ADVANTEST®
ADVANTEST CORPORATION

INSTRUCTION MANUAL

R4611

NETWORK ANALYZER

MANUAL NUMBER OEK02 9002

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Printed in Japan

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1. INTRODUCTION

This manual describes how to operate the R4611 network analyzer.

This chapter explains how to use this manual and contains the general description of the R4611 network analyzer functions, the procedure from the setup operation to the power supply operation, and general requirements. Before taking measurements with the R4611 network analyzer, read this manual very carefully.

1.1 Using the Manual

This manual explains the R4611 network analyzer according to the flow shown in Figure 1.1 for the users having moderate knowledge and experience with electronic measuring meters. Beginners must read through this manual from the beginning.

Experienced users may read only Chapter 3 of this manual. Before operating the analyzer, however, check the general requirements in this chapter. Chapter 4 contains the supplementary description of the functions.

The GPIB remote control operation is explained in the programming manual. Using GPIB requires a basic knowledge of programming. Refer to the proper basic programming manuals if necessary.

If the analyzer operation appears to be abnormal, see Chapter 5.

Introduction of R4611 (1.2)

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How to observe the CRT display, and basic operations of the network analyzer for beginners (2)

(Functional description)
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How to store, inspect and troubleshoot the network analyzer (5)

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Basic description and programming of GPIB remote control operation

Figure 1-1 Structure of This Manual

1.2 General Description of R4611

R4611 is a network analyzer for measuring phase, group delay and impedance, accurately and speedily.

This analyzer is provided with three input terminals, R, A, and B to measure the absolute values of the three inputs and to compare these values within the wide range of frequency, 10 to 300 MHz. You can perform measurements by using not only 50 Ω but also 1 MΩ as the input impedance.

The main feature of the R4611 is the provision of a conciderable increase in measurement precision and throughput by use of the unique analog and digital signal processing technology. For example, the partial variable sweep functions and the analysis function for the user-specified block of the R4611 functions are useful on the production line, and also increase the measurement throughput remarkably.

The integrated BASIC controller function allows you to create programs for measurements, analysis and data processing by using the external key board (TR45103), and permits high-speed processing. This great benefits the automatic production line operation.

You can display the measurement and analysis data on the integrated, CRT in various modes, such as the overwrite display mode or split display mode.

Features

(1) R4611 permits high-precision and high-resolution measurement.

- Integrates the synthesizer with 0.01 Hz resolution.
- Provides outstanding dynamic precision and resolution.
  Amplitude measurement precision: 0.02 dB
  Resolution: 0.001 dB
  Phase measurement precision: 0.2°
  Resolution: 0.01°
- Provided with an error correcting function.
- Integrates the power splitter and is provided with three inputs R, A and B as standard.
- Allows high-impedance measurement.

(2) The R4611 provides high-throughput measurement.

- Permits high-speed measurement of 1 ms/point and allows selection of the measurement point.
- Increases the measurement speed greatly by using the partial variable sweep function.
- Enables high-speed data processing through sequential program creation by using the BASIC controller function.

(3) R4611 supports many marker functions and variable display modes.

- Allows you to perform the marker search operation, inflection point analysis (ripple and spurious), band width measurement and Q computation on the desired portion with one-touch operation.
- Provided with a compensate marker function for high-precision data reading between measurement points.
- Provided with a marker track function to track the maximum or minimum value every sweep operation.
- Provided with a split display function to display the 2-ch measurement data in each format.

1.3 Requirements before Using the R4611

1.3.1 Checking External View and Accessories

On receiving the R4611, inspect the external view and check whether any cracks or damage has occurred during transportation.

Then, check the standard accessories according to Table 1-1 and verify each quantity and specification.

If any cracks or damage is found or if some accessories are missing, contact the sales division or agency nearest your place of business.

Address and telephone numbers are listed at the end of this manual.

Table 1-1 R4611 Standard Accessary List

Item	Model name	Parts code	Quantity	Remarks
Power cable	A01402	DCB-DD2428X01	1	
BNC-BNC cable	M1-78	DCB-FF0981X01	2	30 cm
		DCB-FF0981X04	1	60 cm
BNC through connector	BNC-A-JJ	JCF-AB001EX05-1	1	
Fuse	MDA-4A	DFT-AF4A	2	For standard model and option
	MDA-2A	DFT-AF2A		For options 42 and 44.
Instruction manual		J4611	1	Japanese manual
		E4611		English manual

1.3.2 Ambient Environment for Use and Precautions

(1) Do not use this device in locations exposed to dust, direct sunshine or corrosive gases.
Also do not use this device in an ambient temperature lower than 0°C to +40°C (+5°C to +40°C for FDD) or humidity lower than 85% (no dewing).

(2) Cooling System

In the cooling system of the R4611, air is taken in from the larger fan on the rear panel and discharged from the smaller one.
Install the R4611 so that this cooling system works well. Do not put anything on the R4611.

(3) Though the R4611 has been designed with much consideration of the noise caused by the AC power line, it is better used with a minimum noise. To use the R4611 in a very noisy, environment attach a proper device such as a noise filer.

(4) Do not use the R4611 in a location with much vibration.

1.3.3 Connecting Power Supply

(1) Connecting R4611 to Power Cable

Verify that the POWER switch on the R4611 front panel is set OFF and then connect the power cable of an accessory to the AC LINE connector on the rear panel.
The power voltage for use was set at shipping, according to the specification when the order was received.
In any case, the power frequency must be set to 48 to 66 Hz.

Table 1-2 Power Voltage

Option No.	Standard	32	42	44
Power voltage (V)	90 to 110	103 to 132	198 to 242	207 to 250

(2) Power Cable and Adapter

The power cable plug has three pins. The round pin at the center of the plug is the grounding pin.
To connect the plug to the outlet using the adapter, connect either of the grounding cords (shown in Figure 1-1 (a)) of the adapter) or the grounding terminal on the R4611 rear panel to ground via an external grounding cord.
Accessory adapter A09034 conforms to the Law for Electric Products.
The width (A) of one electrode of the A09034 is different from (B) of the other one as shown in Figure 1-1 (b). When inserting this adapter into the outlet, check the direction of both the plug and outlet.
When A09034 is unsuitable for the outlet to be used, purchase adapter KPR-13.

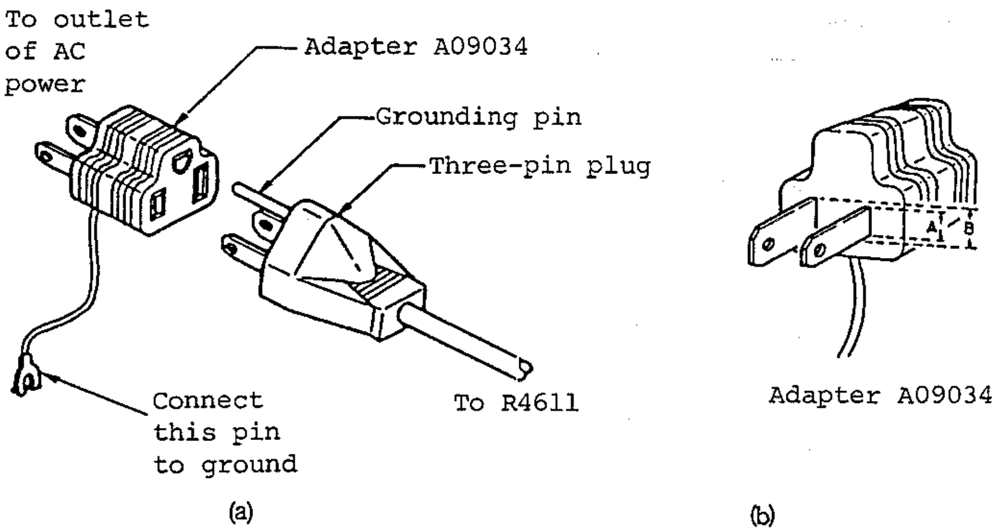


Figure 1-1 Power Cable Plug and Adapter

(3) Replacing Fuse

To replace a fuse, set the PS POWER switch to OFF and remove the power cable from the AC LINE connector.
Then, slide the plastic cover of the fuse box on the right side of the AC LINE connector to the left. Next, pull the lever, FUSE PULL, toward you to remove the fuse.
When replacing the fuse, use the following types: (See Figure 1-2.)

- Standard and option 32: MDA-4A (DFT-AF4A)
- Options 42 and 44 : MDA-2A (DFT-AF2A)

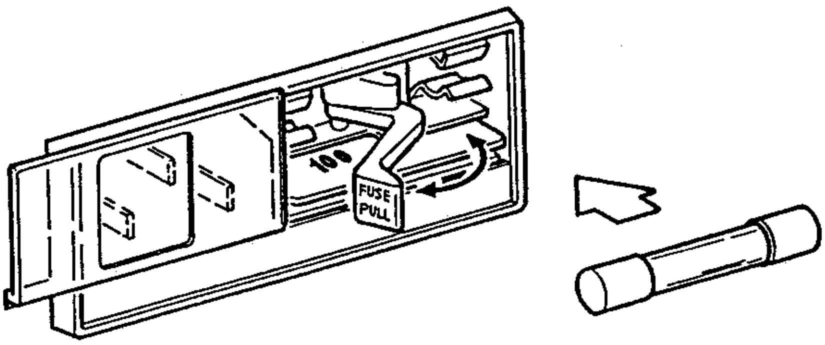


Figure 1-2 Replacing Fuse

2. DESCRIPTION FOR BEGINNERS

This chapter describes the self-diagnostic test at power supply and the initial setting by using the PRESET key in the former part, and how to read the data displayed on the CRT screen in the latter part.

At the end of this chapter, the R4611 basic key operation is explained along with concrete measurement examples for beginners.

2.1 Power Supply and Initial Setting

Connect the R4611 to the AC power using the power cable and turn the power switch at the lower portion of the R4611 front panel ON.

Caution

Before supplying power, verify that the voltage of the AC power to be used is the same as the specified voltage.
Before using the R4611, warm it up for about one hour to obtain the specified performance.

2.1.1 Self-Diagnostic Test

When power is supplied, all LEDs on the R4611 panel come on and the self-diagnostic test is executed automatically.

During execution of the self-diagnostic test, the following data is displayed on the CRT screen:

```
              ******        **       *****     **     **
              *    *       * *      *         * *    * *
              *    *      *  *     *            *      *
              ******     *   *     *******      *      *
              *   *     *********  *      *     *      *
              *    *         *     *      *     *      *
              *     *        *      ******    *****  *****

                      self Test in progress.

                    Main Ram                 --> OK
                    I/O Ram                  --> OK
                    I/O Communication        --> OK
                    Coprocessor              --> OK
                    Display Rom              --> OK
                    Display Ram              --> OK
                    Display Communication    --> OK
                    ***  self Test All Pass!! ***


 Copyright ADVANTEST Corporation
```

When the self-diagnostic test terminates, the system is set to the initial mode described in Section 2.1.2.
If NG is displayed or indication is aborted in the above self-diagnostic test, contact our sales division nearest your place of business.

2.1.2 Pre-setting

R4611 is set to the initial mode forcedly when the power is set ON or when key INSTR PRESET is pressed.

ACTIVE CHANNEL	:	CH1
MEASUREMENT		
INPUT MEAS	:	A/R
CONVERSION	:	OFF
Z0	:	50Ω
FORMAT	:	LOG MAG
SCALE REF.		
/DIV	:	10 dB/DIV
REF. VALUE	:	0.000 dB
REF. POSITION	:	Top of the screen (100.0%)
REF. LINE	:	OFF
DISPLAY		
DUAL CH ON/OFF	:	OFF
SPLIT ON/OFF	:	OFF
GRATICULE ON/OFF	:	ON
INTENSITY	:	INTENSITY 8
SOURCE		
MENU		
OUTPUT	:	2
OUTPUT LEVEL	:	0dBm
CENTER	:	150 000 000.00 Hz
SPAN	:	300 000 000.00 Hz
SWEEP		
TIME	:	0.300 sec
TYPE		
COUPLE CH ON/OFF	:	ON
VAR.SWEEP ON/OFF	:	OFF
POINT	:	301
TRIGGER	:	INTERNAL
MODE	:	CONTINUE
RECEIVER		
IMP/ATT	:	R 50 Ω/20 dB (ATT) A 50 Ω/20 dB (ATT) B 50 Ω/20 dB (ATT)
RESOLN/BW	:	1kHz
MARKER	:	ALL OFF

2.2 Reading CRT Display

The following figure shows how to read the data displayed on the CRT screen:

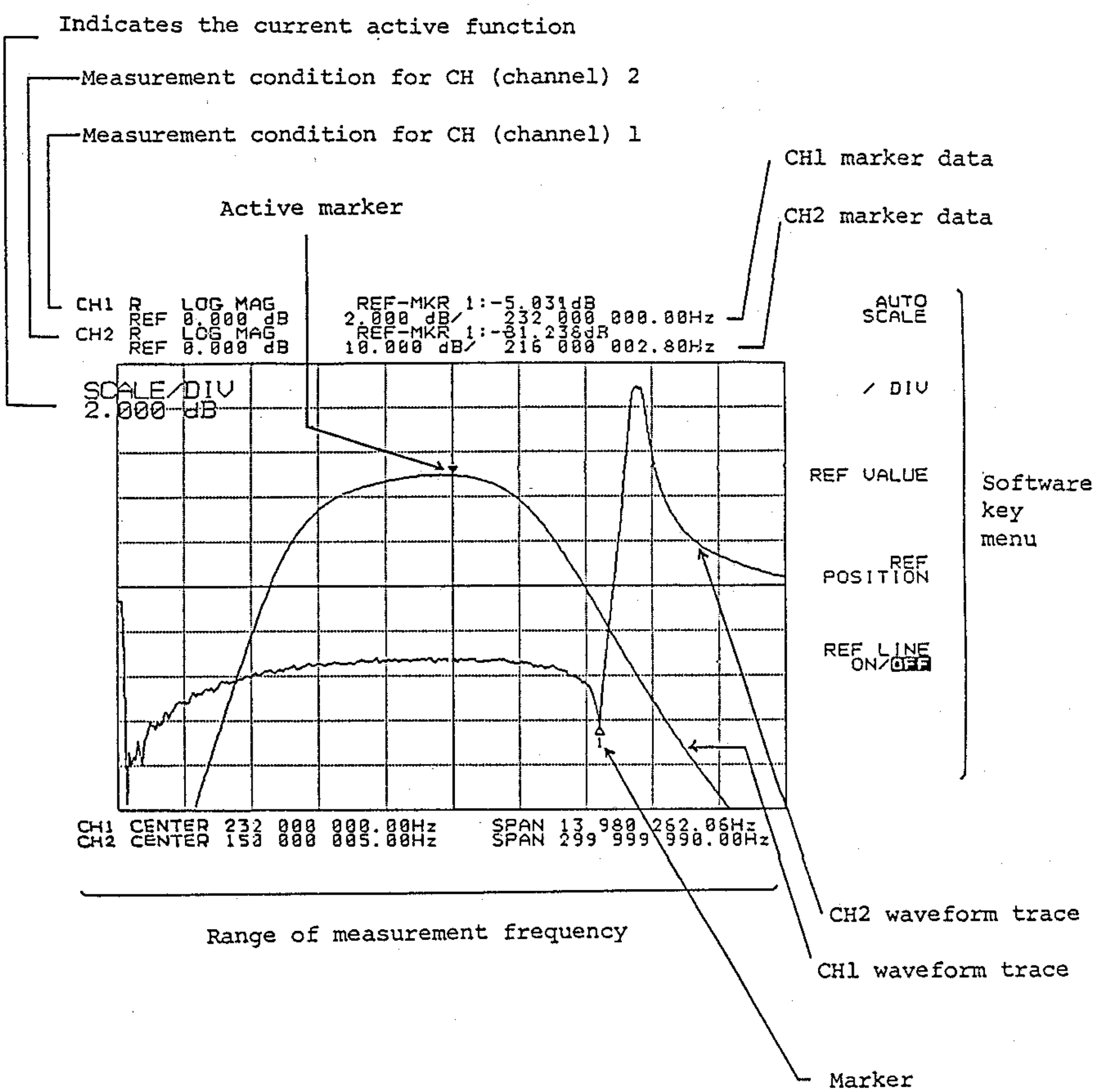


Figure 2-1 Reading CRT Display

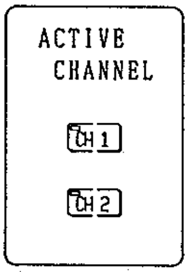
2.3 Basic Operations

This section describes the basic key operations of R4611 along with concrete measurement examples for beginners first using the network analyzer.

It is assumed that experienced users can satisfactorily operate the R4611 after referring only to Chapters 3 and 4.

2.3.1 Basic Operational Keys

(1) Channel Selecting Keys



Select the key to set the MEASUREMENT key and MARKER key described in (2) and (5) to the active mode. This lights the LED corresponding to the current active channel. Usually, either of the two channels (CH1 or CH2), can be selected.
Both the receiver setting key and the MARKER key can be operated independently for both CH1 and CH2.

(2) MEASUREMENT keys

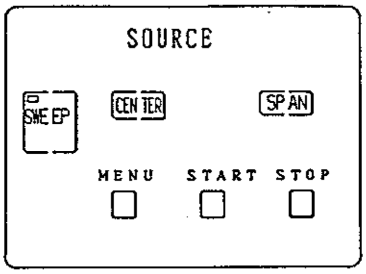
[INPUT MEAS] ... Selects the input (A/R, B/R, A/B, R, A or B).

[FORMAT] ... Sets the measurement format (amplitude, phase, group delay, Smith diagram, etc.).

[DISPLAY] ... Sets data such as the waveform trace to be displayed on the screen.
This key also sets the DUAL trace display mode, SPLIT display mode and LABEL.

[SCALE REF] ... Sets the position and value of the scale on the screen (AUTOSCALE,/DIV) and the reference line.

(3) Signal Block Setting Keys

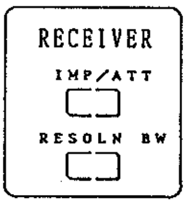


These keys are used to set the frequency, output level, sweep speed, sweep point count, sweep trigger and sweep mode of SOURCE (signal source).
The keys are also used to connect CH1 and CH2 and to set the partial sweep operation according to the sweep TYPE.
The SOURCE output is divided into two types, OUTPUT1 and OUTPUT2. Select either by using key   and the software keys. The selected output type is indicated by the LED at the upper portion of the connector. In the default mode, OUTPUT2 is selected.

NOTE

When a marker is displayed, if the setting of SPAN 0Hz or the setting where SPAN becomes 0Hz is performed, the message "Warning. Can't convert MKR   X" is output. This message means ripple of MARKER and value of X during Next search cannot be converted at SPAN 0Hz. (If ripple and Next search is not needed, this message is invalid.)

(4) Receiver Setting Keys



These keys are used to set the input impedance and input attenuator of the RECEIVER.
The keys can also set the resolution band width according to the required measurement dynamic range.

(5) MARKER Keys

MKR ⊿MKR [ ] ... Issues the normal marker, multi-marker or the other delta markers. This key can also set the marker correcting function, marker couple function and partial analysis function related to the all MARKER functions.

MKR SRCH [ ] ... Performs the marker search operation such as the MAX. search, X-dB down search and X-degree search (phase measurement).

MKR → [ ] ... Changes the setting condition by using the marker. For example, this key is used to change the marker frequency to the center frequency, marker level to the reference level, the frequency between the delta markers to the span frequency, etc.

(6) Software Keys

Seven key assigned in a line vertically at the right end of the CRT screen. The system displays selection items from 1 to 7 at the right end of the CRT screen according to the item set with the MEASUREMENT key. Select the desired item by using the software keys.
In the following description, the software keys are indicated by adding the label on the left side of each key like PHASE[ ].

(7) ENTRY Keys

These keys are used to enter numeric values for the setting items after the system is set to the ready mode for data entry by using the SOURCE keys.

Ten keys

[7] [8] [9] dBm [MHz] (DIV) V (s)
[4] [5] [6] -dBm [kHz] mV (ms)
[1] [2] [3] dB [Hz] μV (μs)
[0] [.] [-] UNIT [deg] nV (ns)

... Consists of numeric keys, unit keys and polarity keys. These keys are used to enter numeric values directly.

Back space key [BK SP] ... Pressing the BKSP key deletes the last entered numeral and allows correction of the entry.

Entry-off key ENTRY OFF [ ] ... Clears the active function.

Exponent key [EXP] ... Used to enter exponents. To enter 1.23 MHz for example, press [1], [.], [2], [3], [EXP], [6] and [Hz].

Step key [⇧] [⇩] ... Changes the set data every value (step unit) previously defined for each function.

Data nob ... Used for minor rearrangement of the set data.

(8) Unit Keys

Frequency unit key	... MHz, kHz and Hz
SCALE and REF keys for LOG MAG	... dB
SCALE and REF keys for PHASE	... deg.
SCALE and REF keys for DELAY	... S, ms, s and ns
SCALE and REF keys for SMITH (R+jX), SMITH (G+jB), POLAR, LIN MAG, REAL and IMAG	... 1 U : Use 1 [MHz] . 1 mU: Use 1 [kHz] . 1 U: Use 1 [Hz] . 1 nU: Use 1 [deg] .

DELAY APERTURE unit key ... %
REF POSITION unit key ... %
INTENSITY unit key ... UNIT
SWEEP TIME unit key ... S, ms, s and ns
OUTPUT LEVEL unit key ... dBm and -dBm
E.LENGTH VALUE unit key ... m and cm

(9) INSTRUMENT STATE Keys

INSTR PRESET [ ] ... Pre-sets the device.

SAVE [ ] ... Used to save the setting conditions.

RECALL [ ] ... Used to recall the setting conditions.

COPY [ ] ... Used to plot out the measurement waveform or to print out the measurement data.

PROGRAM [ ] ... Used to create programs by using the BASIC controller function. This LED comes on when the created program is executed. To reset the screen to be measurement mode, press this key again.

(10) GPIB

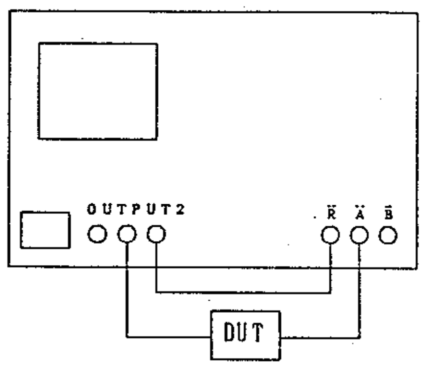
LOCAL ... Sets the system controller or TALKER/LISTENER by using the BASIC controller function, and sets the address of the GPIB bus.

2.3.2 Basic Key Operations with Sample Measurements

This section describes the R4611 basic key operations showing a sample measurement of the filter characteristics. In this measurement, the impedance of the filter is assumed to be 50 Ω.

(1) Setup Operation

Connect the filter to the OUTPUT2 connector and the A connector, and the connection cable to the OUTPUT2 connector and the R connector, as shown in the figure below.



(2) Pre-setting

Press INSTR PRESET . See Section 2.1.2 for the initial mode.

(3) Setting Frequency of Signal Source

Perform the following key operation:

[SPAN] [5] [0] dBm [MHz DIV] V S

[CENTER] [2] [3] [2] dBm [MHz DIV] V S

This key operation displays the waveform trace shown in Figure 2-2 on the screen.

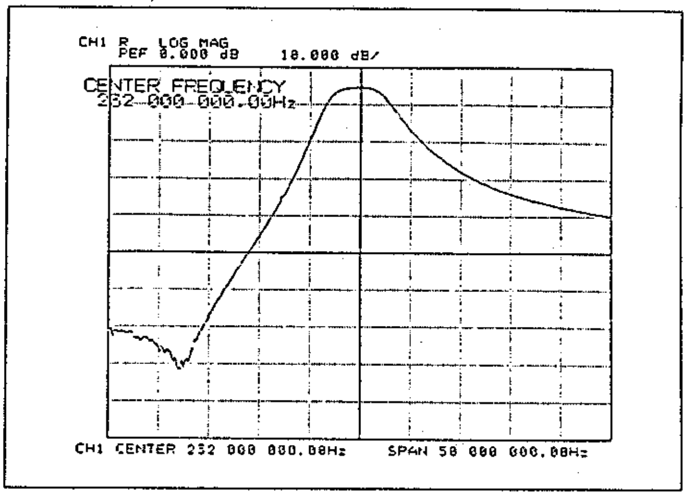


Figure 2-2 Filter Characteristics Waveform Trace

(4) Measuring Insertion Loss

The output level of the signal source is the same as the reference level. Thus, the following key operation allows you to obtain the insertion loss directly by using the marker: (See Figure 2-3.)

MKR ΔMKR [ ] ΔMODE MENU [ ] ΔREF-REF.POSN [ ]

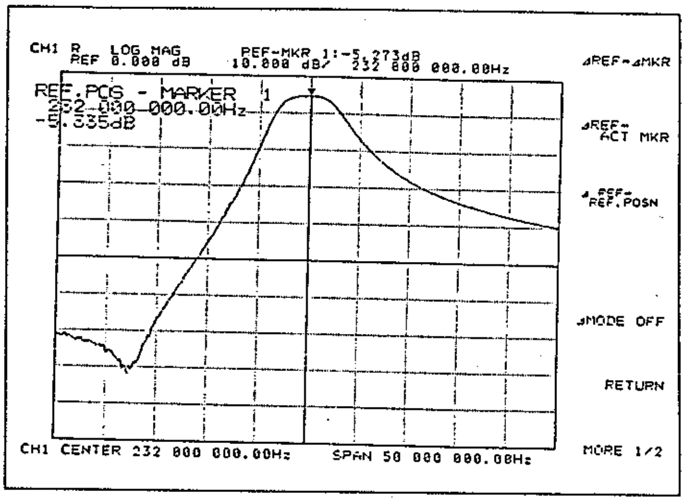


Figure 2-3 Sample Measurement of Insertion Loss

2.4 Measurement Examples

This section introduces various measurement examples using the band-pass filter (BPF) and the X'tal resonator.

Try to measure your DUT according to the introduced examples.

The measurement examples are as follows:

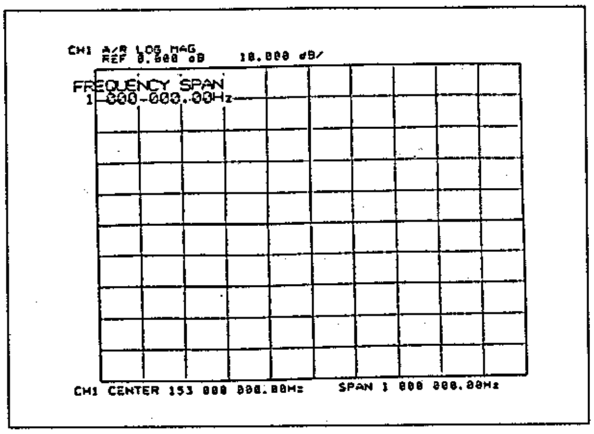
(1) Filter measurement
(2) Phase measurement
(3) Group delay time measurement
(4) Narrow band/wide band sweep measurement
(5) Amplitude/phase measurement
(6) Amplitude/group delay measurement
(7) Reflection measurement
(8) X'tal resonator measurement
(9) Measurement using multi-marker
(10) Measurement using delta marker
(11) Measurement using marker
(12) Partial sweep measurement
(13) Measurement in user defined sweep
(14) Measurement of resonant and antiresonant points of ceramic resonator (f=16.075MHz)

(Note)
In all of the above measurement examples, 153-MHz BPF is used as DUT.
- The key indicated by the solid line ($\boxed{}$) is a panel key.
- The key indicated by the dot line ([ ]) is a software key.

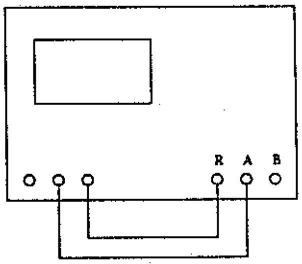
(1) Measuring Filter (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



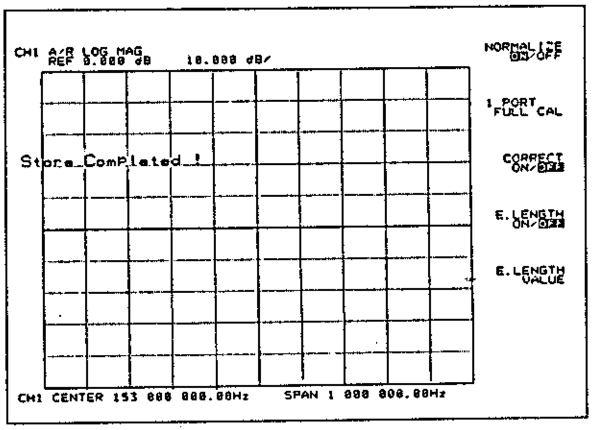
Perform the following setup and power the R4611, then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],

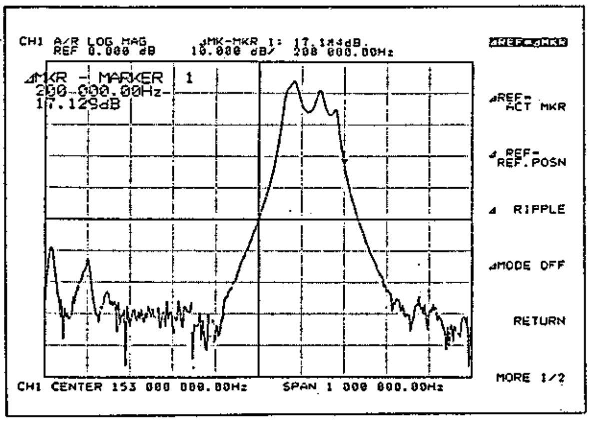
[SPAN], [1], [MHz].

Normalize

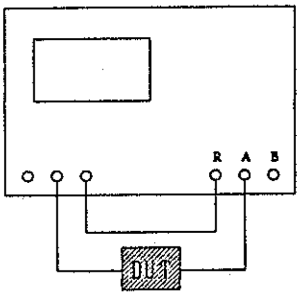


Press CAL [ ] and [NORMALIZE ON/OFF].

Set the through state and normalize the frequency characteristics.



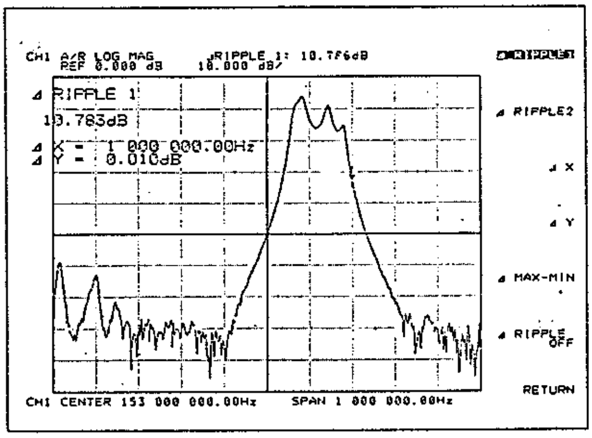
Connect DUT to the R4611 as follows:



MKR ΔMKR [ ] , MKR CMP/UNCMP , Δ MODE MENU , Δ REF= Δ MKR , ⇧ , ⇩

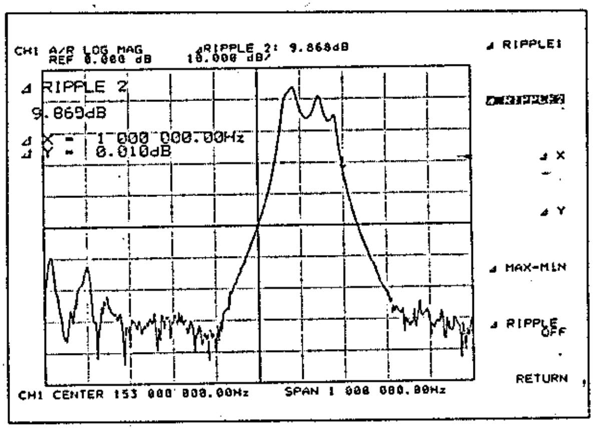
Ripple meas-
urement 1

Specify the ripple analysis block by using the above keys or the rotary encoder.



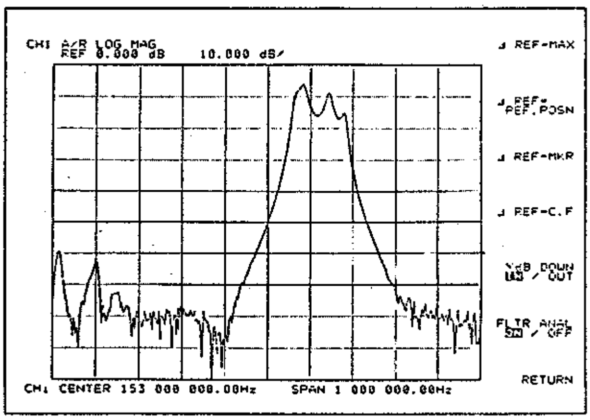
Press Δ RIPPLE and Δ RIPPLE 1 .

Ripple meas-
urement 2



Press Δ RIPPLE 2 .

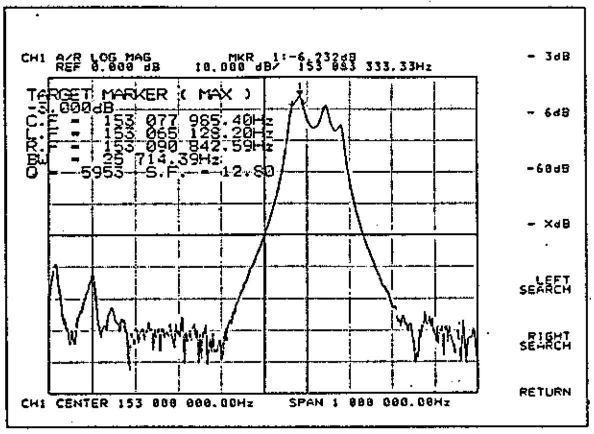
Measure 3-dB band width



MKR ΔMKR , MKRKER ALL OFF , MKR SRCH ,

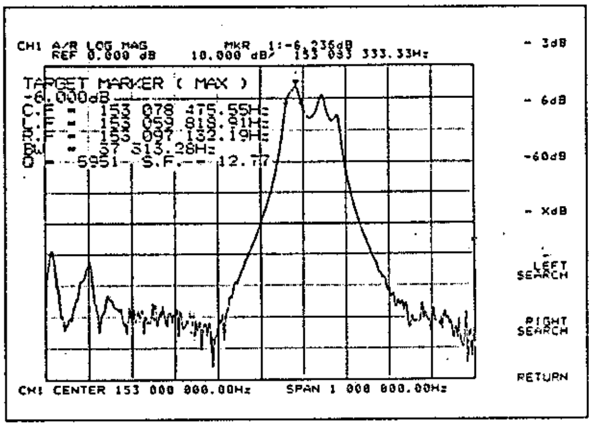
TARGET SEARCH , FLTR ANAL ON/OFF

Press the above keys.



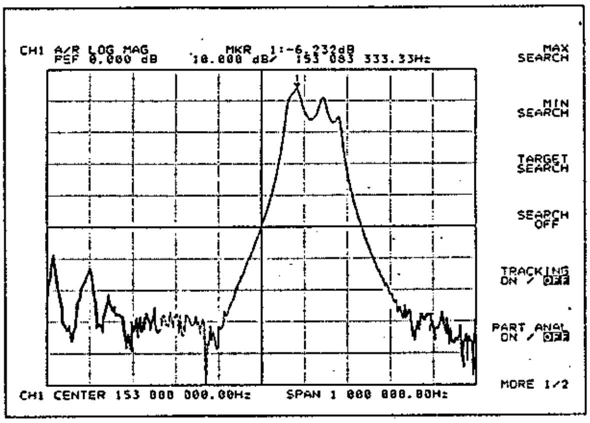
Press ΔREF=MAX and -3dB .

Measure 6-dB band width



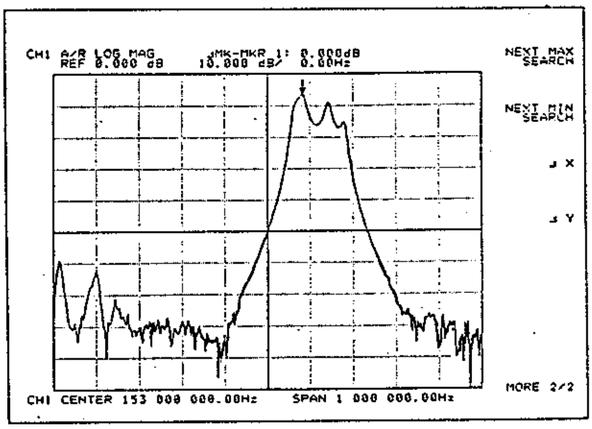
Press -6dB .

Measure the spurious level



RETURN , RETURN , SEARCH OFF ,

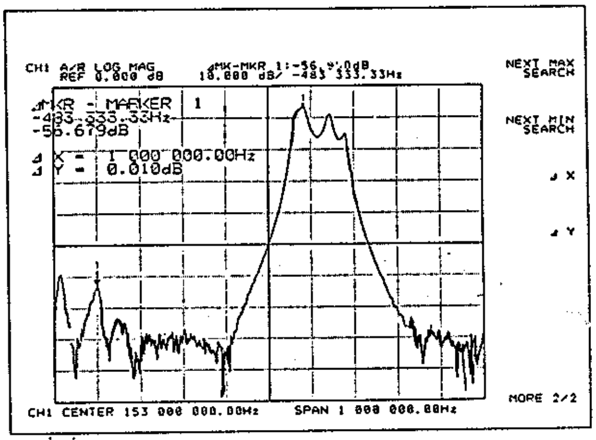
Press the above keys.



MKR Δ MKR [ ] , Δ MODE MENU , MKR SRCH [ ] ,

MORE 1/2

Press the above keys.



NEXT MAX SEARCH , NEXT MAX SEARCH ,

NEXT MAX SEARCH , NEXT MAX SEARCH

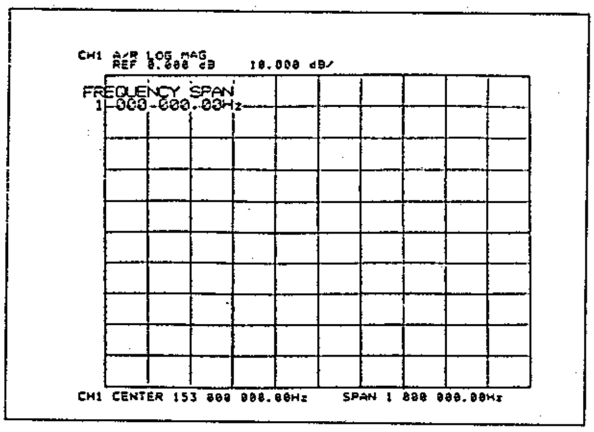
Press the above keys.

End

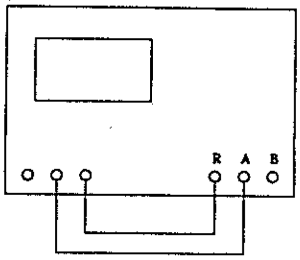
(2) Measuring Phase (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



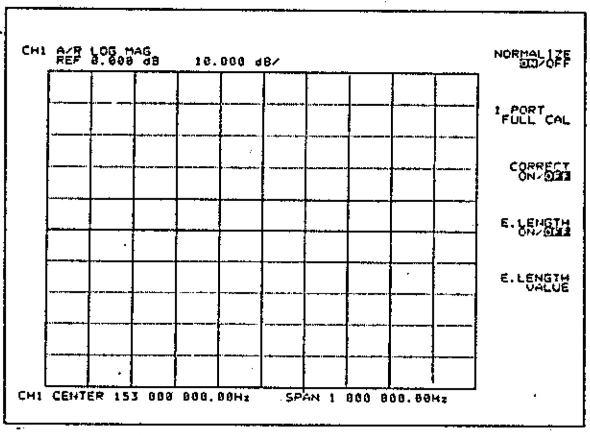
Perform the following setup and power the R4611, then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],

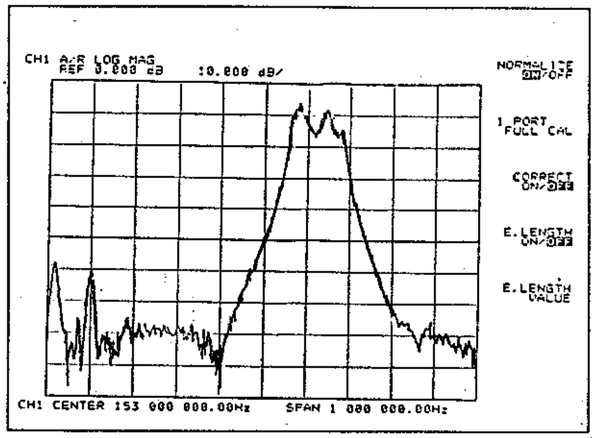
[SPAN], [1], [MHz].

Normalize

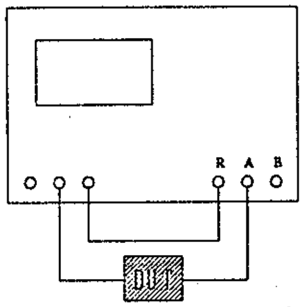


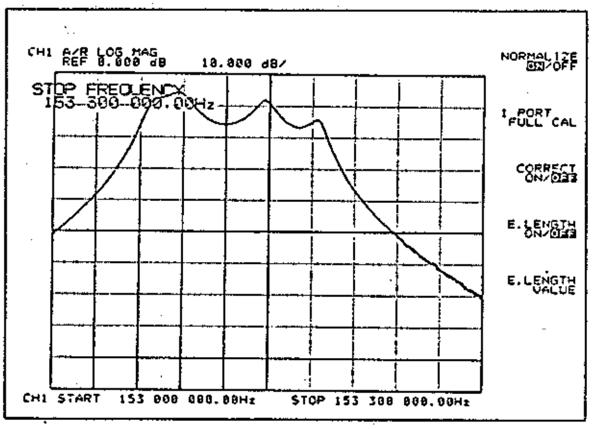
Press [CAL] and [NORMALIZE ON/OFF].

Set the through state and normalize the frequency characteristics.



Connect DUT to the R4611 as follows:

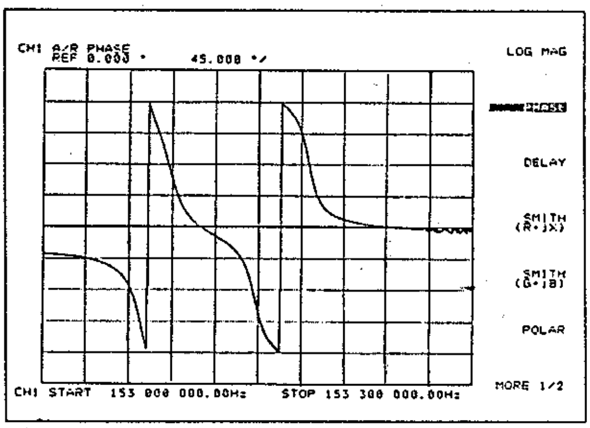




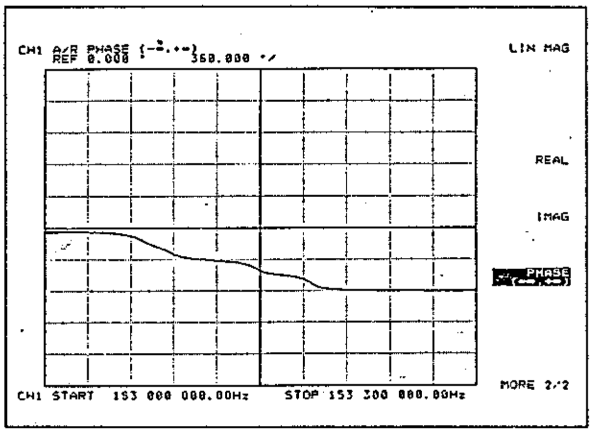
START
[ ] , [1] , [5] , [3] , [MHz] ,
STOP
[ ] , [1] , [5] , [3] [.] ,
[3] , [MHz]

Press the above keys to enlarge the filter band:

Phase measurement



Pressing [FORMAT] and [PHASE] sets the screen to the normal mode.



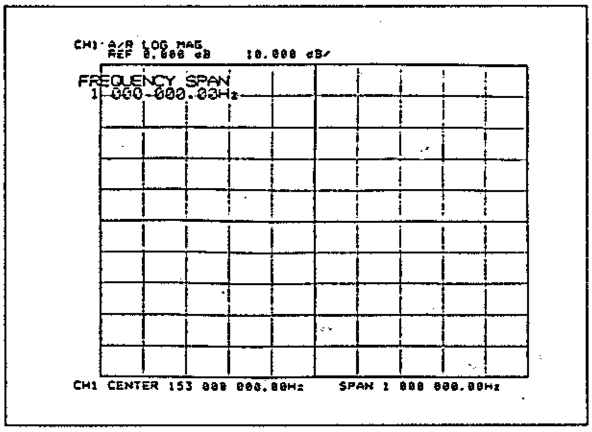
Pressing [MORE 1/2] and [PHASE (−∞, +∞)] sets the phase extension display.

End

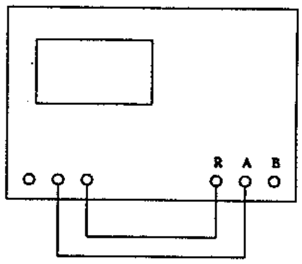
(3) Measuring Group Delay Time (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



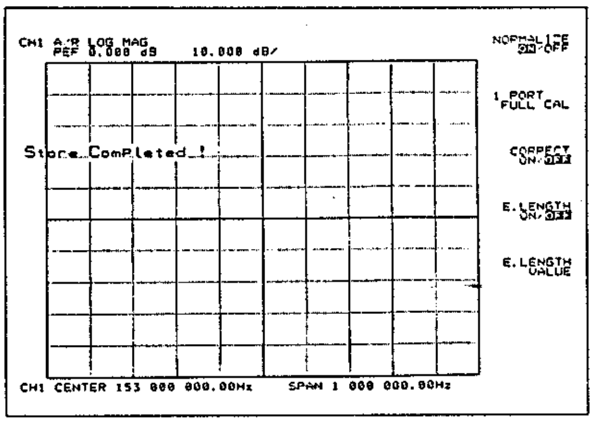
Perform the following setup and power the R4611 then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],

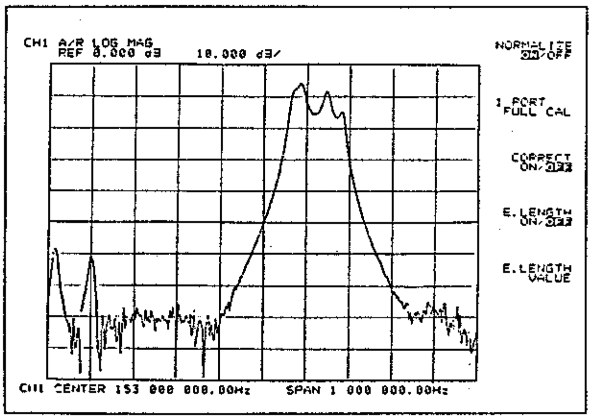
[SPAN], [1], [MHz].

