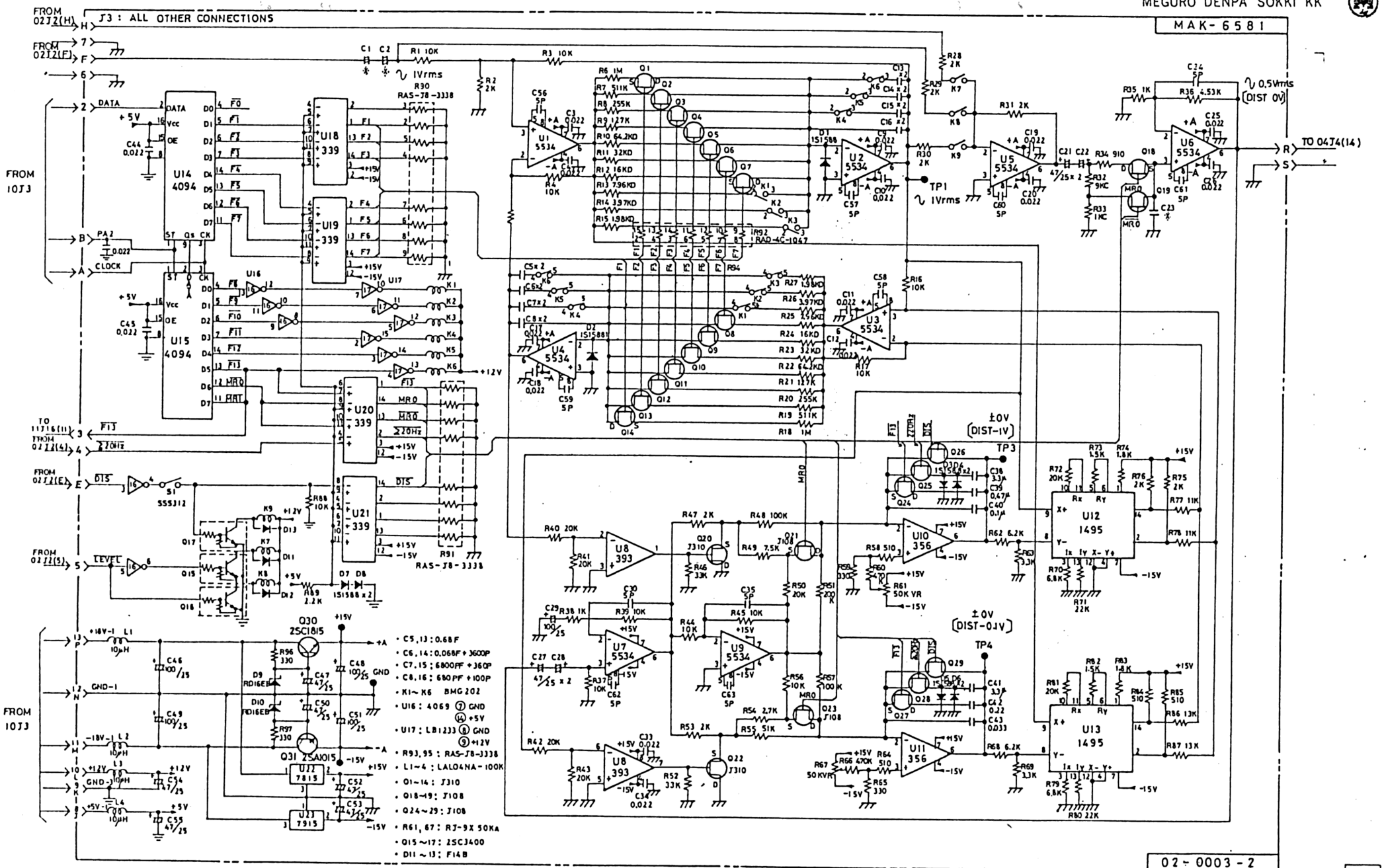
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacitance in pF μ=μF
NAME Screwdriver adjustment in case
[NAME] Screwdriver adjustment on panel
[NAME] Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
[PCB] Printed Circuit Board
(1)—○— Connector or Terminal number

1988.7
CHANGES: 1985.8
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581

MAK-6581



02-0003-2

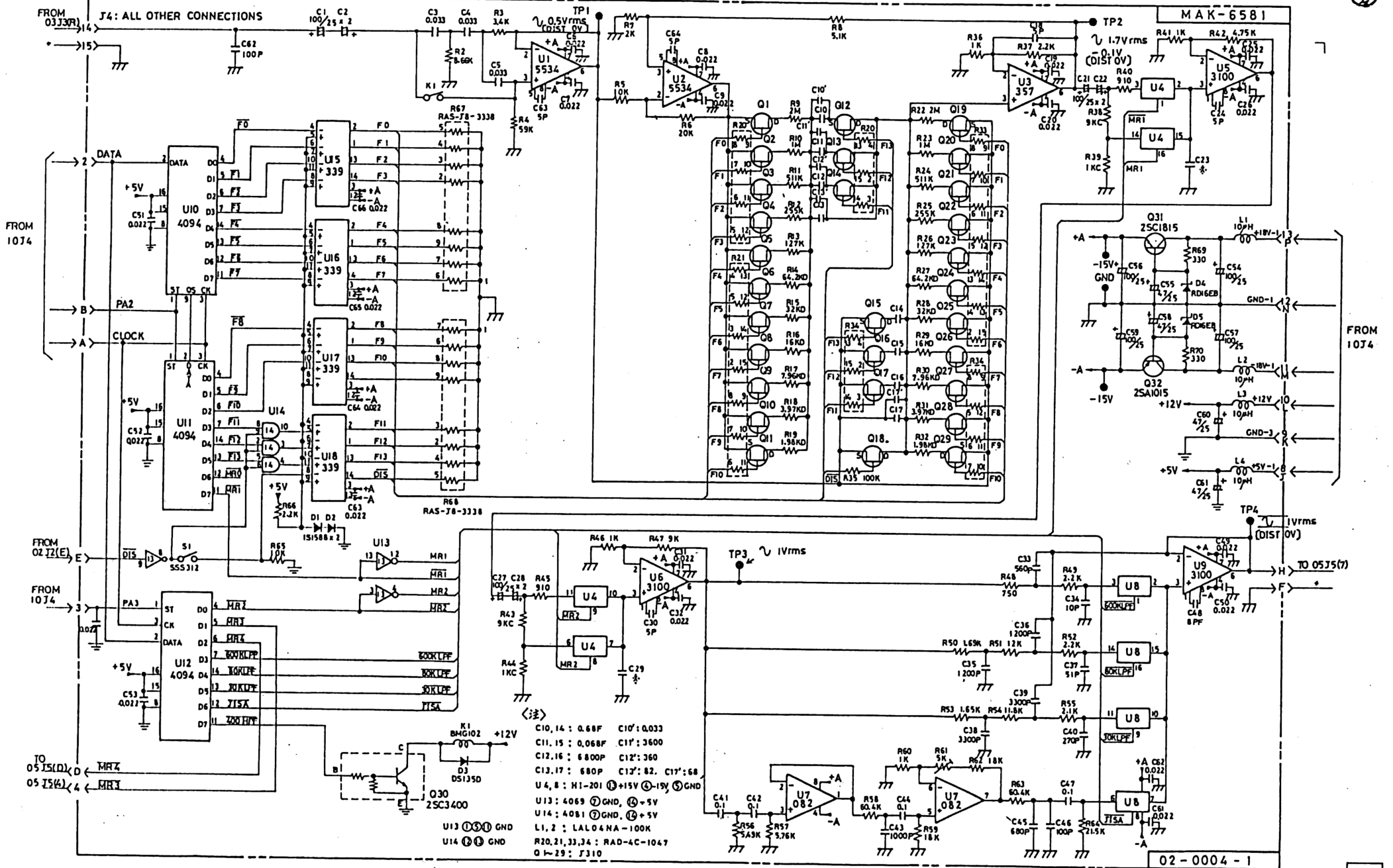
NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacitance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

1988.7
CHANGES: 1985.8
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581

4



NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacitance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

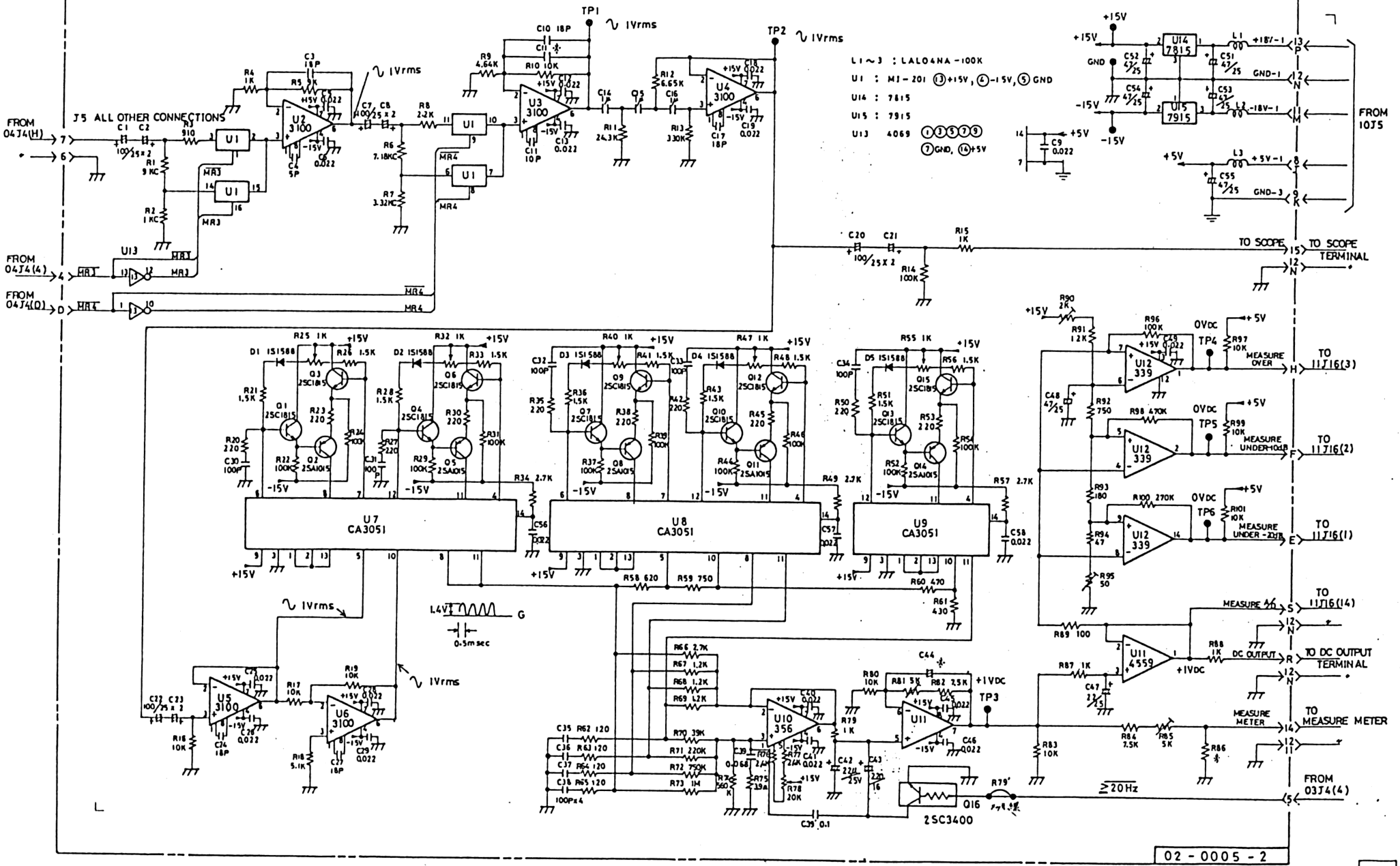
Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
* Value selected at factory; Average value shown
PCB Printed Circuit Board
Ⓟ Connector or Terminal number