Normalize

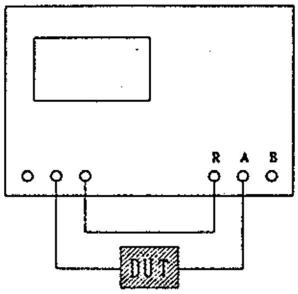


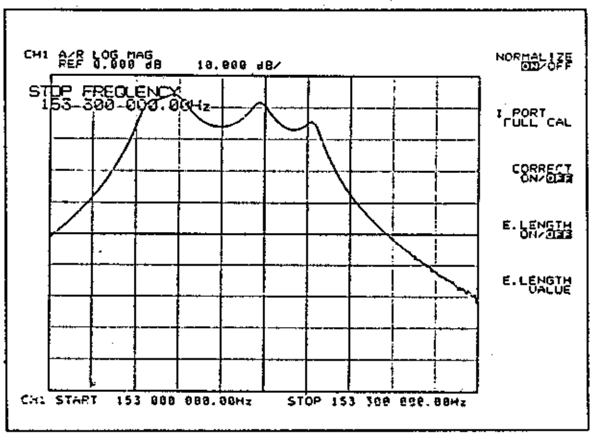
Press CAL [ ] and [NORMALIZE ON/OFF].

Set the through state and normalize the frequency characteristics.



Connect DUT to the R4611 as follows:

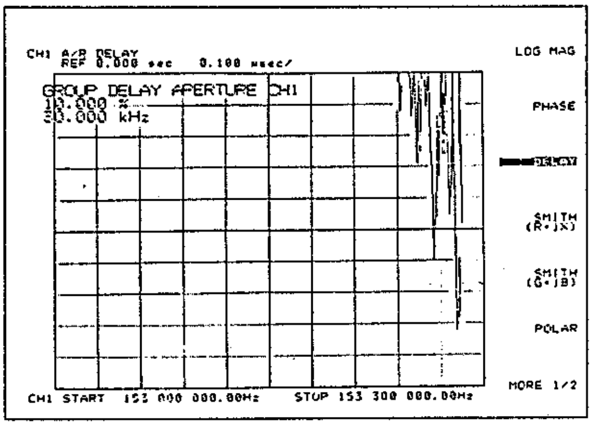




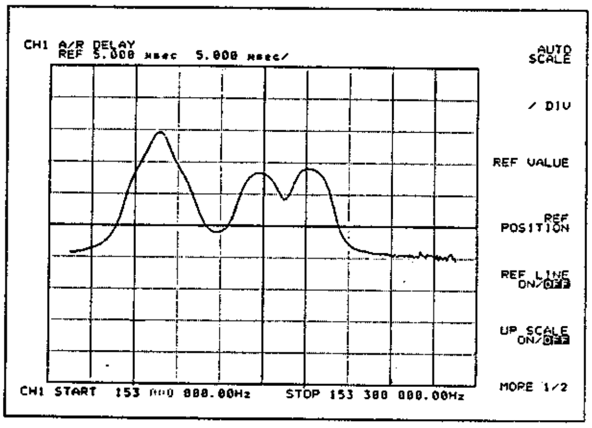
START
[ ], [1], [5], [3], [MHz],
STOP
[ ], [1], [5], [3], [.],
[3], [MHz]

Press the above keys to enlarge the filter band:

Group delay measurement

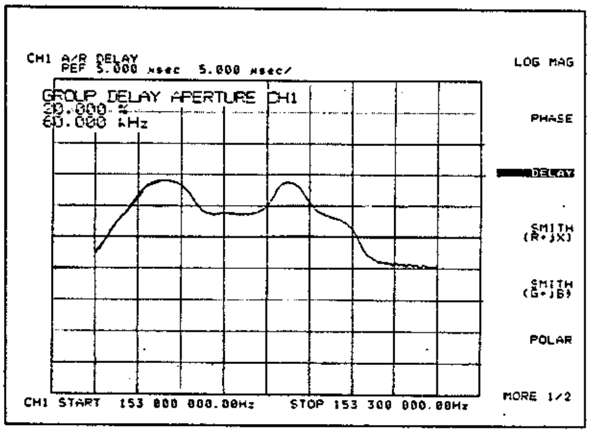


Pressing [FORMAT] and [DELAY] sets the screen to the group delay mode.



Pressing [SCALE REF] and [AUTO SCALE] sets the auto-scale mode for your eyes.

Change aperture



[FORMAT] , [DELAY] , [2] , [0]

[% kHz]

This key entry sets the aperture to 20%.

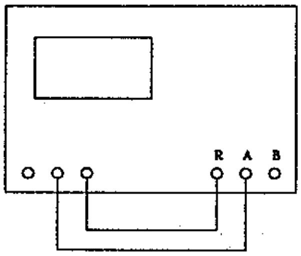
End

(4) Measuring Narrow Band/Wide Band Sweep (Using 153-MHz BPF as DUT)

Start

Set up the measurement device

Perform the following setup and power the R4611, then press the keys below in this sequence:



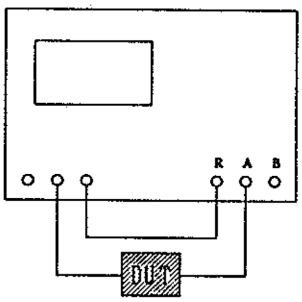
[CENTER], [1], [5], [3], [MHz],
[SPAN], [1], [MHz].

Normalize

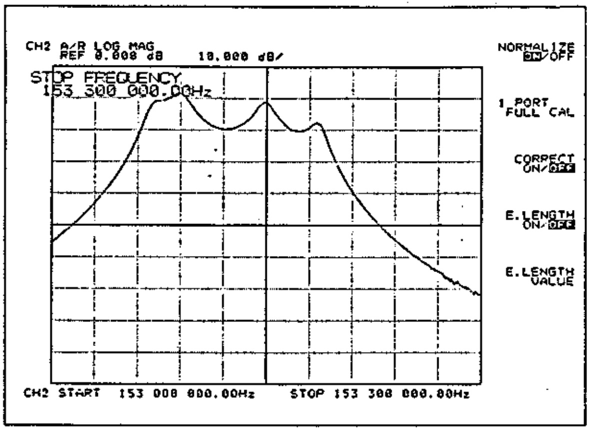
Press CAL [ ] and [NORMALIZE ON/OFF].

Set the through state and normalize the frequency characteristics.
(Note) Also set CH2 to the frequency level to be used and normalize it.

Connect DUT to the R4611 as follows:



Set CH2 to the narrow band mode



START

[CH2], [ ], [1], [5], [3],

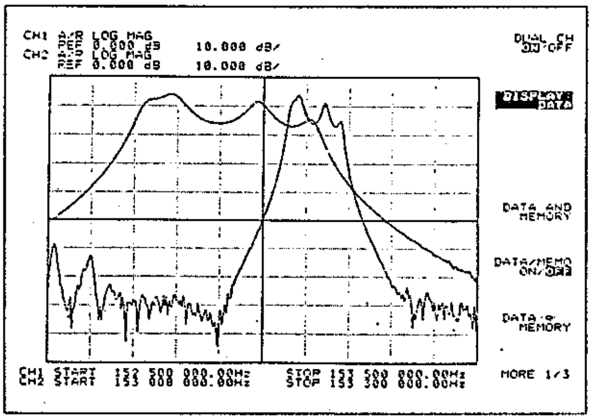
STOP

[MHz], [ ], [1], [5], [3],

[.], [3], [MHz]

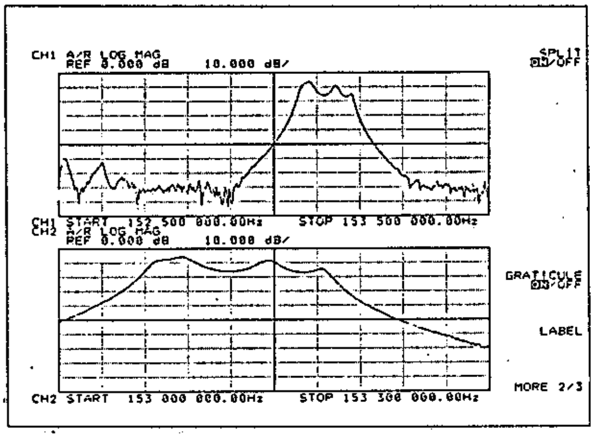
Press the above keys:

Two screen simultaneous display mode



Press [DISPLAY] and [DUAL CH ON/OFF] .

Two screen split display mode



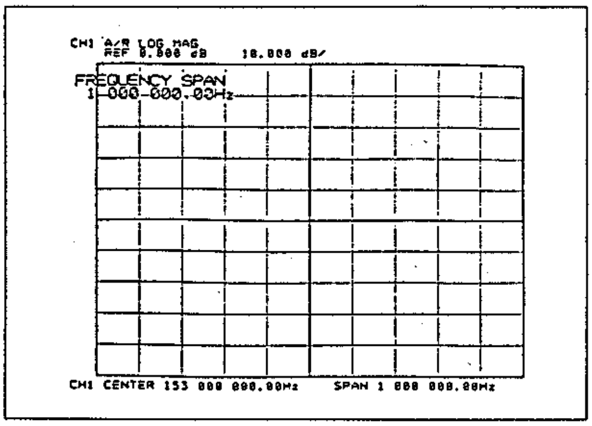
Press [MORE 1/3] and [SPLIT ON/OFF] .

End

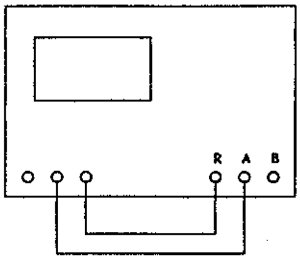
(5) Measuring Amplitude/Phase (Using 153-MHz BPF as DUT)

Start

Set up the measurement device

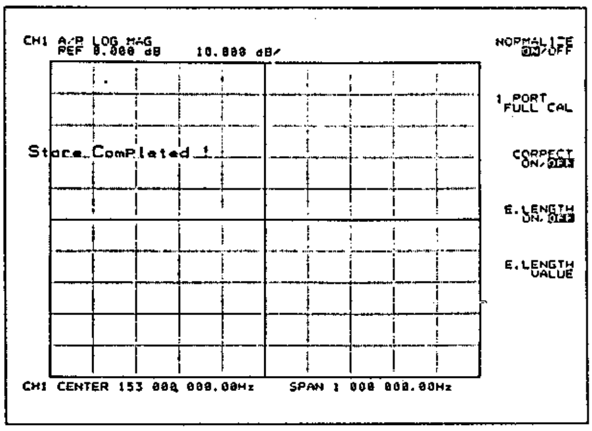


Perform the following setup and power the R4611, then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],
[SPAN], [1], [MHz].

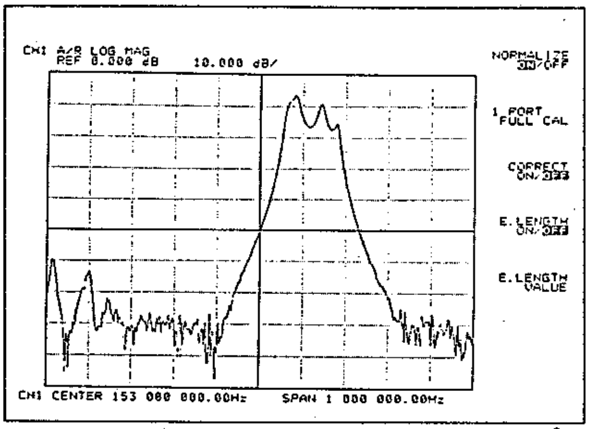
Normalize



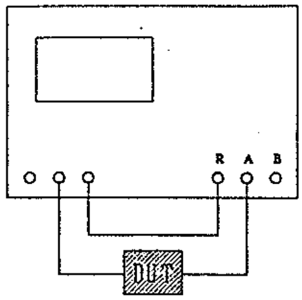
Press [CAL] and [NORMALIZE ON/OFF].

Set the through state and normalize the frequency characteristics.

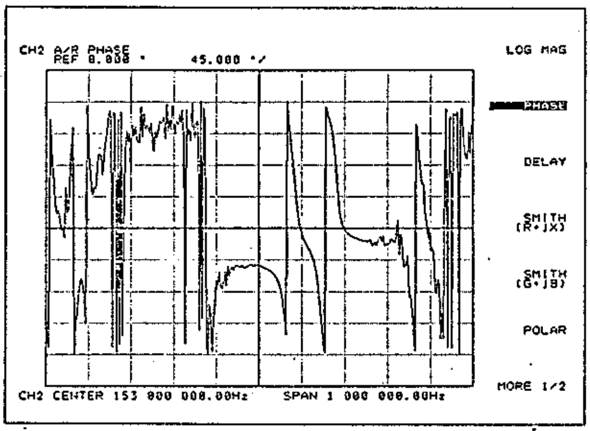
(Note) Also set CH2 to the same frequency level and normalize it.



Connect DUT to the R4611 as follows:



Set CH2 to the phase mode



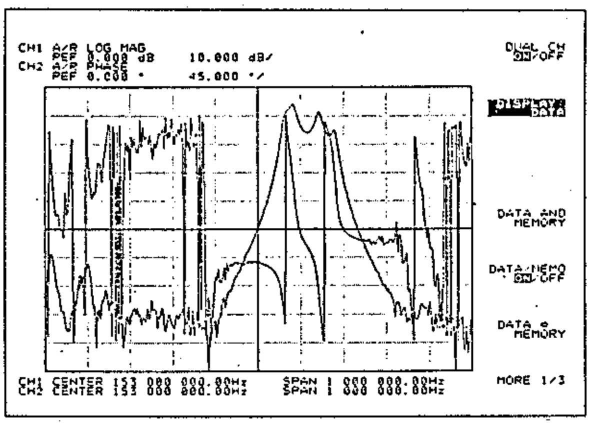
CH2 , CENTER , 1 , 5 , 3 ,

MHz , SPAN , 1 , MHz , FORMAT

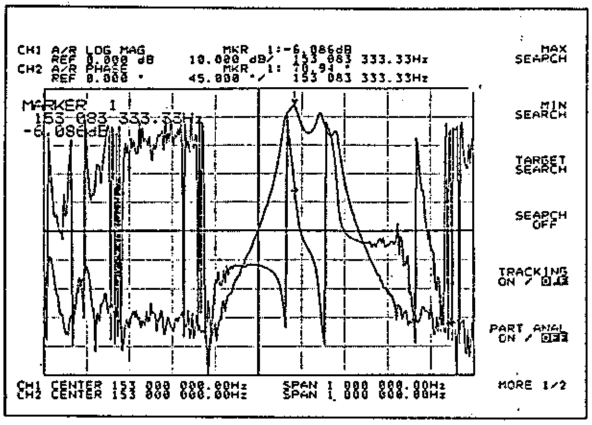
PHASE

This key entry sets the frequency to that of CH1 and enables the phase mode.

Two-screen simultaneous dispaly mode



Pressing DISPLAY and DUAL CH ON/OFF sets the 2-CH simultaneously display mode.

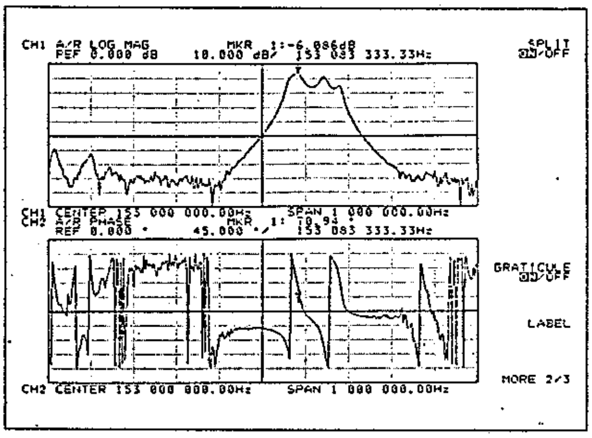


MKR ΔMKR [ ] , [MKR CPL/UNCPL] , [CH1] .

MKR ΔMKR [ ] MKR SEARCH [ ] , [MAX SEARCH]

This key entry couples the markers for CH1 and CH2.

Two-screen split display mode



[DISPLAY] , [MODE 1/3] , [SPLIT ON/OFF]

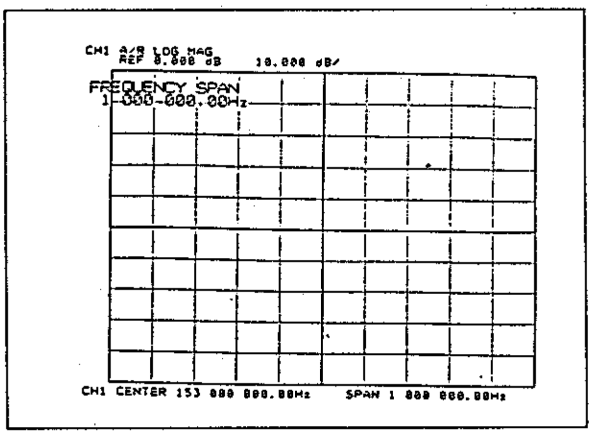
This key entry sets the 2-CH split display mode.

End

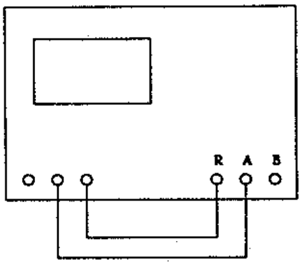
(6) Measuring Amplitude/Group Delay (Using 153-MHz BPF as DUT)

Start

Set up the measurement device

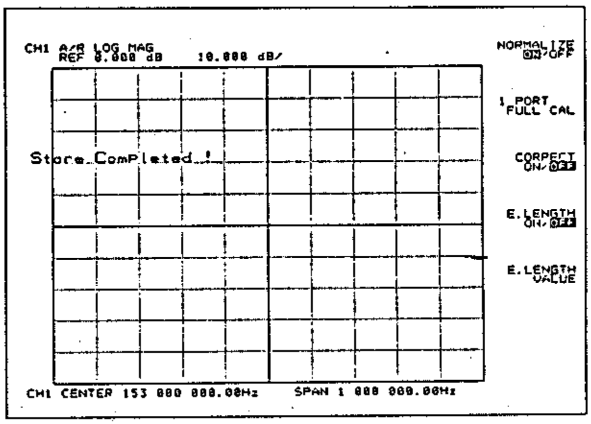


Perform the following setup and power the R4611, then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],
[SPAN], [1], [MHz].

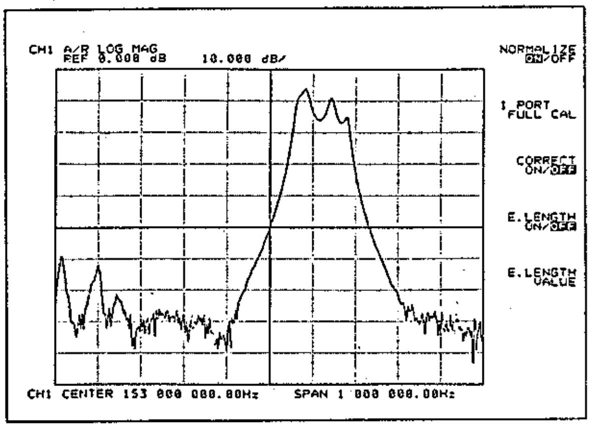
Normalize



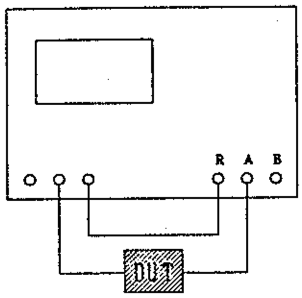
Press CAL [ ] and [NORMALIZE ON/OFF].

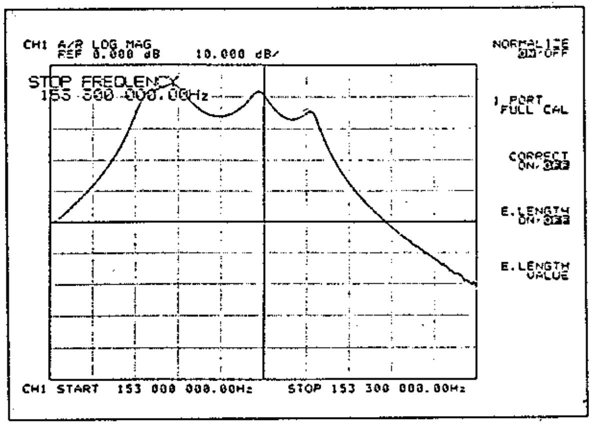
Set the through state and normalize the frequency characteristics.

(Note) Also set CH2 to the same frequency level and normalize it.



Connect DUT to R6411 as follows:

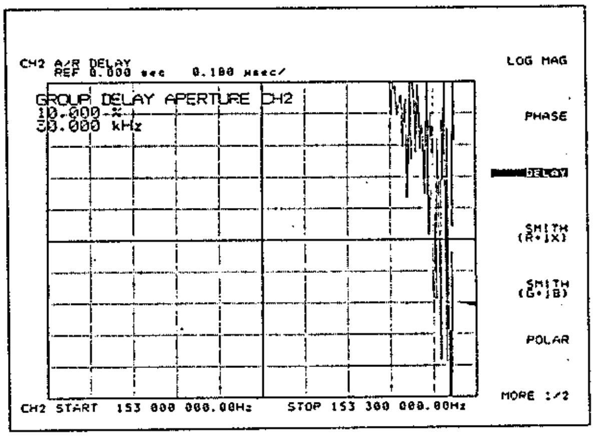




START [ ], [1], [5], [3], [MHz],
STOP [ ], [1], [5], [3], [.],
[3], [MHz]

This key entry enlarges the display.

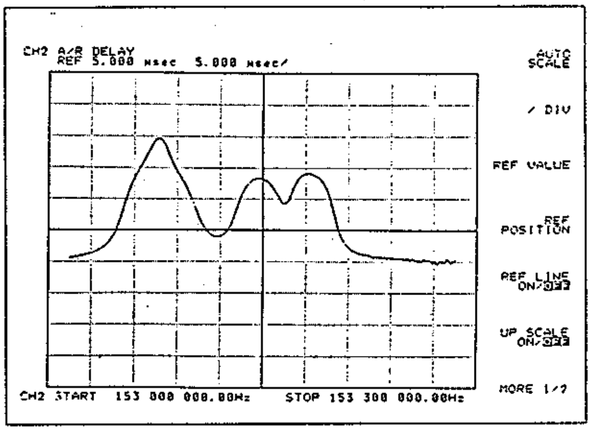
Set CH2 to the group delay mode



[CH2], START [ ], [1], [5], [3],
[MHz], STOP [ ], [1], [5], [3],
[.], [3], [MHz]

This key entry sets the frequency level to that of CH1.

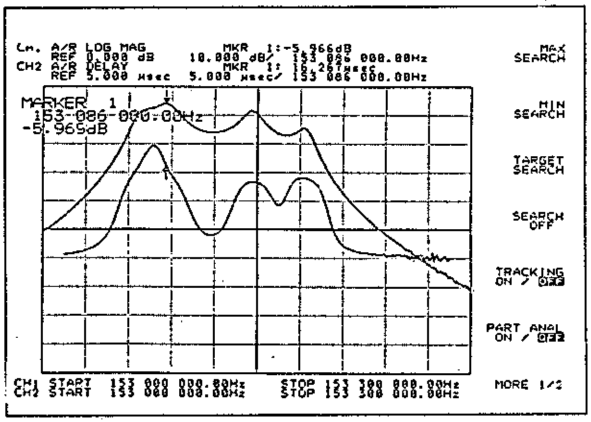
Pressing [FORMAT] and [DELAY] sets CH2 to the group delay mode.



SCALE REF , AUTO SCALE

This key entry sets the auto-scale for your eyes.

Two-screen simultaneous display mode



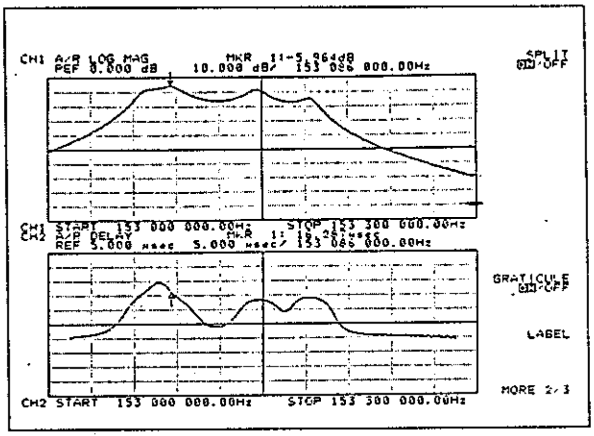
DISPLAY , DUAL CH ON/OFF , MKR ⊿MKR ,

MKR CPL/UNCPL , CH1 , MKR ⊿MKR ,

MKR SRCH , MAX SEARCH

This key entry couples the markers of CH1 and CH2.

Two-screen split display mode



DISPLAY , MORE 1/3 , SPLIT ON/OFF ,

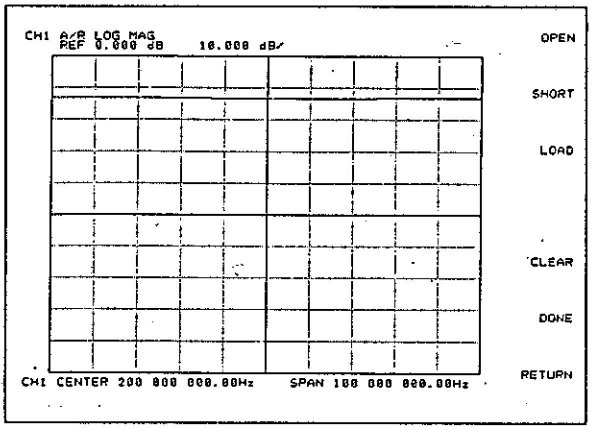
Press the above keys.

End

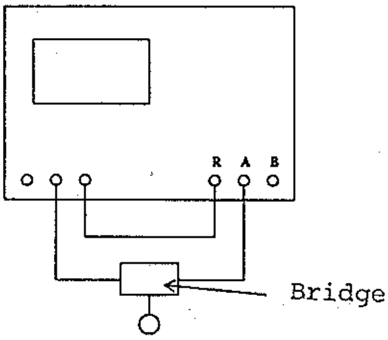
(7) Measuring Reflection (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



Perform the following setup and power the R4611, then press the keys below in this sequence:

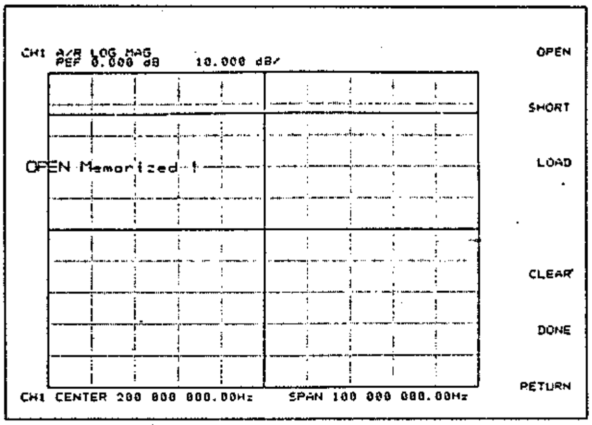


[CENTER], [2], [0], [0], [MHz],

[SPAN], [1], [0], [0], [MHz],

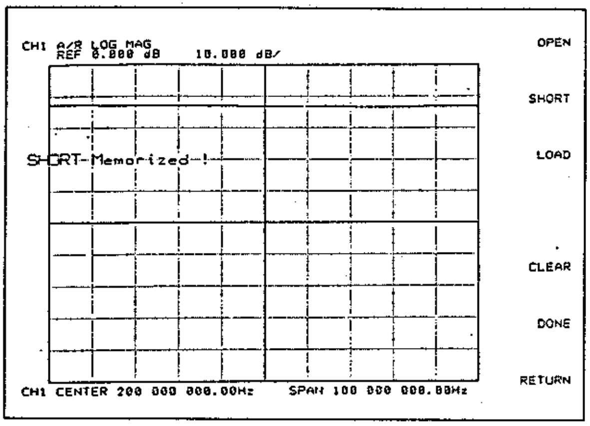
CAL [ ], [1 PORT FULL CAL]

Calibration



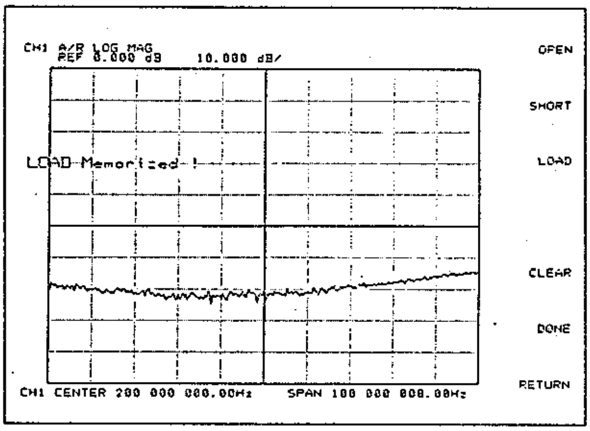
Connect OPEN to the test port of the bridge.

Pressing [OPEN] fetches the calibration data from three terms.



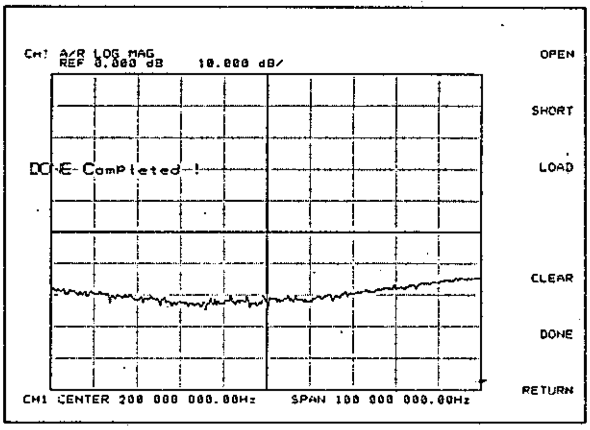
Connect SHORT to the test port of the bridge.

Pressing SHORT fetches the calibration data from three terms.

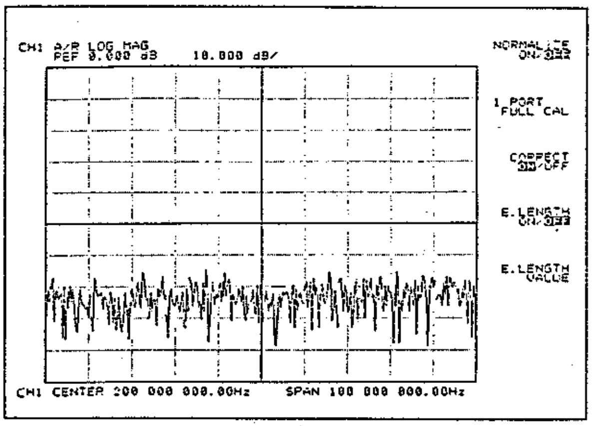


Connect the edge of 50 Ω to the test port of the bridge.

Pressing LOAD fetches the calibration data from three terms.



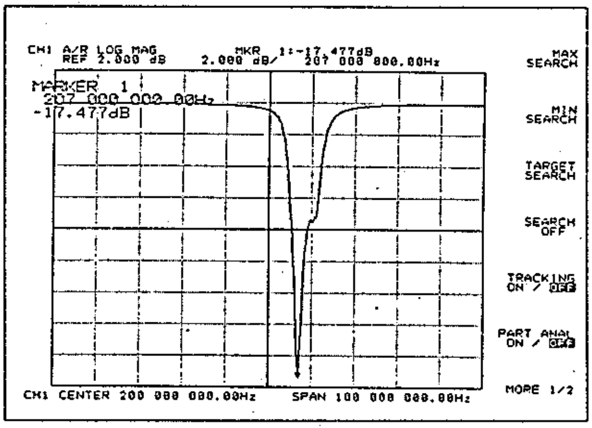
Pressing DONE terminates calibration.



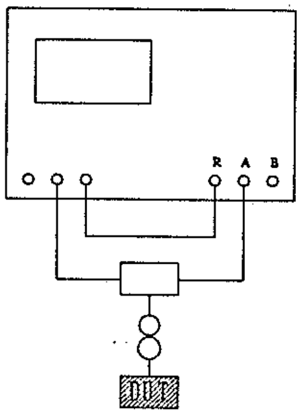
Pressing RETURN and CORRECT ON/OFF corrects the error caused by 1 PORT FULL Calibration.

Measurement

(LOG MAG)



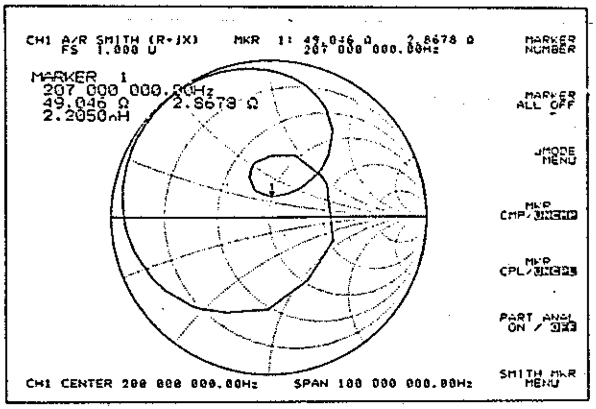
Remove the edge of 50 Ω and connect DUT as follows:



SCALE REF , AUTO SCALE , MKR SRCH , MIN SEARCH Press the left keys.

This key entry sets the LOG MAG display mode.

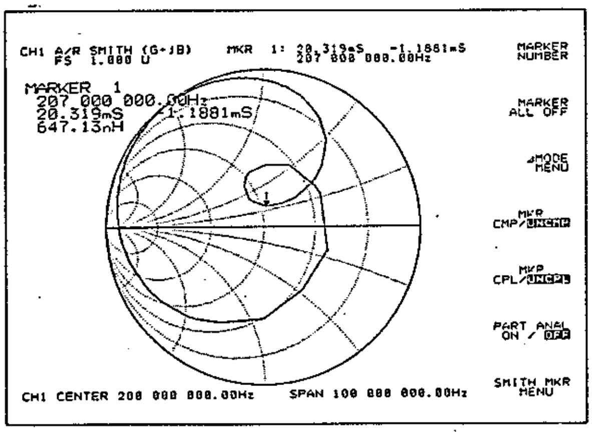
(Smith chart)



FORMAT , SMITH (R+jX) , MKR ΔMKR

Press the above keys.

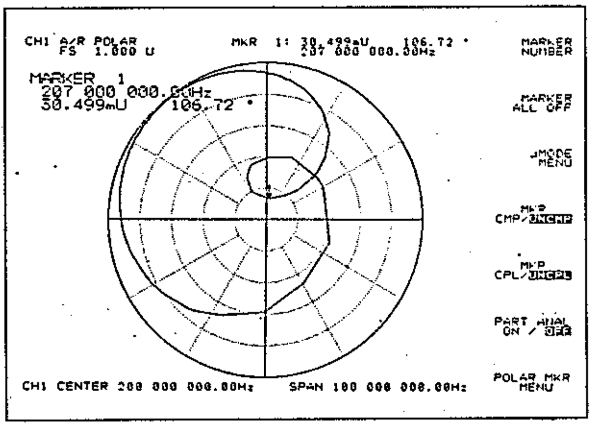
(Admittance chart)



FORMAT , SMITH (G+JB) , MKR Δ MKR

Press the above keys.

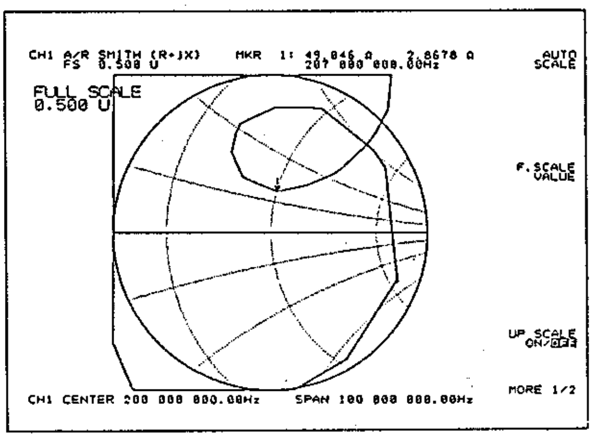
Polar display



FORMAT , POLAR , MKR Δ MKR

Press the above keys.

Change scale

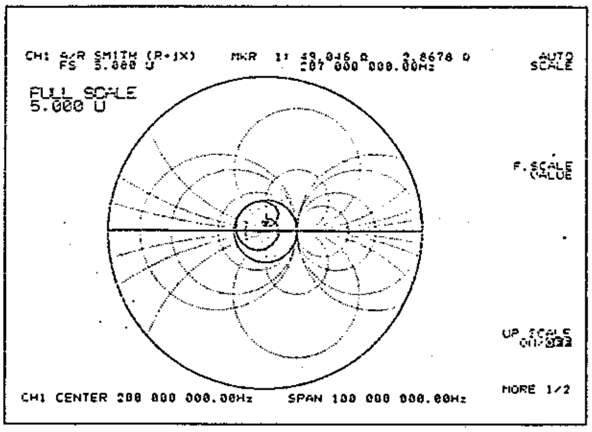


FORMAT , SMITH (R+JX) , SCALE REF ,

F.SCALE VALU , 0 , . , 5 ,

MHz

Press the above keys.



F.SCALE VALU , 5 , MHz

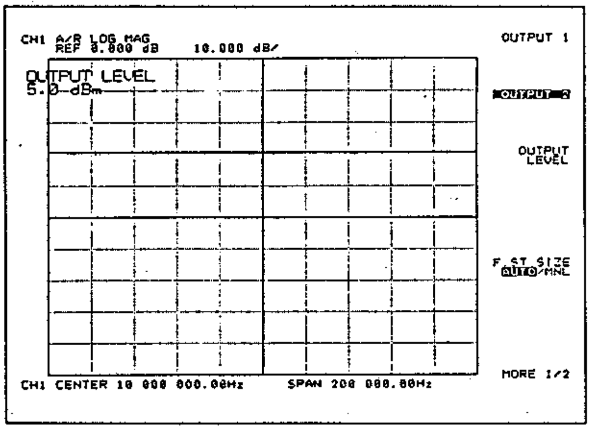
Press the above keys.

End

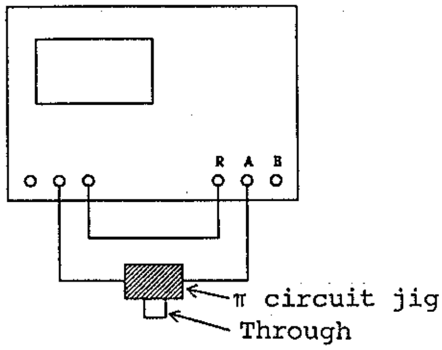
(8) Measuring X'tal Resonator (Using 153-MHz BPF as DUT)

Start

Set up the measurement device (CH1)

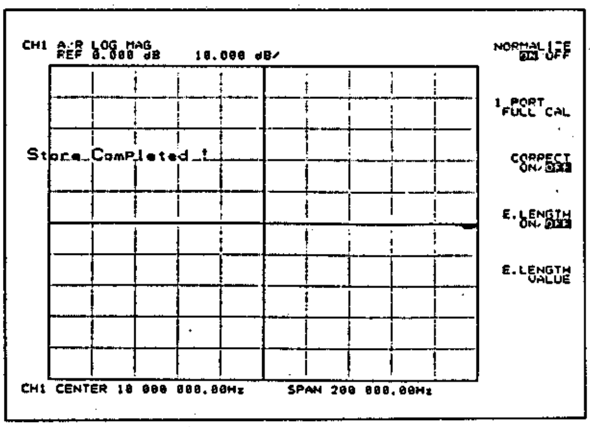


Perform the following setup and power the R4611, then press the keys below in this sequence:



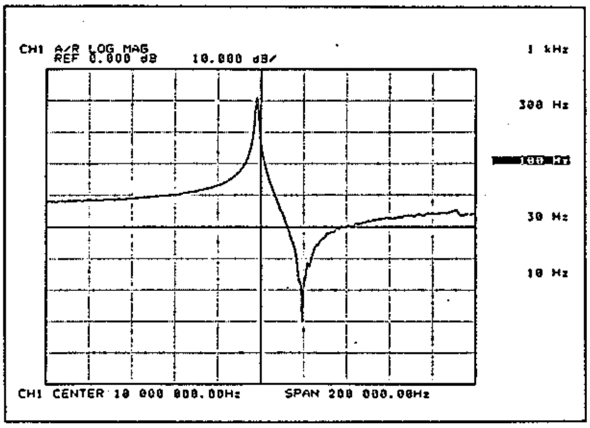
SWEEP, POINTS, 1201, CENTER, 1, 0, MHz, SPAN, 2, 0, 0, kHz, MENU, OUTPUT LEVEL, 5, dBm MHz

Normalize

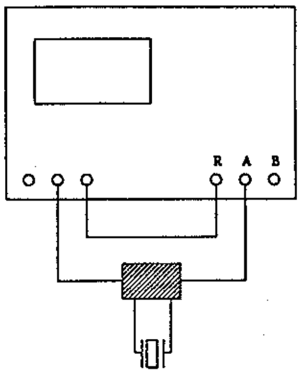


Press CAL and NORMALIZE ON/OFF.

This sets the through mode and normalizes the frequency characteristics.



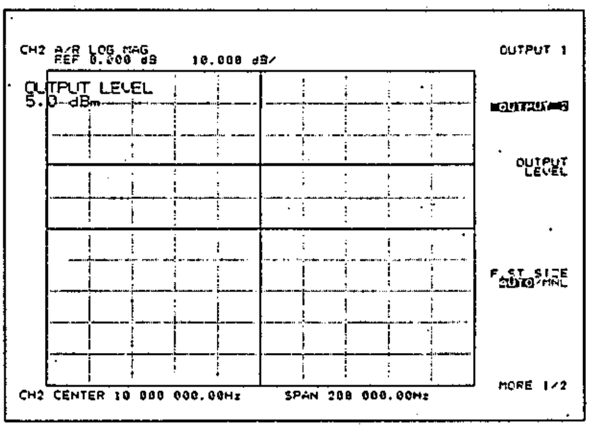
Connect X'tal to be measured to the test port. This operation narrows the resolution band width.



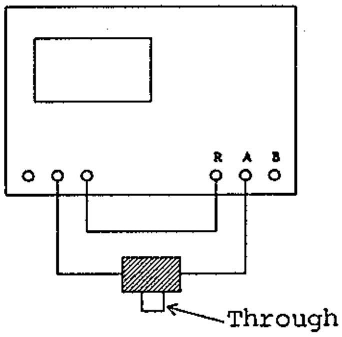
RESOLN BW [ ] , [100Hz]

Setup operation

(CH2)



Connect the through to the circuit jig again.

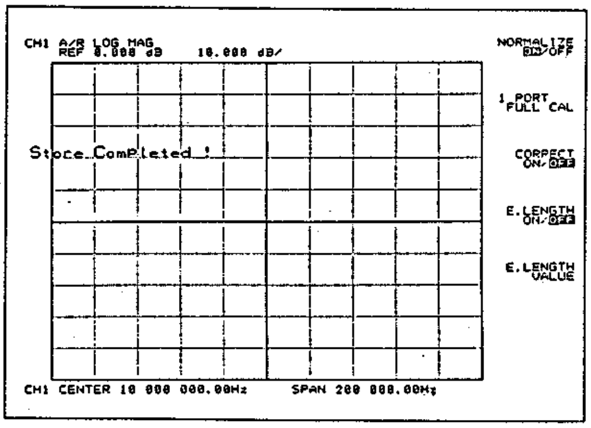


[CH2] , SWEEP [ ] , [POINTS] , [1201] , [CENTER] , [1] , [0] , [MHz] , [SPAN] ,

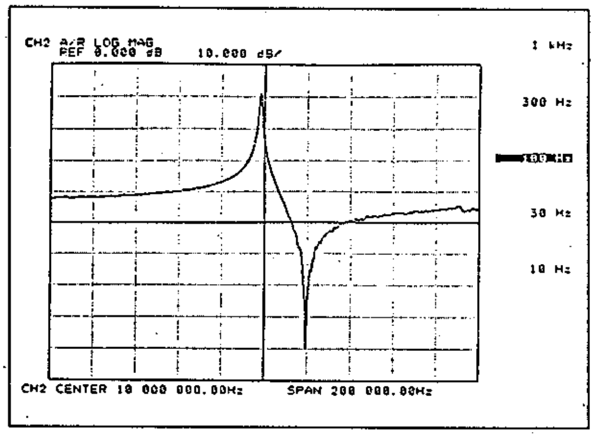
[2] , [0] , [0] , [kHz] , MENU [ ] , [OUTPUT LEVEL] , [5] , dBm[MHz]

Press the above keys.

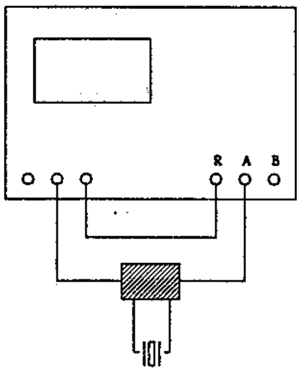
Normalize



Press CAL [ ] and NORMALIZE ON/OFF. This normalizes CH2 in the same way as CH1.

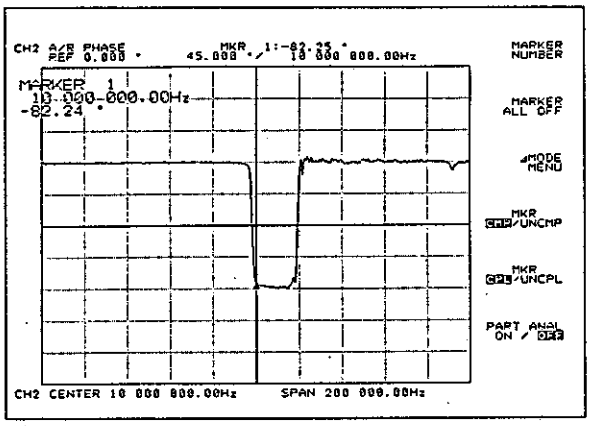


Connect X'tal to be measured to the test port.



Press RESOLN BW [ ] and 100Hz.

Measure amplitude with CH1 and phase with CH2

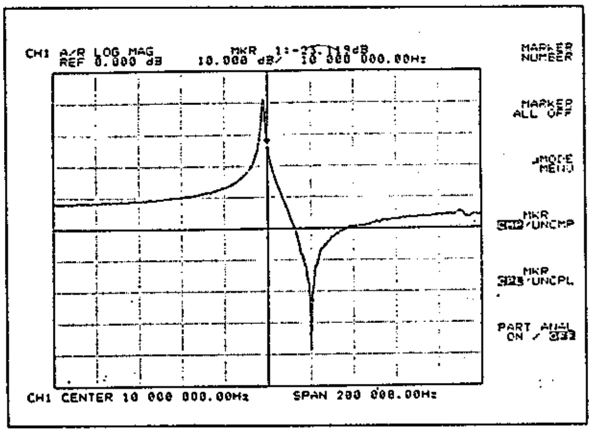


FORMAT , PHASE ,

MKR ΔMKR , MKR CMP/UNCMP ,

MKR CPL/UNCPL

Press the above keys.



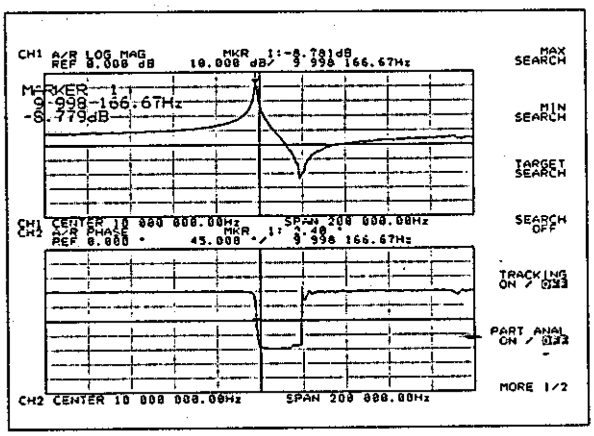
CH1 , MKR ΔMKR ,

MKR CMP/UNCMP

Press the above keys.

Correction marker mode

These operations couple the markers for CH1 and CH2.



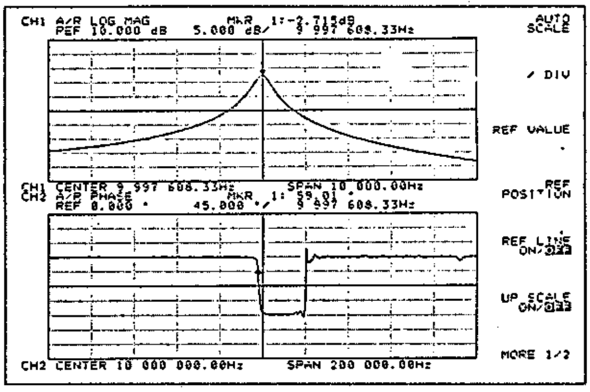
DISPLAY , DUAL CH ON/OFF , MORE 1/3 ,

SPLIT ON/OFF , MKR SRCH , MAX SEARCH → ,

Press the above keys.

This entry displays 2 CHs in both the simultaneous format and the split format.

Narrow band measurement

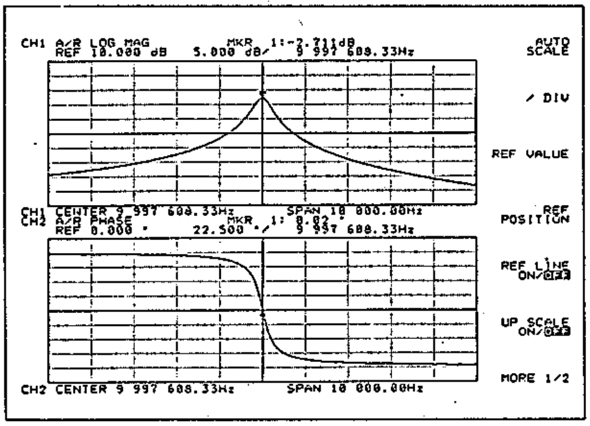


[SPAN] , [1] , [0] , [kHz] , MKR SRCH [ ]

MAX SEARCH , MKR→ [ ] , MARKER CENTER F→ ,

[SCALE REF] , AUTO SCALE

Press the above keys.

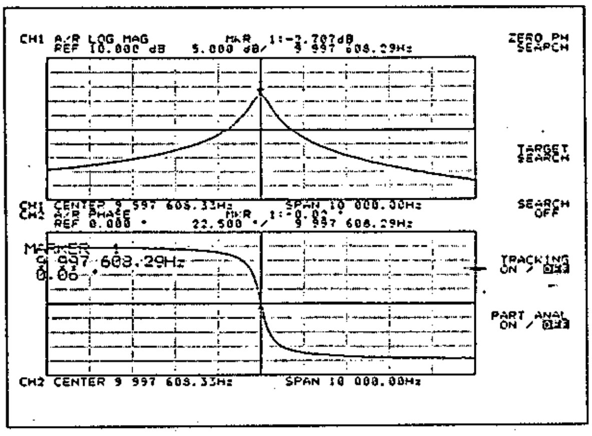


[CH 2] , MKR→ [ ] , MARKER CENTER F→ , [SPAN] ,

[1] , [0] , [kHz] , [SCALE REF] , AUTO SCALE

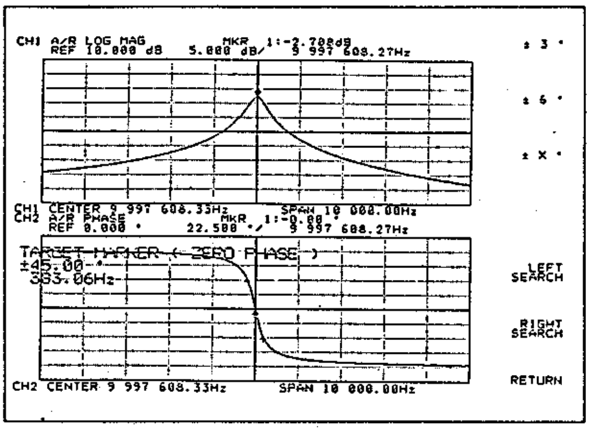
Press the above keys.

Zero-phase search



Press MKR SRCH [ ] and ZERO PH SEARCH .

±X° search

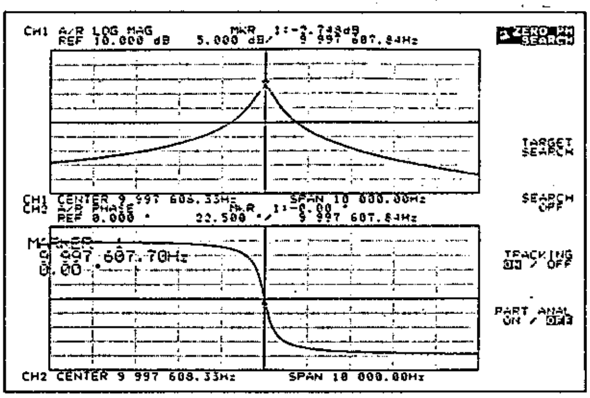


[TARGET SEARCH], [ΔREF= ZERO PH],

[±X°], [4], [5], [deg]

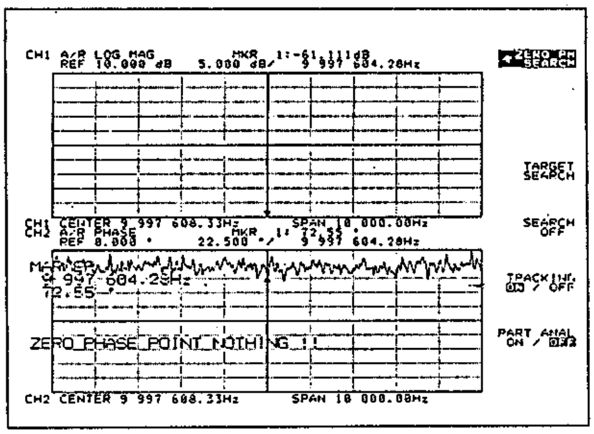
Press the above keys.

Tracking



[RETURN], [RETURN], [SEARCH OFF],

[TRACKING ON/OFF], [ZERO PH SEARCH],



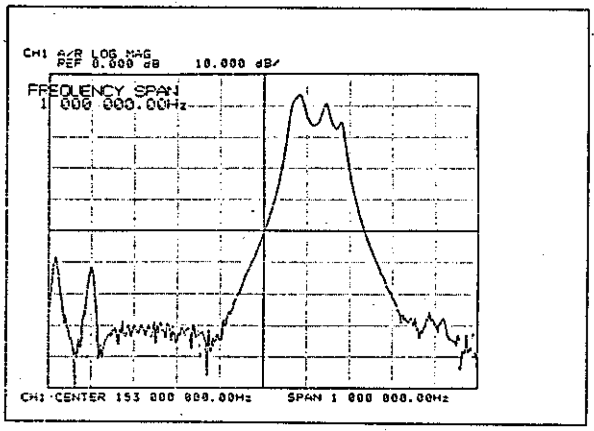
Remove the X'tal from the jig. The system displays the message meaning that the zero-phase point cannot be found since zero-phase search is performed every sweep operation. This condition is caused by the removal of X'tal. The left screen shows how the tracking operation has been performed.

End

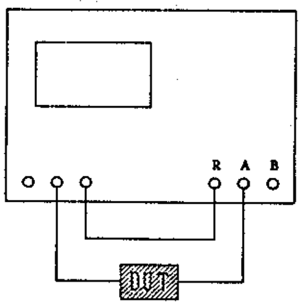
(9) Measurement by Using Multi-marker (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



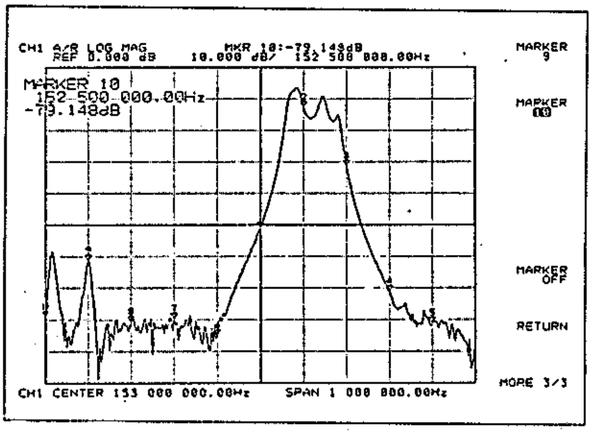
Perform the following setup and power the R4611 then press the keys below in this sequence:



CENTER , 1 , 5 , 3 , MHz ,

SPAN , 1 , MHz

Display 10 markers



MKR ΔMKR [ ] , MARKER NUMBER ,

MARKER 2 , ⇧ ,

(Continued on the next page.)

[MARKER 3], ⇧, ⇧,

[MARKER 4], ⇧, ⇧, ⇧, [MORE 1/2],

[MARKER 5], ⇧, ⇧, ⇧ ⇧

[MARKER 6], ⇩,

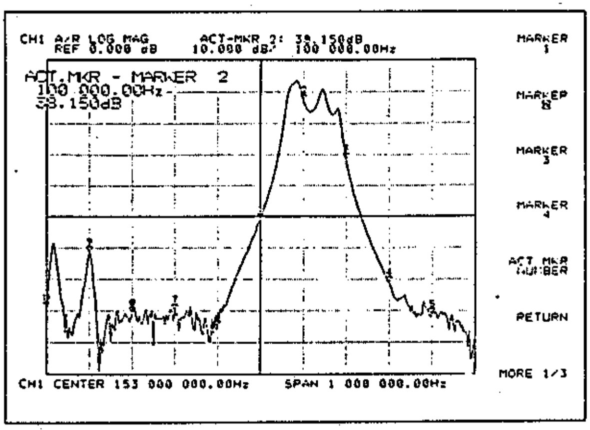
[MARKER 7], ⇩, ⇩,

[MARKER 8], ⇩, ⇩, ⇩, [MORE 1/2],

[MARKER 9], ⇩, ⇩, ⇩, ⇩,

[MARKER 10], ⇩, ⇩, ⇩, ⇩, ⇩,

Measure frequency between markers



[MORE 3/3], [MARKER 1], [RETURN],

[Δ MODE MENU], [Δ REF=ACT MKR], [MARKER 2]

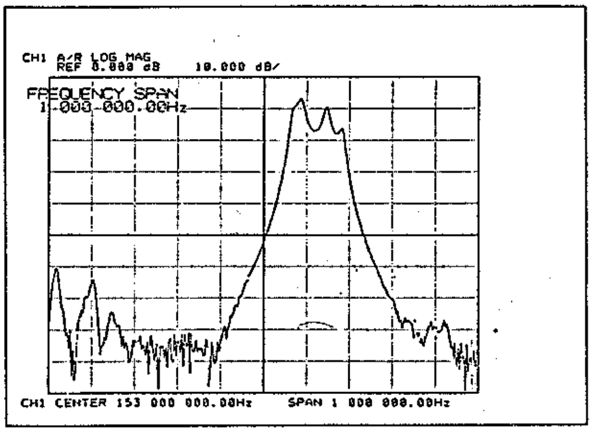
This key entry measures the frequency and level between marker 1 and marker 2.

End

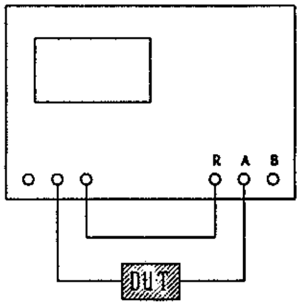
(10) Delta Marker (Using 153-MHz BPF as DUT)

Start

Set up the measurement device

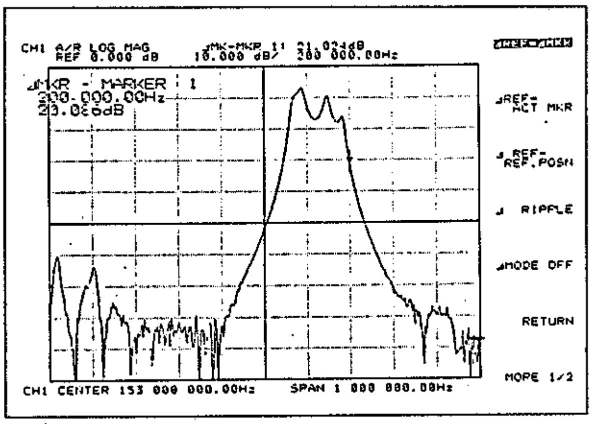


Perform the following setup and power R4611 then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],
[SPAN], [1], [MHz]

Set the delta block

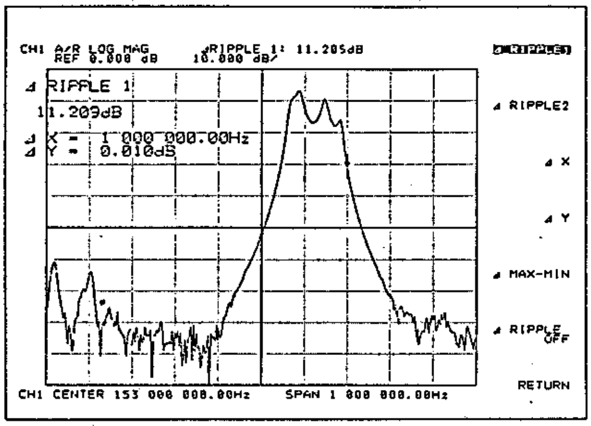


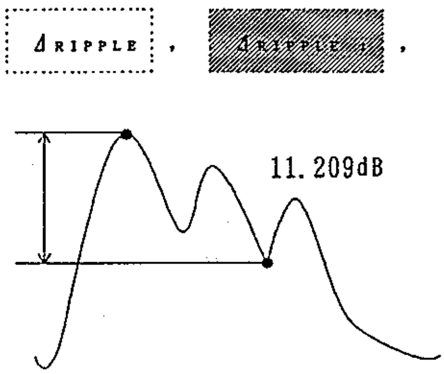
MKR ΔMKR [ ], [ΔMODE MENU], [ΔREF=ΔMKR],
[⇧], [⇩]

Specify the ripple analysis block by using the above keys or the rotary encoder.

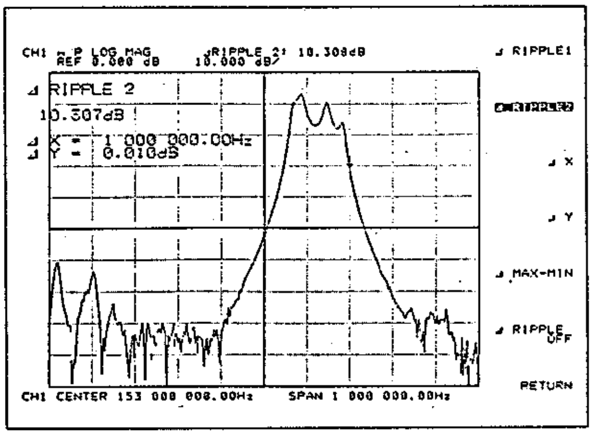
* The succeeding operations are enabled as if you do not follow the index.

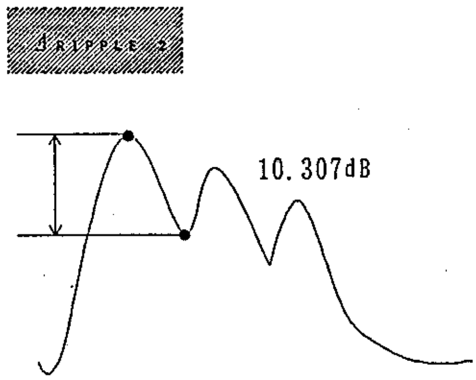
Ripple 1



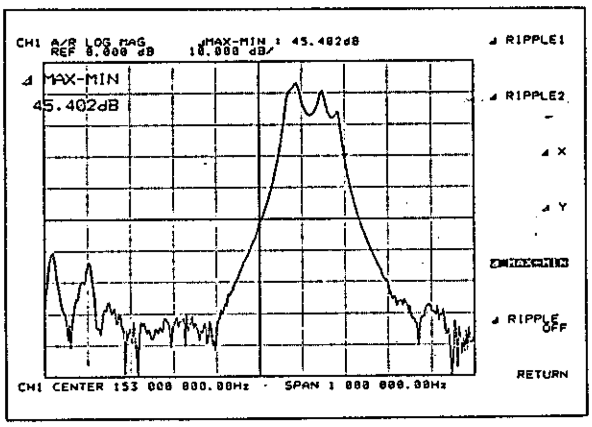


Ripple 2

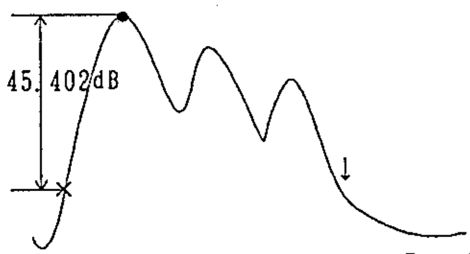




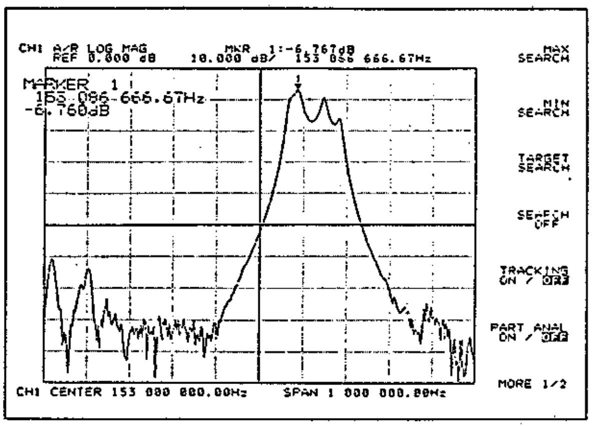
ΔMAX-MIN



The above key is used to obtain the maximum and minimum values within the delta band.

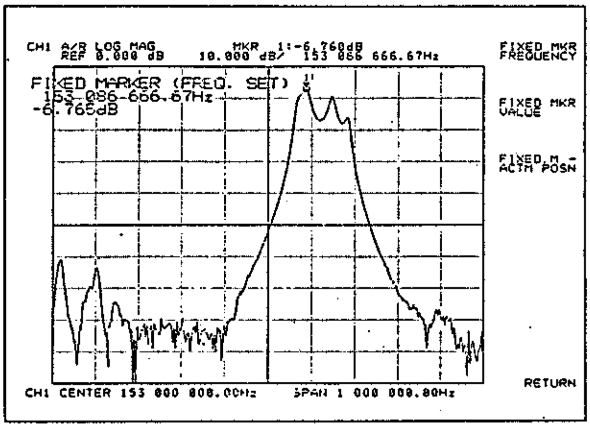


Fixed marker



RETURN , Δ MODE OFF , MKR SRCH [ ] ,

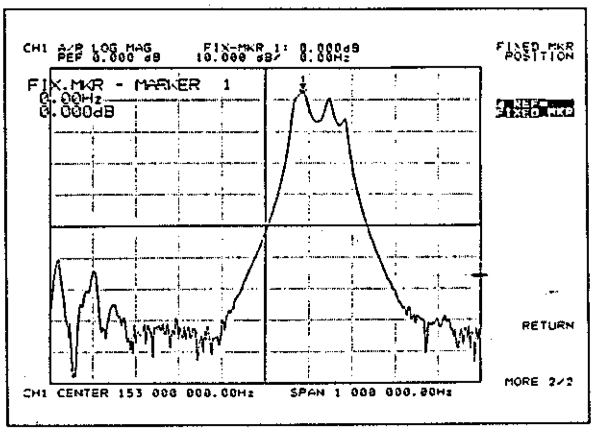
MAX SEARCH ,



MKR Δ MKR [ ] , Δ MODE MENU , MORE 1/2 ,

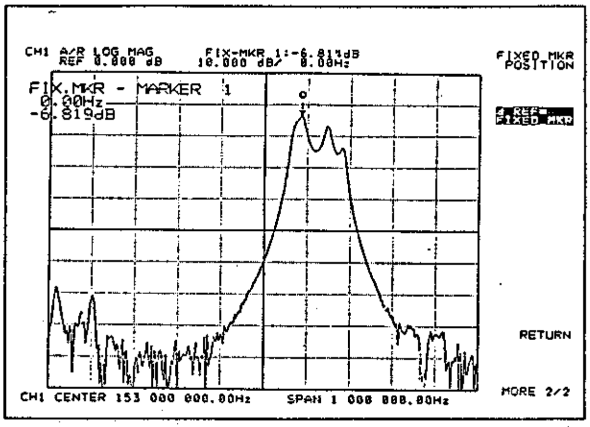
FIXED MARKER POSITION , FIXED M → ACTM POSM

This key entry sets the fixed marker to the current marker position.



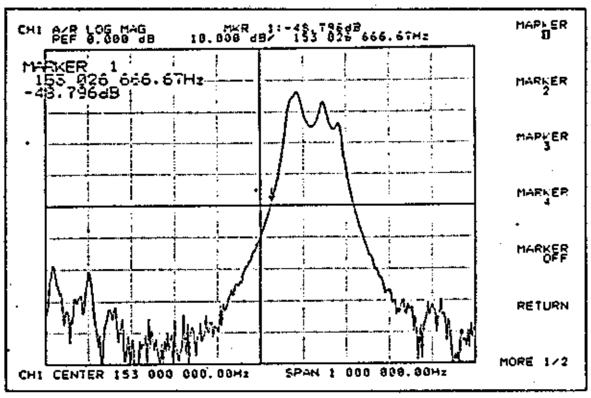
RETURN , Δ REF= FIXED MKR

This key entry displays the error between the fixed marker and the active marker.



Arrange DUT. In this case, lower the peak value. The system displays the error between the lowered active marker and the fixed marker.

.Normal marker



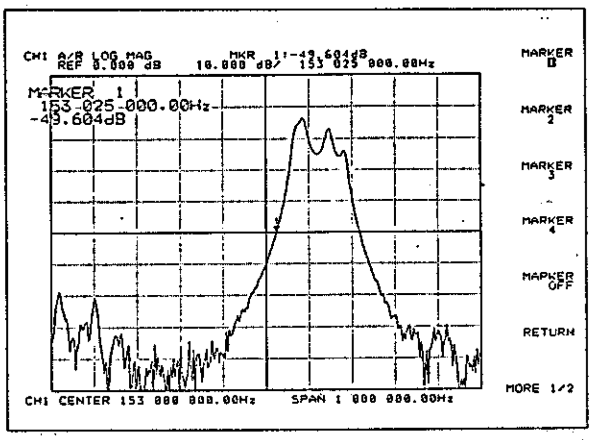
RETURN , MARKER ALL OFF , MARKER NUMBER ,

[1] , [5] , [3] , [.] , [0] ,

[2] , [5] , [MHz]

Since the uncompensated marker mode is set, the system displays 153.026666.67 Hz (153.02666667) despite of setting 153.025 MHz.

Correction marker



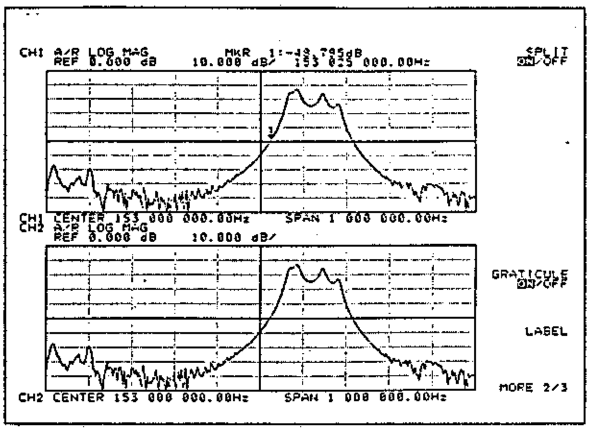
RETURN , MKR CMP/UNCMP , MARKER NUMBER

[1] , [5] , [3] , [.] , [0] ,

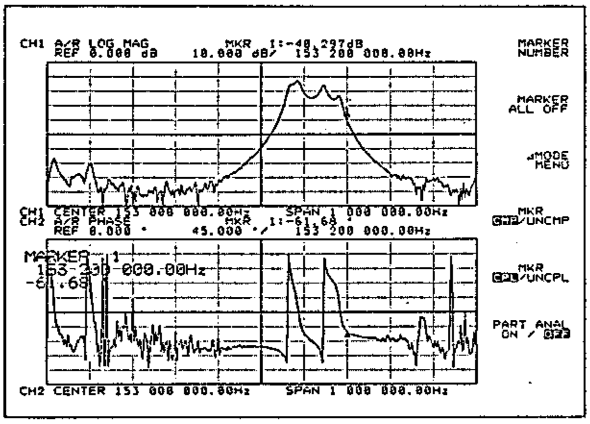
[0] , [2] , [5] , [MHz]

The system displays the specified marker value because the compensated marker mode is set.

Marker ripple



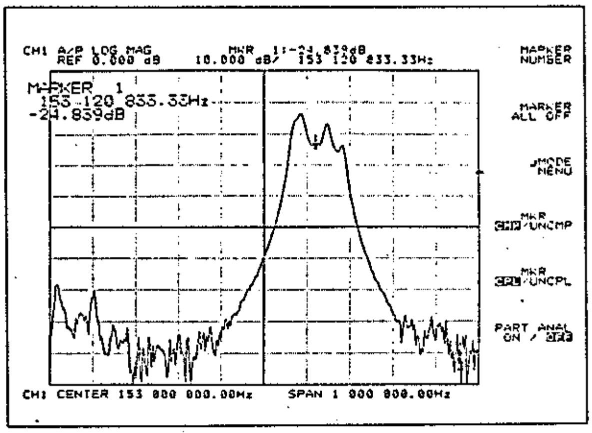
SWEEP , TYPE , COUPLE CH ON/OFF ,
DISPLAY , DUAL CH ON/OFF , MORE 1/3 ,
SPLIT ON/OFF



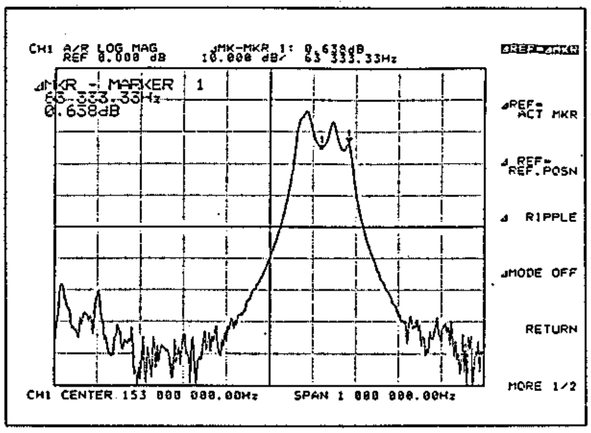
CH 2 , FORMAT , PHASE , MKR ΔMKR [ ] ,
MKR CMP/UNCMP , MKR CPL/UNCPL ,
⇧ , ⇧

When you move the CH2 marker, the CH1 marker follows.

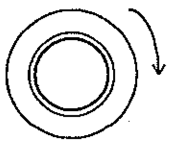
Partial analysis (in delta block)



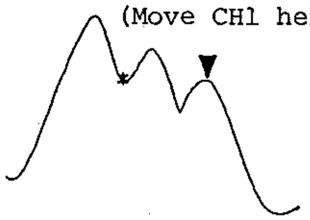
CH 1 , DISPLAY , DUAL CH ON/OFF ,
MORE 1/3 , SPLIT ON/OFF , MKR ΔMKR [ ] ,



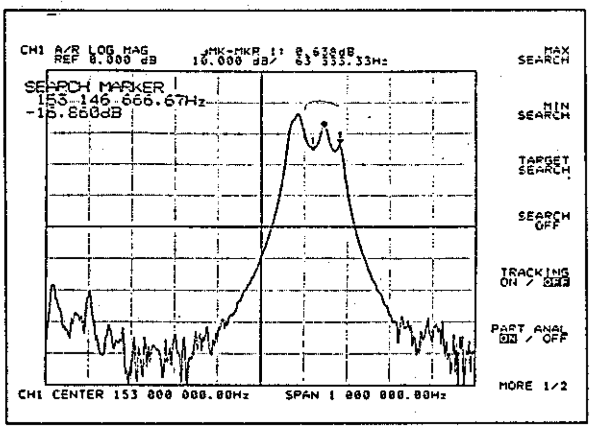
[Δ MODE MENU], [Δ REF= Δ MKR],



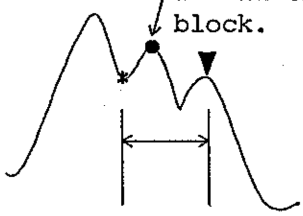
(Data nob)



(Move CH1 here.)



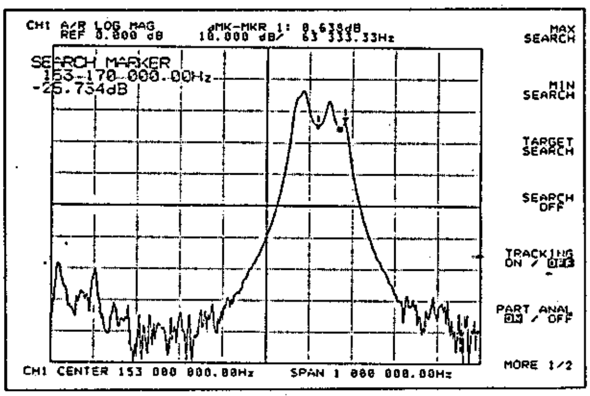
Perform peak search within the delta block.



Delta block

[RETURN], [PART ANAL ON/OFF], MKR SRCH [ ],

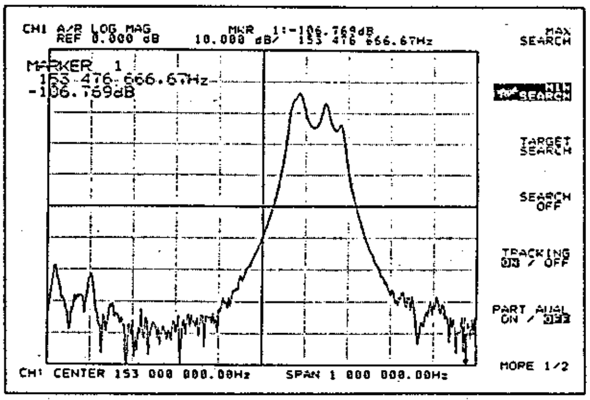
[MAX SEARCH],



[MIN SEARCH],

This key is used to perform the MIN search in the delta block.

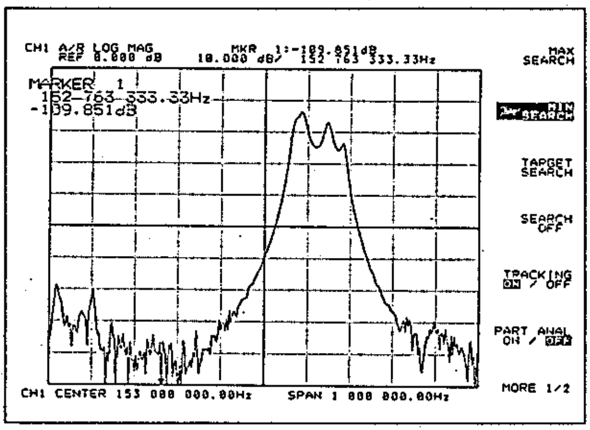
Marker track



MKR ΔMKR [ ] , MARKER ALL OFF , MKR SRCH [ ] ,

TRACKING ON/OFF , MIN SEARCH .

A few seconds later, this key entry changes the MIN value and detects the value for every sweep operation.

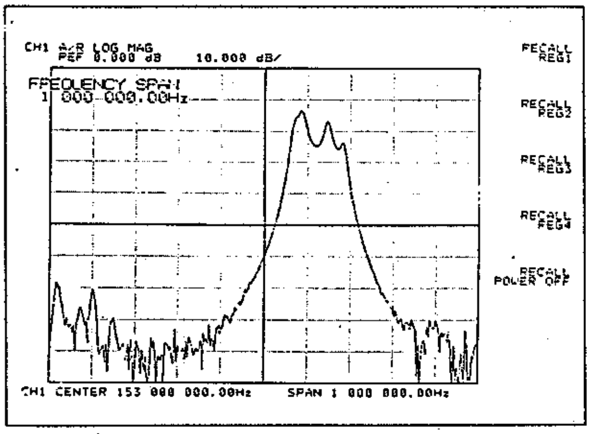


End

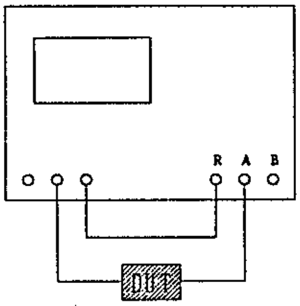
(11) Measurement by Using Marker (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



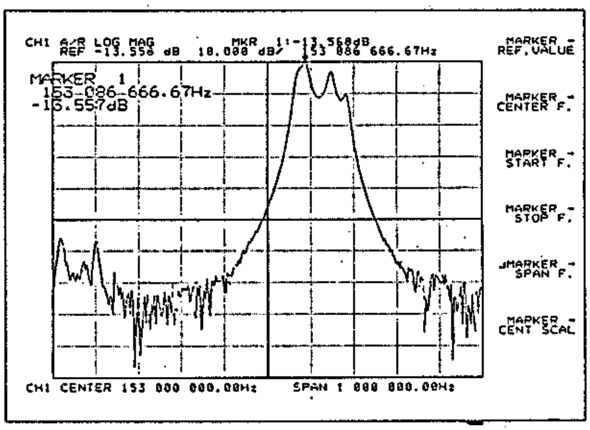
Perform the following setup and power the R4611, then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],

[SPAN], [1], [MHz]

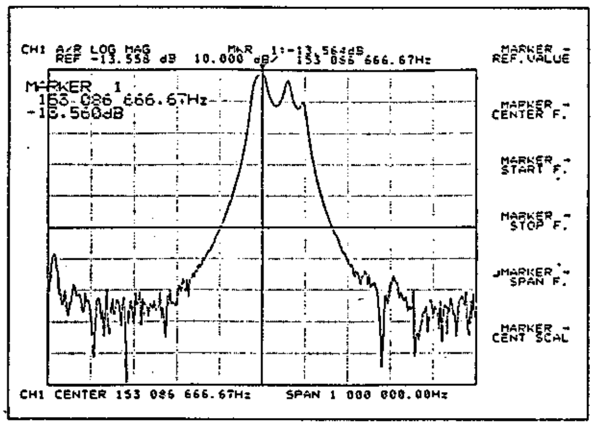
Marker⇨Reference Level



MKR SRCH [ ], MAX SEARCH, MKR→ [ ],

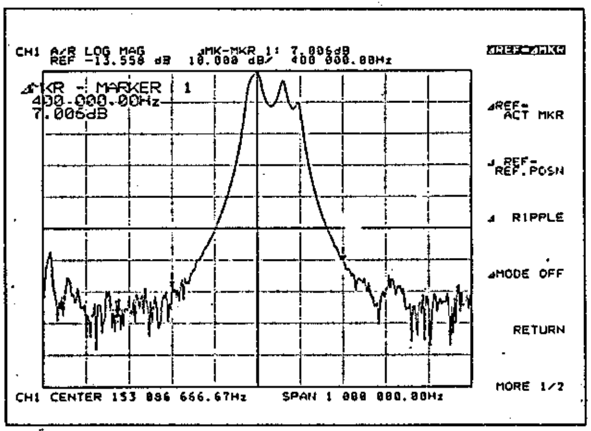
MARKER REF.VALUE→,

Marker → center frequency



MARKER CENTER F. →

Marker → span frequency

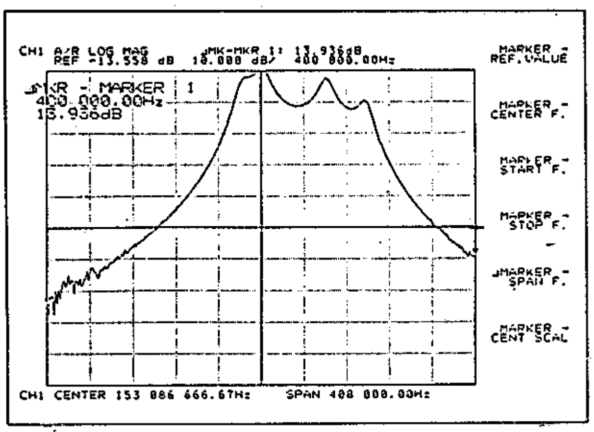


MKR ΔMKR [ ] , [↓] , [↓] , ΔMODE MENU

ΔREF=ΔMKR , [↑] , [↑] , [↑] ,

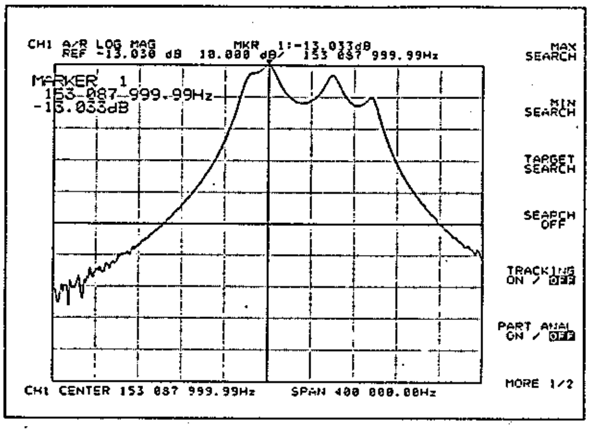
[↑]

Δ区間を設定します。



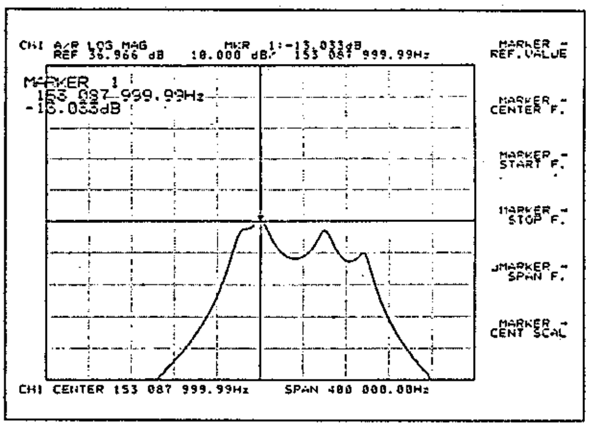
MKR → [ ] , ΔMARKER SPAN F.→

Marker → center scale



MKR SRCH , MAX SEARCH

Search the peak value to move the waveform peak to the center.



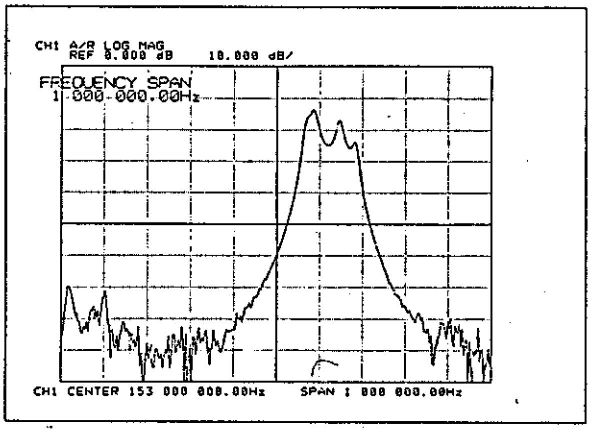
MKR→ , MARKER CENT SCAL

End

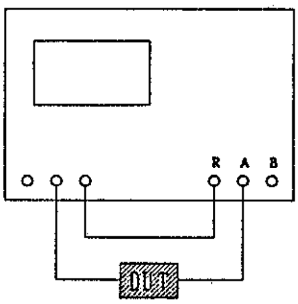
(12) Measurement with Partial Sweep (Using 153-MHz BPF as DUT)

Start

Set up the measurement device



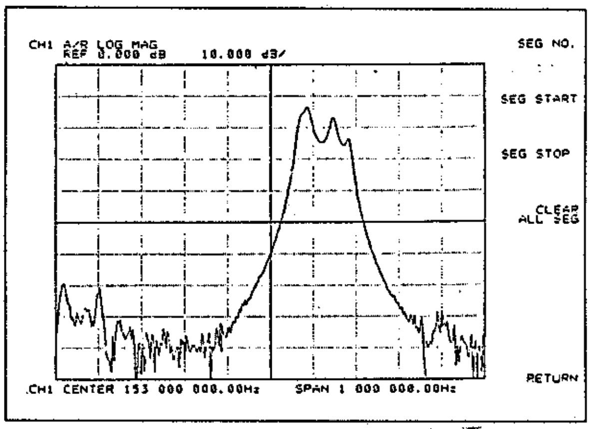
Perform the following setup and power the R4611, then press the keys below in this sequence:



[CENTER], [1], [5], [3], [MHz],

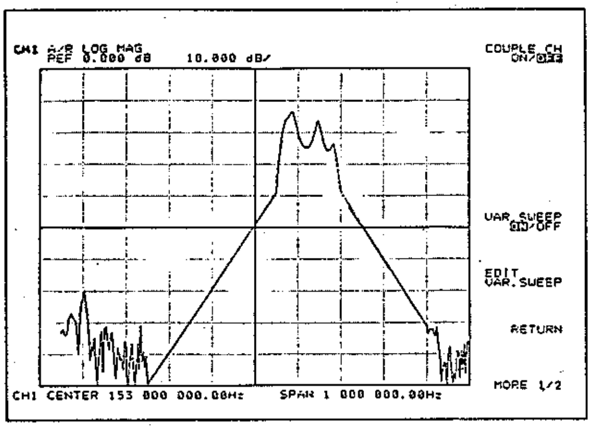
[SPAN], [1], [MHz]

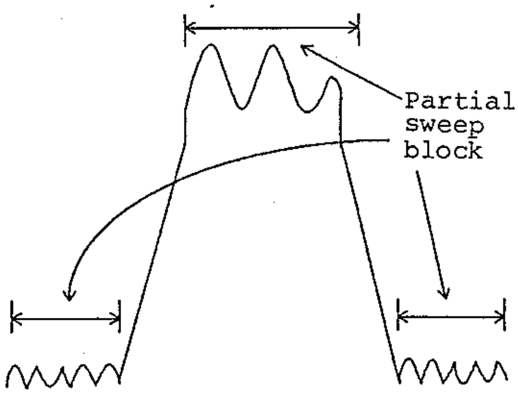
Partial sweep menu



[SWEEP], [TYPE], [EDIT VAR. SWEEP],

Set the partial sweep block





In this case, the system sweeps three blocks of 152.55 to 152.75 MHz, 153.05 to 153.20 MHz and 153.40 to 153.50 MHz.

SEG NO. , SEG START , [1] , [5] , [2] , [.] , [5] , [5] , [MHz]

SEG STOP , [1] , [5] , [2] , [.] , [7] , [5] , [MHz]

SEG NO. , [⇧] , SEG START , [1] , [5] , [3] , [.] , [0] , [5] , [MHz]

SEG STOP , [1] , [5] , [3] , [.] , [2] , [0] , [MHz]

SEG NO. , [⇧] , SEG START , [1] , [5] , [3] , [.] , [4] , [0] , [MHz]

SEG STOP , [1] , [5] , [3] , [.] , [5] , [0] , [MHz]

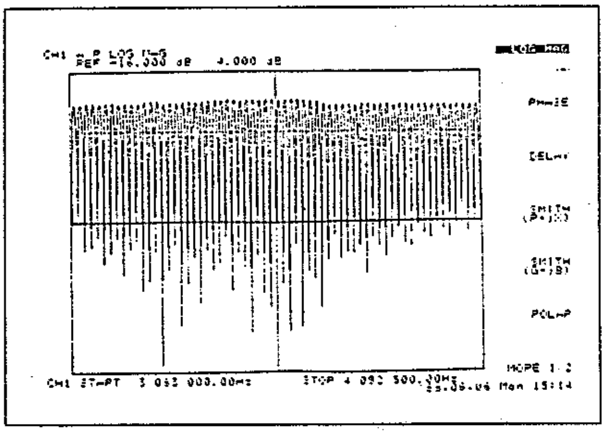
RETURN , VAR. SWEEP ON/OFF

End

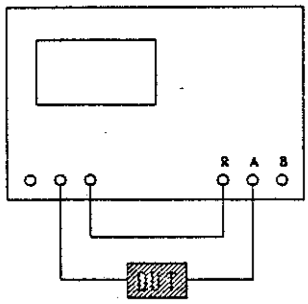
(13) Measurement in user defined sweep (Example using the tandem filter to DUT)

Start

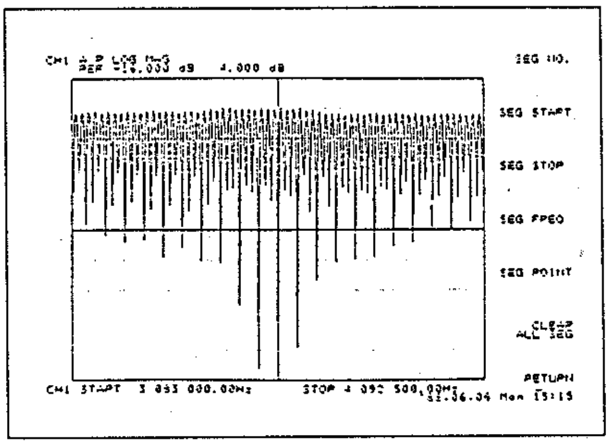
Set up



Perform the following set up and turn the power supply on.



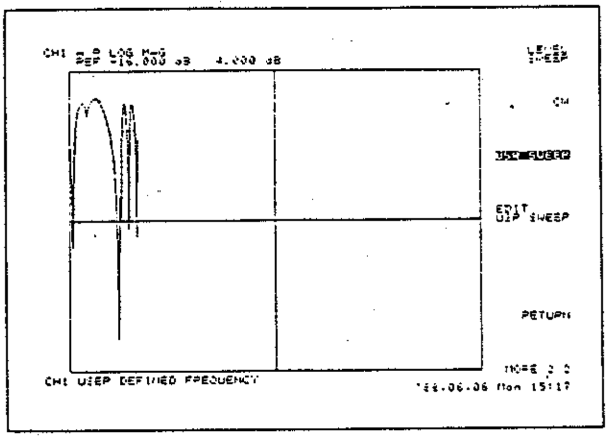
User defined sweep menu



SWEEP , TYPE , MORE 1/2 ,

EDIT USR SWEEP

Setting of user definition sweep



In this case, the system sweeps three blocks of 50 points between 3.083 and 3.0905 MHz, 100 points between 3.5705 and 3.5885 MHz, 50 points between 4.0588 and 4.0925 MHz.