C10, 14 : 0.68F C10' : 0.033
C11. 15 : 0.068F C11' : 3600
C12, 16 : 6800P C12' : 360
C13, 17 : 680P C13' : 82. C17' : 68
U4, 8 : HI-201 ⑬+15V ④-15V ⑤GND
U13 : 4069 ⑦GND, ⑭+5V
U14 : 4081 ⑦GND, ⑭+5V
L1, 2 : LAL04NA-100K
R20, 21, 33, 34 : RAD-4C-1047
Q1~29 : 2310
U13 ①③⑪ GND
U14 ⑫⑬ GND

1988. 7
CHANGES: 1985. 8
DRAWING: KUBOTA
CHECK:
DATE: 1975. 2

5

MAK-6581



02-0005-2

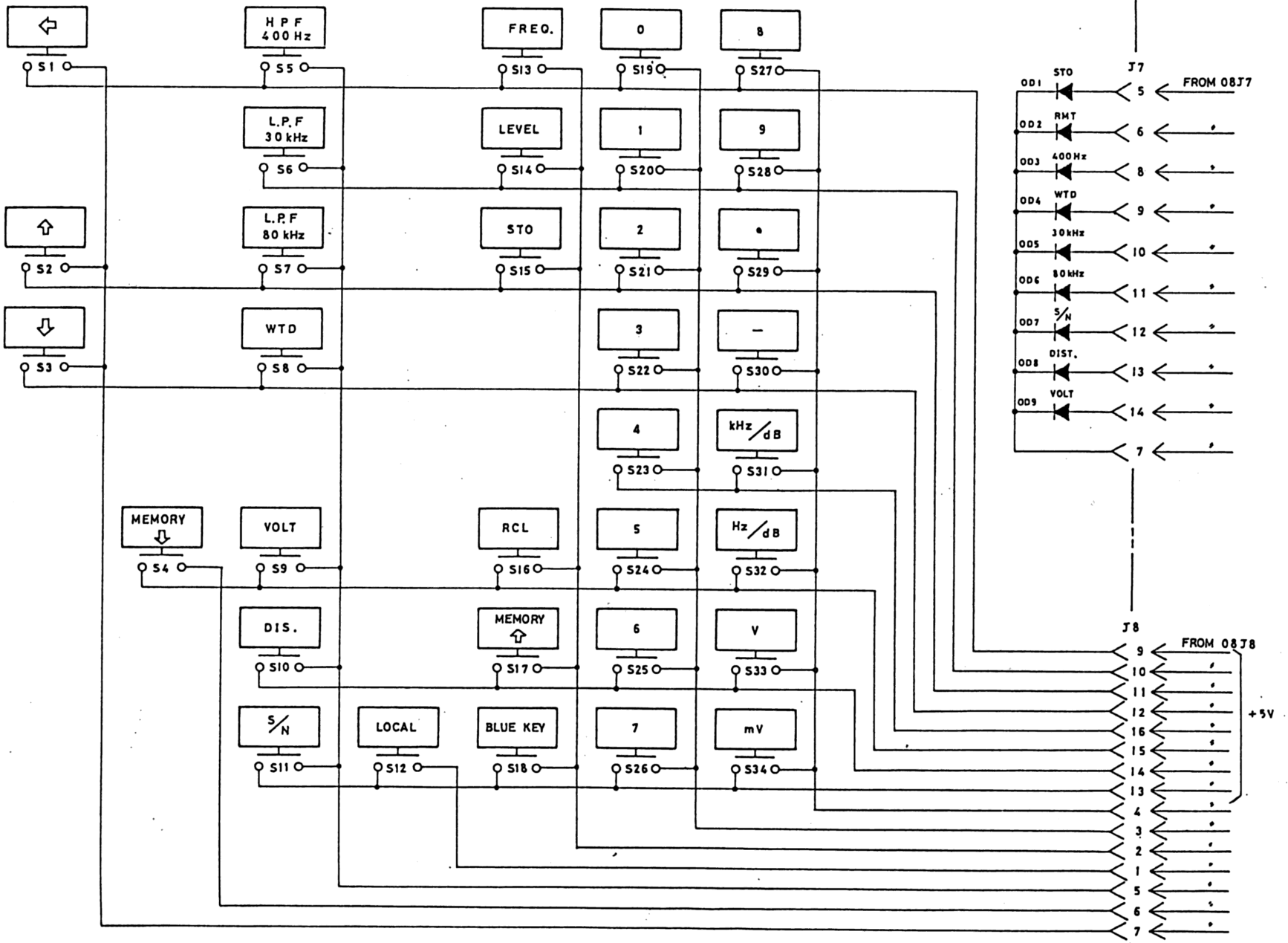
SCHEMATIC DIAGRAM MAK-6581

6

NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
Connector or Terminal number