CLEAR ALL SEG

SEG NO., [0], [UNIT]

SEG START, [3], [.], [0], [8], [3], [MHz]

SEG STOP, [3], [.], [0], [9], [0], [5], [MHz]

SEG POINT, [5], [0], [UNIT]

SEG NO., [⇧], SEG START, [3], [.], [5], [7], [0], [5], [MHz]

SEG STOP, [3], [.], [5], [8], [8], [5], [MHz]

SEG POINT, [1], [0], [0], [UNIT]

SEG NO. , ⇧ , SEG START , [4] , [.] , [0] , [5] , [8] , [8] , [MHz]

SEG STOP , [4] , [.] , [0] , [9] , [2] , [5] , [MHz]

SEG POINT , [5] , [0] , [UNIT]

RETURN , USR SWEEP

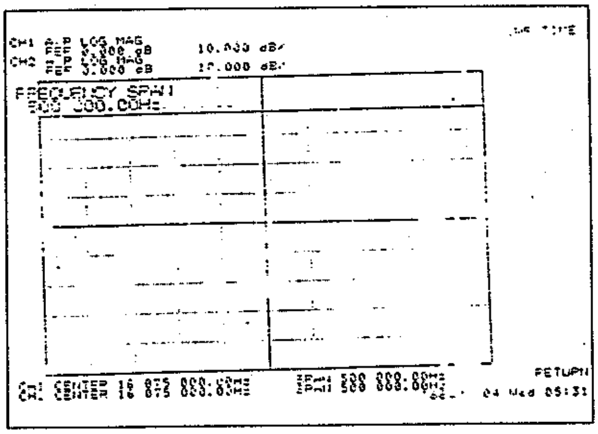
End

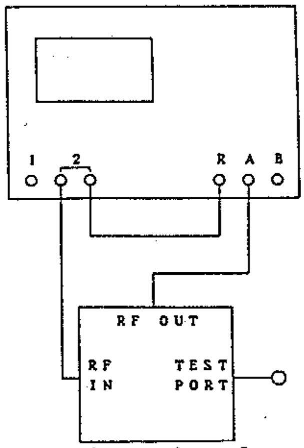
(14) Measurement of resonant and antiresonant points of ceramic resonator (f=16.075MHz)

Start

Set up the measurement device

Connect directional bridge with R4611 as follows.





Directional bridge

- Dual CH

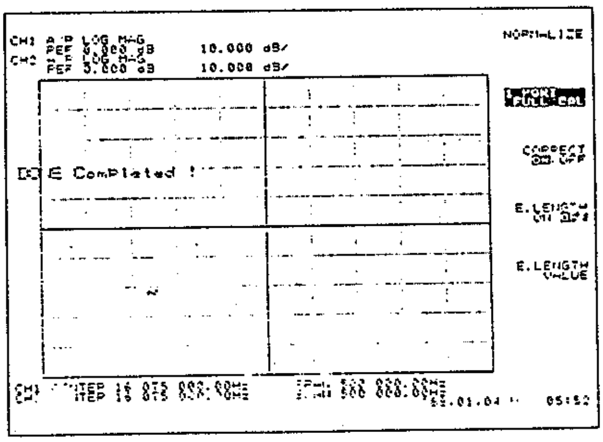
DISPLAY , DUAL CH ON/OFF

- Sweep time of 1 sec

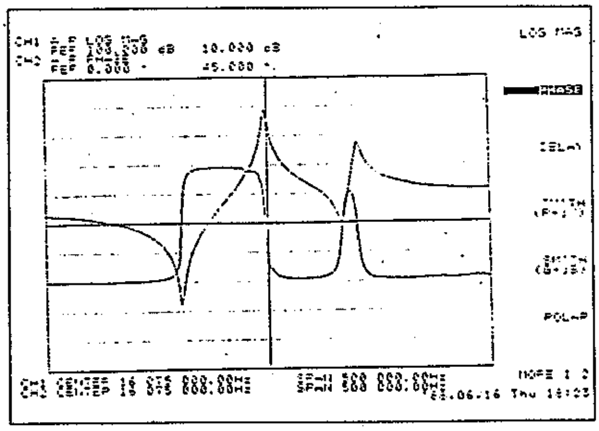
SWEEP , TIME , 1s

CENTER 16.075MHz
SPAN 500kHz

CAL



1 PORT Full CAL is made for both CH1 and CH2.



CH1 , INPUT MEAS , CVRSN , Z (REFL)

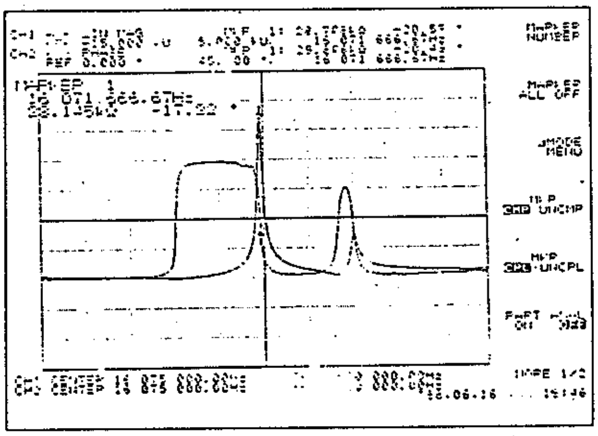
CH2 , Z(REFL)

CH1 , SCALE REF , AUTO SCALE

CH2 , AUTO SCALE , FORMAT , PHASE

- Z mode (impedance) can be set and AUTO scaling can be made.

Measurement of impedance and phase at antiresonant point in the linear mode



CH1 , MORE 1/2 , LIN MAG ,

MKR ⊿ MKR , MKR CMP/UNCMP ,

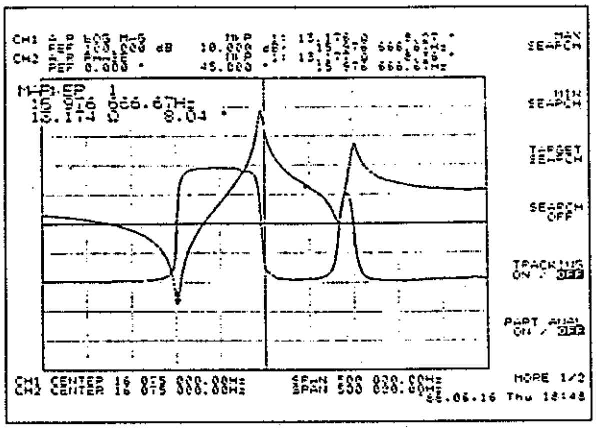
MKR CPL/UNCPL , MORE 1/2 ,

LIN MKR , MKR SRCH , MAX SRCH ,

CH2 , MKR ⊿ MKR , MKR CMP/UNCMP

- Antiresonant point can be measured by coupling the markers of CH1 and CH2, and setting the marker indication to LINEAR MAG.

Measurement of impedance and phase at resonant point in the LOG mode

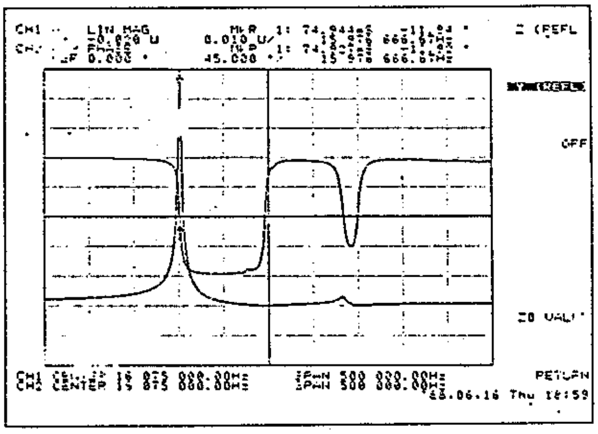


CH1 , FORMAT , LOGMAG , MKR SRCH [ ]

MIN SEARCH

- Set CH1 to LOG mode and measure the resonant point.

Measurement of admittance and phase at resonant point in the linear mode



FORMAT , MORE 1/2 , LIN MAG ,

INPUT MEAS , CVRSN , Y (REFL) ,

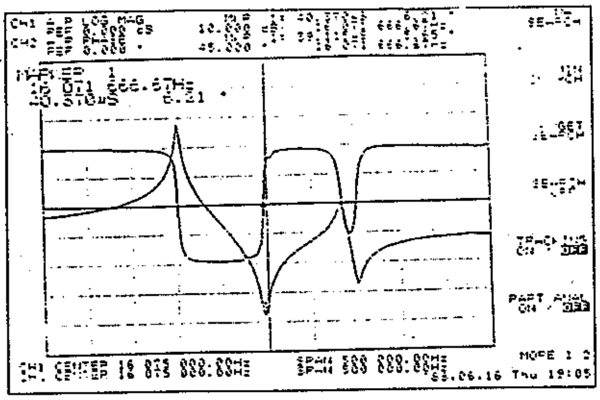
SCALE REF , AUTO SCALE ,

MKR SRCH [ ] , MAX SRCH ,

CH2 , INPUT MEAS , CVRSN , Y (REFL) ,

- Set the system to Y (admittance) mode and measure admittance and phase of the resonant point.

Measurement of admittance and phase at antiresonant point in the LOG mode



CH 1 , FORMAT , LOGMAG , SCALE REF ,

AUTO SCALE , MKR SRCH [ ] , MKR SEARCH

- Set CH1 to LOG mode and measure admittance and phase of the antiresonant point.

End

3. OPERATING PANEL FUNCTIONS

This chapter describes the outline of the R4611 panels in the former portion and explains the software keys and function keys of the R4611 panel setting features in the latter.

3.1 Description of Panel

3.1.1 Front Panel

Selection of the display mode (waveform display, list display, etc.) [See Section 3.3.7.]

Format selection (MAG, PHASE, DELAY, etc.) [See Section 3.3.6.]

Setting of reference level, reference position, /DIV, etc. [See Section 3.3.8.]

Input to be used for measurement (A, B, R, etc.) [See Section 3.3.5.]

Channel selection to set the function keys active [See Section 3.3.1.]

Software keys [See Section 3.2]

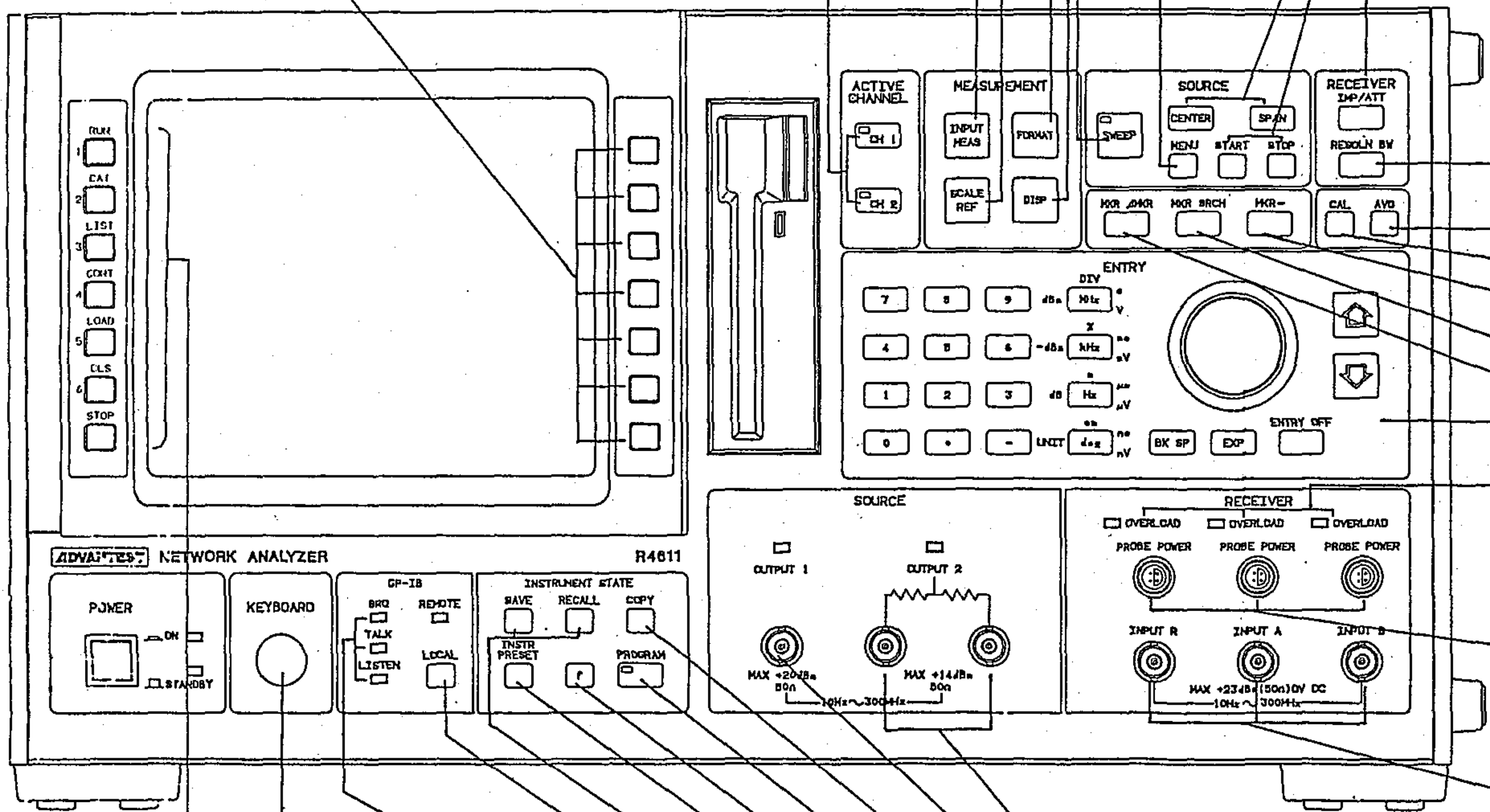
Setting of sweep time, point count, trigger, etc. [See Section 3.3.2.]

Setting of signal source output connector, output level, etc. [See Section 3.3.1.]

Setting of center span frequency [See Section 2.3.1.]

Setting of start and stop frequency [See Section 2.3.1.]

Setting of receiver input impedance and input attenuator values [See Section 3.3.3.]



Setting of receiver resolution band width [See Section 3.3.4.]

Averaging execution [See Section 3.3.12.]

Calibration execution [See Section 3.3.13.]

Marker → function [See Section 3.3.11.]

Marker search function [See Section 3.3.10.]

Setting of marker and delta marker [See Section 3.3.9.]

Data input key switch group [See Section 2.3.1.]

Input overload display:
LED comes on when -20 dBm or more is left after the system subtracts the attenuation of the input attenuator from the input level.
(The system displays the overload value for the DC input on the CRT.)

Probe power connector

Receiver input connector

Signal source output connector (integrating power splitter for comparison measurement)

Signal source output connector

Condition setting for hard copy operation

Program creation and execution

Special function

Instrument pre-setting (initial setting)

Save recall

REMOTE (GPIB) → LOCAL (The key operation via the front panel is enabled.)

LED to display the device state during the GPIB operation

External key board connector

Function keys

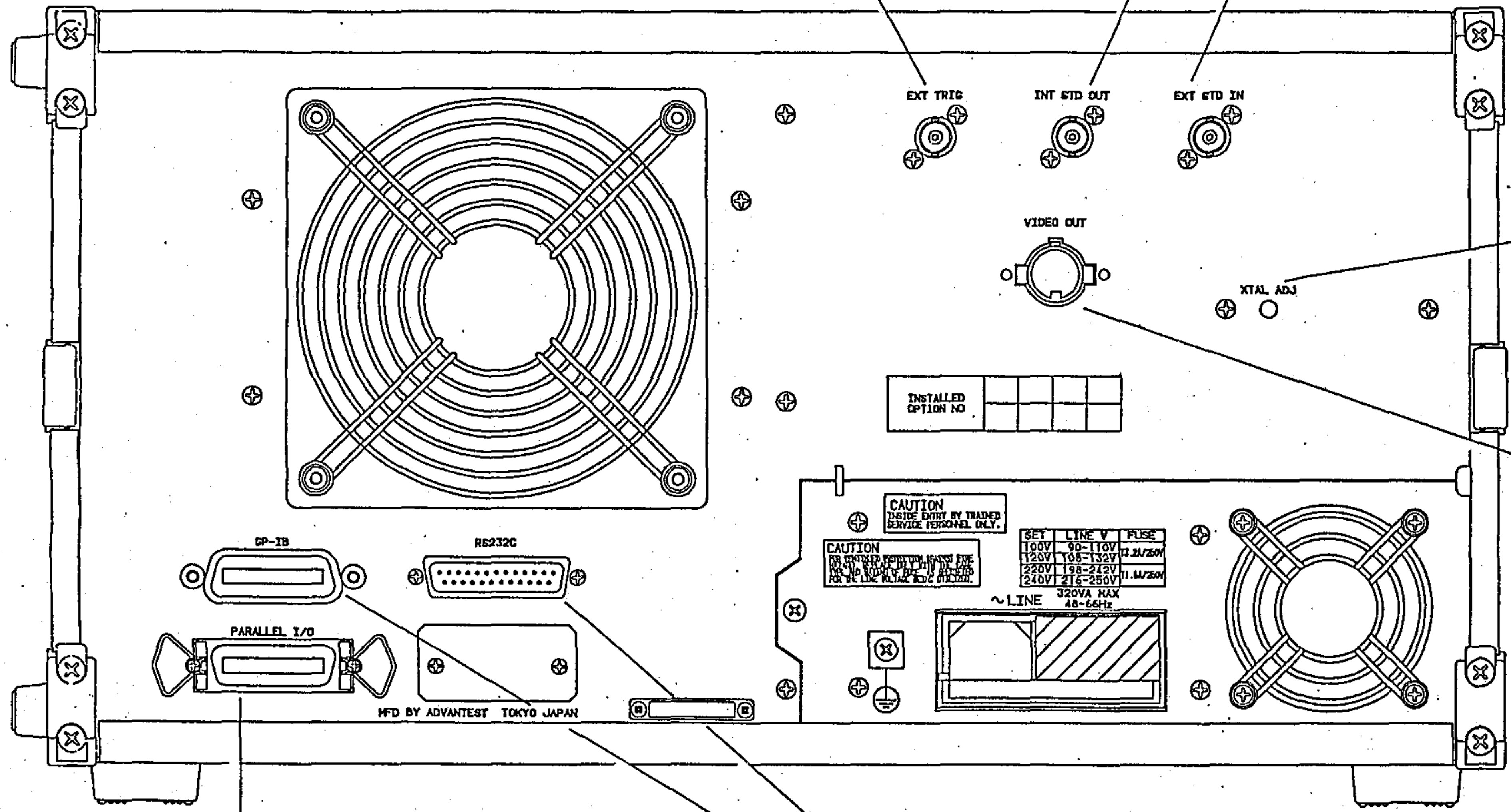
Figure 3-1 Front panel

3.1.2 Rear panel

INT STD OUT connector ------- Internal reference frequency output (10 MHz and 0 dBm or more)

EXT TRIG connector ---- External trigger input (TTL level and LOW enable)

EXT STD IN connector ------- External reference frequency input (1, 2, 5 and 10 MHz)



XTAL ADJ volume ------ Internal reference frequency arrangement volume

VIDEO OUT connector (8 pins and DIV) ------ Video signal (separate) output
To perform the hard copy operation, connect the video plotter to this output.

RS-232-C connector ----- Refer to the programming manual

GPIB connector -------- Refer to the programming manual

PARALLEL I/O connector -------Refer to the programming manual

Figure 3-2 Rear panel

3.2 Software Keys and Function Keys

On the R4611, each function is set by using the function keys and software keys. Pressing each function key displays up to seven set items (software key menu) on the right of the CRT.

Another screen (second page) is provided for each function key having eight set items or more. Some set items branch into further related items (secondary screen).

The key operation to select and set the desired item is divided into six types as follows:

1. Operation requiring the numeric data entry: Display the current parameters and their data on the upper left (active function area) of the CRT display.
2. Operation selecting the displayed set item
3. Operation changing the set item every pressing a software key: Indicates the current set item in the reverse display format.
4. Operation branching to further items: Exchanges all the data in the software key menu.
5. Operation moving to the next page (or back to the previous page)
6. Operation returning to the initial software key menu mode directly

The following figure shows the structure of the above operations:

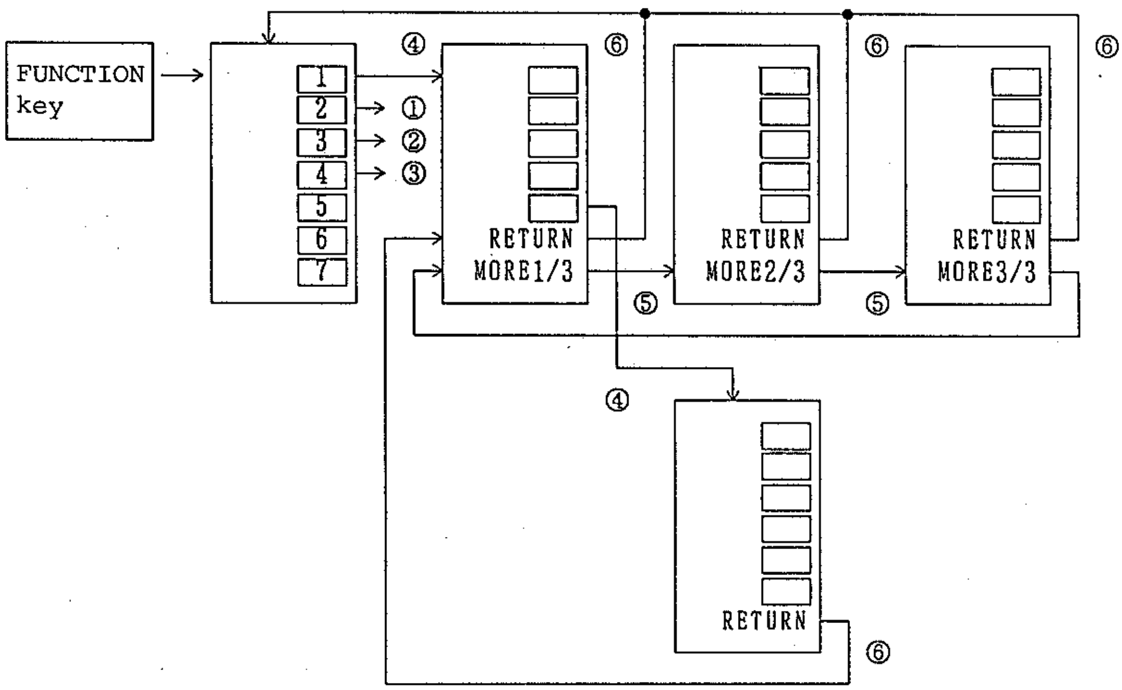


Figure 3-3 Structure of Software Key Menu

3.3 Basic Functions

This section explains the basic functions of a part of the source, the RECEIVER section and MEASUREMENT section in the following sequence:

A part of SOURCE ... [See Section 3.3.1 and 3.3.2.]
RECEIVER section ... [See Section 3.3.3 and 3.3.4.]
MEASUREMENT section ... [See Section 3.3.5 and 3.3.13.]

3.3.1 SOURCE MENU

This menu is used to select the signal source output for measurement and to set the output level.

MENU

OUTPUT1	Outputs the signal source in the single format from the OUTPUT1 connector on the front panel.
OUTPUT2	Outputs the signal source in the dual format from the OUTPUT2 connector on the front panel via the power splitter.
OUTPUT LEVEL	Sets the output level. (Use the entry keys.)
F.ST AIZE AUTO/MNL	Selects whether to set the frequency step size automatically or manually. When you select the manual mode, set the frequency step size on the second page of the menu. In this operation, you cannot change the center frequency with the encoder.
MORE 1/2	Shifts to the second page of the menu.

FREQ STEP SIZE	Inputs the step size to increase or decrease the center frequency and span frequency by a certain value (using the entry keys).
MORE 2/2	Returns to the first page of the menu.

3.3.2 SWEEP

This function sets the sweep time, measurement point count, sweep mode and so on.

SWEEP

TIME ········· See Section 3.3.2-(1).

TYPE ········· Selects the sweep type of the linear sweep and log sweep. (Continued on Section 3.3.2-(2).)

POINTS ········· Sets the measurement point. (Continued on Section 3.3.2-(3).)

TRIGGER ········· Selects the sweep trigger. (Continued on 3.3.2-(4).)

MODE ········· Selects the sweep mode. (Continued on Section 3.3.2-(5).)

RESTART ········· Pressing this key restarts the measurement from the beginning.

(1) TIME

(CW SWEEP)

SAMPLE TIME ········· Sets the sampling time.

SWP TIME ········· Sets the sweep time (using the entry keys).
The sweep time is determined according to the following expression,
ΔF = FREQ.SPAN/measurement point count; and the measurement point count. (When $\Delta F \leqq 1$ MHz, min. the sweep time is 1 ms/point (MIN.) and the resolution is 0.5 ms/point. When $\Delta F > 1$ MHz, the sweep time is 1 ms/point (MIN.) (every 1 MHz).)
When DUAL CH is ON and COUPLE CH is ON, the sweep time is 1.5 times the above value. When the both CHs are set ON, and CORR is set ON, the sweep time is twice the above value. The default sweep time is 300 ms/301-point.

RETURN ········· Returns to the initial menu.

(2) TYPE

COUPLE CH ON/OFF ······ Link the sweep frequency range of CH1 to that of CH2. When this function is OFF, the alternate sweep mode is set. When this function is ON, the DUAL TRACE sweep mode is set. The system performs the link operation according to the active channel. See Section 2.4-(10) for the measurement example.

LIN FREQ ······ Linear frequency sweep

LOG FREQ ······ Log frequency sweep
- Setting at start and stop frequency is only enabled.
- Group delay measurement is disabled.

PART SWP ON/OFF ······ Partial sweep. When this function is ON, the system measured only the specified block. Using this function reduce the measurement time.

EDIT PART SWP ······ Specifies the target block of the partial sweep operation.

RETURN ······ Returns to the initial menu.

See the next page.

MODE 1/2 ······ Shifts to the second page of the menu.

LEVEL SWEEP ······ Level sweep

CW ······ CW sweep

CW FREQ ······ Set the frequency at CW sweeping.

USR SWEEP ······ User defined sweep

EDIT USR SWEEP ······ Definds the user defined sweep

RETURN ······ Returns to the initial menu.

MODE 2/2 ······ Returns to the menu in the first menu.

START LEVEL ······ Sets the start level (using the entry keys).

STOP LEVEL ······ Sets the stop level (using the entry keys).

CW FREQ ······ Sets the frequency at level sweeping

RETURN ······ Returns to the second page of the menu.

(Partial sweep)

EDIT VAR. SWEEP [ ] (See Section 2.4-(12) for the measurement example.)

SEG NO .... Specifies the segment number (0 to 14). (Use the ten-key pad.) The terminate key is the [deg] key.

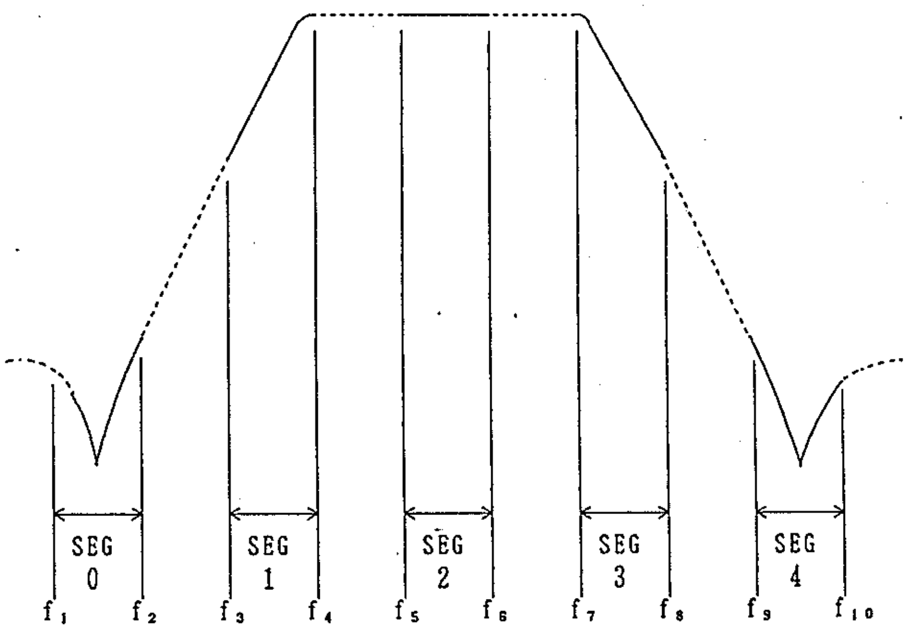
SEG START .... Inputs the start frequency of the segment specified by SEG NO. (Use the ten-key pad.)

SEG STOP .... Inputs the stop frequency of the segment specified by SEG NO. (Use the ten-key pad.)

CLEAR ALL SEG .... Clears the input frequency data of all segments.

RETURN .... Returns to the initial menu.

A "segment" represents each of the following blocks:



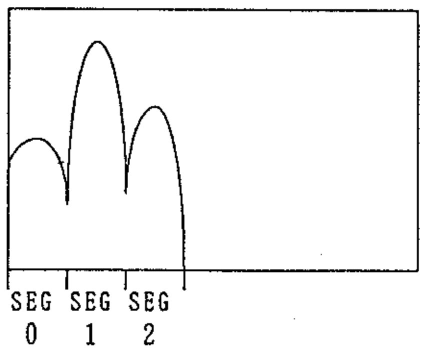
The segment of one point only can also be defined.
To do so, input SEG START and SEG STOP as the same value.
SEG START and SEG STOP of each segment cannot be set in the out of range of measuring frequency range (START FREQ. STOP FREQ) which is set at that time.

(User defined sweep)

EDIT USR. SWEEP ☐ (For the example measured, refer to [Item 2.4-(13)]

SEG NO	Specifies the segment No. (0 to 14). The terminate key is [deg] key.
SEG START	Input the start frequency of the segment specified by SEG No. (Ten-key is used)
SEG STOP	Input the stop frequency of the segment specified by SEG No. (Ten-key is used)
SEG FREQ	Input the frequency of the segment specified by SEG No. (Ten-key is used. When this value is input, SEG START becomes equal to SEG STOP, and next SEG POINT becomes 1)
SEG POINT	Inputs the number of measuring points of the segment specified by SEG No. (This value defines the number of measuring points in the interval between SEG START and SEG STOP of the specified segment)
CLEAR ALL SEG	Clears the information where all segments wereinput.
RETURN	Returns to the first menu.

Though the "SEGMENT" is the same concept as that of the partial sweep, to define the segment of one point, either input SEG POINT as 1 or the value of SEG FREQ.
If SEG START and SEG STOP are the same value and SEG POINT is not 1, repeat the measurement of same frequency for the number of times specified by SEG POINT.
When SEG START is not equal to SEG STOP and SEG POINT is 1, execute the measurement only in the frequency specified by SEG START.
Total of POINTs of each segment cannot be set exceeding 1201.
Differs from the partial sweep, the user defined sweep can set the optional frequency regardless of the measuring frequency range set at that time.
All displays are performed with left justified.
Similar to the ordinary sweep, the number of measuring points can be set. If the total number of measuring points is 97 for each segment of user-defined sweep mode, the frequency waveforms is displayed on the entire screen when the number of measuring points of 101 is set.



If the selected number of measuring points is much greater than that of each segment of user-defined sweep mode, the number of measuring points is changed automatically.
The number of measuring points cannot be changed during user-defined sweep. It can be changed only when the other sweep mode is selected.

(This page has been intentionally left blank.)

(3) POINTS

1201	1201 points (However, only 601 points are displayed on the screen.)
601	601 points
301	301 points
201	201 points
101	101 points
RETURN	Returns to the initial menu.
MORE 1/2	Shifts to the second page of the menu.

51	51 points
21	21 points
11	11 points
6	6 points
3	3 points
RETURN	Returns to the initial menu.
MORE 2/2	Returns to the first page of the mnu.

(4) TRIGGER

INTERNAL	.... Free run
LINE	.... Line trigger
EXTERNAL	.... External trigger. This function starts the sweep operation according to the trigger input by EXT TRIG. on the rear panel. (Trigger ... TTL level and LOW enable)
RETURN	.... Returns to the initial menu.

(5) MODE

CONTINUE	.... Repeats the sweep operation continuously.
SINGLE	.... Single sweep mode
HOLD	.... Holds the sweep operation.
RETURN	.... Returns to the initial menu.

3.3.3 IMP/ATT (Impedance/Attenuator)

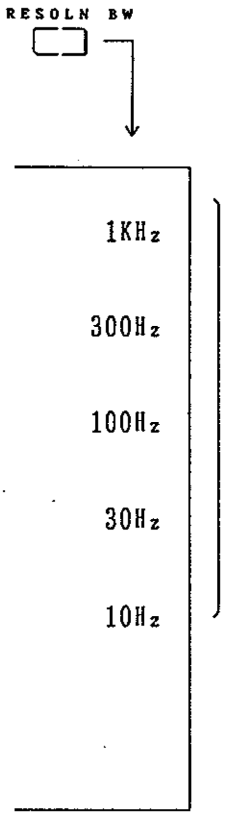
This function sets the input impedance and input attenuator of INPUT, A, B and R.

INP/ATT

R 50Ω 0dB/20dB	
A 50Ω 0dB/20dB	
B 50Ω 0dB/20dB	.....Sets the impedance and attenuator values of each input.
R 1MΩ 0dB/20dB	
A 1MΩ 0dB/20dB	
B 1MΩ 0dB/20dB	
CLEAR TRIP	.........Recovers from the over-input protection mode.

3.3.4 RESOLN BW (Resolution Band Width)

This function sets the receiver resolution band width. Narrow the resolution band width according to the required dynamic range to lower the noise level. When you narrow the resolution band width, however, the response time of the filter integrated in the R4611 is prolonged. Thus, slow the sweep time so that the waveform trace does not change.



...... Sets the resolution band width.

3.3.5 INPUT MEAS (Measurement)

(a) Standard R4611

INPUT MEAS →

A/R
B/R
A/B

....For comparison measurement:
○/○
This input becomes the reference.

R
A
B

....For no comparison measurement

PARAMETER CONVERT ..Shifts to the menu of parameter conversion

Z(REFL) ....Converts the data obtained by the set input to the complex impedance (R + jx).

Y(REFL) ....Converts the data obtained by the set input to the complex admittance (G + jB).

OFF ....Turns off the conversion to impedance or admittance.

Z0 VALUE ....Inputs the characteristic impedance of the measuring system. (Terminates using the UNIT key)

RETURN ....Returns to the original menu.

Since conversion to the complex impedance or the complex admittance is executed by the operation shown below,

$$Z(REFL) = \frac{1+\Gamma}{1-\Gamma} Z0 = R + jX \qquad Y(REFL) = \frac{1-\Gamma}{1+\Gamma} \times \frac{1}{Z0} = G + jB$$

based on the complex reflection coefficient obtained by the set inputs (A/R, B/R, A/B, R, A, B ...), it is necessary to set the reflection coefficient measurement of the DUT for input.

(b) R4611 with an S-parameter test set

Select the entry to be used by CH1 or CH2.

INPUT MEAS

S11 (A/R) REFL FWD .... Setting S11 parameter

S21 (B/R) TRNS FWD .... Setting S21 parameter

S12 (A/R) TRNS REV .... Setting S12 parameter

S22 (B/R) REFL REV .... Setting S22 parameter

PARAMETER CONVERT .... Move to the menu of parameter conversion

MORE 1/2

A/R
B/R
A/B
....For comparision measurement

O/O
This input becomes the reference.

R
A
B
....For no comparison measurement.

MORE 2/2

Z(REFL) .... Converts the data obtained by the set input to the complex impedance (R + jx).

Y(REFL) .... Converts the data obtained by the set input to the complex admittance (G + jB).

OFF .... Turns off the conversion to impedance or admittance.

~ ~

Z0 VALUE .... Inputs the characteristic impedance of the measuring system. (Terminates using the UNIT key)

RETURN .... Returns to the original menu.

Since conversion to the complex impedance or the complex admittance is executed by the operation shown below,

$$Z(REFL) = \frac{1+\Gamma}{1-\Gamma} Z0 = R + jX \qquad Y(REFL) = \frac{1-\Gamma}{1+\Gamma} \times \frac{1}{Z0} = G + jB$$

based on the complex reflection coefficient obtained by the set inputs (A/R, B/R, A/B, R, A, B ...), it is necessary to set the reflection coefficient measurement of DUT for input.

3.3.6 FORMAT

Selects the measurement format for amplitude, phase and group delay.

FORMAT

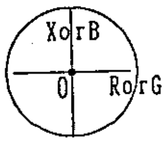
LOG MAG	Measurement amplitude and displays vertical log. See Section 2.4-(1) for the measurement example.
PHASE	Measures phase. See Section 2.4-(2) for the measurement example.
DELAY	Measures the group delay. See Section 2.4-(3) for the measurement example. The set resolution of DELAY APERTURE is as follows: (100/SWEEP POINT-1) x 2 [%]
SMITH (R+jX)	Displays the Smith chart. (Impedance display)
SMITH (G+jB)	Displays the Smith chart. (Admittance display)
POLAR	Displays the polar coordinates.
MORE 1/2	Shifts to the second page of the menu.

See Section 2.4-(7) for the measurement example. (applies to SMITH (R+jX), SMITH (G+jB) and POLAR)

LIN MAG	Measures amplitude and displays vertical linear.
REAL	Displays the real portion of the measurement data.
IMAG	Displays the imaginary portion of the measurement data.
PHASE $(-\infty, +\infty)$	Displays phase in the - and + format. (Display without loop at $+180^{\circ}$ and -180°) See Section 2.4-(2) for the measurement example.
MORE 2/2	Returns to the first page of the menu.

When conversion (Z or Y) of INPUT MEAS is set, the formats SMITH (R + jX), SMITH (G + jB), PHASE ($-\infty,+\infty$), and DELAY have no meaning.

Other formats have the following meaning respectively.
(Here, the result of the conversion is written as follows,
$Z = R + JX$, $Y = G + jB$)

FORMAT	The meaning of format
LOGMAG	$20 \log_{10} \lvert Z \rvert$ or $20 \log_{10} \lvert Y \rvert$
PHASE	$\tan^{-1} X/R$ or $\tan^{-1} B/G$
LIN MAG	$\lvert Z \rvert$ or $\lvert Y \rvert$
REAL	R or G
IMAG	X or B
POLAR	

To obtain the value of L or C from the imaginary part of Z or Y, refer to the MKR menu.

3.3.7 DISP (DISPLAY)

Sets the mode related to the CRT display (waveform trace display, list display and scale form display).

DISPLAY

DUAL CH ON/OFF	Two-channel simultaneous display. See Section 2.4-(4) for the measurement example.
DISPLAY: DATA	Displays the waveform data to be rewritten for every sweep operation on the CRT.
DATA AND MEMORY	Displays the above data and memory on the CRT at one time.
DATA/MEMO ON/OFF	Selects whether to divide the data by the memory. Division is made in complex format.
DATA ⇨ MEMORY	Stores the data to the memory.
MORE 1/3	Returns to the second page of the menu.

SPLIT ON/OFF	Split display. (CH1 and CH2 are displayed separately into two columns, up and down on half scale. See Section 2.4-(4) for the measurement example.
GRATICULE ON/OFF	Setting this OFF displays only the frame of the scale.
LABEL	Continued on Section 3.3.7-(1).
MORE 2/3	Returns to the third page of the menu (continued on Section 3.3.7-(2)).

(1) LABEL

Displays the label character at the bottom of the screen.

LABEL

SELECT LETTER	Selects a letter. (Use the rotary encoder.) When a letter is selected, the cursor moves one character right.
SPACE	Space. This function deletes the character specified by the cursor and moves the cursor one character right.
BACK SPACE	Back space. This function moves the cursor one character left and deletes the character at the position.
CURSOL →	Moves the cursor one character right.
CURSOL ←	Moves the cursor one character left.
CLEAR LABEL	Deletes all label characters.
RETURN	Returns to the previous menu.

(2) MORE 3/3

MORE 2/3

INTENSITY	Arranges the CRT intensity. (Use the up-down keys and ten keys.) The intensity can be changed in 9 levels of 0 to 8. If level 0 is selected, the screen is changed to dark. When any key is pressed, level 8 is set automatically.
REAL TIME CLOCK	Sets the realtime clock. See Section 3.3.7-(3).
MORE 3/3	Returns to the first page of the menu.

(3) REAL TIME CLOCK

Sets the real-time clock.

REAL TIME CLOCK

R.T.C. DATA SET ...... Menu key to set the real-time clock

30 sec ADJUST ...... Key to reset the value of the second.

For example, pressing this key at 12:01:30 to 59 sets 12:02:00.

Pressing this key at 12:01:00 to 29 sets 12:01:00.

RETURN

YEAR ...... Key to set the year. Terminate the year setting by using the ten-key pad or the [deg] key. When the value of the year is reset, the value of the second is reset.

MONTH ...... Key to set the month. Terminate the month setting by using the ten-key pad or [deg] key.

DAY ...... Key to set the date. Terminate the date setting by using the ten-key pad or [deg] key.

WEEK ...... Key to set the day of the week. Use the ⇧⇩ shift keys.

HOUR ...... Key to set the hour. Terminate the hour setting by using the ten-key pad or [deg] key.

MINUTE ...... Key to set the minutes. Terminate the setting by using the ten-key pad or [deg] key.

RETURN

3.3.8 SCALE & REF (Reference)

Sets the position and value of the reference line or screen scale. The unit of the entry key and menu varies with the selected format.

(a) When the format is LOG MAG, PHASE or DELAY:

SCALE REF

AUTO SCALE	Auto-scale. This function is used to set the optimum reference value and /DIV automatically.
/DIV	Sets /DIV (using the entry keys).
REF VALUE	Sets the value of the reference line (using the entry keys).
REF POSITION	Sets the position of the reference line on the screen (in terms of %). When the top position of the screen is at 100% or less, one DIV corresponds to 10%.
REF LINE ON/OFF	Selects whether to display the reference line on the screen.
UP SCALE ON/OFF	When this function is ON, the system displays no characters but the scale.

(b) When the format is SMITH or POLAR:

SCALE REF

AUTO SCALE	Auto-scale. This function is used to set the optimum scale for the measurement value automatically.
F. SCALE VALUE	Sets the value at a full scale (using the entry keys). At 0.2U or less with SMITH selected, the format changes to the POLAR display mode automatically.
UP SCALE ON/OFF	When this function is ON, the system displays no characters but the scale.

3.3.9 MKR MKR (Marker Delta Marker)

The R4611 is provided with various marker functions to read data according to the displayed waveform. The system displays the marker data in the active function area or on the upper portion of the screen. The form and function of each marker are as follows:

Marker \ Channel	CH1	CH2
Non-active marker	N ▽	△ N
Active marker	N ▼	▲ N

The menu in the Smith or polar chart format is different from that in the other formats.

(a) When the format is not the Smith chart mode:

MKR ΔMKR

- Issues up to 10 multi-markers to read data. (Continued on Section 3.3.9-(a-1).) See Section 2.3-(9) for the measurement example.

MARKER NUMBER

- Sets all markers OFF.

MARKER ALL OFF

- Reads data by using the delta marker. (Continued on Section 3.3.9-(a-2).) See Section 2.3-(10) for the measurement example.

Δ MODE MENU

- MKR COMPENSATE system to display the response value with the frequency other than those at the sweep point by using the linear approximation. See Section 2.4-(10) for the measurement example.

MKR CMP/UNCMP

- Even if the sweep frequency is uncoupled with the marker coupled in the 2-CH display mode, the system is set to the marker mode to search a frequency value with the displayed sweep frequency range by using each channel. See Section 2.4-(10) for the measurement example.

MKR CPL/UNCPL

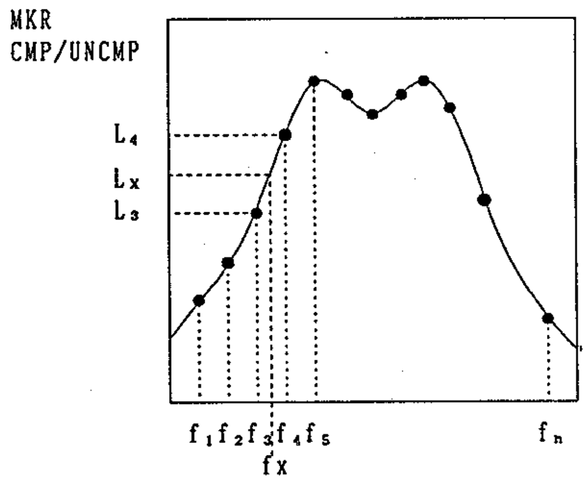
PART ANAL ON/OFF

- Performs analysis (MAX search, MIN search, RIPPLE measurement, etc.) by using the marker in the specified block.
See Section 2.4-(10) for the measurement example.

* See the figure on the next page.

<Reading the response value of fx>

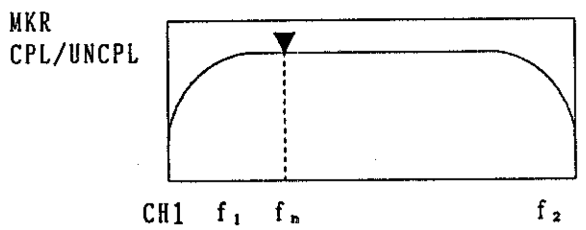
The marker value in the UNCMP mode corresponds to response value L_3 at the measurement point nearest fx. The marker value in the CMP mode corresponds to Lx obtained through linear approximation between response values L_3 and L_4 at measurement points f_3 and f_4.



f_1 to fn ... Measurement points

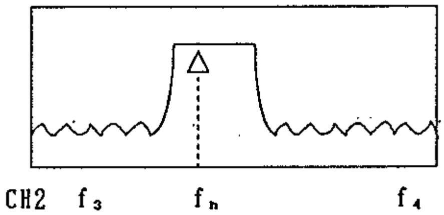
<UNCPL mode>

Only the active marker moves independently.



<CPL mode>

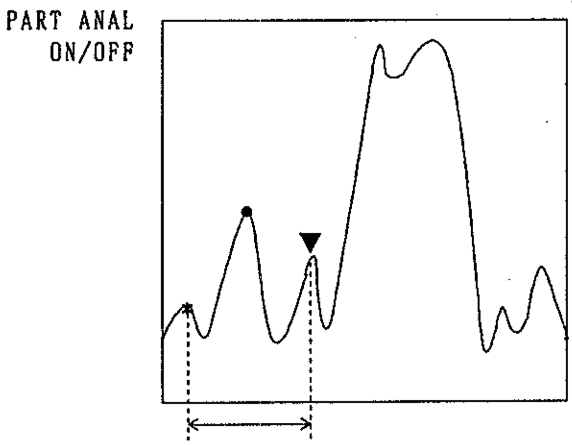
Non-active channel marker fn moves in conjunction with the active channel marker fn.



<Measurement example in the MAX search mode>

At OFF: The system searches the maximum value of the response values within the measurement frequency range.

At ON : The system searches the maximum value in the block specified by the non-active marker (ΔMKR) (between * and ▲).



(a-1) Multi-marker

MARKER 1
MARKER 2
MARKER 3
MARKER 4
··· Issues markers 1 to 4.
(To move the issued marker, use the entry keys.)

MARKER OFF ······ Sets the specified marker OFF. Specify the desired number from among the above marker numbers and press this key.

RETURN ······ Returns to the initial menu.

MORE 1/3 ······ Returns to the second page of the menu.

MARKER 5
MARKER 6
MARKER 7
MARKER 8
··· Issues markers 5 to 8.

MARKER OFF ······ Sets the specified marker OFF.

RETURN ······ Returns to the initial menu.

MORE 2/3 ······ Shift to the third page of the manu.

······ Shift to the third page of the menu.

MARKER 9
MARKER 10
··· Issues marker 9 to 10.

MARKER OFF ······ Sets the specified marker OFF.

RETURN ······ Returns to the initial menu.

MORE 3/3 ······ Returns to the first page of the menu.

(a-2) Δ MODE MENU

Δ MODE MENU

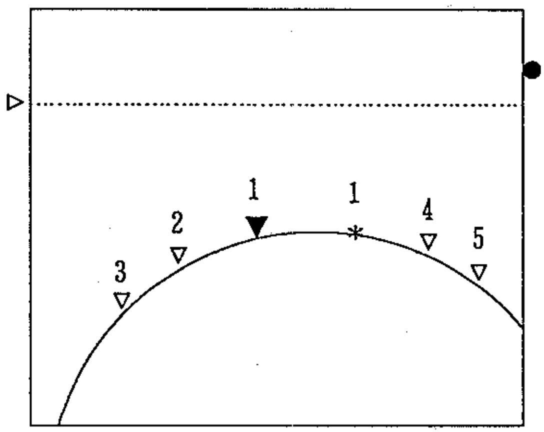
	Sets the normal delta mode (using the entry keys).
Δ REF=Δ MKR	Pressing this key issues the child marker (*) at the position of the active marker (▼) to measure the delta value in the portion specified by moving the marker. See Section 2.4-(10) for the measurement example.
Δ REF= ACT MKR	Sets the delta marker mode for the multi-marker function using the active marker. See Section 3.3.9-(a-2-1) for specifying the active marker number. For the measurement example, see Section 2.4-(9).
Δ REF= REF. POSN	Sets the delta marker mode in the portion specified by the active marker based on the reference position.
(Δ RIPPLE)	Used with ΔREF = ΔMKR or Δ REF = ACT MKR to set the ripple measurement mode. (Continued on Section 3.3.9-(a-2-3)). (This key is enabled only in the LOG MAG or DELAY display mode.)
Δ MODE OFF	Sets the delta mode OFF.
RETURN	Returns to the initial menu.
MORE 1/2	Goes to the second page of the Δ MODE MENU. (Continued on Section 3.3.9-(a-2-4).)

△REF = △MKR
The system measures the delta value between the active marker (▼) and child marker (*).

△REF = ACT MKR
The system measures the delta value between the active marker (▼) and the specified compare marker (▽ to ▽).

△REF = REF.POSN
The system measures the delta value between the active marker (▼) and the reference position.

△ MODE MENU



(a-2-1) ΔREF = ACT MKR

ΔREF=
ACT MKR

COMPARE MARKER1
COMPARE MARKER2
COMPARE MARKER3
COMPARE MARKER4
....Specifies the number of the marker to be compared with the active marker.

ACT MKR NUMBER ......Specifies the number of the active marker. Continue to [(a-2-2) of 3.3.9].

RETURN ......Returns to the second page of the menu.

MORE 1/3

COMPARE MARKER5
COMPARE MARKER6
COMPARE MARKER7
COMPARE MARKER8
...Specifies the number of the marker to be compared with the active marker.

ACT MKR NUMBER ....Specifies the number of the active marker. Continue to [(a-2-2) of 2.2.9)

RETURN .....Returns to the second page of the menu.

MORE 2/3

COMPARE MARKER9
COMPARE MARKER10
....Specifies the number of the marker to be compared with the active marker.

ACT MKR NUMBER .....Specifies the active marker number continue to [(a-2-2) of 3.3.9].

RETURN ......Returns to the second page of the menu.

MORE 3/3

(a-2-2) ACT MKR NUMBER

ACT MKR NUMBER

ACT MKR 1	······ Marker 1 is set to active marker.
ACT MKR 2	······ Marker 2 is set to active marker.
ACT MKR 3	······ Marker 3 is set to active marker.
ACT MKR 4	······ Marker 4 is set to active marker.
ACT MKR 5	······ Marker 5 is set to active marker.
RETURN	···· Returns to the menu in [3.3.9-(a-2-1)].
MORE 1/2	

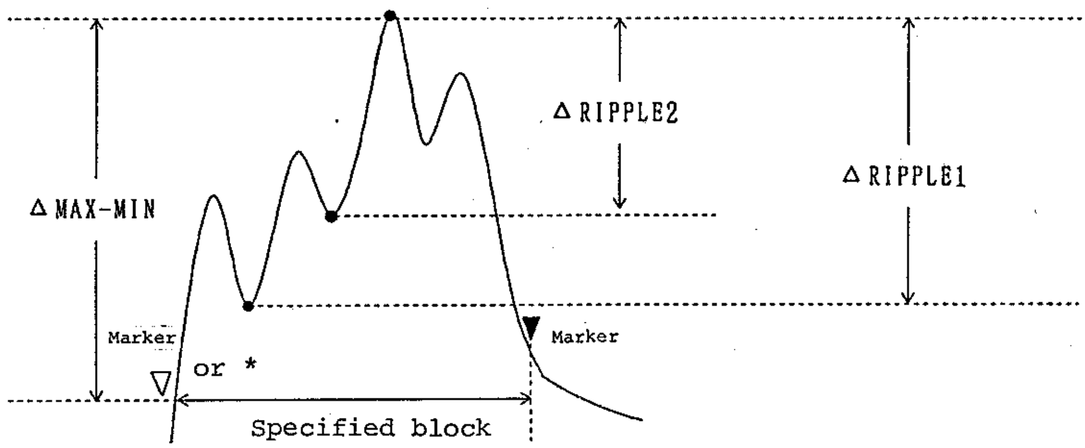
ACT MKR 6	······ Marker 6 is set to active marker.
ACT MKR 7	······ Marker 7 is set to active marker.
ACT MKR 8	······ Marker 8 is set to active marker.
ACT MKR 9	······ Marker 9 is set to active marker.
ACT MKR 10	······ Marker 10 is set to active marker.
RETURN	···· Returns to the menu in [3.3.9-(a-2-1)].
MORE 2/2	

(a-2-3) △RIPPLE

For the measurement example, see Section 2.4-(10).
To specify the target block of the delta ripple function, use the delta marker.

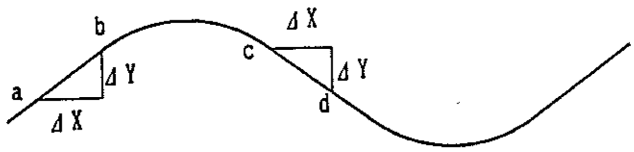
ΔRIPPLE

△RIPPLE1	Obtains the convex wave of the highest level and the concave wave of the lowest level in the specified block.
△RIPPLE2	Obtains the largest difference between a convex wave and the next concave wave.
△X △Y	Used to change the detection sensitivity in the △RIPPLE mode. See the next section for details.
△MAX-MIN	Obtains the maximum and minimum values in the specified block.
△RIPPLE OFF	Sets the △RIPPLE mode OFF.
RETURN	Returns to the second page of the menu.



- ΔX and ΔY

To obtain a ripple, first obtain the point a where the waveform gradient becomes more than ΔY/ΔX, next, obtain the point d where the waveform gradient becomes less than ΔY/ΔX, then obtain the maximum value between the two points.



This is why you can change the sensitivity of the peak detection by changing ΔX and ΔY. In the RIPPLE mode, ΔX and ΔY can be changed as follows:

For example:

Press ΔX, [ ] [3] and [MHz] . This sets ΔX to 3 MHz.
Press ΔY, [ ], [2], dB and [Hz]. This sets ΔY to 2 dB.
The initial value of ΔX is 1000000.00 Hz (0.33% of SPAN) and that of ΔY is 0.010 dB.

The range of ΔX is

$$\frac{SPAN}{1200} \leq \Delta X \leq SPAN$$

The system computes using the above conditions even when the source frequencies (CENTER, SPAN, START, STOP) have been changed.

(a-2-4) FIXED MKR (Available only in the LOG MAG mode)

See Section 2.4-(10) for the measurement example. Though the normal marker can be specified only on the measurement wave, the fixed marker can be specified not only within the measurement frequency range but also outside of the screen.

MORE 1/2

FIXED MKR POSITION	······Specifies the position of the fixed marker.
Δ REF= FIXED MKR	······When you press this key after specifying the position of the fixed marker with the FIXED MKR POSITION key, the system displays the difference between the fixed marker and active marker.
RETURN	······Returns to the first page of the menu.
MORE 2/2	······Returns to the second page of the menu.

FIXED MKR FREQUENCY	······Specifies the frequency of the fixed marker (using the entry keys).
FIXED MKR VALUE	······Specifies the value of the fixed marker (using the entry keys). Ex.: 0 dBm
FIXED.M → ACTM POSN	······Moves the active marker to the position of the fixed marker.
RETURN	

(b) Smith Chart or Polar Chart Format

In this format, the SMITH MKR or POLAR MKR menu is added.

MKR ΔMKR

- MARKER NUMBER
- MARKER ALL OFF
- ΔMORE MEMU
- MKR CMP/UNCMP
- MKR CPL/UNCPL
- PART ANAL ON/OFF

Same as the operations in the formats other than the Smith chart format.

MKR CMP/UNCMP: (Does not function at log sweep.)

- SMITH MKR MENU ...... (Sets the POLAR MKR menu in the polar chart mode.)

(In either of the following operations, the system converts the value of the active marker to the normal coordinate system and displays the converted value.)

- LIN MKR ---- Displays the linear amplitude and phase of the active marker.
- LOG MKR ---- Displays the LOG amplitude and phase of the active marker.
- Re/Im MKR ---- Displays the value of the active marker in terms of the multi-element data, real and imaginary parts.
- R+jX MKR ---- Displays the value of the active marker in terms of impedance. (The system does not display the menu in the polar format.)
- G+jX MKR ---- Displays the value of the active marker in terms of admittance. (The system does not display the menu in the polar format.)
- Z0 VALUE ---- Input characteristic impedance for system of measurement. (Can be terminated by UNIT key.)
- RETURN ---- Returns to the initial menu.

(c) When parameter conversion is ON

MORE 1/2 is added

MKR ΔMKR

MARKER NUMBER MARKER ALL OFF ΔMORE MEMU MKR CMP/UNCMP MKR CPL/UNCPL PART ANAL ON/OFF	The same as the case when parameter conversion is OFF.
MORE 1/2	

DEFAULT	Active marker default indication (Displays associated with each format. See Section 3.3.6.)
LIN MKR	Displays the linear amplitude and phase of the active marker. (Means $\|Z\|$ and $\tan^{-1} X/R$ or $\|Y\|$ and $\tan^{-1} B/G$.)
Re/Im MKR	Displays the value of the active marker in terms of the multi-element data, real and imaginary parts. (Means R and X or G and B.)
L or C ON/OFF	Switches the complex imaginary part according to the L or C value. (When default is displayed, a menu is not displayed.)
Z0 VALUE	Input characteristic impedance for system of measurement. (Terminated using the unit key)
MORE 2/2	Returns to the initial menu.

3.3.10 MKR SRCH (Marker Search)

This function is used to search the maximum value of the waveform trace, X-dB down band width, etc..

(a) LOG MAG Format

MKR SRCH

MAX SEARCH .... Searches the maximum value of the waveform trace.

MIN SEARCH .... Searches the minimum value of the waveform trace.

TARGET SEARCH .... Starts the search operation at a reference value (reference position, etc.). (Continued on Section 3.3.10-(a-1)).) (Does not function at log sweep.)

SEARCH OFF .... Sets the search function OFF.

●

TRACKING ON/OFF .... Performs the marker search operation specified for every sweep operation.

PART ANAL ON/OFF .... Performs marker search in the specified range. This key is available only when a block is specified by the delta marker. See Section 2.4-(10) for the measurement example.

MORE 1/2

NEXT MAX SEARCH .... Each time this key is pressed the next maximum value is searched sequentially. (Does not function at log sweep.)

NEXT MIN SEARCH .... Each time this key is pressed the next minimum value is searched sequentially. (Does not function at log sweep.)

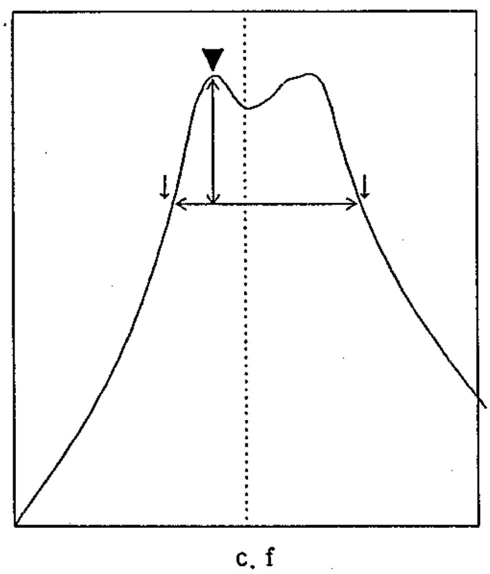
ΔX
ΔY ..... Used to change the data detection sensitivity in the NEXT MAN SEARCH or NEXT MIN SEARCH mode. The operations are the same as those in the MKR ΔMKR mode. See Section 3.3.9-(a-2-2).

MORE 2/2 .... Returns to the first page of the menu.

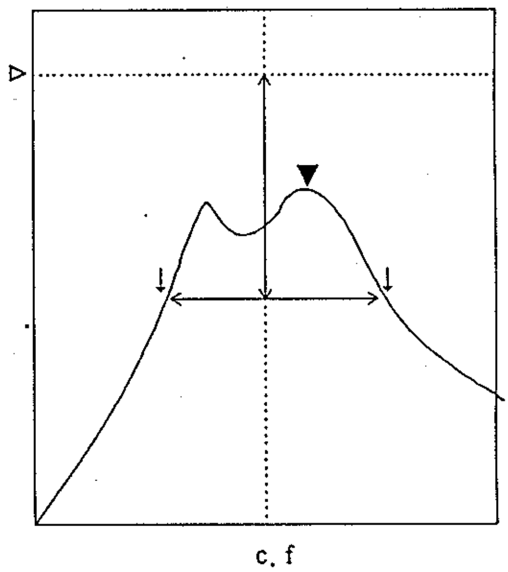
(a-1) TARGET SEARCH

See Section 2.4-(1) for the measurement example.

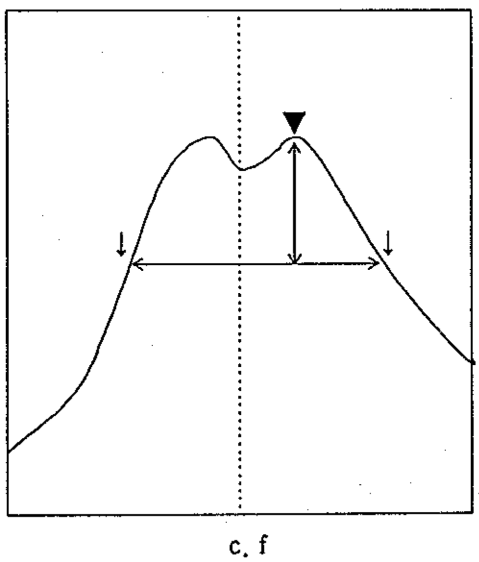
Δ REF=MAX



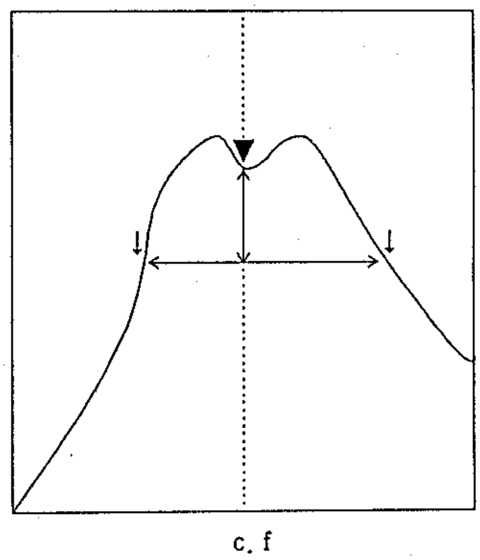
Δ REF=REF. POSN



Δ REF=MKR



Δ REF=C. F



△REF=MAX	Automatically specifies the maximum value of the waveform trace as the reference.
△REF= REF.POSN	Automatically specifies the reference position as the reference.
△REF=MKR	Specifies the selected marker as the reference.
△REF=C.F	Automatically specifies the value of the center frequency as the reference.
XdB DOWN IN/OUT	In X-dB down search: IN : The system searches the right and left portions of the marker point when REF is MAX or MKR. When △REF is REF. POS. or C.F, the system searches the right and left portions of the center frequency position. OUT: The system starts the search operation at both ends of the screen. When the delta marker is set, the system starts the search operation toward the inside of the marker point.
FLTR ANAL ON/OFF	Selects whether to compute the LEFT frequency, RIGHT frequency, center frequency, band width, Q and shape factor. When △REF is REF.POSN, Q and the shape factor disabled.
RETURN	Returns to the initial menu.

-3dB	3-dB down band width
-6dB	6-dB down band width
-60dB	60-dB down band width
-XdB	X-dB down band width (Use the entry keys.)
LEFT SEARCH	Displays the left frequency of the X-dB down band width.
RIGHT SEARCH	Displays the right frequency of the X-dB down band width.
RETURN	Returns to the initial menu.

(b) PHASE or PHASE(-∞, +∞) Format

See Section 2.4-(8) for the measurement example.

MKR SRCH

ZERO PH SEARCH	Searches the point of 0°-waveform trace phase. The system, however, does not search phase 0° accurately with a certain number of measurement points. To search phase 0° accurately, set MKR Δ MKR of MKR CMP/UNCMP to CMP.
TARGET SEARCH	Specifies the search function for a certain reference (zero phase, etc.). (Continued on Section 3.3.10-(b-1).)
SEARCH OFF	Sets the search function OFF.
TRACKING ON/OFF	Performs the marker search operation specified for every sweep operation.
PART ANAL ON/OFF	Performs marker search in the specified block. This key is available only when a block is specified by the delta marker.

(b-1) TARGET SEARCH

Δ REF= ZERO PH	········· Used to search the point of phase 0° automatically and to search $\pm X^{\circ}$ referring to the point.
Δ REF=MKR	········· Used to search $\pm X^{\circ}$ referring to the selected active marker.
RETURN	········· Returns to the initial menu.

$\pm 3^{\circ}$	········· Searches point $\pm 3^{\circ}$.
$\pm 6^{\circ}$	········· Searches point $\pm 6^{\circ}$.
$\pm X^{\circ}$	········· Searches point $\pm X^{\circ}$. (Use the entry keys.)
LEFT SEARCH	········· Displays the left frequency of $\pm X^{\circ}$.
RIGHT SEARCH	········· Displays the right frequency of $\pm X^{\circ}$.
RETURN	········· Returns to the initial menu.

3.3.11 MKR → (Marker →)

See Section 2.4-(11) for the measurement example.

This function is used to substitute the marker value for the value of another function. The menu for when only the data of the waveform trace is displayed (a) is different from that for when the data and memory are displayed (b).

(a) When only the data of the waveform trace is displayed:

MKR->

MARKER → REF. VALUE	Substitutes the value of the active marker for the reference value.
MARKER → CENTER F.	Substitutes the value of the active marker point for the center frequency.
MARKER → START F.	Substitutes the value of the active marker point for the start frequency.
MARKER → STOP F.	Substitutes the value of the active marker point for the stop frequency.
Δ MARKER→ SPAN F.	Substitutes the frequency between delta markers for the span frequency.
MARKER → CENT SCAL	Substitutes the center value on the scale and the frequency for the value of the marker which is active before this key is pressed.
MORE1/2	

AUTO ZOOM	Pressing this key starts MAX SEARCH and MARKER → CENTER F. automatically and sets the span to the value specified by AUTO ZOOM SPAN. (However, when FORMAT is not LOG MAG OR LIN MAG, the menu is not displayed.)
AUTO ZOOM SPAN	Key to enter the final span frequency to be specified.
MORE2/2	

(b) When the data and memory of the waveform trace are displayed:

MKR->

MARKER → REF. VALUE

MARKER → CENTER F.

MARKER → START F.

MARKER → STOP F.

Δ MARKER→ SPAN F.

MARKER→ CENT SCAL

...... Same as the operations for when only the data of the waveform trace is displayed. [See Section 3.3.11-(a).]

MORE 1/3

MARKER → MEMORY ...... Moves the active marker onto the memory waveform.

MARKER → DATA ...... Moves the active marker onto the data waveform.

MARKER → ALL MEM ...... Moves all markers onto the memory waveform.

MARKER → ALL DATA ...... Moves all markers onto the data waveform.

MORE 2/3

AUTO ZOOM ..... Pressing this key starts MAX SEARCH and MARKER → CENTER F, automatically and sets the span to the value specified by AUTO ZOOM SPAN. (However, when FORMAT is not LOG MAG or LIN MAG, the menu is not displayed)

AUTO ZOOM SPAN ..... Key to enter the final span frequency to be specified.

MORE 3/3

(c) For level sweep

MKR →

MARKER → REF. VALUE	The same as the cases for (a) and (b)
MARKER → CENTER L.	Substitutes the output level of the active marker point to the center output level.
MARKER → START L.	Substitutes the output level of the active marker point to the start output level.
MARKER → STOP L.	Substitutes the output level of the active marker point to the stop output level.
MARKER → SPAN L.	Substitutes the output level between delta markers to the span output level.
MARKER → CENTSCAL	The scale center value and the output level become the marker values which were active before this key was pressed.

3.3.12 AVG (Average)

Pressing the AVERAGE key enables the settings related to averaging the measurement data.

In the averaging mode, the data fetched serially is averaged in terms of time. The system adds the averaging data in terms of time sequentially according to the set count (number of times).

The R4611 uses the vector averaging system to reduce the noise level.

That is, the R4611 realizes the same effects as those brought about by narrowing the resolution band width (RBW) and allows you to perform a widely dynamic range or measurement by using RBW.

The following shows the averaging expression at each point on the frequency axes:

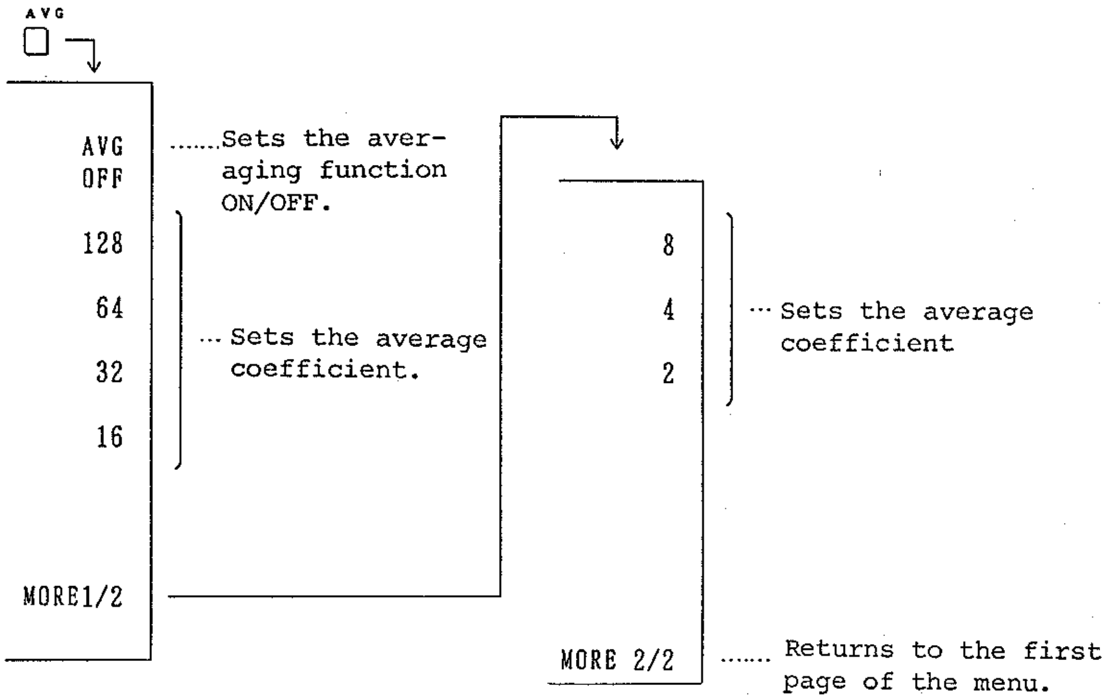
$$\overline{Y}n = \frac{n-1}{n} \cdot \overline{Y}(n-1) + \frac{1}{n} Yn \quad (n \leqq N)$$

Yn corresponds to "n"th data. $\overline{Y}n$ and $\overline{Y}(n-1)$ correspond to the "n"th and "n - 1"th averaging data.

When the averaging count reaches the specified value (N), n - 1/n is set to N - 1/N and 1/n is set to 1/N.

Hereafter, averaging with n > N is performed as follows:

$$\overline{Y}n = \frac{N-1}{N} \cdot \overline{Y}(n-1) + \frac{1}{N} Yn$$



3.3.13 CAL (Calibration)

CAL

See Section 2.4-(1) and 2.4-(7) for the measurement examples.

NORMALIZE	Excludes the frequency characteristics of the measurement system.
1 PORT FULLCAL	Enters the 1-port calibration menu. This calibration function is used to measure reflection by using the external bridge. See Section 2.4-(7) for the measurement example.
CORRECT ON/OFF	Sets NORMALIZE or 1-port calibration function ON/OFF. Before using this key, execute NORMALIZE or OPEN, SHORT, LOAD and DONE.
E.LENGTH ON/OFF	Sets the function to correct the electric length ON/OFF.
E.LENGTH VALUE	Inputs the electric length by using the entry keys. Electric length is effective to the currently set INPUT MEAS and/or the results of AVG.

1 PORT FULLCAL

OPEN	Press this key after setting the test port open. This stores the reflection characteristics in the SHORT mode to the internal memory.
SHORT	Press this key after setting the test port short. This stores the reflection characteristics in the short mode to the internal memory.
LOAD	Connect the terminator having the characteristic impedance to the test port and press this key. This stores the reflection characteristics caused by the load operation in the internal memory.
CLEAR	Clears CAL.DATA entered in advance.
DONE	Performs the internal computation of the errors according to each reflection characteristic caused by the OPEN, SHORT and LOAD operation. After this operation, CORRECT is automatically set to ON.
RETURN	Returns to the first page of the menu.

4. OTHER FUNCTIONS

This chapter explains the supplementary function to support the basic functions described in Chapter 3.

4.1 SAVE/RECALL

SAVE : Saves the conditions specified on the R4611 to the internal register or your floppy disk. The system makes the backup copy of the internal register. However, if you leave the R4611 with the power code removed for a long period, this function will not work. In this case, the data of the SAVE register is deleted and the initial setting is invalidated. At this time, execute CLEAR or SAVE.
When the R4611 power code is connected to the AC power, you can leave the R4611 for a long period.

RECALL: Recalls the data saved with the SAVE function.

NOTE

Data saved into the floppy disk have upward compatibility for the firmware on the R4611 main unit. However, the data have no compatibility for the old version firmware. File saved by any version firmware can always be loaded on the updated firmware. Normal loading cannot be guaranteed when file is loaded on the old version firmware than that the file have been generated. (It has no probability that the file is destroyed.) In this case, update the firmware version of the R4611 main unit.

4.1.1 SAVE

SAVE

SAVE REG	Saves the set conditions to the internal register. See Section 4.1.1-(1).
CLEAR REG	Clears the saved data. See Section 4.1.1-(2).
STORE	Saves waveforms, calibration, data, etc. to the floppy disk. See Section 4.1.1-(3). To use a new floppy disk, first initialize it.
PURGE	Clears the data of the data saved with STORE. See Section 4.1.1-(4).
INIT DISC	Initializes your floppy disk.

INIT ?

YES	Pressing this key displays the initialization procedure on the CRT. Perform the key operation according this procedure.
NO	Returns to the original menu without floppy initialization.

(1) SAVE REG

SAVE REG

SAVE REG 1 SAVE REG 2 SAVE REG 3 SAVE REG 4	..... Specifies the register to be saved.
NAME REG	.... Names each register. This function is useful in recognizing each piece of data to be recalled.
RETURN	.... Returns to the original menu.

NAME REG 1 NAME REG 2 NAME REG 3 NAME REG 4	..... Specifies the register to be named.
RETURN	.... Returns to the second page of the menu.

Pressing the NAME REG N ☐ key changes the software key menu as shown in the next page and prompts you to enter the "register name" by using the entry keys. On register name must be within nine characters.

NAME REG N ☐ ↓

Menu	
SELECT LETTER	..... Same as the operations of LABEL (see Section 3.3.7).
BACK SPACE	
CURSOL →	
CURSOL ←	
CLEAR NAME	
RETURN	.... Returns to the third page of the menu.

(2) CLEAR REG.

CLEAR REG

CLEAR REG 1	..... Specifies the register to be cleared.
CLEAR REG 2	
CLEAR REG 3	
CLEAR REG 4	
RETURN	.... Returns to the first page of the menu.

(3) STORE

Cautions on STORE FILE

- If you set the R4611 OFF or execute the instrument preset operation during floppy access, the files may be destroyed.
- RAW ARRAY is prior to DATA ARRAY. When you specify loading the files saved with DATA ARRAY ON and RAW ARRAY ON, the system processes the values of the RAW ARRAY and ignores those of the DATA ARRAY.
- You cannot save DATA, RAW and MEM on CHs which have been not measured by the R4611.

Key	Description
STORE FILE 1 STORE FILE 2 STORE FILE 3 STORE FILE 4	Specifies the file to be saved.
DEFINE STORE	Sets the save conditions.
NAME FILE	Names each file. This function is useful for recognizing each file to be recalled. See the next page for the entry format.
RETURN	Returns to the first page of the menu.

Key	Description
RAW ARRAY ON/OFF	Selects whether to save the data on which INPUT MEAS and AVG have been performed. Save this data with RAW ARRAY ON and you can freely change the format conversion after recall.
CORR COEF ON/OFF	Selects whether to save the collection coefficients at the 1-port calibration.
DATA ARRAY ON/OFF	Selects whether to save the measurement data after the format conversion. You, cannot however, save the marker data.
MEM ARRAY ON/OFF	Selects whether to save MEM.
RETURN	Returns to the second page of the menu.

NOTE

The formats can be changed after recall, because the RAW, COEF., DATA., MEN arrays are saved in the form of plural prime numbers. Markers cannot be saved.

NAME FILE

NAME
FILE 1

NAME
FILE 2

NAME
FILE 3

NAME
FILE 4

RETURN

SELECT
LETTER

BACK
SPACE

CURSOL
→

CURSOL
←

CLEAR
NAME

RETURN

Same as the operations of LABEL described in Section 3.3.7. Up to nine characters can be entered.

Returns to the third page of the menu.

(4) PURGE

PURGE

PURGE FILE 1 PURGE FILE 2 PURGE FILE 3 PURGE FILE 4	Specifies the file to be cleared.
MORE FILE	Displays the file names saved in files other than those displayed on the above four software key menus onto these four software key menus.
RETURN	Returns to the first page of the menu.

4.1.2 RECALL

RECALL

RECALL REG 1 RECALL REG 2 RECALL REG 3 RECALL REG 4 RECALL POWER OFF	Recalls the R4611 setting conditions saved with SAVE REG.
LOAD FILE	Recalls the waveform data stored with STORE FILE.

NOTE

MEM or CORRECTION COEFFICIENTS cannot be saved with SAVE REG. The following modes set before saving are reset to OFF when recalled.

- Data/Memo ON/OFF
- Correct ON/OFF

LOAD FILE 1 LOAD FILE 2 LOAD FILE 3 LOAD FILE 4	Specifies the file to be recalled. (Note) When you recall the file saved with RAW ARRAY ON or DATA ARRAY ON, the sweep mode is set to the HOLD mode automatically.
MORE FILE	Displays the file names saved in the files other than those displayed on the above four software key menus onto these four software key menus.
RETURN	Returns to the first page of the menu.

4.2 GPIB LOCAL

LOCAL

SYSTEM CONTROL ········ Used to set the R4611 to the system controller and to control the plotter or externally-connected device directly with the R4611.

TALKER LISTENER ········ Used to communicate with the external computer.

GPIB ADDRESS ········ Used to specify the GPIB address of the plotter in the direct plotter mode or the GPIB address of R4611 in the TALKER/LISTENER mode.

R4611 ········ Key to specify the R4611 address.
The default address is 11.

PLOTTER ········ Key to specify the plotter address.

RETURN

4.3 COPY

COPY

PLOT ....Draws the waveforms and setting conditions on the screen on to the plotter.

> When using the direct plotter, press the LOCAL key to change the TALKER LISTENER mode to the SYSTEM CONTROL mode and to set the plotter GPIB address.

PLOT

PLOTTER TYPE ....Selects whether to use the ADVANTEST-supplied plotter or HP-supplied one. (Continued on Section 4.3.1.)

SIZE & LOCATION ....Specifies the size and location of the drawing on the plotter. (Continued on Section 4.3.2.)

DEFINE PLOT ....Selects the data of the plot. (Continued on Section 4.3.3.)

CONFIG PLOT ....Specifies PEN for the plot. (Continued on Section 4.3.4.)

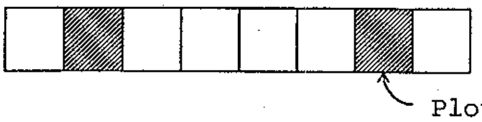
EXECUTE ....Executes the direct plotter.
(Note) After the EXECUTE key is pressed, all keys other than the ABORT key are disabled until the end of the plot operation. The measurement sweep operation is also stopped.

ABORT ....Aborts the execution.

RETURN ....Returns to the original menu.

<TALKER/LISTENER mode>

Using this mode requires an external controller.
First, press the plotter EXECUTE key manually or execute the EXECUTE operation via the external controller.
Second, set the plotter to the listener mode and the R4611 to the talker mode via the external controller, then set the GPIB ATN (attention) line to "H". This operation outputs the data to the plotter.
When the plotter output terminates, the system issues SRQ.



Plotter end

Sample program (TALKER/LISTENER mode)

PLOTTER HP series

10 OUTPUT 711;"PLTEXEC"	... Specifies the plotter output.
20 WAIT .1	... Wait (Specify Wait for one second or more.)
30 SEND 7;UNL UNT LISTEN 1	... Sets the plotter to the listener mode.
40 SEND 7;TALK 11 DATA	... Sets the R4611 to the talker mode and sets the ATN line to "H".
50 END	

4.3.1 PLOTTER TYPE

PLOTTER TYPE

AT PLOTTER	.... Selected to use the ADVANTEST-supplied plotter.
HP PLOTTER	.... Selected to use the HP-supplied plotter.
RETURN	

(1) To use the R9833 as a direct plotter by connecting it to R4611, set as follows:

<Setting R4611>

LOCAL key → SYSTEM CONTROL

PLOTTER ADDRESS ----→ 5

COPY key → PLOTTER TYPE ----→ HP PLOTTER

<Setting R9833>

Set each DIP switch to the following standard values.

Setting DIP switches

The DIP switches are used to set the initial state at power supply and the interface conditions. Figure 4-1 shows the external view of the DIP switches.

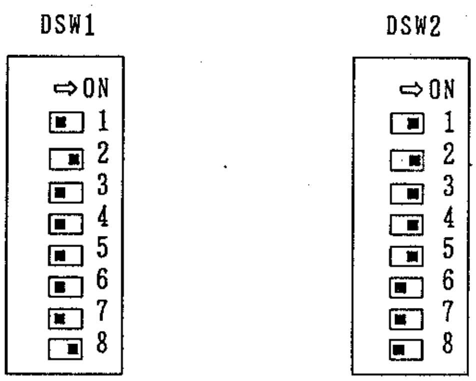


Figure 4-1 External View of DIP Switches

① DSW1

When the SW number is 8 to 1, the HP mode is specified.
When the SW number is 8 to 0, the GP-GL mode is specified. (In the AT mode, set the SW number of 8 to 0 and 4 to 1.)

② DSW2

Set the plotter address to 31 to 5.

- Table 4-1 lists the DSW1 functions and Table 4-2 lists the DSW2 functions.

Table 4-1 DSW1 Functions

<table>
<tr><th>SW number</th><th>Functions (ON = 1)</th><th>Standard value</th></tr>
<tr><td>1 to 3</td><td>Form size setting (S3 = 0) (S3 = 1)
<table>
<tr><th>S1</th><th>S2</th><th>ISO or JIS system</th><th>ANSI system</th></tr>
<tr><td>0</td><td>0</td><td>A3 width and maximum depth</td><td>B width and maximum depth</td></tr>
<tr><td>1</td><td>0</td><td>Supplements the vertical length of A3 toward your side.</td><td>Supplements the vertical length of B toward your side.</td></tr>
<tr><td>0</td><td>1</td><td>Supplements the horizontal length of A4 toward your side.</td><td>Supplements the horizontal length of A toward your side.</td></tr>
<tr><td>1</td><td>1</td><td>Supplements the vertical length of A4 toward your side.</td><td>Supplements the vertical length of A toward your side.</td></tr>
</table></td><td>S1 = 0
S2 = 1
S3 = 0
A4 horizontal</td></tr>
<tr><td>4</td><td>Rotation coordinate setting 1; Rotation coordinates is set "ON".</td><td>0</td></tr>
<tr><td>5</td><td>Unit length selection of step count 0; Standard 1; Switch</td><td>0</td></tr>
<tr><td>6</td><td>Paper-end function disable 0; Paper-end function is provided.
1; Paper-end function is not provided.</td><td>0</td></tr>
<tr><td>7</td><td>Input buffer size switch 1; Maximum value (12 KB)
0; 1 KB</td><td>0</td></tr>
<tr><td>8</td><td>Selection of FP-GL-I/FP-GL-II 1; FP-GL-I 0; FP-GL-II</td><td>1</td></tr>
</table>

Table 4-2 DSW2 Functions

SW number	Functions (ON = 1)	Standard value
1 to 5	Plotter address setting. These switches are used to define the device address by using all bits as follows: Bit configuration | S5 | S4 | S3 | S2 | S1 | Address 31 specifies the listen-only mode.	S1 = 1 S2 = 1 S3 = 1 S4 = 1 S5 = 1
6	EOI signal control selection 0; EOI disable 1; EOI enable This switch is available only when FP-GL-II is used. The switch is not defined when FP-GL-I is used.	0
7	Undefined.	0
8	Shrinking plot mode selection (available only for FP-GL-II) 1; Selects the shrinking plot mode (0.9 times).	0

When the EOI signal is set to 1 (enable) and "L" is received at the EOI terminal in the FP-GL-II mode, plotter operates in the same way as for a terminator reception. When sending data from the plotter, the system outputs the "LF" code at the end of the sending data and sets the EOI terminal to "L" at the same time. When the shrinking plot mode is selected with FP-GL-II used, the system plots the output figure of 0.9 times as large as the original one referring to the Global origin. At that time, the actual size of the effective plot range is not changed and the specifiable range has been enlarged only on the program.

(2) Connecting R4611 to TR9832(G)

To use the TR9832(G) as a direct plotter by connecting it to R4611, set as follows:

<Setting R4611>

LOCAL key → SYSTEM CONTROL

PLOTTER ADDRESS → 5

COPY → PLOTTER TYPE → HP PLOTTER

<Setting TR9832(G)>

Set the switch to 8, A, C or E.

- Setting bottom digital rotary switch

  To set the following functions to the initial state, use the digital rotary switch (see the following figure) in the acrylic cover on the bottom of TR9832:
  If you do not set this switch as specified, you cannot get the correct plot. Before using the TR9832, check the following table.

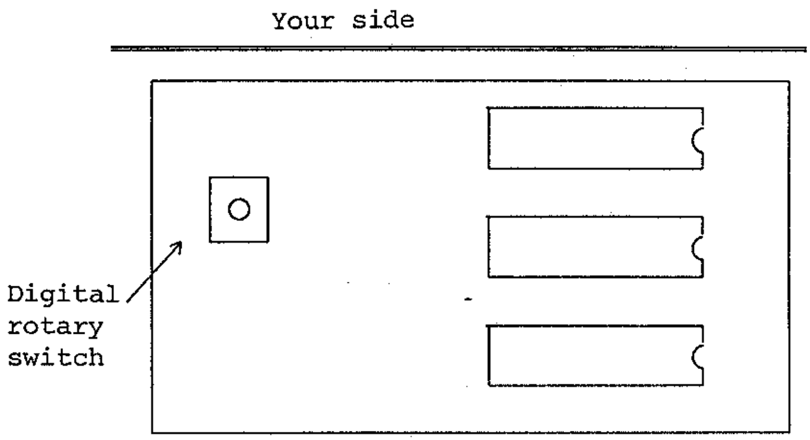
Setting for R4611 to TR9832 Connection

Function \ Switch setting	5	7	8	A	C	E
Character form fine		o		o		o
Plot area shrinking	o	o			-	-
HP-GL specification			o	o	o	o
Command system	GP-GL		HP-GL			

o: Valid function

-: Invalid function

Note: Refer to the TR9832 instruction manual (page 15) for details.



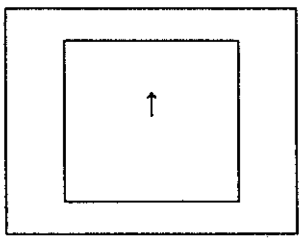
Inside of Bottom Acrylic Case

4.3.2 SIZE & LOCATION

SIZE & LOCATION

1 PICTURE	.... Draws one plot on the A4-size form. (Continued on Section 4.3.2-(1).)
2 PICTURE	.... Draws two plots on the A4-size form. (Continued on Section 4.3.2-(2).)
4 PICTURE	.... Draws four plots on the A4-size form. (Continued on Section 4.3.2-(3).)
EXECUTE	.... Executes the direct plotter.
ABORT	.... Resets the execution.
RETURN	.... Returns to the initial menu.

(1) 1 PICTURE



(A4-size form)

(2) 2 PICTURE

2 PICTURE

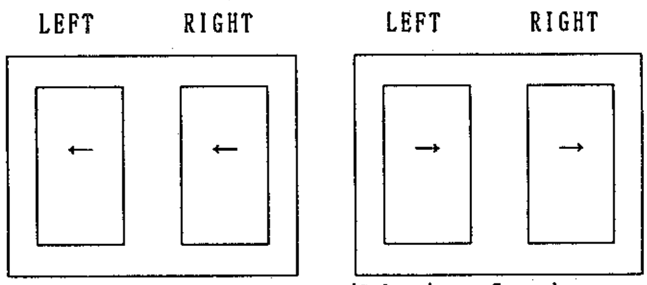
LEFT

RIGHT

EXECUTE

ABORT

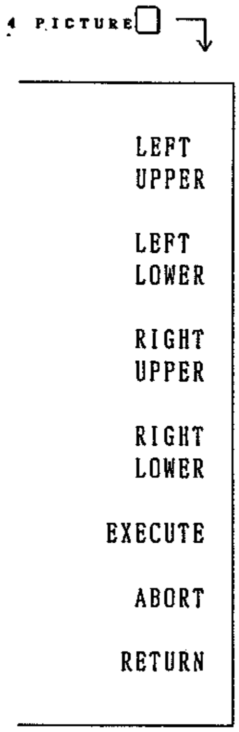
RETURN

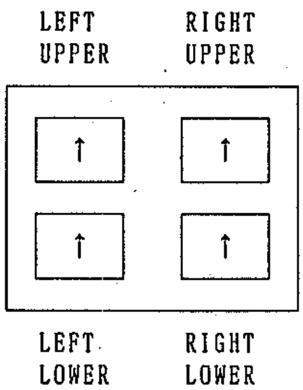


(A4-size form)
with HP-GL command
specified

(A4-size form)
with GP-GL command
specified

(3) 4 PICTURE





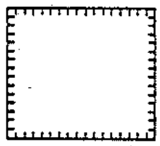
(A4-size form)

4.3.3 DEFINE PLOT

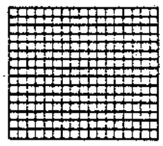
DEFINE PLOT .... (Key to select the data of the plot. The default values of the following items are all ON.)

Key	Function
DATA ON/OFF	Sets the plot of the measurement DATA waveform data ON/OFF.
MEMORY ON/OFF	Sets the plot of the memory waveform data ON/OFF.
MARKER ON/OFF	Sets the marker symbol ON/OFF.
SCALE ON/OFF	Sets the scale display mode ON/OFF.
GRATICULE ON/OFF	Sets the check display mode ON/OFF. Effective only when graticule is indicated in the screen.
RETURN	Returns to the initial menu.
MORE1/2	

<Scale>



<Graticule>



Key	Function
REFLINE ON/OFF	Sets the reference line ON/OFF. Effective only when reference line is indicated in the screen.
TEXT ALL ON/OFF	Sets the characters of the setting conditions ON/OFF.
LABEL ON/OFF	Sets the label ON/OFF.
RETURN	Returns to the initial menu.
MORE2/2	Returns to the first page of the menu.

4.3.4 CONFIG PLOT

CONFIG PLOT

CH1 DATA PEN No.	..........Pen to specify the characters related to the CH1 DATA waveform, CH1 REF LINE and CH1 and the CH1 marker.
CH1 MEM PEN No.	..........Pen to specify the CH1 memory waveform.
CH2 DATA PEN No.	..........Pen to specify the characters related to the CH2 DATA waveform, CH2 REF LINE and CH2 and the CH2 marker.
CH2 MEM PEN No.	..........Pen to specify the CH2 memory waveform.
SCALE PEN No.	..........Pen to specify the scale.
LABEL PEN No.	..........Pen to specify the label.
RETURN	..........Returns to the initial menu.

You can specify the pen of the plotter. This pen value must be within 1 and 15. The following table lists the default value of each setting:

CH1 DATA PEN	CH1 MEM PEN	CH2 DATA PEN	CH2 MEM PEN	SCALE PEN	LABEL PEN
1	3	2	4	5	6

4.4 Parallel I/O Functions

The parallel I/O functions are executed by using the 8-bit I/O (input/output) ports to communicate with the handler and peripheral devices.

The communication is performed with the parallel I/O connector on the rear panel. Figure 4-5 shows the internal pin assignment of the connector. To control these I/O ports, refer to the R4611 programming manual (Section 5.5).

4.4.1 8-bit Input

To read signals sent from the handler and peripheral devices, use the "ENTER" statement.

Operating ENTER statement

```
ENTER 32;3
```

This entry fetches the data when DI0 and DI1 of pins 14 and 15 are set to "1".

4.4.2 8-bit Output

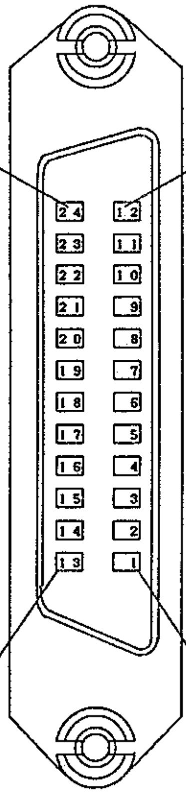
To output signals to the handler and peripheral devices, use the "OUTPUT" statement.

Operating OUTPUT statement

```
OUTPUT 32;2
```

This entry sets DO1 of pin 3 to "1".