1988.7
CHANGES: 1985.8
DRAWING: KUBOTA
CHECK:
DATE: 1985.2



02-0006-1

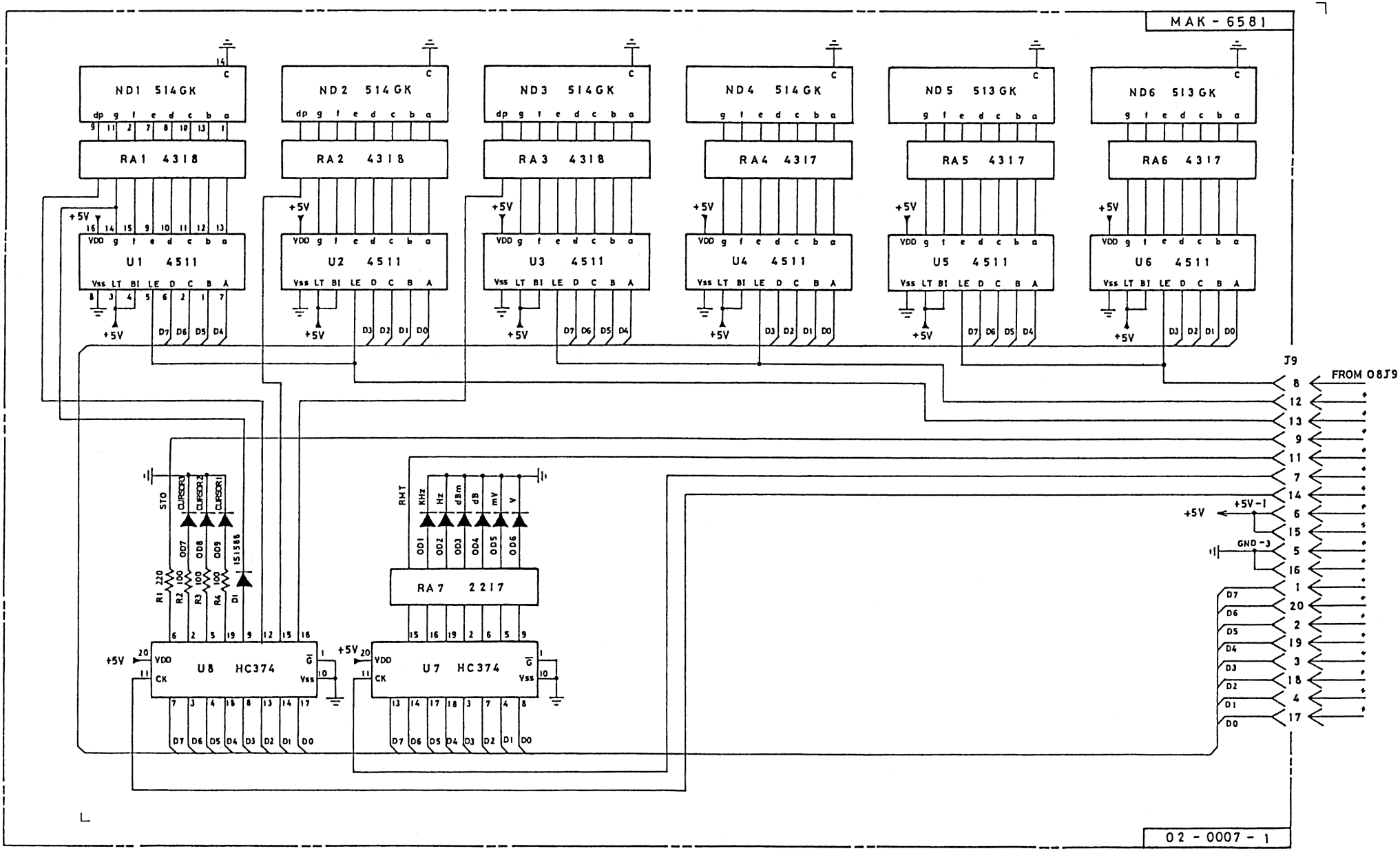
SCHEMATIC DIAGRAM MAK-6581

7

NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

CHANGES:
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

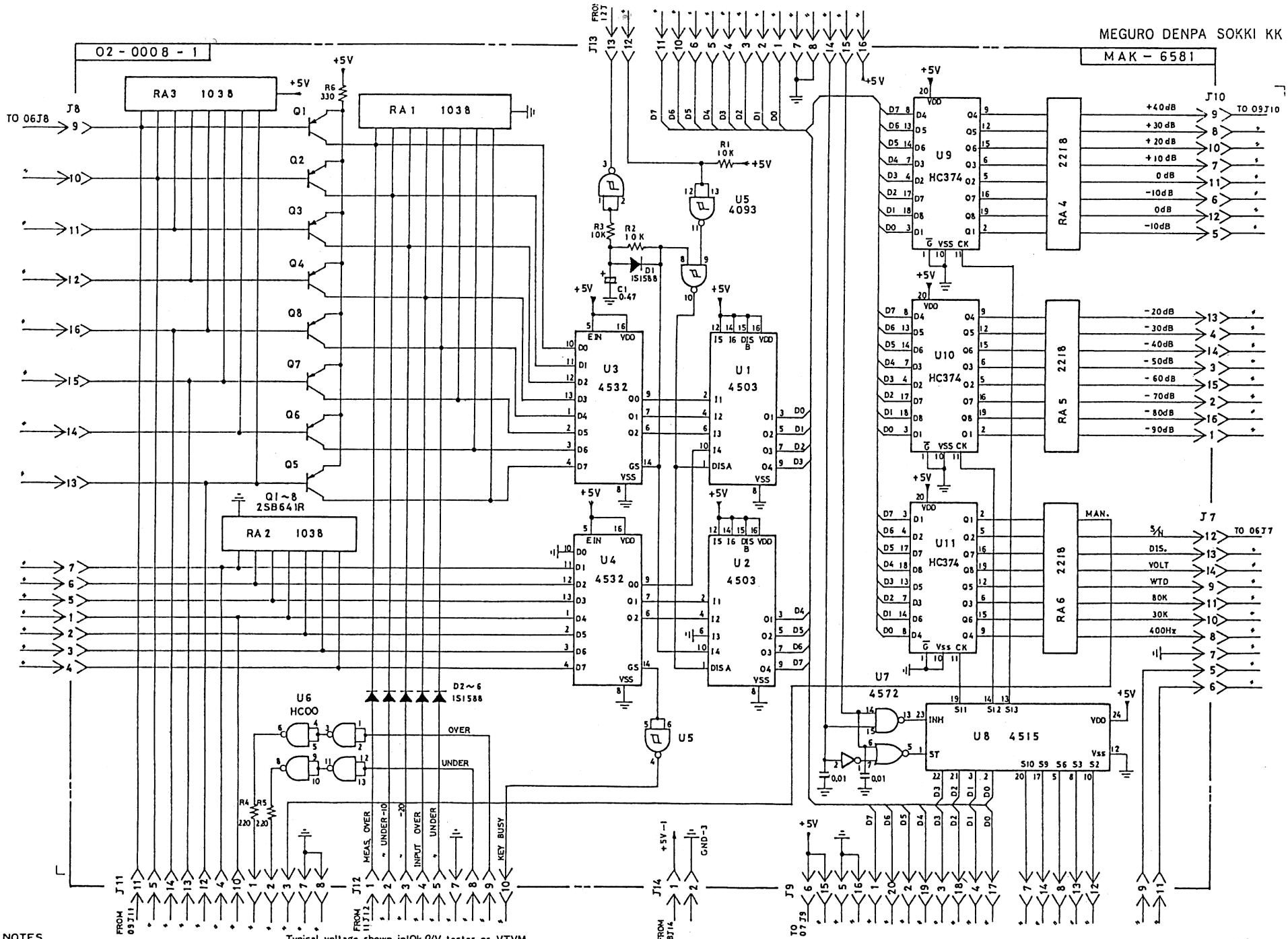


NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
* Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

CHANGES: 1988.7
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581



NOTES

Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
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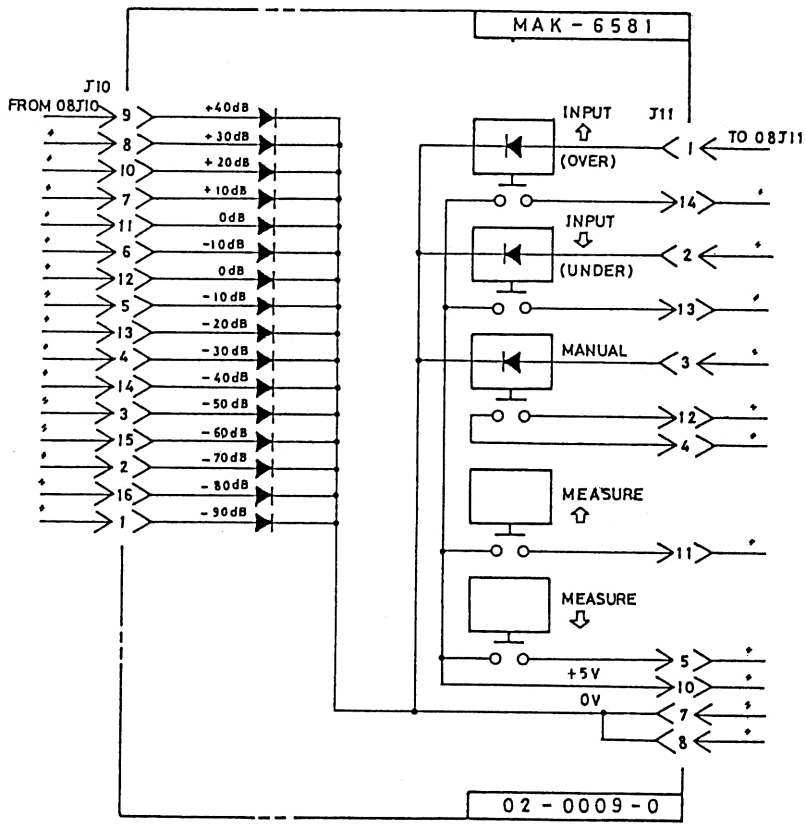
Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

1988. 7
CHANGES: 1985. 8
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581