Signal name	Pin No.
GND	24
	23
	22
DI 7	21
DI 6	20
DI 5	19
DI 4	18
DI 3	17
DI 2	16
DI 1	15
DI 0	14
GND	13



Pin No.	Signal name
12	GND
11	
10	
9	DO 7
8	DO 6
7	DO 5
6	DO 4
5	DO 3
4	DO 2
3	DO 1
2	DO 0
1	GND

DO 7 to D 0 : Output (DO 7 is MSB and DO 0 is LSB.)
DI 7 to DI 0: Input (SI 7 is MSB and DI 0 is LSB.)

Notes: DO 7 to DO 0 correspond to the output equivalent to the TTL 74LS series (including 100 Ω protection resistance).
DI 7 to DI 0 correspond to the input equivalent to the TTL 74LS series (including 10 kΩ pull-up resistance).

Figure 4-2 Connector Internal Pin Assignment and Signals

4.5 RS-232C

Besides the GPIB interface, the R4611 is provided with the RS-232C interface as standard. Thus, the R4611 permits outputting the data communication with host CPUs and pattern programs to the RS-232C printer.

The RS-232C interface features the mechanical and electrical characteristics of the interface between the data terminals and data communication units standardized by the Electric Industry Association in the United States (EIA). For details, refer to the specifications of EIA.

4.5.1 Connector and Signal List

(1) Connector: 25-pin D-subconnector (male type)

Signal list

Pin No.	Signal	Meaning
1	FG	Safety ground
2	TxD	Sending data
3	RxD	Receiving data
4	RTS	Sending request
5	CTS	Sending enable
6	DSR	Data set ready
7	SG	Signal ground
20	DTR	Data terminal ready

TxD, RTS and DTR are sent at SN75188N (power supply $\pm$12 V), and RxD, CTS and DSR are received at SN75189AN.

4.5.2 Printer Output

This section describes the data output to the RS-232C printer.

You can print data by using the R4611 in both the LPRINT format and the LLIST format.

LLIST : Outputs the basic program to the printer.
LPRINT: Outputs the data of the characteristics, numerals and variables.

Recommended device type
Device supplied by EPSON Co., Ltd.

- Printer
  FP-80 series or equivalent one

- Interface
  8148 (intelligent serial interface)

4.6 Functions Keys

The function keys on the left side of the R4611 display are used to execute the previously created programs.

These keys are allocated as follows. The function caused by pressing each key varies with the specified mode:

In the editor mode, the keys are all invalidated.

	[Measurement screen]	[Command line]	[Program execution]
1 RUN	RUN	RUN	ON KEY1 (Note 1)
2 CAT	Not function.	CAT	ON KEY2
3 LIST	Not function.	LIST	ON KEY3
4 CONT	CONT	CONT	ON KEY4
5 LOAD	Not function.	LOAD (Note 2)	ON KEY5
6 CLS	Not function.	CLS	ON KEY6
STOP	STOP	STOP	STOP

Note 1: An interruption occurs when this key is pressed during program execution. You can number each interruption from 1 to 6 and the specified interruption number corresponds to the key number and the number of the BASIC command "ON KEY". (Refer to the R4611 programming manual (Section 4.4).)
During program execution, function keys "F1" to "F6" have the same functions as software keys "1" to "6".

Note 2: Executing LOAD requires selecting a filename. To do this, use the rotary encoder, shift (↑ ↓), UNIT deg keys.
(The next page shows the LOAD examples.)
CAT can list up the menu of all files saved in a floppy disk.
LOAD can function only for the BASIC type file.
To recall the setting data, depress RECALL key.
(LOAD examples are shown as follows.)

<LOAD examples>

(1) Pressing keys 2 and CAT displays all files in the disk.

```
[COMMAD]  < ················ >   ( ? )    Done

<<   Entry File        Secto        Byte Group  >>

 1. ABC2_30              4          1820 BASIC
 2. TRIANGL              5          2086 BASIC
 3. RUNNING_TEST         1           294 BASIC
 4. PAGING               1           126 BASIC
 5. ASCII                1           232 BASIC
 6. FILE_1              22         10952 SYSTEM

▶
```

(2) Pressing keys 5 and LOAD changes the screen as follows:

```
[COMMAD]  < ················ >   ( ? )    Done
Entry ⇨  1

▶  LOAD "ABC2_30"
```

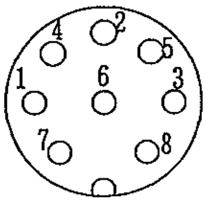
The number on the upper left corresponds to the number displayed on the left of the screen by using the "CAT" command. Use it to select a file. Display the file to be loaded by using the rotary encoder and press the UNIT deg key. This starts the LOAD operation.

Rotary encoder and shift keys (↑ ↓) ... Used to select files.
UNIT deg key ... Used to start the LOAD operation.

4.7 Video Plotter Output

You can output the waveforms on the screen to the video plotter by using the video output on the R4611 rear panel.

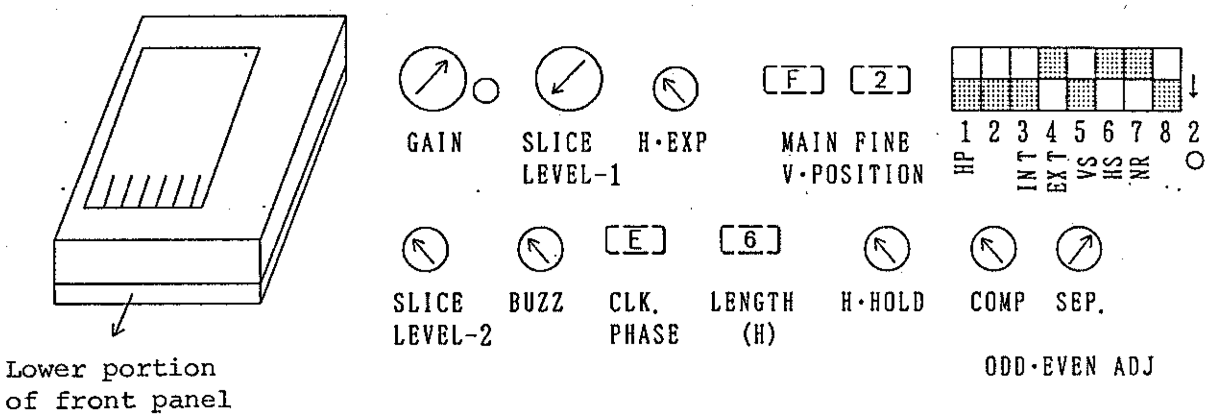
To connect R4611 to the video plotter, use the cable exclusively. The video plotter output uses separate signals. The pin numbers and signals of the connector (8-pin DIN connector) are as follows:



Pin No.	Signal
1	V SYNC (Positive)
2	
3	EXT CLOCK (IGM)
4	SEPARATE VIDEO (Positive)
5	
6	GND
7	HSYNC (Positive)
8	

The recommended video plotter is VP-45 (supplied by SEIKO Co., Ltd.)
The following shows how to set each switch and volume used with VP-45:

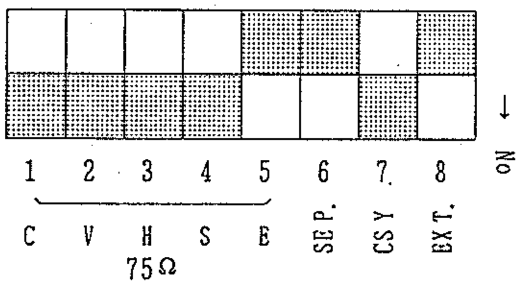
<Setting on lower portion of front panel>



NOTE

> To set SLICE LEVEL-2, CLK PHASE and SEP, perform minor adjustment for each product to be used.

<Setting DIP Switches on Rear Panel>



4.8 Special Functions (f)

The special function keys are used for seldom used debug function, switching ON/OFF of marker point count display and others.

f

MKR POINT ON / OFF

Selects the display or no display of the number of active marker points in the active area.
When this switch is turned on, the active marker position is shown in the active area by using the number of points in the active marker or delta marker display mode. (In the compensate mode, the number of points for 1201 is shown.)

- Display in active area

<MKR POINT OFF>

```
MARKER 1
 150 000 000.00Hz
-10.000dB
```

<MKR POINT ON>

```
MARKER 1
 150 000 000.00Hz    ( 150 )
-10.000dB
```

DEBUG MODE

Checks the R4611 system operation.
(For maintenance only)

5. INSPECTION AND MAINTENANCE

5.1 Inspection and Brief Diagnosis

If any problem occurs on the R4611, verify the following inspection items before requesting repairs: When problems cannot be solved despite the inspection, contact our sales division nearest your place of business. The addresses and telephone numbers of the sales divisions are listed at the end of this manual. We will charge for actions with respect to problems associated with the following inspection items:

Table 5-1 Inspection Items

Condition	Cause	Action taken
R4611 cannot be powered. (The LED on the panel does not come on or the fan motor does not rotate.)	The power cable has not been completely inserted into the connector.	Disconnect the power supply and re-insert the power cable.
	Disconnection of the power fuse	Exchange the power fuse.
Though the LED on the panel lights, the data such as the scale characters is not displayed on the screen.	The display intensity has been set too low.	DISPLAY, MORE2/3 □, INTENSITY □, ⇧ ..... Adjust the intensity by pressing these keys.
The normal waveform does not appear.	The selected input is different from that used for the measurement.	Correct the input to the selected level and re-start the measurement.
All keys are disabled.	The GPIB remote control mode has been set.	Stop the program execution and press the LOCAL key.

5.2 R4611 Storage and Transportation

5.2.1 Storing the R4611

The R4611 must be stored at temperatures between -20°C to +60°C. When the R4611 will not be used for a long period, wrap it with a plastic cover or store it in the carbon box and keep it in a dry location not exposed to direct sunshine.

5.2.2 Cleaning CRT Display Filter

Regularly clean the filter protecting the CRT display with a soft cloth soaked in alcohol. Do not soak the cloth with a liquid other than alcohol.

5.2.3 Cleaning CRT Display

Clean the surface of the CRT display filter. If there is any soil inside the filter or on the surface of the CRT display, remove the bezel, using the following procedure, and clean with a soft cloth soaked in alcohol:

① Remove the belt cover with a standard-type screw driver.

② Remove two screws on the bezel.

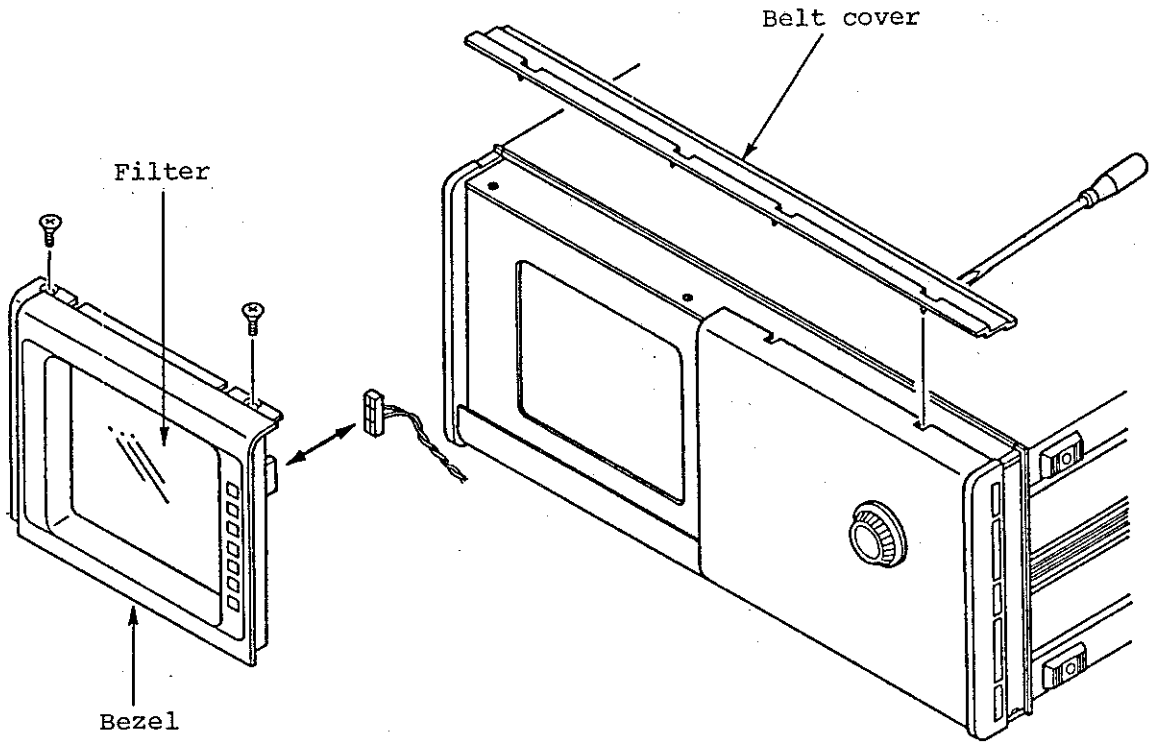


Figure 5-1 Removing CRT Filter

NOTE

To conserve and clean this unit, do not use a solvent that degenerate prastics (ex. organic solvent such as benzene, toluene, and acetone).

5.2.4 Transporting R4611

To transport the R4611, use the packing material which came with the unit or the equivalent. If you have lost the material, use a carbon box 5-mm or more in thickness. After wrapping the R4611 in cushioning material, store it in the box and fasten the box with the packing rope.

Insert the yellow floppy disk into the floppy disk drive.

Otherwise, the floppy disk drive may be damaged because of vibration.

6. PERFORMANCE

- Measure functions

Ratio of amplitude	:	A/R, B/R, A/B (dB, linear ratio)
Phase	:	θ (deg)
Group delay time	:	τ
Absolute amplitude	:	R, A, B, (V, dBm)

(Signal source)

- Frequency

Range	:	10 Hz to 300 MHz
Resolution	:	10 MHz
Accuracy	:	$\pm 5 \times 10^{-7}$/week, $\pm 2 \times 10^{-6}/0^{\circ}C$ to $40^{\circ}C$

- Output level

Range	:	+20.0 dBm to -64.9 dBm
Resolution	:	0.1 dB
Accuracy	:	±1.0 dB (at 0 dBm, 10 MHz) Add whichever is higher, +0.02 dB/dB or 0.2 dB
Flatness:	:	1.5 dBp-p (-40 dBm or more) 2.0 dBp-p (-40 dBm or less)
Output impedance	:	50 Ω Return loss; 20 dB or more (at +10 dBm or less) 13 dB or more (at +10.1 dBm or less)

- Signal purity

High-frequency strain	:	≦-30 dB or less (at +15 dBm or less)
Non-high frequency spurious	:	Whichever is higher, <-35 dBc or -70 dBm (at<150 MHz,≦+15 dBm) Whichever is higher, <-30 dBc or -70 dBm (at≧150 MHz,≦+15 dBm)
Phase noise	:	< -75 dBc/Hz (10 kHz offset)

- Sweep functions

Sweep parameter	:	Frequency, Signal level
Maximum sweep range	:	Frequency; 10 Hz to 300 MHz
	:	Signal level; -64.9 dBm to +20 dBm (But, frequency of more than 10 kHz is fixed)
Range setting	:	Start/stop or center/span
Sweep type	:	Sweep of linear and variable parts (only amplitude sweep)
Sweep trigger	:	Repeat, single, manual, EXT
Sweep mode	:	Dual and alternate sweeps of 2 ch
Sweep rate	:	1 ms/1 point

Number of measuring point:
3, 6, 11, 21, 51, 101, 201, 301, 601, 1201 points
(Up to 601 points for indication)

- Output type
  - Output : Single, dual type (an internal splitter is used for dual type)
  - Connector : 50 Ω, BNC
  - Internal power splitter:
    - Insertion loss; 6 dB
    - Output tracking; < 0.1 dB, <1° (≧-49.9 dBm)
      - < 0.2 dB, <1° (≦-50.0 dBm)
    - Equivalent output SWR; <1.1

(Analyzer)

- Input characteristics
  - Input terminal : 3 channels (Rch, Ach, Bch)
  - Input impedance : 50 Ω, 1 MΩ/20PF or less
    - Return loss; 25 dB or more
    - Connector; 50 Ω, BNC
  - Maximum input level :

	Attenuator 0 dB	Attenuator 20 dB
50 Ω 1 MΩ	-20 dBm 22.4 mV	0 dBm 224 mV

  - Input breakdown level : 50 Ω; +23 dBm or 0 V d.c.
    - 1 MΩ; 3 V rms or 0 V d.c.
  - Cross-talk : 95 dB or more (during input)
  - Resolution bandwidth : 1 kHz to 10 Hz (Variable at 1 and 3 steps)
  - Noise floor :

Resolution bandwidth	Minimum frequency	Attenuator 0 dB (Maximum input level: -20 dBm)		Attenuator 20 dB (Maximum input level: -20 dBm)	
		Minimum frequency	30 kHz to 300 MHz	Minimum frequency	30 kHz to 300 MHz
10 Hz	100 Hz	-115 dBm	-130 dBm	-95 dBm	-110 dBm
100 Hz	500 Hz	-110 dBm	-125 dBm	-90 dBm	-105 dBm
1 kHz	5 kHz	-100 dBm	-115 dBm	-80 dBm	-95 dBm

Automatic offset correction:

Normalize function; Removal of frequency characteristic in measurement system
Electrical length correction; Equivalent electric length or delay time can be added to measured phase and group delay time.
Range; -3×10^8 m to $+3 \times 10^8$ m or +1 s to -1 s

- Amplitude characteristic

Measuring range	:	Absolute amplitude; ATT = 0 dB	-20 dBm to -130 dBm
		ATT = 20 dB	0 dBm to -110 dBm
		Amplitude ratio; 0 ±130 dBm	
Amplitude resolution	:	0.001 dB	

Accuracy

(At 10 MHz, 25°C ±5°C, and maximum input level)
Absolute value measurement (R, A, B); ±0.5 dB
Specific measurement (A/R, B/R, A/B; ±0.5 dB

Frequency response : When 50 Ω impedance is input
Absolute value measurement (R, A, B)
50 Ω input; 1 dBpp (10 Hz to 100 MHz)
2 dBpp (100 MHz to 300 MHz)
1M Ω input; 1.5 dBpp (10 Hz to 100 MHz)

Specific measurement (A/R, B/R, A/B):
(When damping quantity is the same)
50 Ω input; 0.5 dBpp (10 Hz to 100 MHz)
1.5 dBpp (100 MHz to 300 MHz)
1 MΩ input; 1.0 dBpp (10 Hz to 100 MHz)

Dynamic accuracy :

0 to -10 dB	±0.04 dB
-10 to -50 dB	±0.02 dB
-50 to -60 dB	±0.05 dB
-60 to -70 dB	±0.15 dB
-70 to -80 dB	±0.40 dB
-80 to -90 dB	±0.80 dB

- Phase characteristic

Specific measurement : Effective for (A/R, B/R A/B)
Measuring range : ±180o (Long display function enables continuous display.)
Phase resolution : 0.01o
Accuracy : ±2° (At 10 MHz, 25°C + 5°C, and maximum input level)
Frequency response : (When damping quantity is the same)
50 Ω input; 5° pp (10 Hz to 100 MHz)
15° pp (100 MHz to 300 MHz)
1 MΩ input; 10° pp (10 Hz to 100 MHz)

Dynamic accuracy	:	0 to −10 dB ±0.4°
		−10 to −50 dB ±0.2°
		−50 to −60 dB ±0.5°
		−60 to −70 dB ±1.5°
		−70 to −80 dB ±4.0°
		−80 to −90 dB ±8.0°

- Characteristic of group delay time (effective for linear frequency sweep, specific measurement, and 50 Ω input)

Range : Solved by the following expression

$$\tau = \frac{\Delta\phi}{360 \times \Delta f}$$

$\Delta\phi$ Phase
Δf Aperture frequency (Hz)

Measuring range : 1 ps to 250 s
Group delay time resolution:
1 ps

Aperture frequency : Equivalent to Δf, and can be set from 100/(SWEEP POINT-1) x 2% to 100% of frequency span with resolution of 100/(SWEEP POINTT-1) x 2%.

Accuracy : $\dfrac{\text{Phase accuracy}}{360 \times \text{aperture frequency (Hz)}}$

(Display)

- Display

CRT : 7-inch monochromatic raster scan system
Resolution : 800 x 512 dots
Display mode : Right-angle log, linear coordinate, polar coordinate, Smith chart (Z, Y)

- Display control

CRT format : Double display of single and 2 channels, enlarged scale display, 2 channel separate display
Measuring condition display:
Display of Start/stop, center/span, scale/DIV, standard level, marker value, soft key function, warning message, etc.
Label : Up to 45 characters can be input.
Brightness : CRT brightness can be adjusted

(Others)

- Marker function

Correction marker	: Two modes, displaying data at measured frequency points to read a marker point and displaying values solved with interpolation at proper frequency.
Multiple marker	: 10 markers independent of channels respectively.
Marker track	: Marker search operates track function each sweep.
Marker couple	: Channel markers can be set as both combined or independent types.
Designated block analysis:	Enables marker search of blocks specified by a Δ marker.
Target research	: Enables searches of bandwidth at KdB DOWN point, solution of Q, phase zero degree, and ± X degree.
MKT →	: MKR → reference value, MKR → START, MKR → STOP, MKR → CENTER, MKR → SPAN
MKR search	: MAX search, MIN search, NEXT MAX search
MKR/ΔMKR	: Solution of Δ marker mode, ripple value

- System function

- Error corrective function

Normalize	: Correction of frequency response (both amplitude and phase) for transmission measurement.
1 port calibration	: Correction of bridge direction for measuring reflection, frequency response, and errors by source match. Correction of error requires short, open, and load.
Data averaging	: Data (vector value) is averaged every sweep. An averaging factor can be set, ranging from 2 to 128.

- Instrument state function

Save/recall	: Using a save key, the system settings can be stored in a floppy disk. Stored settings can be recalled using a recall key. Settings contain setting conditions, limit lines, and indication label. With the help of power-off saving function, the system is set to state directly before power-off when the power is on.
Data save/data recall	: Using a standard floppy disk, several kinds of data (RAM data and CAL data) can be stored.

- Connection to external equipment

COPY	:	Using GPIB, a compatible digital plotter and printer, printouts such as graphic hard copy and a data list can be output from the main unit without an external controller.
Output signal for a video plotter:		Separate signal
GPIB data output remote control		
8 bit input/output	:	TTL level
RS232C	:	Serial output conforms to RS232C

- Programming function

Built-in BASIC controller function:		With built-in controller function, this main unit and other instrumentation equipped with the GPIB interface function can be controlled by the program prepared using the main unit.
Built-in FDD function	:	Disk capacity; 1M byte (for unformat) ; 750K bytes (for format) Type of media; 3.5 inch double-side double-density
Built-in function	:	Maximum value (response); MAX (Starting point, end point, measuring channel) Maximum value (frequency); FMAX (Starting point, end point, measuring channel) Minimum value (response); MIN (Starting point, end point, measuring channel) Minimum value (frequency); FMIN (Starting point, end point, measuring channel) Bandwidth; BND (Specified measured value, specified damping quantity) Cut-off frequency (low limit value); BNDL (Specified measured value, specified damping quantity) Cut-off frequency (high limit value); BNDH (Specified measured value, specified damping quantity) Ripple 1; RPL 1 (Starting point, and point, differential coefficient X differential coefficient Y, measuring channel) Ripple 2; RPL 2 (Starting point, and point, differential coefficient X differential coefficient Y, measuring channel)

Ripple 3; RPL 3 (Starting point, and point, differential coefficient X differential coefficient Y, measuring channel)
Maximum value (N, response value); VRPLHN (N maximum value specification, measuring channel)
Maximum value (N, frequency value); FRPLHN (N maximum value specification, measuring channel)
Minimum value (N, response value); VRPLLN (N maximum value specification, measuring channel)
Minimum value (N, frequency value); FPPLLN (N maximum value specification, measuring channel)
Limit test 1; LMTUL 1 (Uninspected data, upper limit value, lower limit value)
Limit test 2; LMTUL 2 (Uninspected data, upper limit value, lower limit value)
Measuring point; POINT 1 (Specified measuring point, measuring channel)
Measuring response value; VALUE (Specified frequency, measuring channel)
Corrective measuring response value; CVALUE (Specified measuring point, measuring channel)

- General specification

External trigger	:	BNC, TTL level, LOW enable
External reference frequency input:		
		Frequency; 1, 2, 5, 10 MHz
		Connector; BNC
		Input level range; 0 to 20 dBm
Reference frequency output:		
		Frequency; 10 MHz 0 dBm or more
		Connector; BNC
Using range	:	FDD in use; +5°C to 40°C, 85% or less
		FDD unused; 0°C to 40°C, 85% or less
Storing range	:	-20°C to 60°C
Power	:	100, 120, 220, 240 V $\pm$10%
		48 Hz to 66 Hz
		330 VA or less
Outside dimension	:	About 424 (W) x 220 (H) x 500 (D) mm
Weight	:	About 30 kg or less

7. EXPLANATION OF OPERATION

Figure 7-1 shows the outline of R4611 block diagram.

<Source>

10 Hz to 300 MHz output signals synthesized, 400.25 MHz to 780.25 MHz synthesizer and 480.25 MHz fixed oscillator output signals are output from OUTPUT 1 or OUTPUT 2.

<Receiver>

Input signals at 10 Hz to 300 MHz are converted to 1st IF signal at 250 MHz with a 1st mixer, and are output to a 2nd mixer. The 1st IF signal is converted to a 2nd IF signal at 10 kHz with the 2nd mixer, and is output to S/H & A/D circuits. Data converted into A/D is processed under high speed in DSP, and is synthesized to a video signal in a display circuit, then is displayed on the CRT.

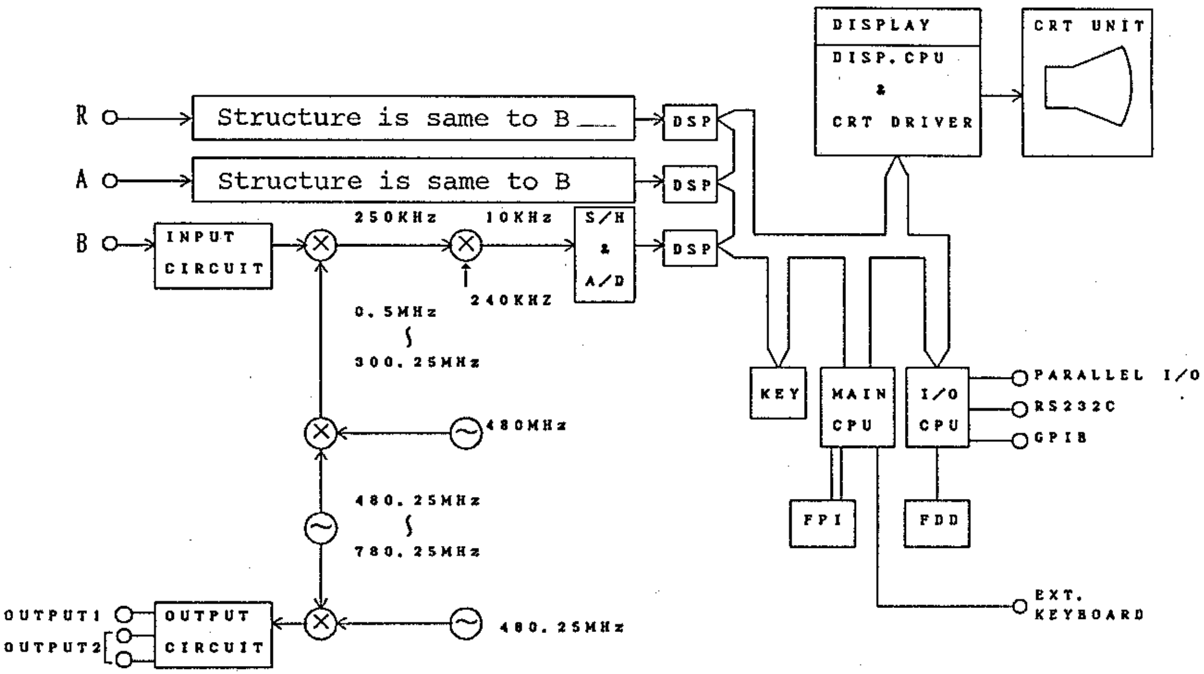
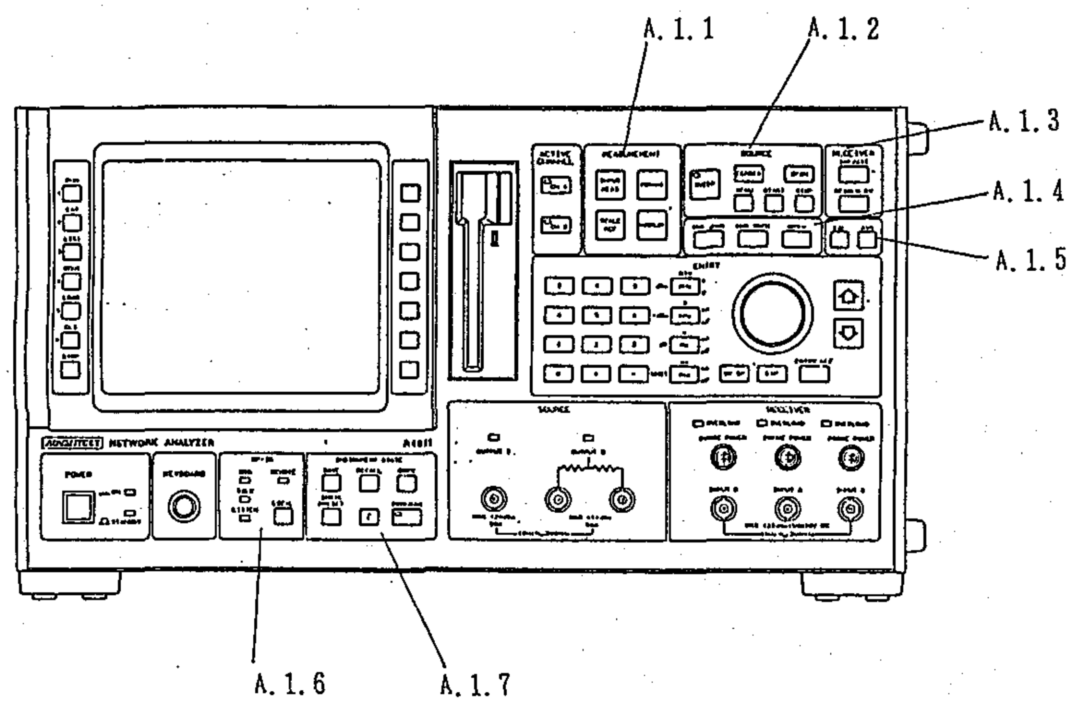


Figure 7-1 Outline of R4611 Block Diagram

APPENDIX

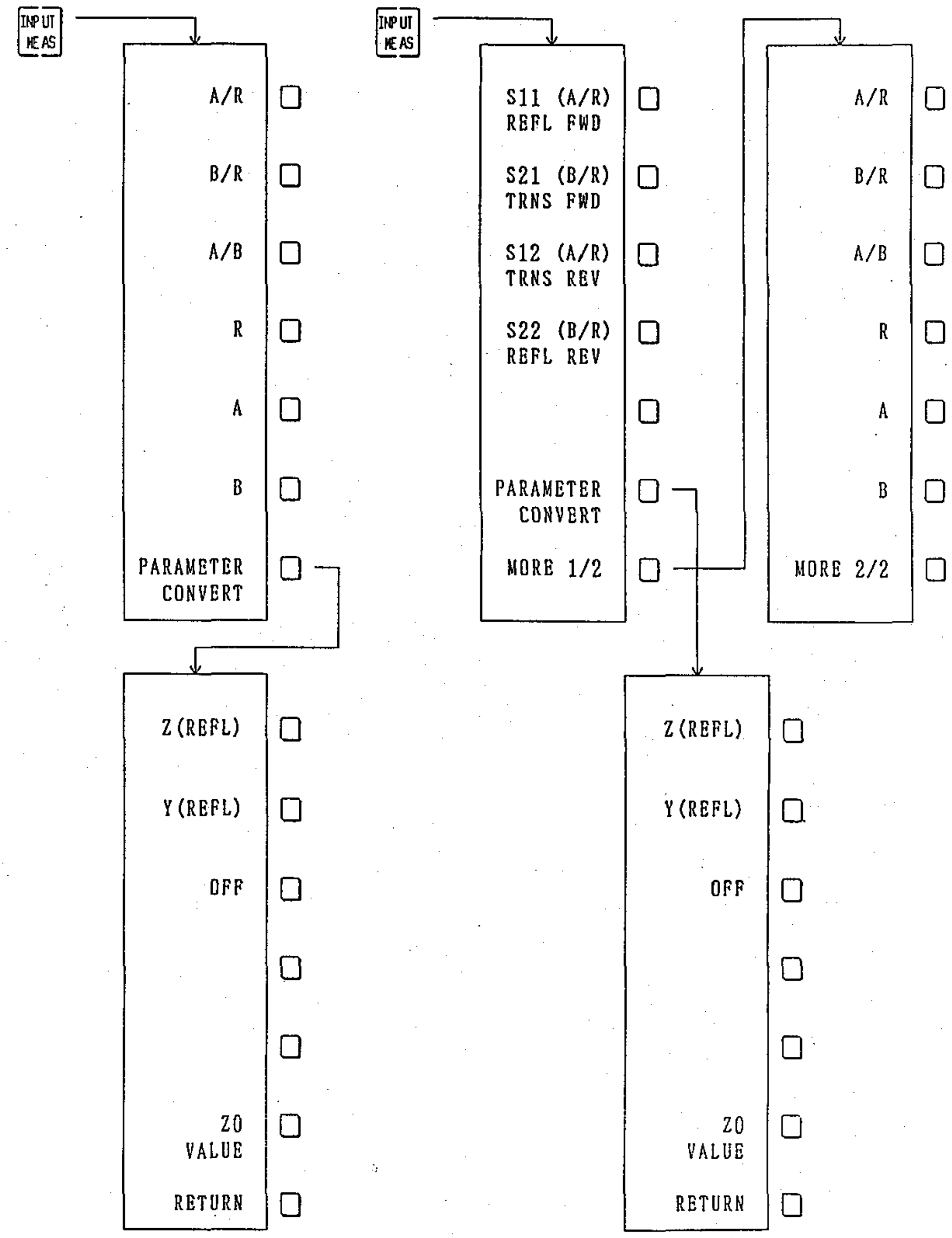
A.1 Soft Key Menus



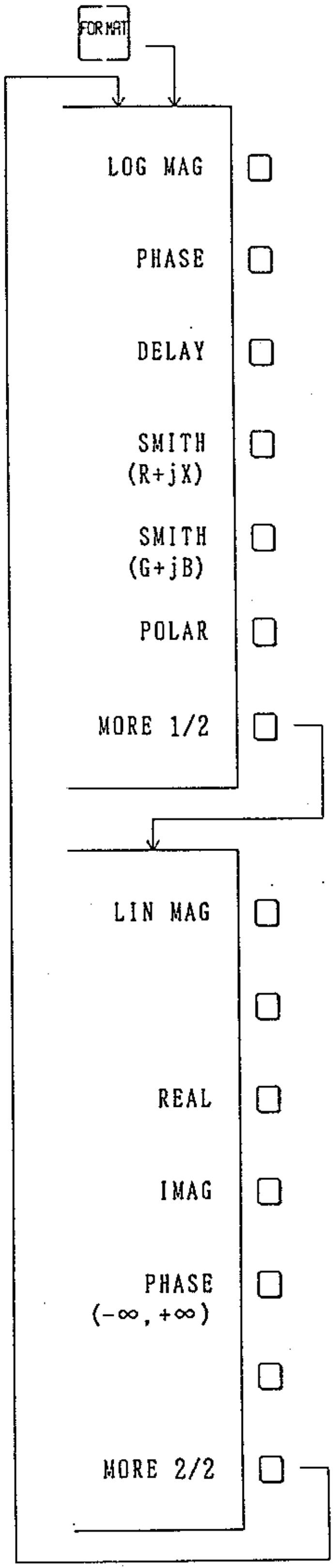
A.1.1 MEASUREMENT

(1) INPUT MEAS

- Standard R4611
- R4611 with S-parameter

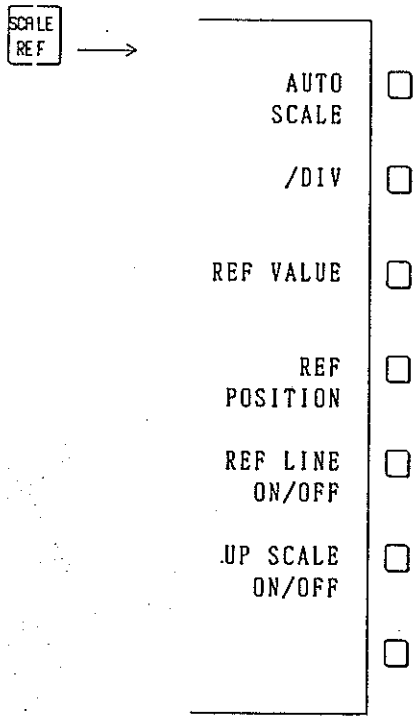


(2) FORMAT

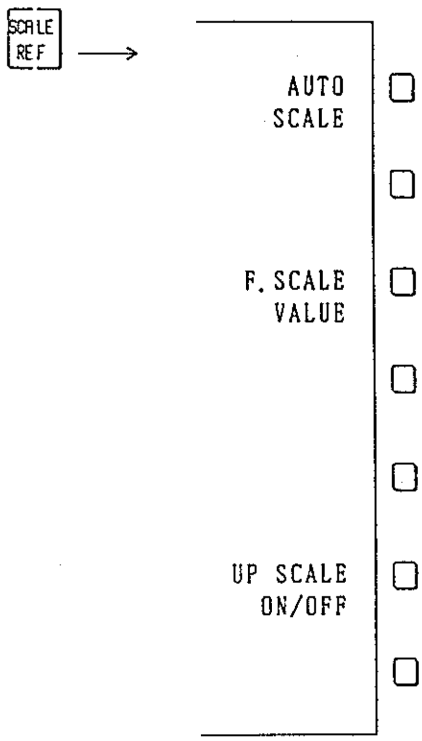

FORMAT
LOG MAG
PHASE
DELAY
SMITH (R+jX)
SMITH (G+jB)
POLAR
MORE 1/2
LIN MAG
REAL
IMAG
PHASE (-∞, +∞)
MORE 2/2

(3) SCALE REF

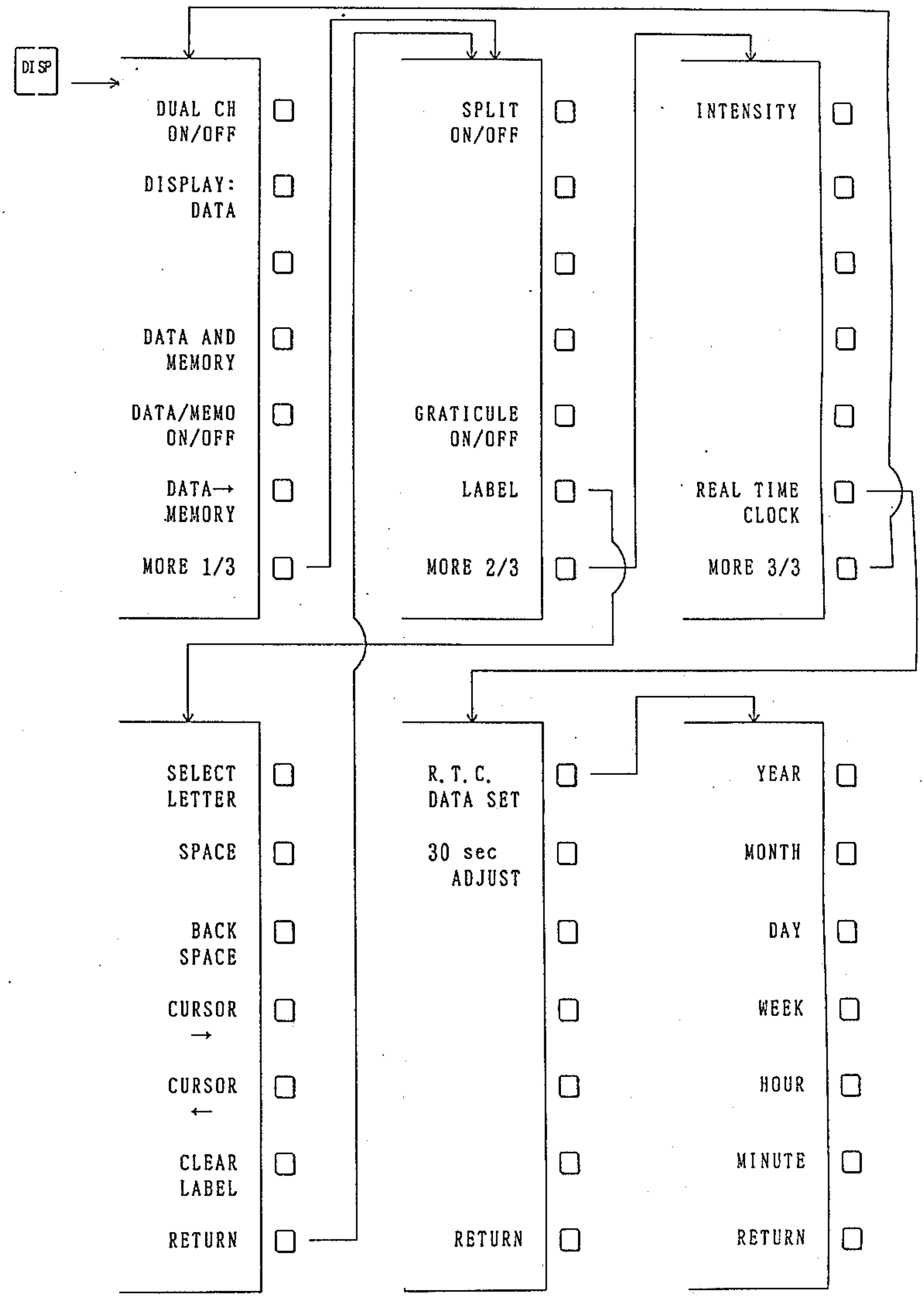
- When FORMAT is LOG MAG, PHASE, or DELAY:



- When FORMAT is SMITH or ROLAR:

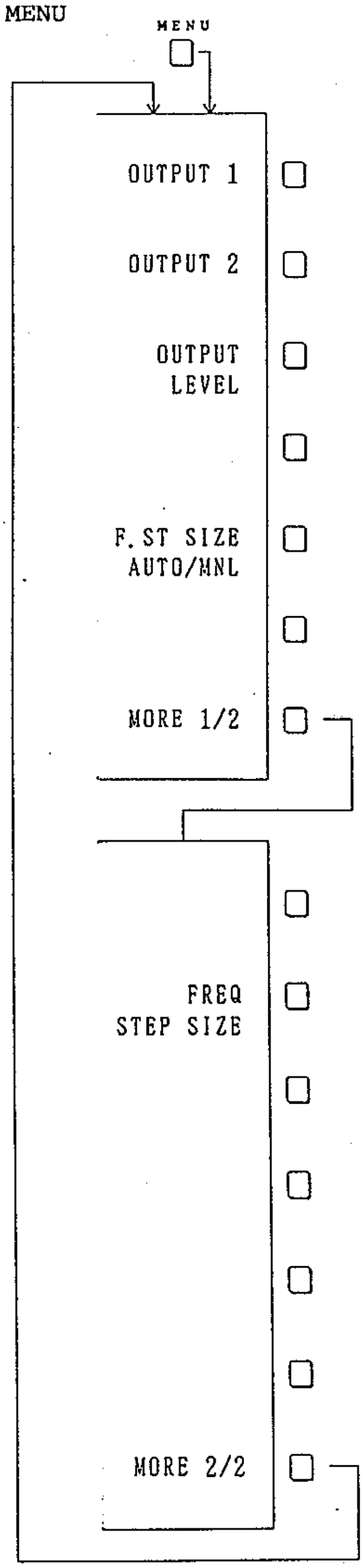


(4) DISP

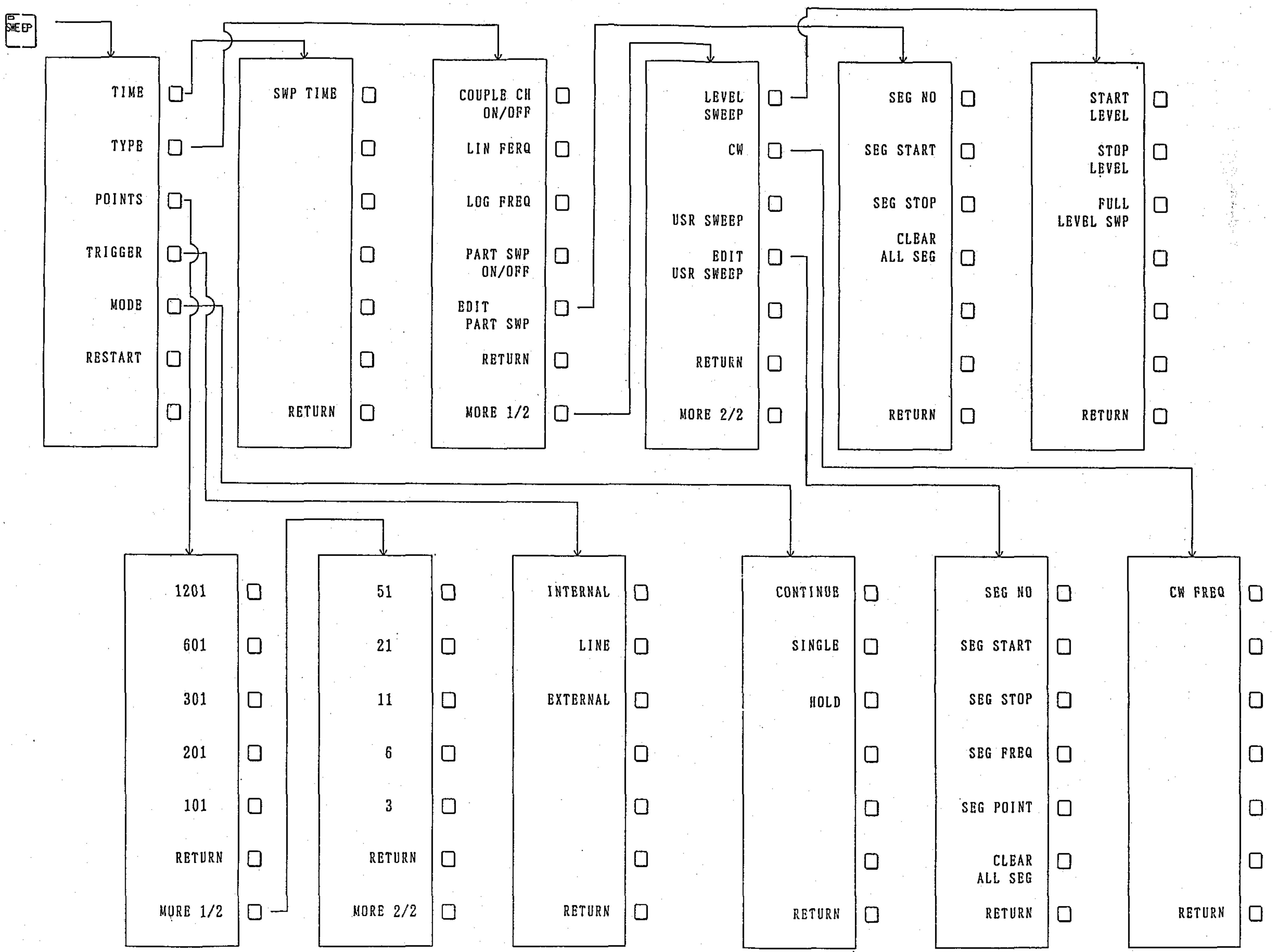

DISP
DUAL CH ON/OFF
DISPLAY: DATA
DATA AND MEMORY
DATA/MEMO ON/OFF
DATA→ MEMORY
MORE 1/3
SPLIT ON/OFF
GRATICULE ON/OFF
LABEL
MORE 2/3
INTENSITY
REAL TIME CLOCK
MORE 3/3
SELECT LETTER
SPACE
BACK SPACE
CURSOR →
CURSOR ←
CLEAR LABEL
RETURN
R. T. C. DATA SET
30 sec ADJUST
RETURN
YEAR
MONTH
DAY
WEEK
HOUR
MINUTE
RETURN

A.1.2 SOURCE

(1) MENU

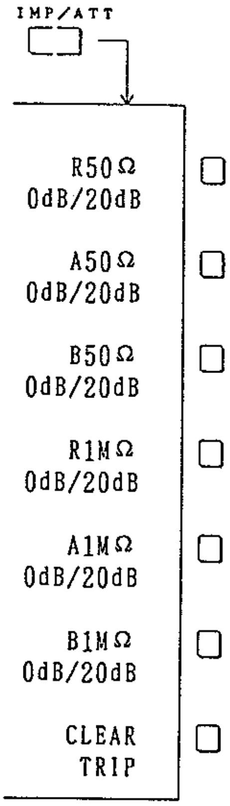


(2) SWEEP

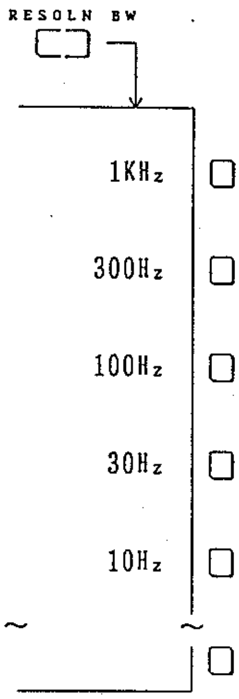

SWEEP
TIME
TYPE
POINTS
TRIGGER
MODE
RESTART
SWP TIME
RETURN
COUPLE CH ON/OFF
LIN FERQ
LOG FREQ
PART SWP ON/OFF
EDIT PART SWP
RETURN
MORE 1/2
LEVEL SWEEP
CW
USR SWEEP
EDIT USR SWEEP
RETURN
MORE 2/2
SEG NO
SEG START
SEG STOP
CLEAR ALL SEG
RETURN
START LEVEL
STOP LEVEL
FULL LEVEL SWP
RETURN
1201
601
301
201
101
RETURN
MORE 1/2
51
21
11
6
3
RETURN
MORE 2/2
INTERNAL
LINE
EXTERNAL
RETURN
CONTINUE
SINGLE
HOLD
RETURN
SEG NO
SEG START
SEG STOP
SEG FREQ
SEG POINT
CLEAR ALL SEG
RETURN
CW FREQ
RETURN

A.1.3 RECEIVER

(1) IMP/ATT



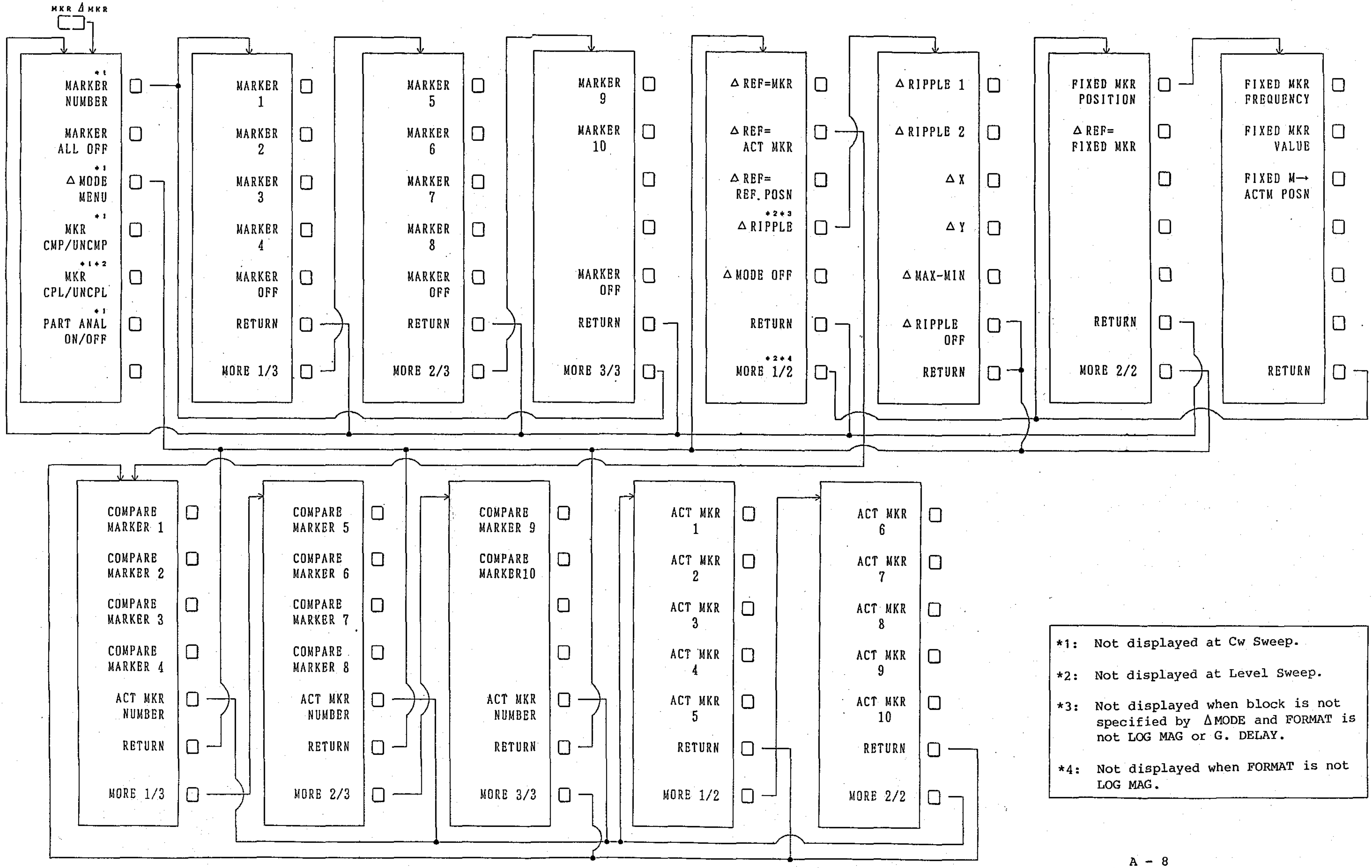
(2) RESOLN BW



A.1.4 MARKER

(1) MKR ΔMKR

- When FORMAT is not SMITH or POLAR:



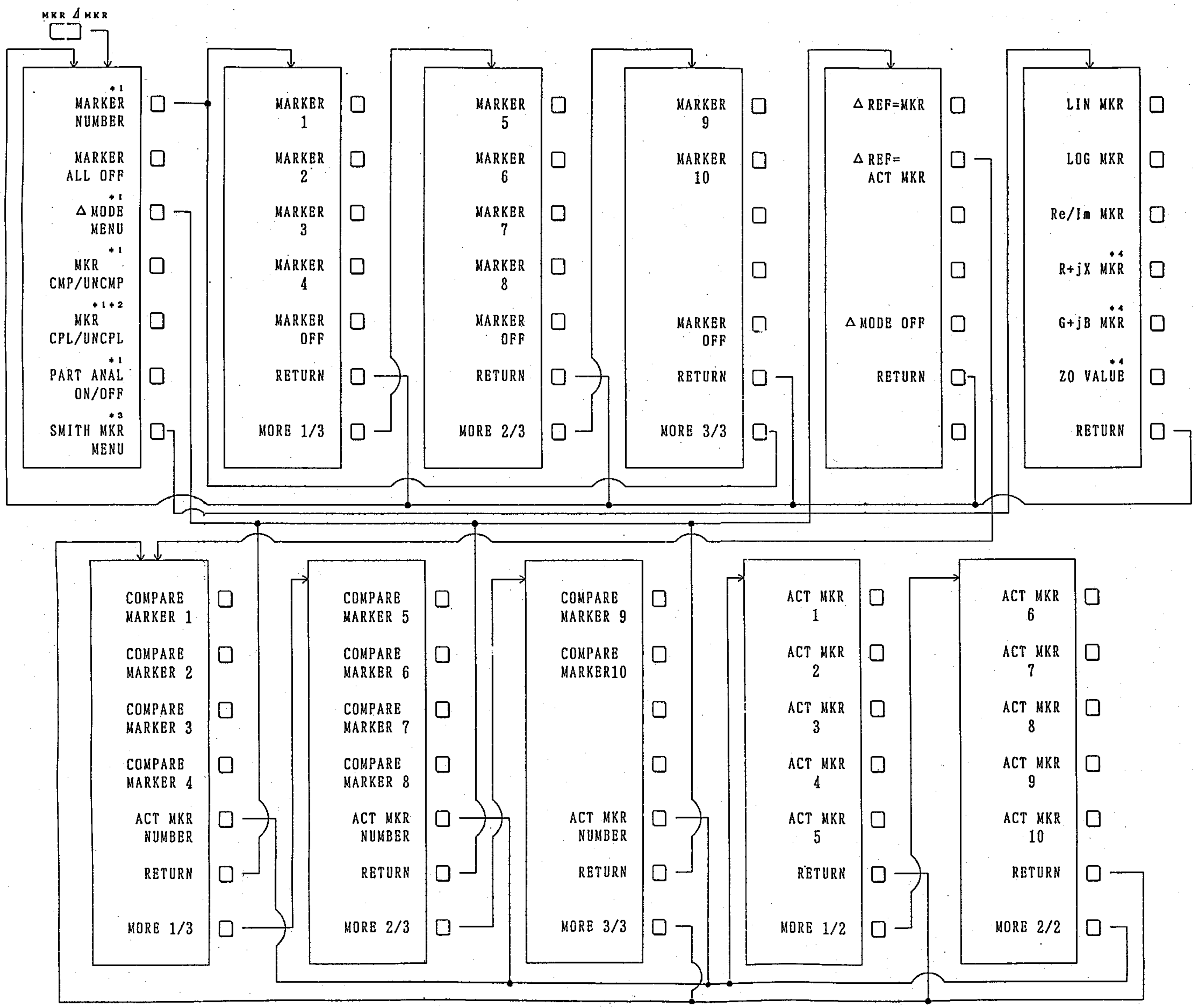
*1: Not displayed at Cw Sweep.

*2: Not displayed at Level Sweep.

*3: Not displayed when block is not specified by ΔMODE and FORMAT is not LOG MAG or G. DELAY.

*4: Not displayed when FORMAT is not LOG MAG.

• When FORMAT is SMITH or POLAR:



*1: Not displayed at Cw Sweep.

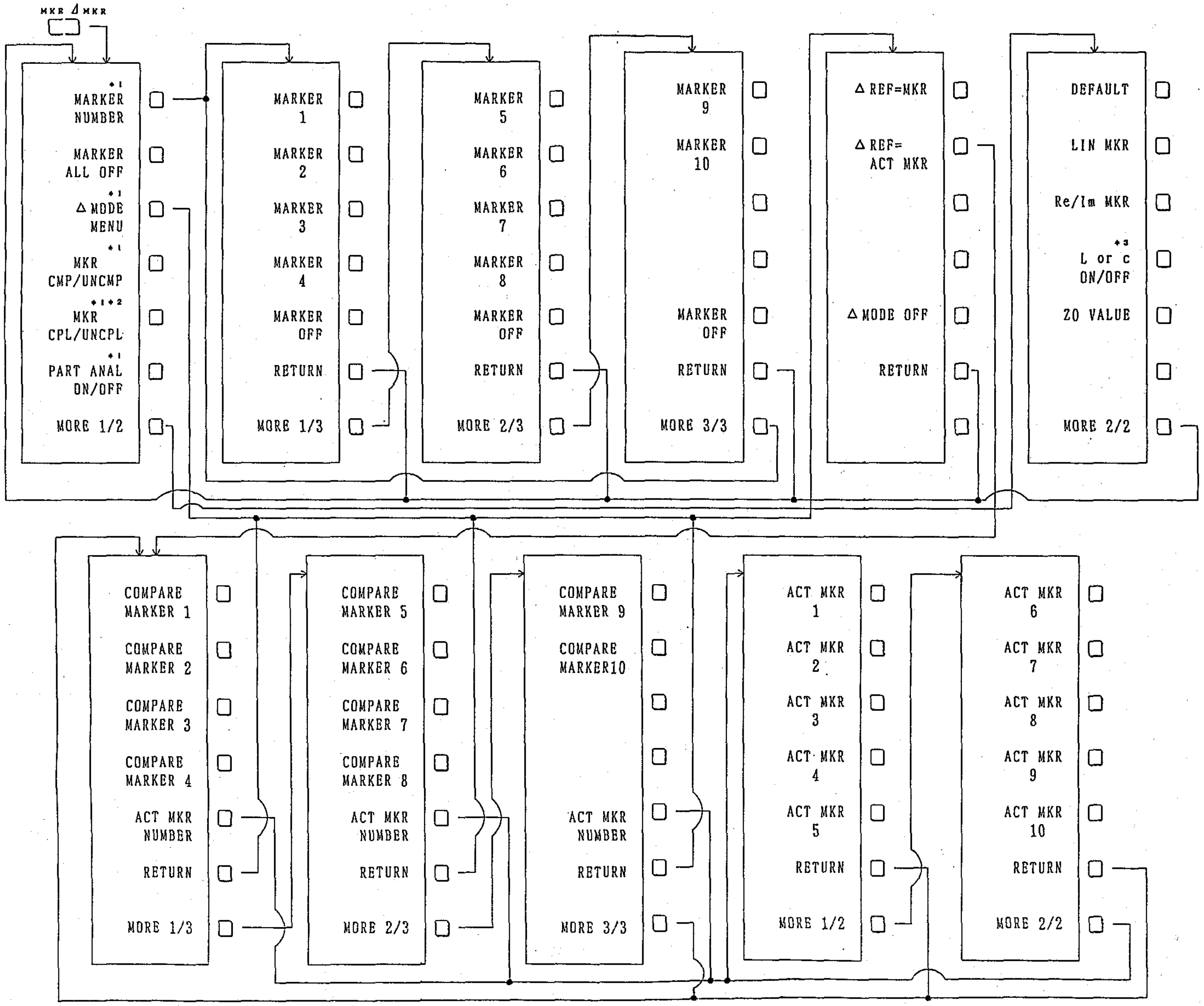
*2: Not displayed at Level Sweep.

*3: When FORMAT is SMITH, SMITH MKR MENU is displayed.

When FORMAT is POLAR, POLAR MKR MENU is displayed.

*4: Not displayed when FORMAT is POLAR.

• When parameter or conversion is ON:



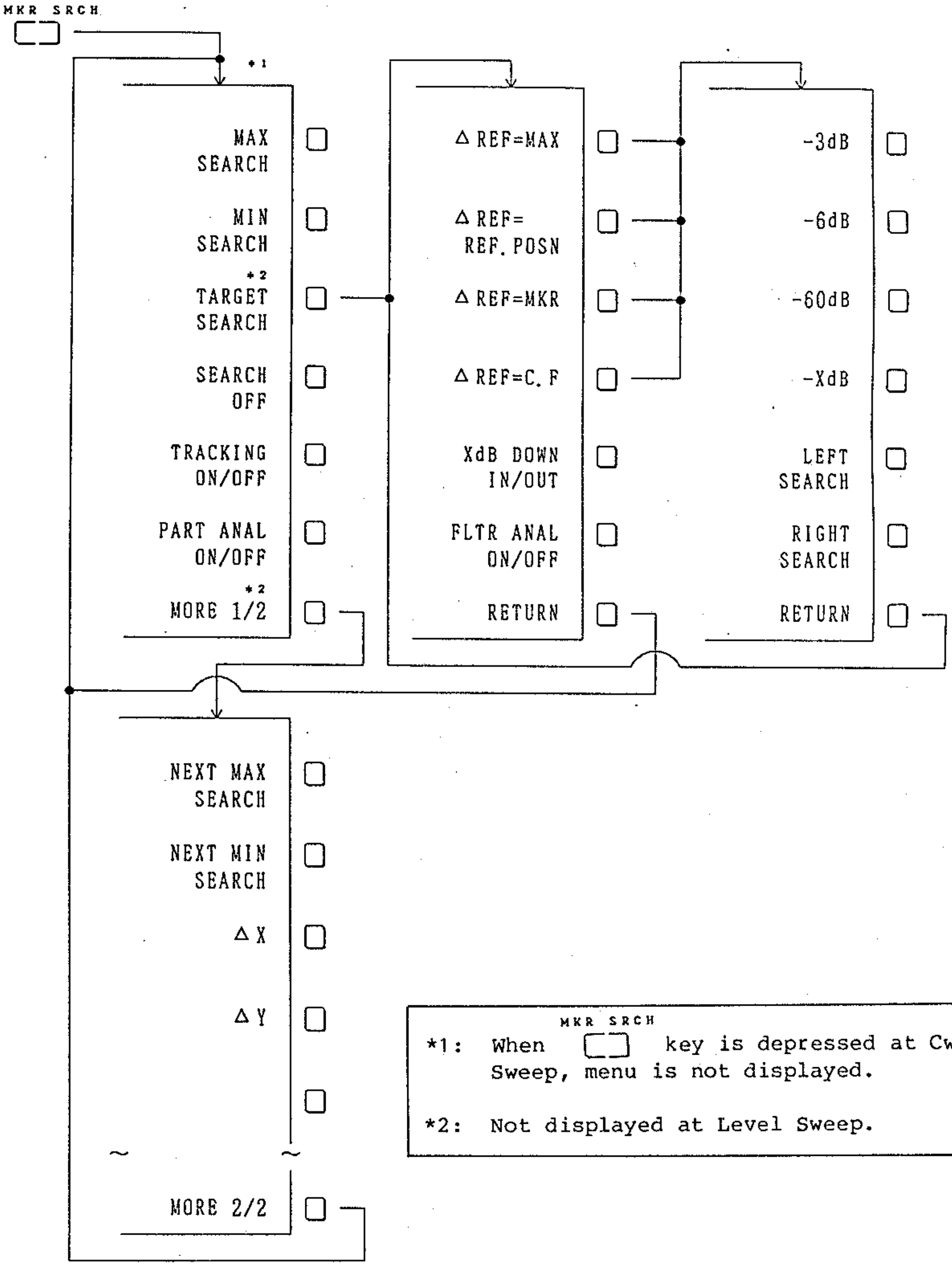
*1: Not displayed at Cw Sweep.

*2: Not displayed at Level Sweep.

*3: Not displayed at DEFAULT.

(2) MKR SRCH

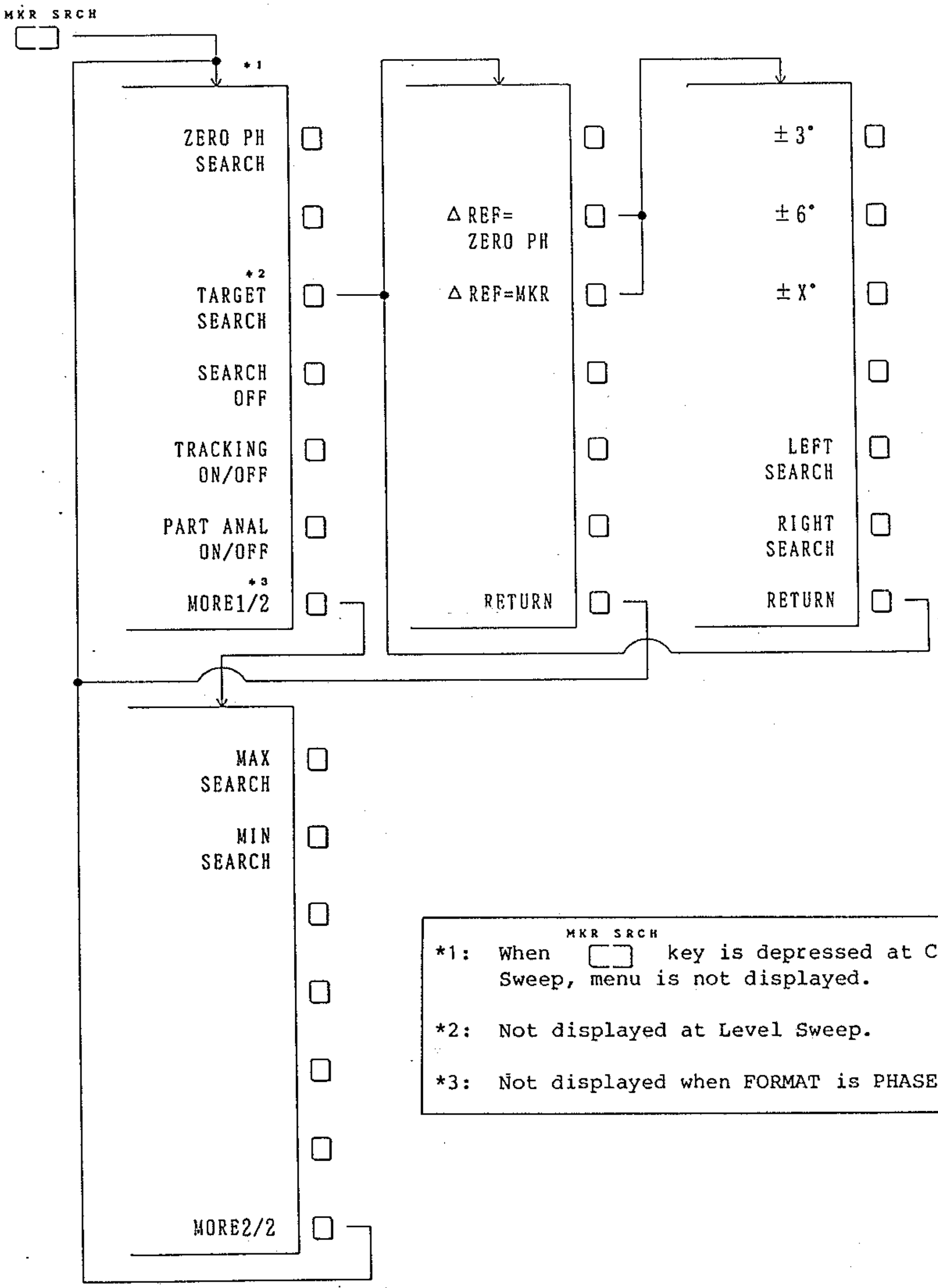
- When FORMAT is LOG MAG:



*1: When MKR SRCH key is depressed at Cw Sweep, menu is not displayed.

*2: Not displayed at Level Sweep.

● When FORMAT is PHASE or PHASE(−∞, +∞):

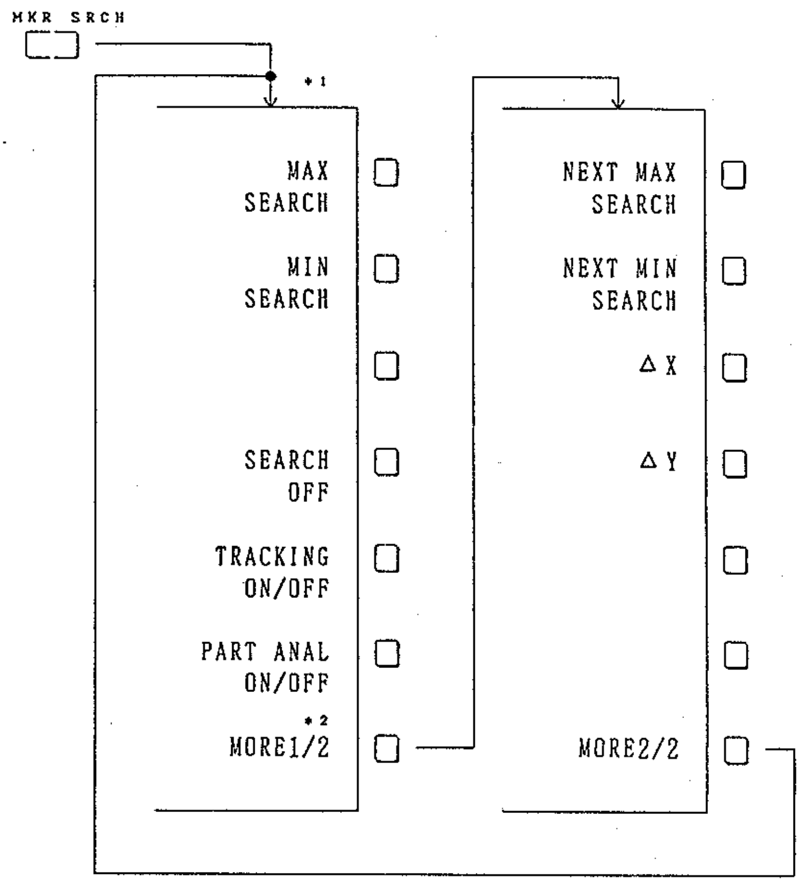


*1: When MKR SRCH key is depressed at Cw Sweep, menu is not displayed.

*2: Not displayed at Level Sweep.

*3: Not displayed when FORMAT is PHASE.

- When FORMAT is not LOG MAG, PHASE, or PHASE(−∞, +∞):

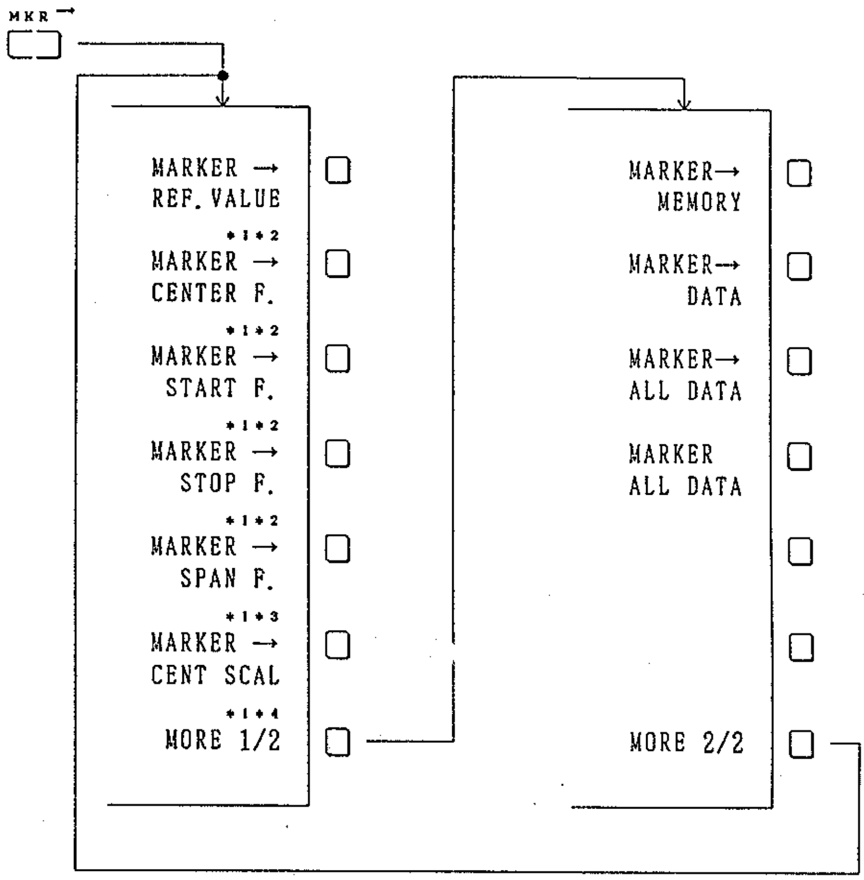


*1: When MKR SRCH key is depressed at Cw Sweep, menu is not displayed.

*2: Not displayed when FORMAT is not G. DELAY.

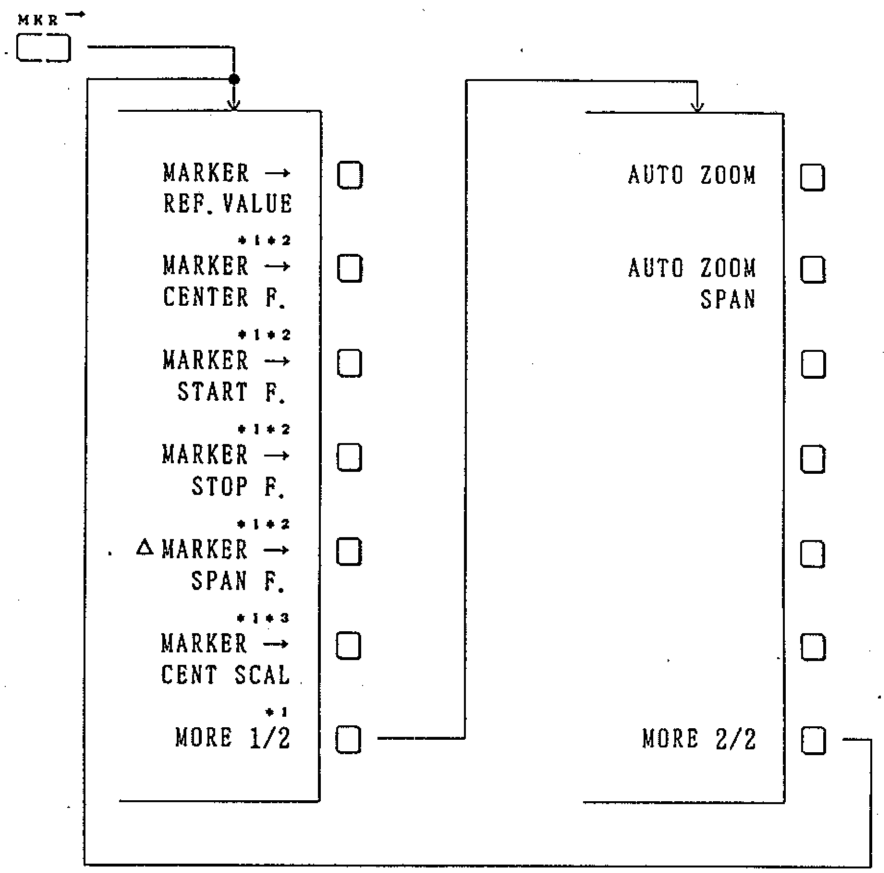
(3) MKR →

- When FORMAT is not LOG MAG or LIN MAG:



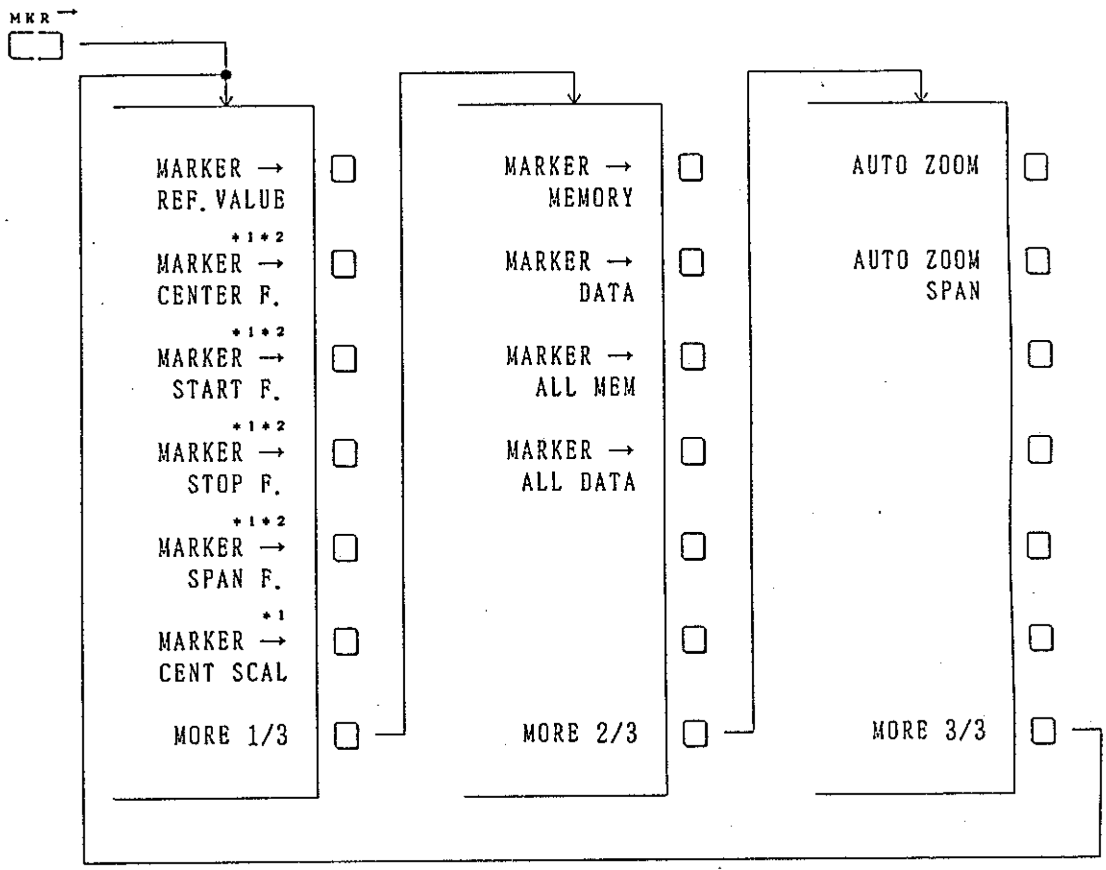
*1:	Not displayed at Cw Sweep.
*2:	MARKER→ XXXXX L. is displayed at Level Sweep
*3:	Not displayed when FORMAT is SMITH or POLAR.
*4:	Not displayed when waveform indication is not DATA & MEMORY.

- When FORMAT is LOG MAG or LIN MAG and waveform indication is only DATA:



*1:	Not displayed at Cw Sweep.
*2:	MARKER → XXXXX L. is displayed at Level Sweep
*3:	Not displayed when FORMAT is SMITH or POLAR.

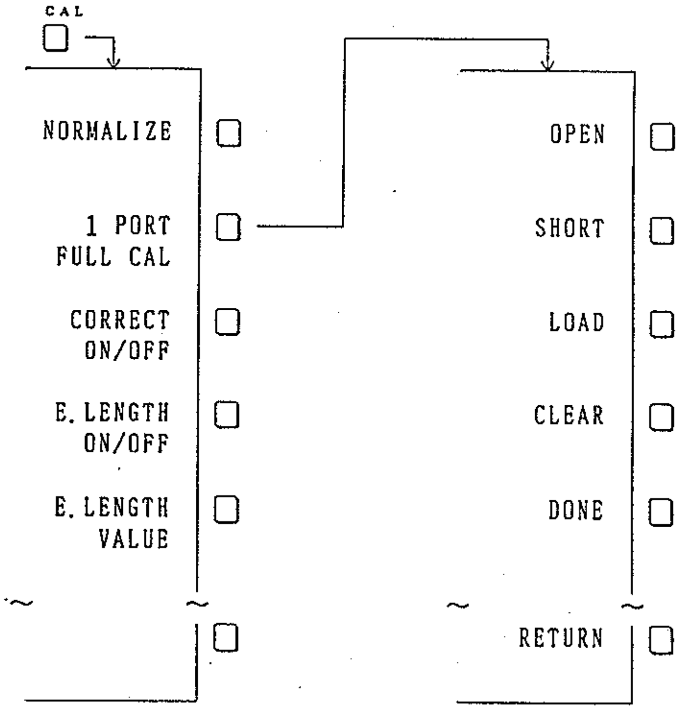
● When FORMAT is LOG MAG or LIN MAG and waveform indication is DATA & MEMORY:



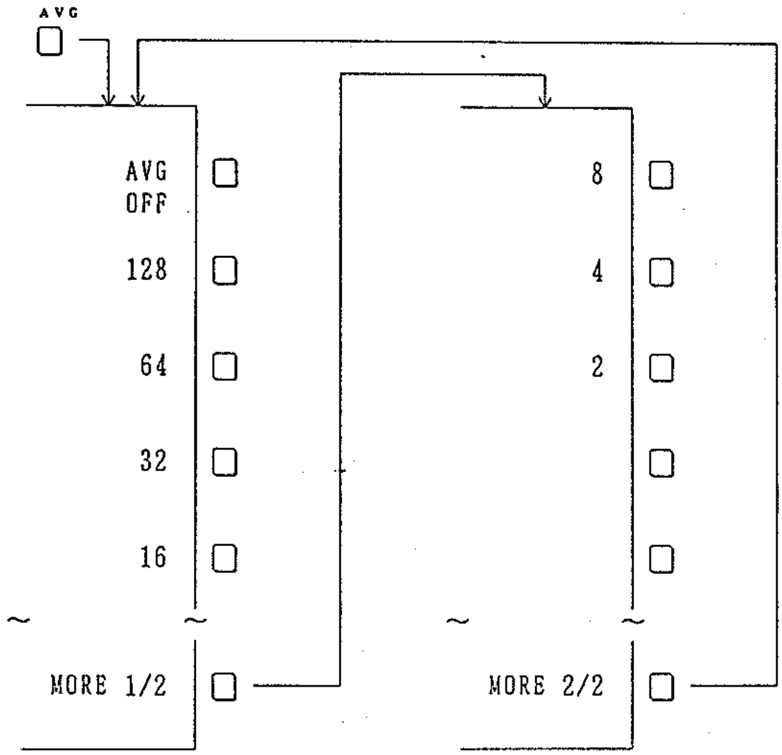
*1:	Not displayed at Cw Sweep.
*2:	MARKER → XXXXX L. is displayed at Level Sweep

A.1.5 CAL and AVG

(1) CAL

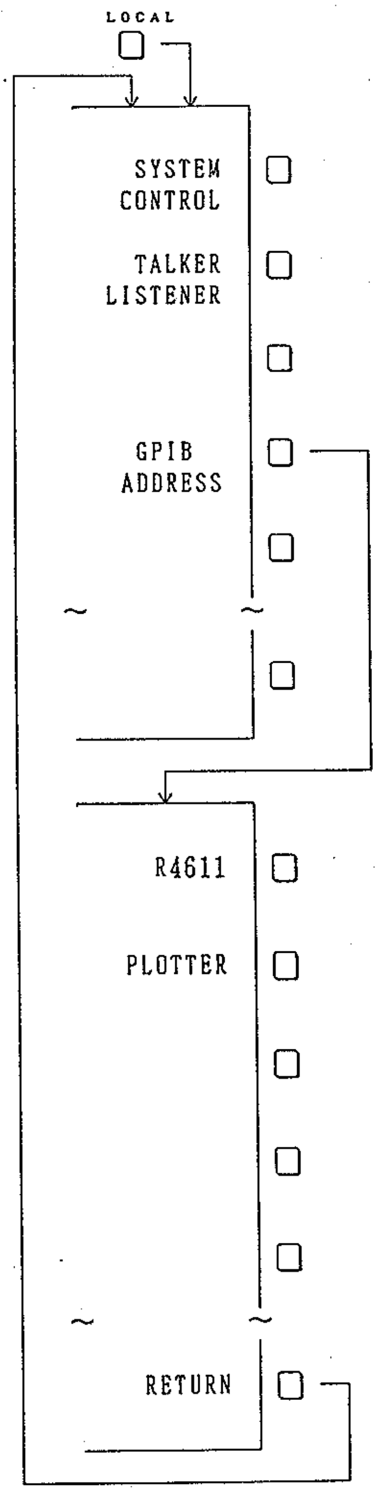


(2) AVG



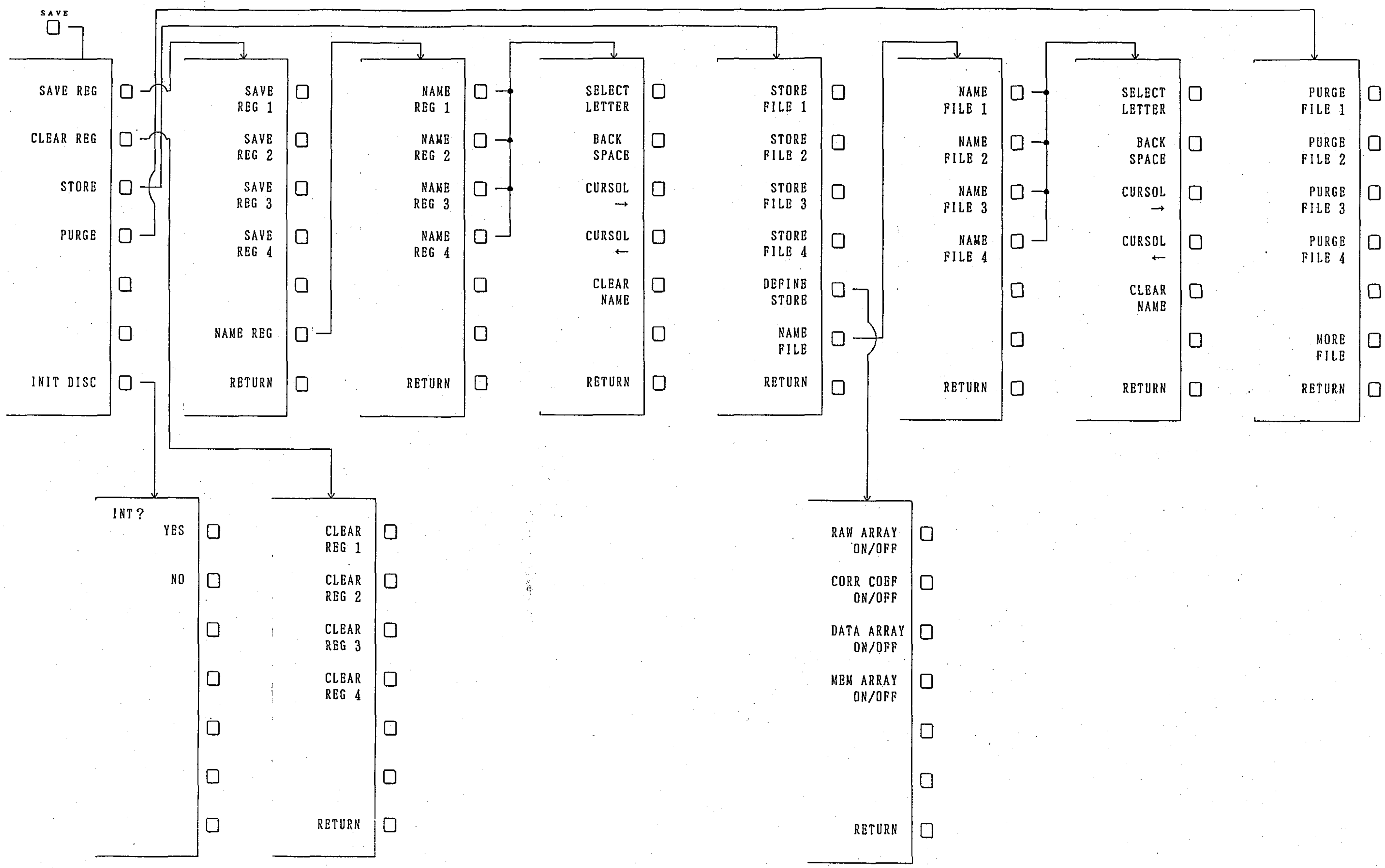
A.1.6 GPIB

(1) LOCAL

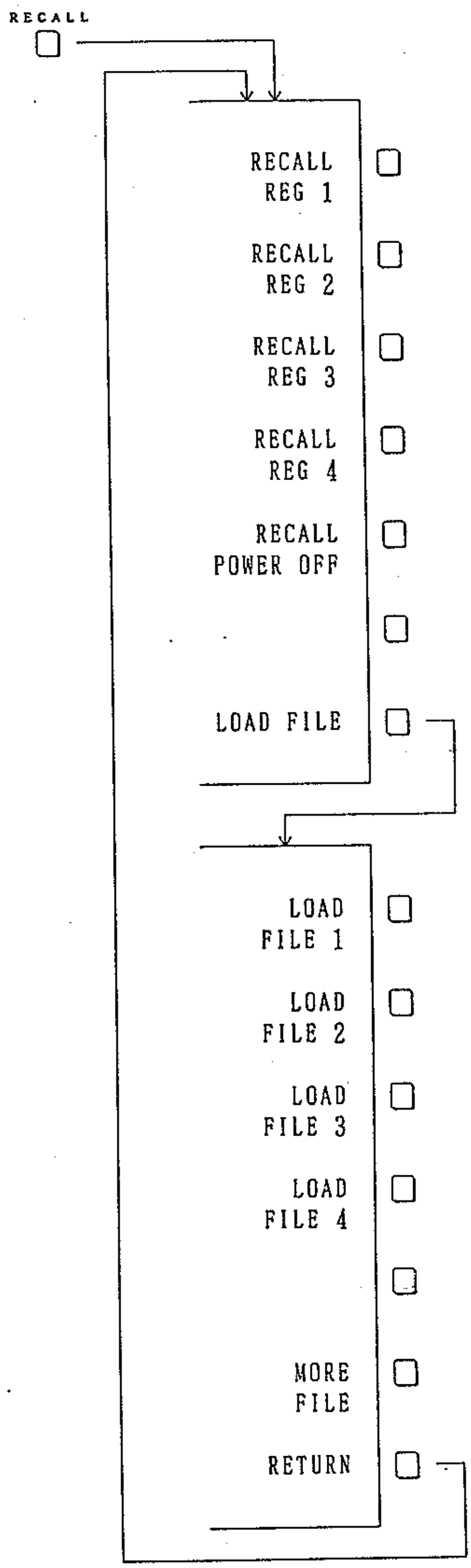


A.1.7 INSTRUMENT STATE

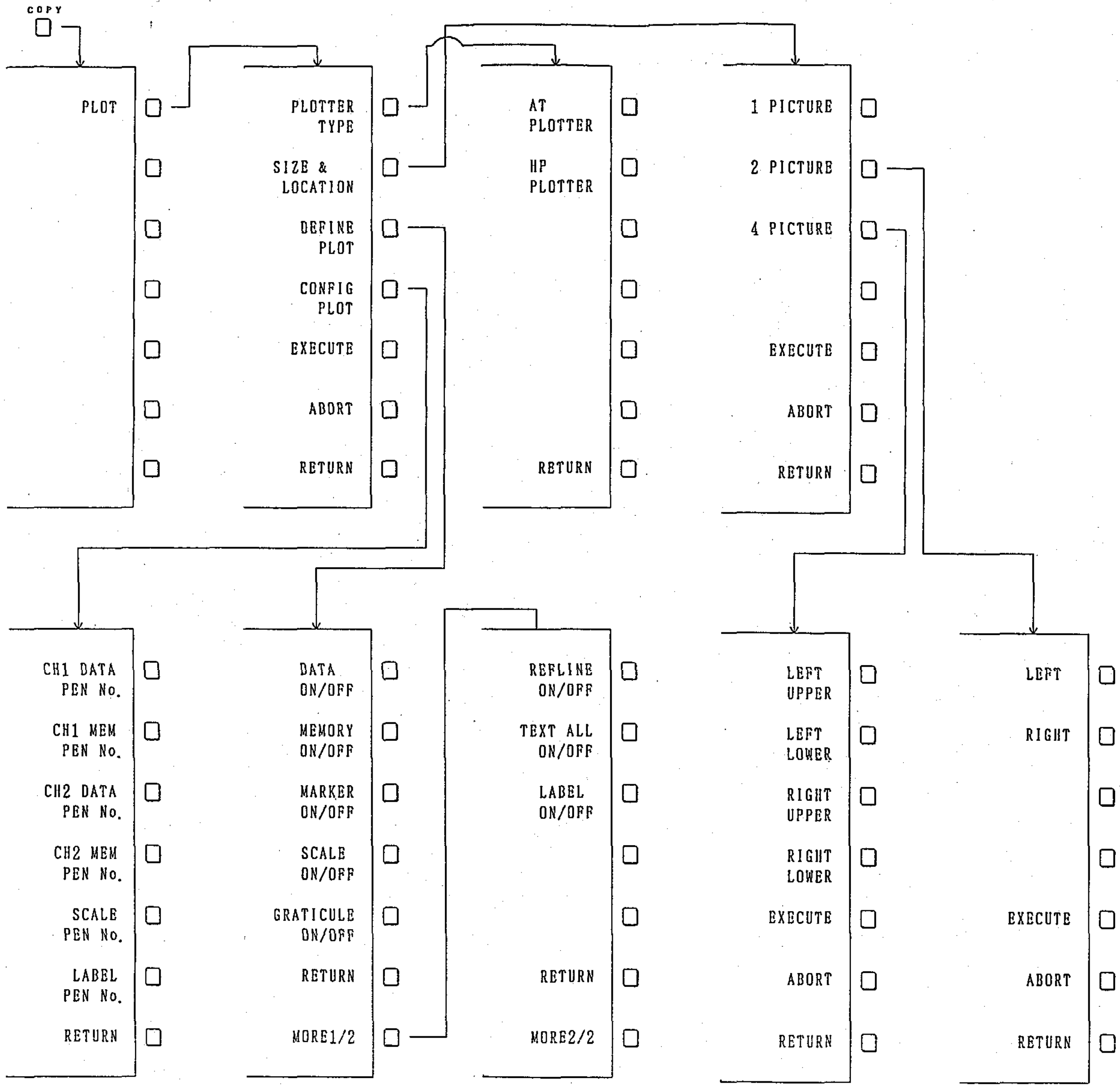
(1) SAVE



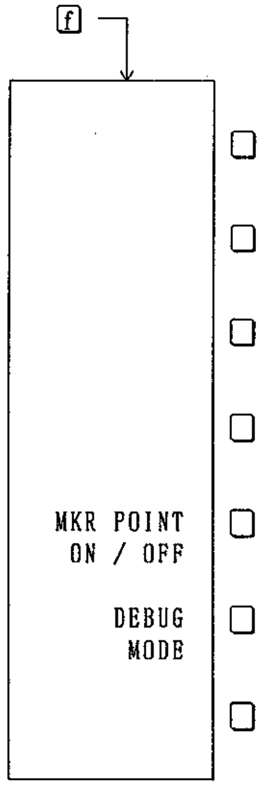
(2) RECALL


RECALL
RECALL REG 1
RECALL REG 2
RECALL REG 3
RECALL REG 4
RECALL POWER OFF
LOAD FILE
LOAD FILE 1
LOAD FILE 2
LOAD FILE 3
LOAD FILE 4
MORE FILE
RETURN