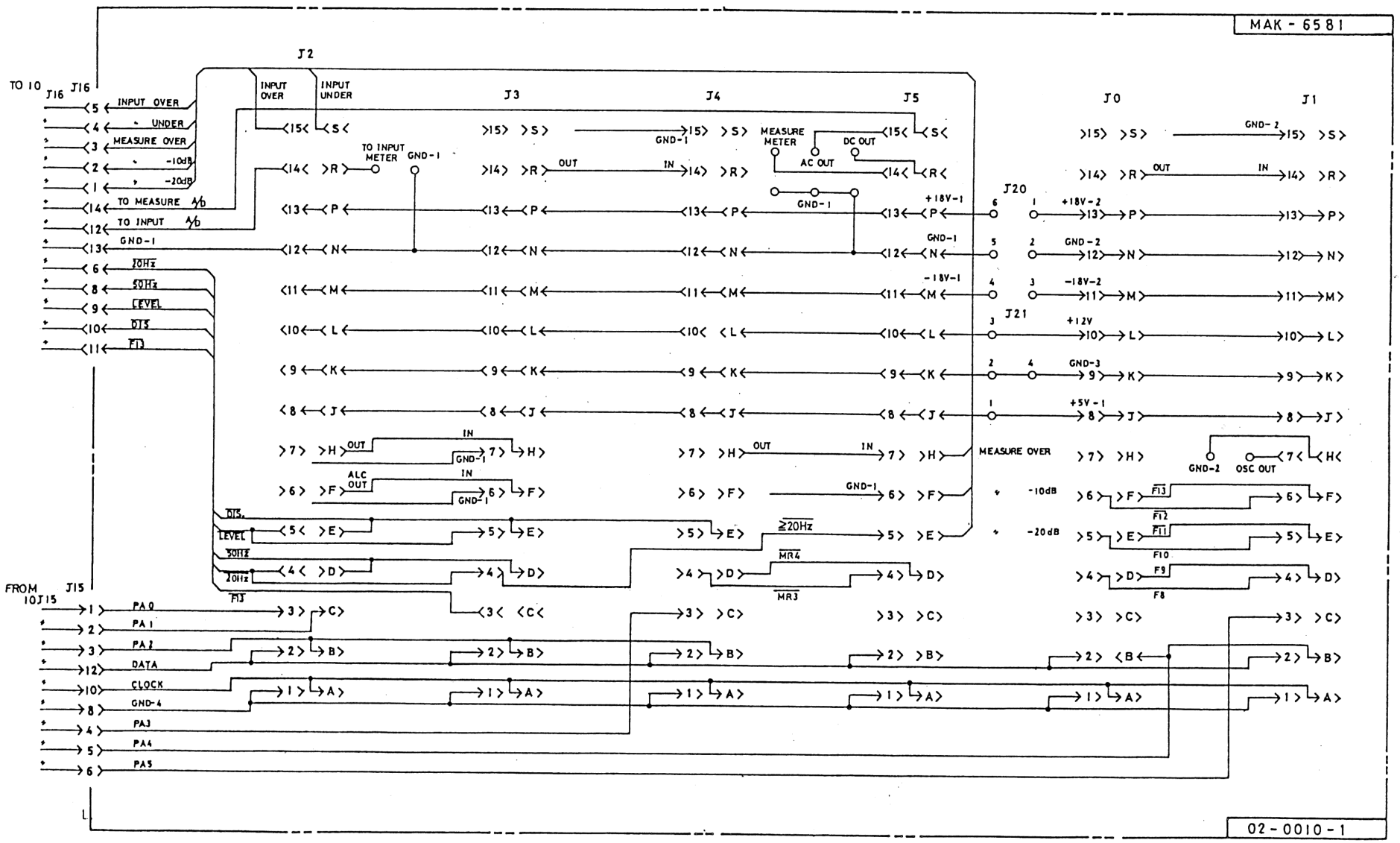


NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

CHANGES:
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581



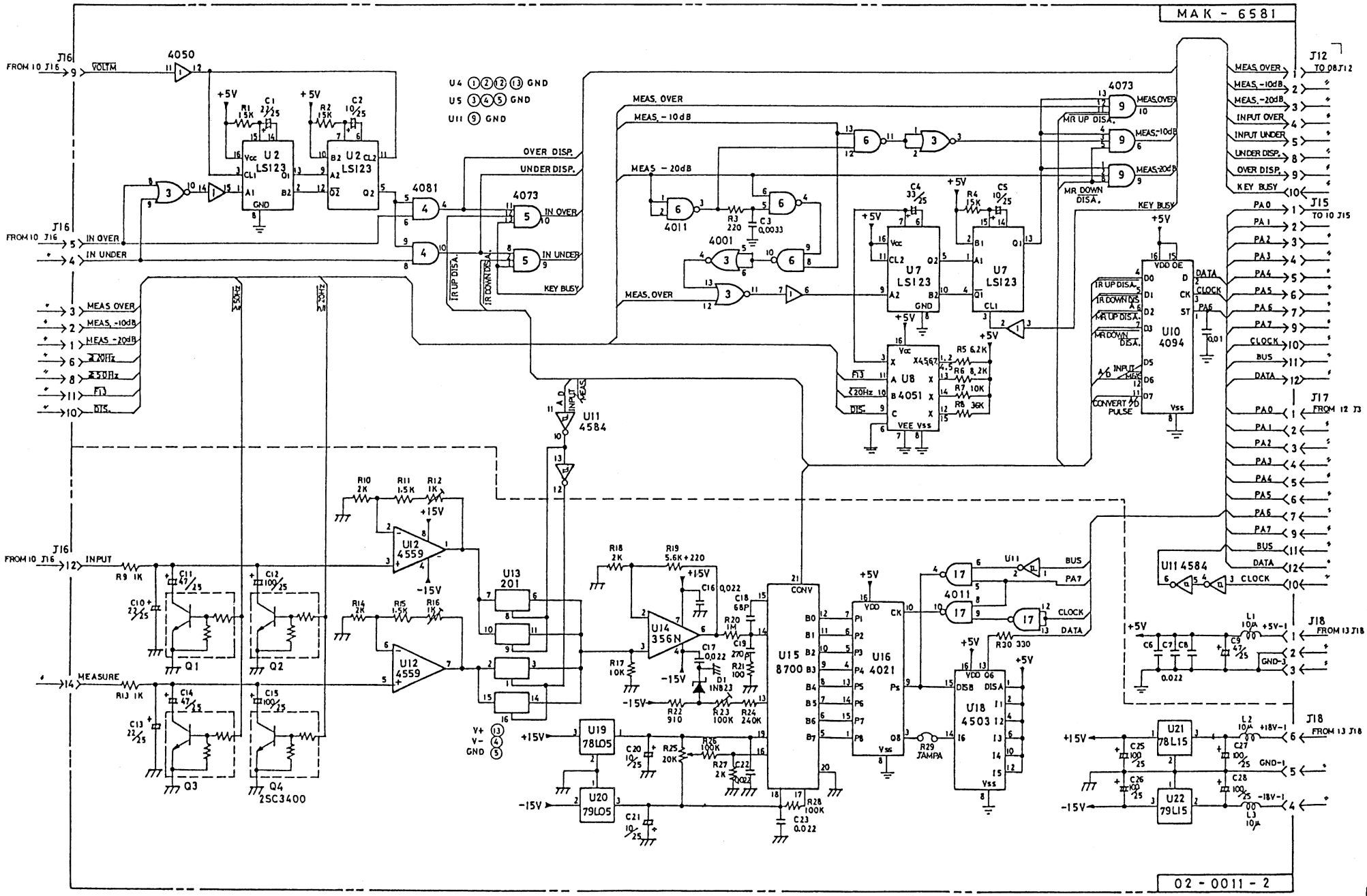
NOTES
Unless otherwise Indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
[NAME] Screwdriver adjustment on panel
[NAME] Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
* Value selected at factory; Average value shown
[PCB] Printed Circuit Board
(2) Connector or Terminal number

CHANGES: 1988.7
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581

MAK - 6581



NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
[NAME] Screwdriver adjustment on panel
[NAME] Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

1988.7
CHANGES: 1985.8
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581

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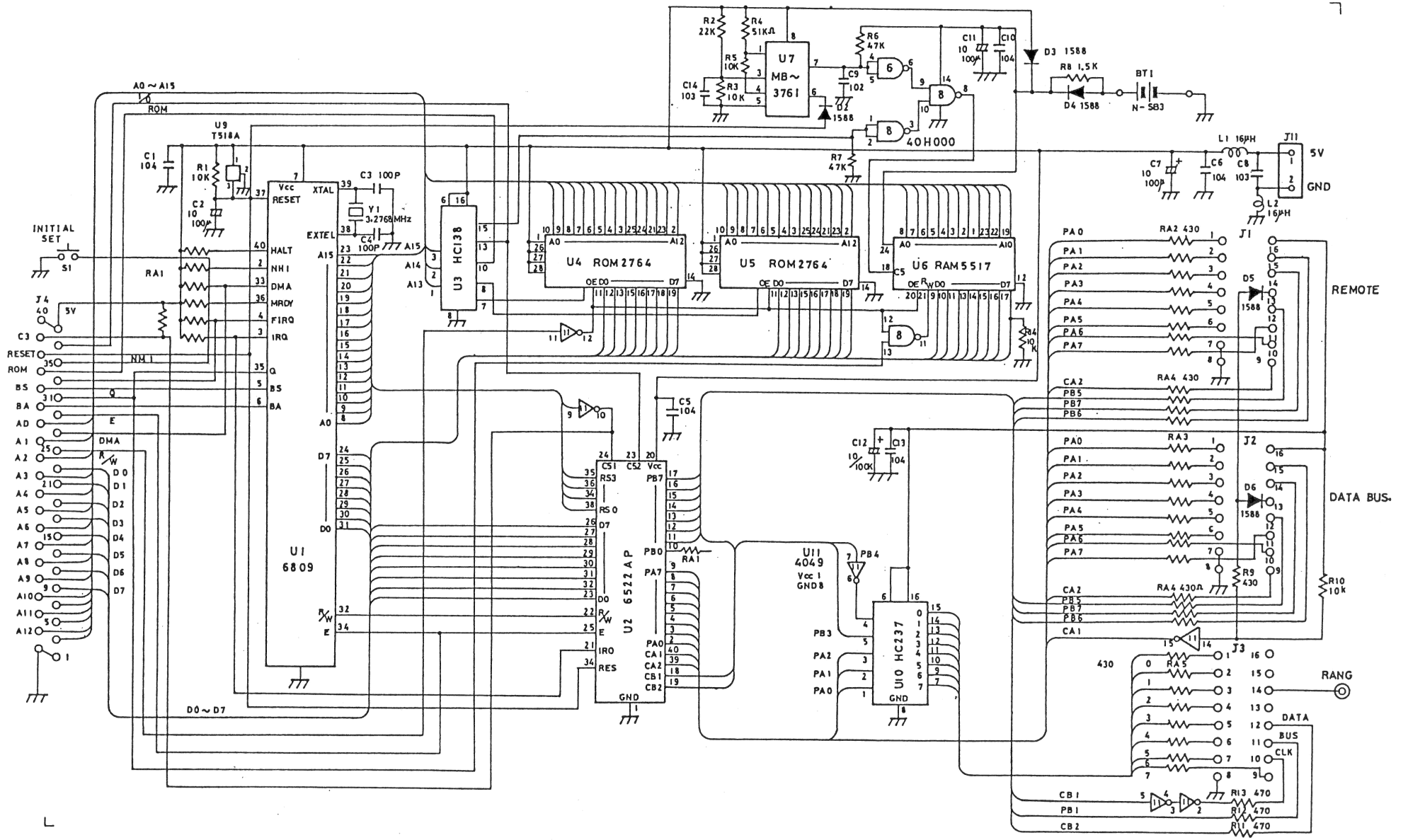

NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
* Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

CHANGES:
DRAWING: IGARASHI
CHECK:
DATE: 1986.1

SCHEMATIC DIAGRAM MAK-6581
CPU SECTION
G1-0220-5

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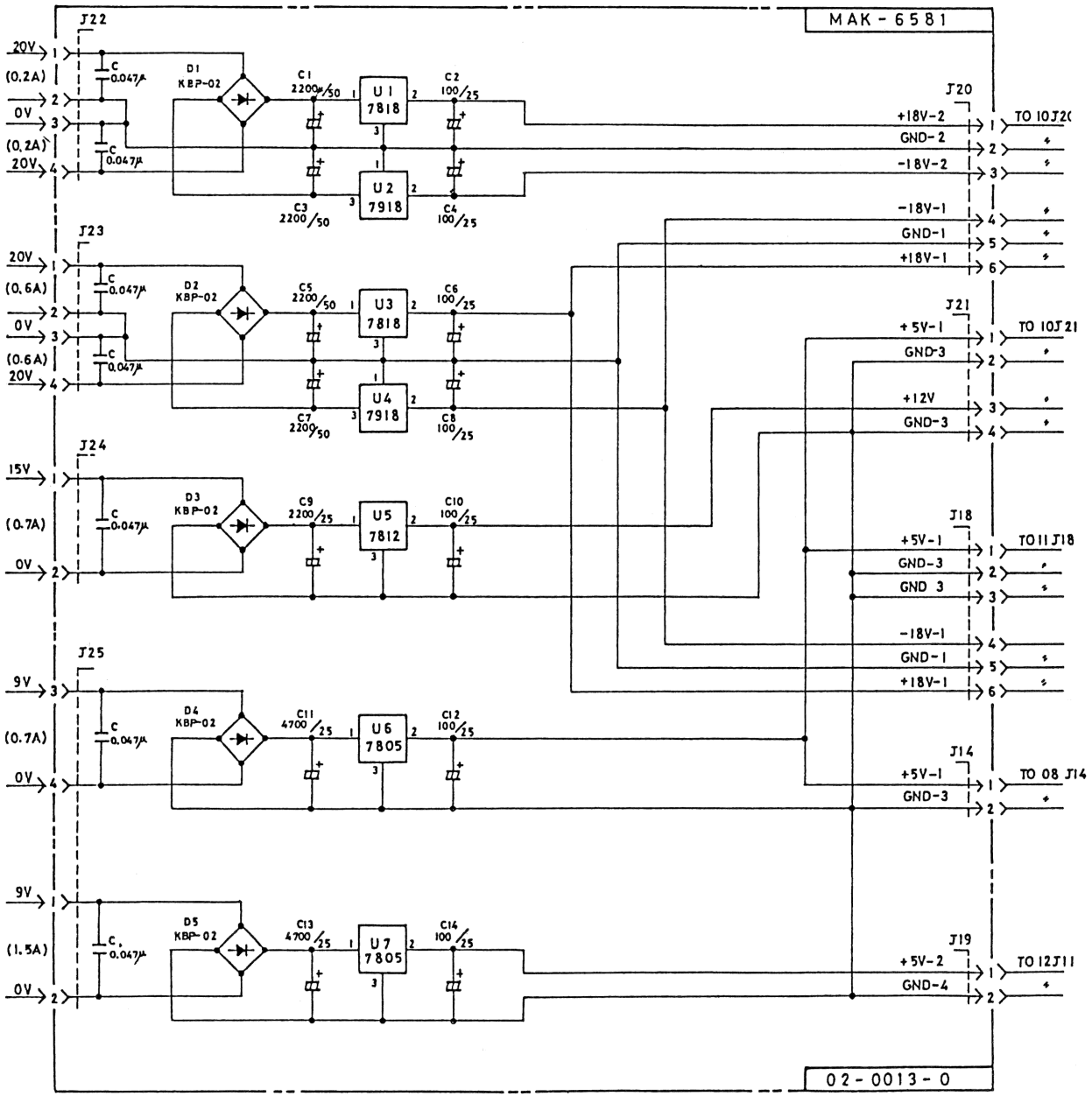

NOTES
Unless otherwise indicated:
Resistance in Ω, k=kΩ, M=MΩ
Resistors 1/2watt
Capacistance in pF μ=μF
NAME Screwdriver adjustment in case
NAME Screwdriver adjustment on panel
NAME Knob control and Panel markings

Typical voltage shown in10kΩ/V tester or VTVM
Rotary switch section shown in max CCW position
※ Value selected at factory; Average value shown
PCB Printed Circuit Board
② Connector or Terminal number

CHANGES: 1985.8
DRAWING: KUBOTA
CHECK:
DATE: 1985.2

SCHEMATIC DIAGRAM MAK-6581

Meguro MAK-6581 Audio Analyzer

Service Information

* Board 02-0000-1 (audio oscillator)

It was found that the actual output frequency do not match very well with the value displayed, for some frequencies, even after a careful adjustment of R9 to R15. This is due the effect of channel resistance of Q20, Q21, which are significant over R43, R55 resistance thus introducing error. This can be minimized by adding a 2.2 MΩ, metal-film resistor (low-TC), in parallel with each one R43 and R55.

* Board 02-0005-2 (r.m.s. converter)

Offsets on the r.m.s. converter should be carefully adjusted or the calculated DC output will be calculated with large errors. To adjust the r.m.s. converter please follow the steps below in sequence. For the null adjustments use a 3 ½ digits, 200 mV-scale voltmeter or better. Leave the instrument to warm up for at least 1 h before adjust it.

Preparation

a) connect pin 3 of **U10** and pin 3 of **U5** to ground.
b) turn R25, R32, R40, R47 and R55 totally CW.

Offset null of U10:

c) adjust R78 until voltage on pin 6 of **U10** is 0.0 mV to ground.

Break point of U7:

d) connect a voltmeter to pins 8 and 11 of **U7**;
e) turn R25 CCW until (Vpin8 - Vpin11) = 0.0 mV.
f) turn R32 CCW until (Vpin8 - Vpin11) begin to raise above 0.0 mV.
g) iterate (f) and (g). The adjustment can be considered finished when (Vpin8 - Vpin11) is 0.0 mV exactly and on the threshold to change to 0.1 mV at the slightest CCW movement of R25, R23.

Break point of U8:

h) adjust R40 CCW until voltage on pin 8 of **U8** is 0.0 V to ground and on the threshold to change to 0.1 mV.
i) adjust R47 CCW until voltage on pin 11 of **U8** is 0.0 V to ground and on the threshold to change to 0.1 mV.

Break point of U9:

j) adjust R55 CCW until voltage on pin 11 of **U9** is 0.0 V to ground and on the threshold to change to 0.1 mV.

Checking

k) unground pin 3 of **U10** and pin 3 of **U5**.
l) Voltage at pin 6 of U6 should be 0.0 mV; otherwise the adjustments should be repeated.

Scale adjust:

k) unground pin 3 of **U10** and pin 3 of **U5.**
l) set the instrument to Voltmeter function.
m) inject a 1 kHz sinusoidal signal to the input.
n) connect a r.m.s voltmeter or an oscilloscope to TP2.

o) adjust the input signal amplitude to get 1 V r.m.s or 2.82 V pp on TP2.
p) adjust R81 for 1.0 V DC on TP3.
q) remove input signal and ground the input.
r) set the input range to 100 V / 40 dB by using the panel keys *manual* and *measure up*.
s) set the voltmeter/distortion/S/N meter needle to 0 by using the mechanical null adjustment.
t) inject a sinusoidal, 1 V r.m.s., 1 kHz signal to the input.
u) set the input range to 1 V / 0 dB by using the panel key *measure down*.
v) adjust R85 until the voltmeter/distortion/S/N meter indicates 1.0 V.
w) by varying the input signal amplitude, check whether the meter readings are correct considering a +/- 3% full-scale accuracy.

Remarks :

* Do not attempt to nullify TP3 offset voltage with R78. For proper operation of the r.m.s. converter, is imperative that voltage at pin 6 of U10 be zero for a 0 V r.m.s. input. U11 output offset voltage is not critical for proper operation of the following circuits, and should be corrected as indicated. If TP3 offset voltage is excessive (more than 5 mV) replace U11.

* Voltmeter reading accuracy is not specified in the MAK-6581 manual. Typical error on mechanical meter readings is +/- 3% of the full-scale reading, and this error range remains constant over the entire meter scale. Thus, a half-scale reading can be imprecise by +/- 6% and a quarter-scale indication can be imprecise by as much as +/- 12%. Take this in account when checking the r.m.s converter accuracy.

* The information here presented is believed to be accurate, and it was obtained when servicing one defective MAK-6581 unit. Comments, remarks and additional information can be addressed to 150ctb31 at gmail dot com.