(3) COPY

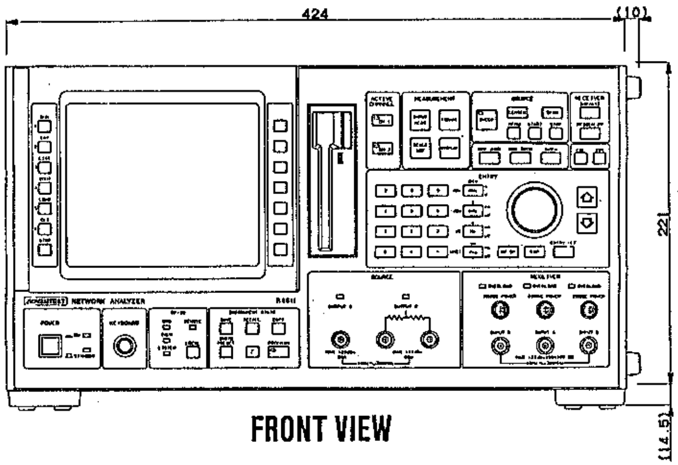

COPY
PLOT
RETURN
PLOTTER TYPE
SIZE & LOCATION
DEFINE PLOT
CONFIG PLOT
EXECUTE
ABORT
RETURN
AT PLOTTER
HP PLOTTER
RETURN
1 PICTURE
2 PICTURE
4 PICTURE
EXECUTE
ABORT
RETURN
CH1 DATA PEN No.
CH1 MEM PEN No.
CH2 DATA PEN No.
CH2 MEM PEN No.
SCALE PEN No.
LABEL PEN No.
RETURN
DATA ON/OFF
MEMORY ON/OFF
MARKER ON/OFF
SCALE ON/OFF
GRATICULE ON/OFF
RETURN
MORE1/2
REFLINE ON/OFF
TEXT ALL ON/OFF
LABEL ON/OFF
RETURN
MORE2/2
LEFT UPPER
LEFT LOWER
RIGHT UPPER
RIGHT LOWER
EXECUTE
ABORT
RETURN
LEFT
RIGHT
EXECUTE
ABORT
RETURN

(4) f

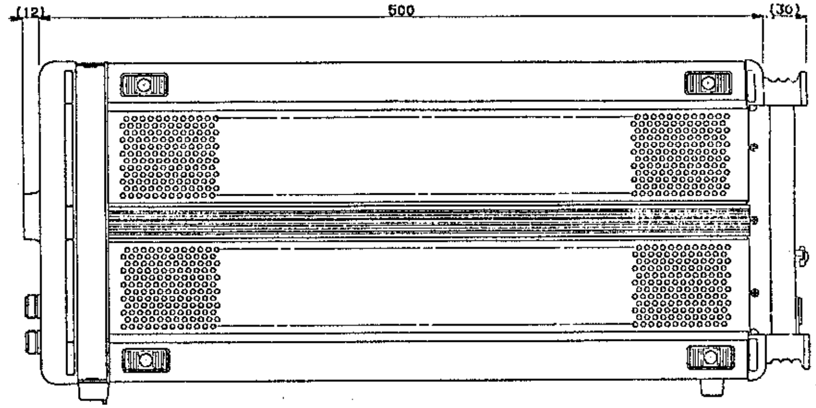


LIST OF FIGURES

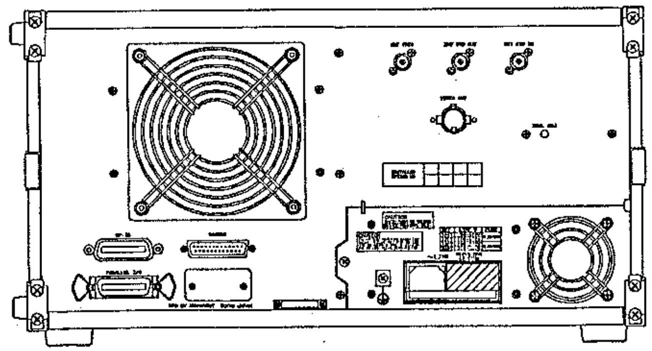
LIST OF TABLES



FRONT VIEW



SIDE VIEW

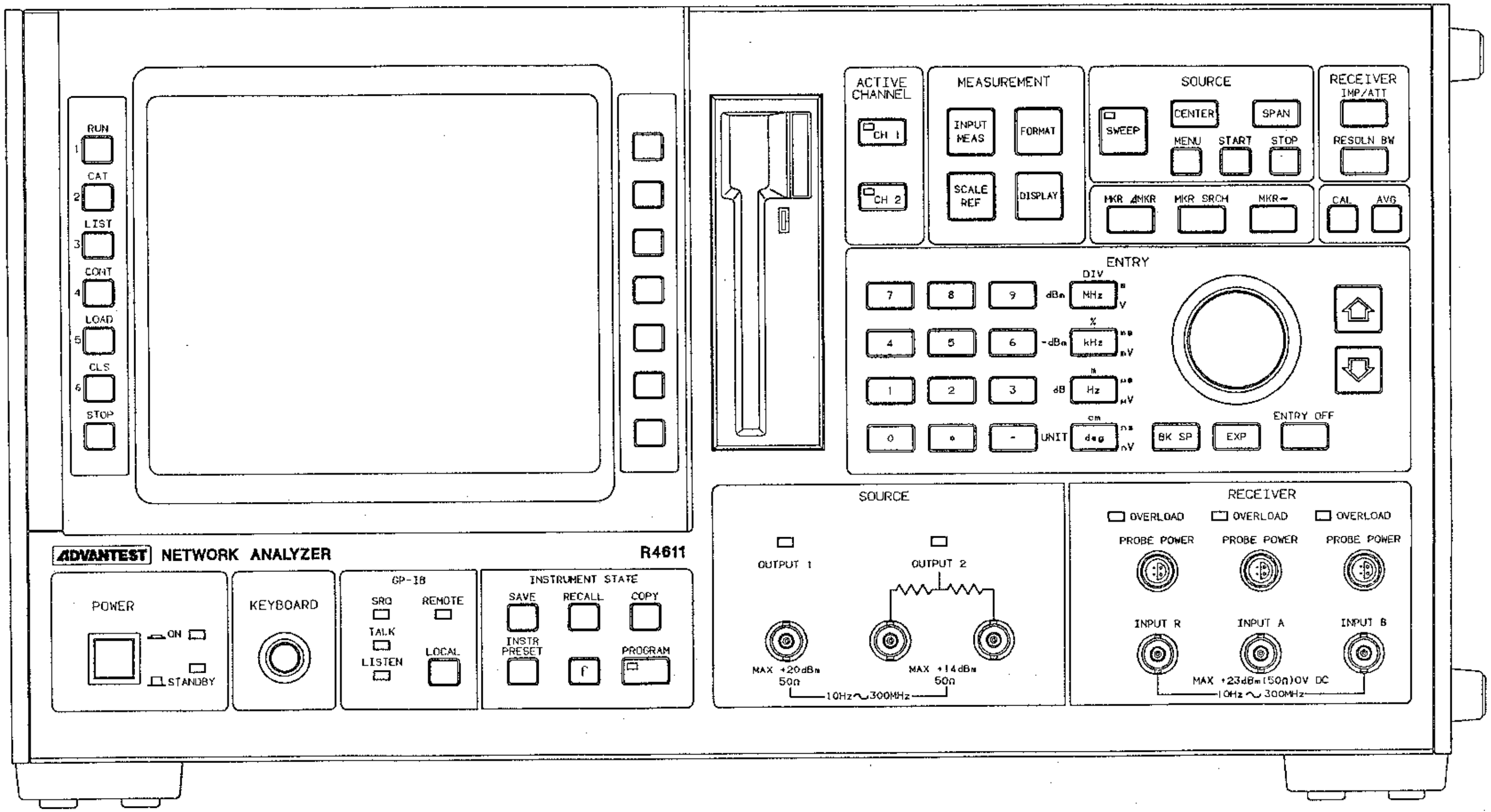


REAR VIEW

Unit : mm

TR4611
EXTERNAL VIEW

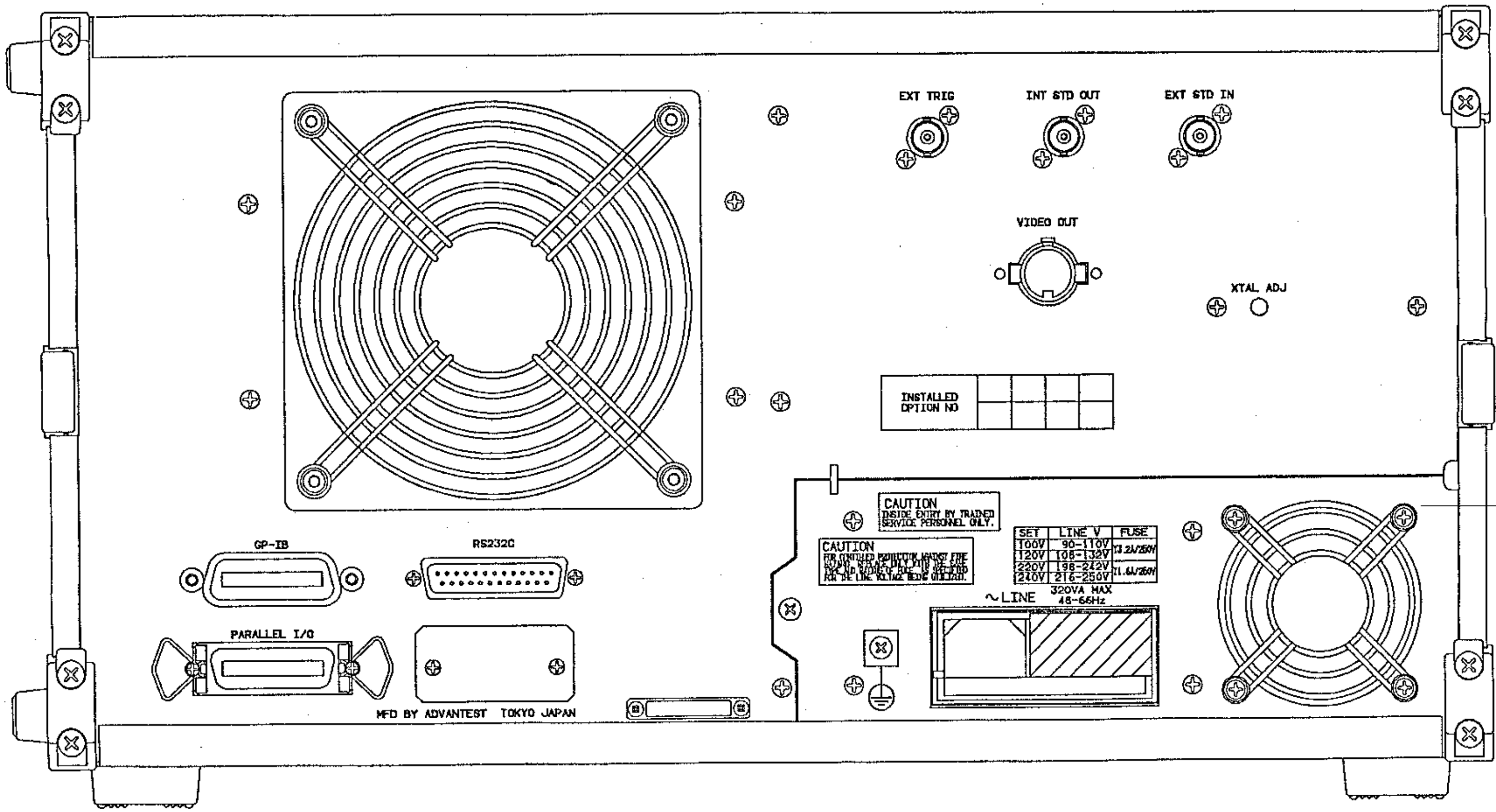
4611EXT1-803-C



R4611 FRONT VIEW

4611EXT2-803-C

2



R4611 REAE VIEW

4611EXT3-709-A

3

ADVANTEST CORPORATION

INSTRUCTION MANUAL

R4611

NETWORK ANALYZER

(Programming)

MANUAL NUMBER (OEK02 9002)

Before reselling to other corporations or re-exporting to other countries, you are required to obtain permission from both the Japanese Government under its Export Control Act and the U.S. Government under its Export Control Law.

Printed in Japan

TABLE OF CONTENTS

1. OUTLINE

The purpose of this programming manual is to describe the procedures for controlling the R4611 Network Analyzer and external peripherals using the analyzer's GPIB remote control and buit-in BASIC controller functions.

R4611 includes the IEEE standards 488-1978 metering bus GPIB (General Purpose Interface Bus) as a standard feature to enable remote control by external controller. And using the controller functions and functions included in the built-in BASIC language, device characteristics can be tested at high speed, and small-scale GPIB systems can be readily constructed.

1.1 How to Use This Manual

This programming manual describes the controller handling procedures, plus the GPIB remote control operating procedures and BASIC programming for users who already have a certain amount of knowledge and experience in programming with the BASIC language.

R4611 can be remote controlled by any of the following three methods.

① Remote control by external controller

② Activation of built-in BASIC programming functions, and exchange data with an external controller while controlling the analyzer.

③ Activation of built-in BASIC programming functions, and controlling external devices and the analyzer itself as the GPIB controller.

Method ① is described in chapter 2, and methods ② and ③ are covered in chapters 3, 4, and 5.

1.2 GPIB Modes

R4611 operates in the following modes.

① TALKER/LISTENER Mode

TALKER/LISTENER is the normal mode controlled by external controller. Data can be exchanged with the external controller while running a built-in BASIC program.

② Controller Mode

Controller mode enables R4611 measuring functions and external devices connected to R4611 to be controlled by built-in BASIC programs.

2. REMOTE CONTROL BY GPIB EXTERNAL CONTROLLER

2.1 Outline

GPIB is an interface system designed to connect measuring equipment to the controller and peripheral devices by simple cable connections. In comparison to more conventional interface systems, GPIB features greater expandability, plus electrical, mechanical, and functional compatibility with other equipment and other brands.

The GPIB system includes three roles - controller, TALKER, and LISTENER, and when controlled by an external GPIB controller, R4611 retains the TALKER and LISTENER functions.

CAUTION

When a BASIC program is run in TALKER/LISTENER mode, settings cannot be made by GPIB command from the external controller (due to priority given to BASIC enter and output commands).
To make settings by GPIB command from external controller, the BASIC program must first be stopped.

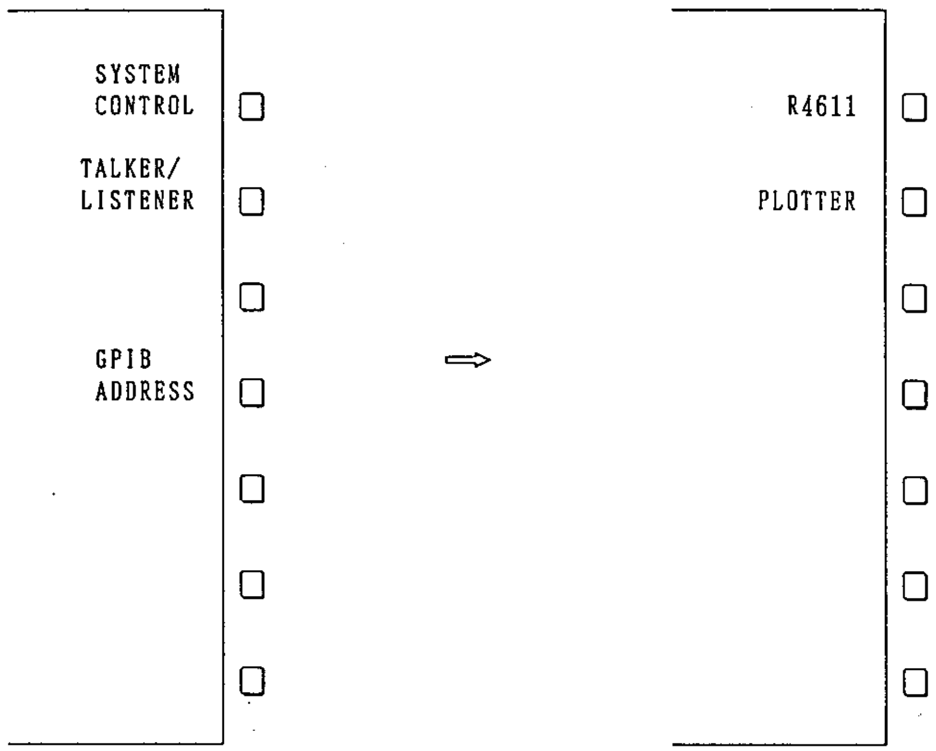
2.2 GPIB Functions

SH1: Source handshake function
AH1: Accept handshake function
T6 : Basic TALKER function, serial polling function, and TALKER function cancellation by LISTENER designation
TE0: No expanded TALKER function
L4 : Basic LISTENER function, and LISTENER function cancellation by TALKER designation
LE0: No expanded LISTENER function
SR1: Service request function
RL1: Remote function, local function, local lockout function
PP0: No parallel polling function
DC1: Device clear function
DT1: Device trigger (when in hold mode)
C0 : No controller function (when in TALKER/LISTENER mode)
C1 : System controller function (when in controller mode)
E1 : Use open collector bus driver

2.3 GPIB Addressing

GPIB Handling Procedures

When the LOCAL key is pressed and the GPIB address is selected, the following soft key menu is displayed.



- GPIB address is set when the R4611 key is pressed.
  GPIB address can be set to any value from 0 to 30.
  Following input of a number by the relevant numeric key, the GPIB address is set by pressing the deg keys.

- The plotter GPIB address is set by pressing the PLOTTER key.
  Plotter address can be set to any value from 0 to 30.
  Following input of a number by the relevant numeric key, the plotter address is set by pressing the dey keys.
  (This address is only valid when in system controller mode.)

NOTE

- Do not specify the same address as the GPIB address for an external controller and other connected devices.
- The address specified here is the address for controlling R4611 by using an external controller. The address for controlling R4611 by built-in BASIC program is fixed at "31".

2.4 GPIB Input and Output Formats

2.4.1 Outline

An external GPIB controller can be used to read setting conditions. The method for reading these conditions involves input of "?" after the R4611 GPIB setting code. If R4611 is then specified as TALKER, output of the requested data or code is obtained.

The output data or code can be in either of two formats.

① If data setting of the function indicating the setting code is possible, the output format is as described later.

② Where data setting is not possible, an output format of 1/0 is used for data or code expressed as yes or no.

Examples: (1)
```
OUTPUT 701; "STARTF?"
ENTER  701;F
```

Input of a code called "STARTF" (start frequency) followed by "?" results in output of the value of the start frequency from R4611.

(2)
```
OUTPUT 701; "AVERAGE?"
ENTER  701;A
```

In a case where "AVERAGE" ON/OFF is to be confirmed, the output is "1" if ON, and "0" if OFF.

2.4.2 Permissible Input Characters

Although ASCII characters are recognized by R4611, all those apart from the characters listed below are disregarded in normal operations except label input mode.

① Upper case alphabetic characters

② Numeric characters

③ Decimal point

④ + or -

⑤ , (comma)

⑥ ; (semi colon)

⑦ CR (carriage return)   Recognized only as GPIB delimiter

(8) LF (line feed) Recognized only as GPIB delimiter

All leading zeros are disregarded. 000208640 → 208640
All lower case characters are disregarded.
STARTFrequency1MHz → STARTF1MHZ

Numeric character inputs may include decimal point and exponential expressions.

0 thru 9 . + -	Mantissa may include sign and up to 17 significant digits.
E	Exponential part may include sign and one or two significant digits.

2.4.3 Input Formats

(1) General Format

[Code][Additional code][Data][Unit][Terminator]

(1) [Code]

Basic R4611 mnemonics

(2) [Additional Code]

Designation used for switches qualifying basic mnemonic or to indicate one of several types.

- ON/OFF
- Integer value which selects one of several types

(3) [Data]

Data set in function specified by code

- Numeric value (ASCII)
  Integer : 278 etc.
  Real number: 278.0, -256.8E+2 etc.
- Character string (ASCII)
  String enclosed between double quotation marks: "278" etc.

(4) [Unit]

All data must have a unit.

⑤ [Terminator]

Any of the following four types can be specified.

(CR) (LF) + EOI

(LF)

Final byte + EOI

(CR) (LF) .... Initial status type

(2) Input Format Types

① TYPE1: [Code][Terminator]

② TYPE2: [Code][Additional code][Terminator]

③ TYPE3: [Code][Data][Unit][Terminator]

④ TYPE4: Enquiry type: [Code][?]

2.4.4 Output Formats

① Numeric Values (integers) in ASCII Code

② Floating Decimal Point Numeric Values in ASCII Code

±D. DDDDDDDDDDDDDDDE±DD
Total number of characters 22
Mantissa sign - (minus) Blank (plus)
One digit (mantissa and number of digits to left of decimal point) + decimal point + 15 digits (mantissa and number of digits to right of decimal point)
E Exponent
Exponential part sign - (minus) Blank (plus)
Two digits exponential part

Example: 1.123456789012345E+08

Note: Although there is no unit code output, an internal basic unit is used.
Hz, V, dB, m, Sec, Unit, div, %, o, etc.

2.4.5 GPIB Program Code Table

R4611 is controlled by built-in BASIC program or external GPIB controller using the following codes.

When controlling R4611 using BASIC in TALKER/LISTENER mode, No.31 is used as shown in the following examples.

```
OUTPUT 31; .....
ENTER 31; .....
```

For input or output to/from an 8-bit parallel port, No.32 is used as shown below.

```
OUTPUT 32; .....
ENTER 32; .....
```

The method for reading the GPIB code table is outlined in Table 2-1.

Table 2-1 How to Read the GPIB Code Table

Item	Function
Code	Program setting code
Contents	Code function
Description format Response format	Input format [t] : [Code][Terminator] [s] [t] : [Code][Additional code][Terminator] [d] [u] [t]: [Code][Data][Unit][Terminator] Additional code ON or OFF (ASCII) Numeric value (ASCII) (ASCII) Data (ASCII) Terminator GPIB terminator (CR, LF) Response to enquiry about setting condition 1, 0: ON/OFF or YES/NO D : Data D → Numeric value [ ] contents s .... Data on horizontal axis : FORMAT valid in all modes r .... Data on vertical axis : FORMAT valid in all modes i .... Data on vertical axis (AUX) : FORMAT valid only when Smith or Polar or parameter conversion is ON C ... Operation data lc ... L[H] or C[F] : FORMAT valid only when Smith The i and lc values are not returned if FORMAT setting is not valid. When partitioned by a comma (,) such as D(s,r), the output is also partitioned by comma in the GPIB.

Table 2-2 GPIB Program Code (1/13)

Item	Code	Contents	Descriptive format	Response format
- ACTIVE CHANNEL -		See section 2.3.1 of main instruction manual for description of basic functions.		
CHANNEL	CH1	CH1 active	[t]	1, 0
	CH2	CH2 active	[t]	1, 0
- INPUT MEASURE -		See section 3.3.5 of main instruction manual for description of basic functions.		
INPUT PORTS	ARIN	A/R	[t]	1, 0
	BRIN	B/R	[t]	1, 0
	ABIN	A/B	[t]	1, 0
	AIN	A	[t]	1, 0
	BIN	B	[t]	1, 0
	RIN	R	[t]	1, 0
PARAMETER CONVERSION	CONVRZ	Z(Reflection)	[t]	1, 0
	CONVRY	Y(Reflection)	[t]	1, 0
	CONVOFF	OFF	[t]	1, 0
	SETZ0	Z0	[d][u][t]	D
S-PARAMETER	S11	TEST SET control	[t]	1, 0
	S12	TEST SET control	[t]	1, 0
	S21	TEST SET control	[t]	1, 0
	S22	TEST SET control	[t]	1, 0
- FORMAT -		See section 3.3.6 of main instruction manual for description of basic functions.		
FORMAT	LOGMAG	Log Mag	[t]	1, 0
	PHASE	Phase	[t]	1, 0
	DELAY	Delay	[t]	1, 0
	SRJX	Smith (R+jX)	[t]	1, 0
	SGJB	Smith (G+jB)	[t]	1, 0
	POLAR	Polar	[t]	1, 0
	LINMAG	Lin Mag	[t]	1, 0
	REAL	Real	[t]	1, 0
	IMAG	Imag	[t]	1, 0
	UNWRAP	Phase $(-\infty, +\infty)$	[t]	1, 0
- GROUP DELAY APERTURE -		See section 3.3.6 of main instruction manual for description of basic functions.		
APERTURE	APERTP	Data Entry	[d] [u] [t]	D(%)

Table 2-2 GPIB Program Code (2/13)

Item	Code	Contents	Descriptive format	Response format
- SCALE REF. -		See section 3.3.8 of main instruction manual for description of basic functions.		
SCALE	AUTO	Auto Scale	[t]	... ...
	SDIV	/Division	[d] [u] [t]	D(r)
REFERENCE	REFV	Ref. Value	[d] [u] [t]	D(r)
	REFP	Ref. Position	[d] [u] [t]	D(%)
	REFL	Ref. Line on/off	[s] [t]	1, 0
UP SCALE	UPSCAL	on/off	[s] [t]	1, 0
- DISPLAY -	See section 3.3.7 of main instruction manual for description of basic functions.			
CHANNEL	DUAL	Dual on/off	[s] [t]	1, 0
	SPLIT	Split on/off	[s] [t]	1, 0
GRATICULE	GRAT	Graticule on/off	[s] [t]	1, 0
CRT	INTENS	Intensity	[d] [u] [t]	D
DISPLAY	DISPDATA	Data	[t]	1, 0
	DISPDM	Data & Memory	[t]	1, 0
	DTOM	Data to Memory	[t]	1, 0 *2
DATA/MEM	DISPDDM	on/off	[s] [t]	1, 0 *6
LABEL	LABEL	LABEL	[strings] [t]	... *8
- SOURCE -		See section 3.3.1 of main instruction manual for description of basic functions.		
FREQUENCY	STARTF	Start freq.	[d] [u] [t]	D(s)
	STOPF	Stop freq.	[d] [u] [t]	D(s)
	CENTERF	Center freq.	[d] [u] [t]	D(s)
	SPANF	Span freq.	[d] [u] [t]	D(s)
OUTPUT PORTS	PORT1	Output port1	[t]	1, 0
	PORT2	Output port2	[t]	1, 0
OUTPUT LEVEL	OUTLEV	Output level	[d] [u] [t]	D(r)
FREQ.STEP	FSTPA	Freq. step auto	[t]	1, 0
	FSTPM	Freq. step manual	[t]	1, 0
STEP SIZE	FRQSTP	Freq. step	[d] [u] [t]	D(s) *11
- SWEEP -		See section 3.3.2 of main instruction manual for description of basic functions.		
TIME	STIME	Sweep time	[d] [u] [t]	D(t)

Table 2-2 GPIB Program Code (3/13)

Item	Code	Contents	Descriptive format	Response format
- SWEEP -		See section 3.3.2 of main instruction manual for description of basic functions.		
TYPE	COUPLE	Couple on/off	[s] [t]	1, 0
	LINFREQ	Lin freq.	[t]	1, 0
	LOGFREQ	Log freq.	[t]	1, 0
	CW	Level sweep	[t]	1, 0
	LEVEL	Level sweep	[t]	1, 0
	PARTIAL (VARIABLE)	PARTIAL on/off	[s] [t]	1, 0
	USRSWP	User sweep	[t]	1, 0
POINTS	M1201P	1201 Points	[t]	1, 0
	M601P	601 Points	[t]	1, 0
	M301P	301 Points	[t]	1, 0
	M201P	201 Points	[t]	1, 0
	M101P	101 Points	[t]	1, 0
	M51P	51 Points	[t]	1, 0
	M21P	21 Points	[t]	1, 0
	M11P	11 Points	[t]	1, 0
	M6P	6 Points	[t]	1, 0
	M3P	3 Points	[t]	1, 0
TRIGGER	FREE	Internal	[t]	1, 0
	LINE	Line	[t]	1, 0
	EXTERN	External	[t]	1, 0
MODE	CONT	Continue	[t]	1, 0
	SINGLE	Single	[t]	1, 0
	SWPHLD	Sweep HOLD	[t]	1, 0
RESTART	MEAS	Restart	[t]	... *3
- PARTIAL SWEEP DATA ENTRY -		See section 3.3.2 of main instruction manual for description of basic functions.		
PARTIAL SWEEP DATA ENTRY	PSEGCL	Segment clear	[t]	...
	PSEG	Segment No.	[d] [u] [t]	D *5
	PSTART	Start freq.	[d] [u] [t]	D(s)
	PSTOP	Stop freq.	[d] [u] [t]	D(s)
- USER SWEEP DATA ENTRY -		See section 3.3.2 of main instruction manual for description of basic functions. *4		
USER SWEEP DATA ENTRY	USEGCL	Segument clear	[t]	1, 0
	USEG	Segument No.	[d] [u] [t]	D *5
	USTART	Start freq.	[d] [u] [t]	D(s)
	USTOP	Stop freq.	[d] [u] [t]	D(s)
	UFREQ	freq.	[d] [u] [t]	D(s)
	UPOINT	Points	[d] [u] [t]	D

Table 2-2 GPIB Program Code (4/13)

Item	Code	Contents	Descriptive format	Response format
- LEVEL SWEEP DATA ENTRY - See section 3.3.2 of main instruction manual for description of basic functions.				
LEVEL SWEEP DATA ENTRY	STLEVEL	Start level	[d] [u] [t]	D(r)
	SPLEVEL	Stop level	[d] [u] [t]	D(r)
CW FREQUENCY	CWFREQ	CW Frequency	[d] [u] [t]	D(s)
- CW SWEEP DATA ENTRY -				
CWF	CW freq.		[d][u][t]	D(s)
- RECEIVER - See sections 3.3.3 and 3.3.4 of main instruction manual for description of basic functions.				
IMPEDANCE ATTENUATOR	RI50A20	R50 Ω, 20 dB	[t]	1, 0
	RI50A0	R50 Ω, 0 dB	[t]	1, 0
	RI1A20	R1 MΩ, 20 dB	[t]	1, 0
	RI1A0	R1 MΩ, 0 dB	[t]	1, 0
	AI50A20	A50 Ω, 20 dB	[t]	1, 0
	AI50A0	A50 Ω, 0 dB	[t]	1, 0
	AI1A20	A1 MΩ, 20 dB	[t]	1, 0
	AI1A0	A1 MΩ, 0 dB	[t]	1, 0
	BI50A20	B50 Ω, 20 dB	[t]	1, 0
	BI50A0	B50 Ω, 0 dB	[t]	1, 0
	BI1A20	B1 MΩ, 20 dB	[t]	1, 0
	BI1A0	B1 MΩ, 0 dB	[t]	1, 0
RBW	RBW1KHZ	1 KHz	[t]	1, 0
	RBW300HZ	300 Hz	[t]	1, 0
	RBW100HZ	100 Hz	[t]	1, 0
	RBW30HZ	30 Hz	[t]	1, 0
	RBW10HZ	10 Hz	[t]	1, 0
CLEAR TRIP	CLRTRIP	Clear trip	[t]	...
- AVERAGE - See section 3.3.12 of main instruction manual for description of basic functions.				
AVERAGING	AVERAGE	off	[s] [t]	1, 0
	AVR2	2	[t]	1, 0
	AVR4	4	[t]	1, 0
	AVR8	8	[t]	1, 0
	AVR16	16	[t]	1, 0
	AVR32	32	[t]	1, 0
	AVR64	64	[t]	1, 0
	AVR128	128	[t]	1, 0

Table 2-2 GPIB Program Code (5/13)

Item	Code	Contents	Descriptive format	Response format
- CALIBRATION -		See section 3.3.13 of main instruction manual for description of basic functions.		
CALIBRATION	CORRECT	Correction on/off	[s] [t]	1, 0 *7
1PORT FULL CAL	OPEN	Open	[t]	... ... *12
	SHORT	Short	[t]	... ... *12
	CLEAR	Clear	[t]	... ...
	DONE	Done	[t]	... ... *12
	LOAD	Load	[t]	... ... *12
	NORM	Normalize on/off	[s] [t]	1, 0
ELECTRICAL LENGTH	LENGTH	on/off	[s] [t]	1, 0
	LENGVAL	Value	[d] [u] [t]	D(1)
- MKR/D MKR -		See section 3.3.9 of main instruction manual for description of basic functions.		
MARKER NUMBER	MKR1A	Marker # 1	[d] [u] [t]	D(s,r,i,lc)
	MKR2A	Marker # 2	[d] [u] [t]	D(s,r,i,lc)
	MKR3A	Marker # 3	[d] [u] [t]	D(s,r,i,lc)
	MKR4A	Marker # 4	[d] [u] [t]	D(s,r,i,lc)
	MKR5A	Marker # 5	[d] [u] [t]	D(s,r,i,lc)
	MKR6A	Marker # 6	[d] [u] [t]	D(s,r,i,lc)
	MKR7A	Marker # 7	[d] [u] [t]	D(s,r,i,lc)
	MKR8A	Marker # 8	[d] [u] [t]	D(s,r,i,lc)
	MKR9A	Marker # 9	[d] [u] [t]	D(s,r,i,lc)
	MKR10A	Marker #10	[d] [u] [t]	D(s,r,i,lc)
MARKER OFF	MKRAOF	Marker all off	[t]	1, 0
	MKROFF	Active marker off	[t]	... ...
	MKR10F	Marker # 1 off	[t]	1, 0
	MKR20F	Marker # 2 off	[t]	1, 0
	MKR30F	Marker # 3 off	[t]	1, 0
	MKR40F	Marker # 4 off	[t]	1, 0
	MKR50F	Marker # 5 off	[t]	1, 0
	MKR60F	Marker # 6 off	[t]	1, 0
	MKR70F	Marker # 7 off	[t]	1, 0
	MKR80F	Marker # 8 off	[t]	1, 0
	MKR90F	Marker # 9 off	[t]	1, 0
	MKR100F	Marker #10 off	[t]	1, 0
MARKER TO MEM	MKRATOM	All to memory	[t]	... ... *13
	MKRTOM	Active marker to memory	[t]	... ... *13
MARKER TO DATA	MKRATOD	All to data	[t]	... ...
	MKRTOD	Active marker to data	[t]	... ...

Table 2-2 GPIB Program Code (6/13)

Item	Code	Contents	Descriptive format	Response format
- MKR/D MKR -		See section 3.3.9 of main instruction manual for description of basic functions.		
COMPENSATE	MKRCMP	Compensate	[t]	1, 0
	MKRUCMP	Uncompensate	[t]	1, 0
COUPLE	MKRCOUP	Coupled	[t]	1, 0
	MKRUCOUP	Uncoupled	[t]	1, 0
SMITH MKR	SMKRLIN	Lin marker	[t]	1, 0
	SMKRLOG	Log marker	[t]	1, 0
	SMKRRI	Re/In marker	[t]	1, 0
	SMKRRX	R+jX marker	[t]	1, 0
	SMKRGB	G+jB marker	[t]	1, 0
POLAR MKR	PMKRLIN	Lin marker	[t]	1, 0
	PMKRLOG	Log marker	[t]	1, 0
	PMKRRI	Re/In marker	[t]	1, 0
IMPEDANCE MARKER	ZYMKDFLT	Default marker	[t]	1, 0
	ZYMKLIN	Lin marker	[t]	1, 0
	ZYMKRI	Re/Im marker	[t]	1, 0
	ZYMKLC	LC on/off	[t]	1, 0
Smith Marker impedance ZO	MKRZ050	smith MKR ZO=50	[t]	1, 0
	MKRZ075	smith MKR ZO=75	[t]	1, 0
ΔREFERENCE	DMKRC	ΔREF = ΔMKR	[t], [d] [u] [t]	1, 0
	DMKRR	ΔREF = ΔREF.POSN	[t], [d] [u] [t]	1, 0
	DMKRA	Active marker	[t], [d] [u] [t]	1, 0 *14
	DMKRF	ΔREF = FIXED.MKR	[t], [d] [u] [t]	1, 0 *15
ΔMODE OFF	DMKROF	Δmode off	[t]	1, 0
FIXED MKR	FMKRS	Stimulus value	[t]	1, 0 *16
	FMKRV	Value	[d] [u] [t]	D(r) *16
	MKRFIX	FIXED.MX → ACT.M POSN.	[t]	... ... *16
ΔRIPPLE	DRIPPL1	Δ ripple 1	[t]	D(r) *17
	DRIPPL2	Δ ripple 2	[t]	D(r) *17
	DLTX	Δ x	[d] [u] [t]	D(s)
	DLTY	Δ y	[d] [u] [t]	D(r)
	DMAXMIN	Δ max-min	[t]	D(r) *17 18
	DRIPOFF	off	[t]	1, 0

Table 2-2 GPIB Program Code (7/13)

Item	Code	Contents	Descriptive format	Response format
- MKR/D MKR -		See section 3.3.9 of main instruction manual for description of basic functions.		
Δ'S OFFSET	DMKR10	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR20	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR30	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR40	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR50	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR60	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR70	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR80	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR90	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
	DMKR100	Multi MKR Δ	[t], [d] [u] [t]	1, 0 *19
- MARKER SEARCH -		See section 3.3.10 of main instruction manual for description of basic functions.		
SEARCH	MAXSRCH	Max search	[t]	D(s,r,i,lc) *24, 31
	MINSRCH	Min search	[t]	D(s,r,i,lc) *24, 31
	SRCHOFF	Search off	[t]	... ...
	LMAXSRC	Next max SRCH	[t]	D(s,r,i,lc) *24, 31
	LMINSRC	Next min SRCH	[t]	D(s,r,i,lc) *24, 31
TARGET	TREFMAX	ΔRef.=max	[t]	1, 0 *16
	TREFREF	ΔRef.=Ref	[t]	1, 0 *16
	TREFACT	ΔRef.=Act MKR	[t]	1, 0 *16
	TREFCNT	ΔRef.=C.F.	[t]	1, 0 *16
	T3DB	-3 dB	[t]	D(s,r) *16, 29
	T6DB	-6 dB	[t]	D(s,r) *16, 29
	T60DB	-60 dB	[t]	D(s,r) *16, 29
	TXDB	-X dB	[d] [u] [t]	D(s,r) *16, 29
	TLEFT	Left Search	[t]	D(s,r) *16
	TRIGHT	Right Search	[t]	D(s,r) *16
	TIN	X dB down IN	[t]	1, 0 *16
	TOUT	X dB down OUT	[t]	1, 0 *16
FILTER ANALYSIS	FLTANA	on/off	[s] [t]	1, 0 *16
PHASE MKR	ZRPSRCH	Zero phase search	[t]	D(s,r) *21
	TREFZRP	ΔRef.=Zero search	[t]	1, 0 *21
	T3DEG	$\pm 3^{\circ}$	[t]	D(s,r) *21
	T6DEG	$\pm 6^{\circ}$	[t]	D(s,r) *21
	TXDEG	$\pm X^{\circ}$	[d] [u] [t]	D(s,r) *21
PART ANALYSIS	MKRPART	Part analysis	[s] [t]	1, 0 *18
TRACKING	MKRTRAC	Tracking	[s] [t]	1, 0

Table 2-2 GPIB Program Code (8/13)

Item	Code	Contents	Descriptive format	Response format
- MKR -		See section 3.3.11 of main instruction manual for description of basic functions.		
MKR	MKRREF	MKR → Ref. value	[t]	... ...
	MKRCENT	MKR → Center F.	[t]	... ... *22
	MKRSTAR	MKR → Start F.	[t]	... ... *22
	MKRSTOP	MKR → Stop F.	[t]	... ... *22
	MKRSPAN	MKR → Span F.	[t]	... ... *22
	MKRCSCL	MKR → Center scale	[t]	... ...
MARKER to MEMORY	MKR1TM	MKR # 1 to mem	[t]	1, 0 *13
	MKR2TM	MKR # 2 to mem	[t]	1, 0 *13
	MKR3TM	MKR # 3 to mem	[t]	1, 0 *13
	MKR4TM	MKR # 4 to mem	[t]	1, 0 *13
	MKR5TM	MKR # 5 to mem	[t]	1, 0 *13
	MKR6TM	MKR # 6 to mem	[t]	1, 0 *13
	MKR7TM	MKR # 7 to mem	[t]	1, 0 *13
	MKR8TM	MKR # 8 to mem	[t]	1, 0 *13
	MKR9TM	MKR # 9 to mem	[t]	1, 0 *13
	MKR10TM	MKR #10 to mem	[t]	1, 0 *13
MARKER to DATA	MKR1TD	MKR # 1 to data	[t]	1, 0
	MKR2TD	MKR # 2 to data	[t]	1, 0
	MKR3TD	MKR # 3 to data	[t]	1, 0
	MKR4TD	MKR # 4 to data	[t]	1, 0
	MKR5TD	MKR # 5 to data	[t]	1, 0
	MKR6TD	MKR # 6 to data	[t]	1, 0
	MKR7TD	MKR # 7 to data	[t]	1, 0
	MKR8TD	MKR # 8 to data	[t]	1, 0
	MKR9TD	MKR # 9 to data	[t]	1, 0
	MKR10TD	MKR #10 to data	[t]	1, 0
- AUTO ZOOM -				
AUTO ZOOM	AUTOZOOM	AUTO ZOOM	[t]	... *27 *23
	ATZMSPAN	AUTO ZOOM SPAN	[d] [u] [t]	D(s)
- Entry -				
NUMERAL	0	0		
	1	1		
	2	2		
	3	3		
	4	4		
	5	5		
	6	6		
	7	7		
	8	8		
	9	9		

Table 2-2 GPIB Program Code (9/13)

Item	Code	Contents	Descriptive format	Response format
- Entry -				
NUMERAL	.	.		
	-	-		
	+	+		
	EXP	EXP on ENT		
STEP	STPUP	⇧		
	STPDN	⇩		
	FU			
	CU			
	FD			
	CD			
BACKSPACE	BS			
ENTRY OFF	EOFF			
UNITS	MHZ	MHz		
	KHZ	KHz		
	HZ	Hz		
	DEG	°		
	DP	dBm		
	DM	dBm		
	DB	dB		
	METER	m		
	CM	cm		
	SEC	sec		
	MSEC	msec		
	USEC	usec		
	NSEC	nsec		
	VOLT	V		
	MV	mV		
	UV	uV		
	NV	nV		
	UNIT	Unit		
	DIV	Div		
	PER,%	%		
DELIMITER	DL0		[t]	... ...
	DL1		[t]	... ...
	DL2		[t]	... ...
	DL3		[t]	... ...
IDENTIFICATION	IDNT	Identification	[t]	Strings *1
INSTRUMENT PRESET	IP	Instrument preset	[t]	... ... *28

Table 2-2 GPIB Program Code (10/13)

Item	Code	Contents	Descriptive format	Response format
- PLOTTER -		See section 4.3 of main instruction manual for description of basic functions.		
GPIB address	ADDRPLOT	Plotter GPIB address	[d] [u] [t]	D
Plotter entry	PLT1PICT	Full size	[t]	1, 0
	PLT2PICT	Half size	[t]	1, 0
	PLT4PICT	Quarter size	[t]	1, 0
	PLTEXEC	Execute	[t]	... ...
	PLTABORT	Abort	[t]	... ...
	PLT2LEFT	Half (LEFT)	[t]	1, 0
	PLT2RIGHT	Half (RIGHT)	[t]	1, 0
	PLT4LUP	Quarter (L,Up)	[t]	1, 0
	PLT4LLOW	Quarter (L,Lo)	[t]	1, 0
	PLT4RUP	Quarter (R,Up)	[t]	1, 0
	PLT4RLOW	Quarter (R,Lo)	[t]	1, 0
	PLTDATA	Data on/off	[s] [t]	1, 0
	PLTMEM	Memory on/off	[s] [t]	1, 0
	PLTMKR	Marker on/off	[s] [t]	1, 0
	PLTSCALE	Scale on/off	[s] [t]	1, 0
	PLTGRAT	Scaletype on/off	[s] [t]	1, 0
	PLTREFLN	Ref.line on/off	[s] [t]	1, 0
	PLTTEXT	Text all on/off	[s] [t]	1, 0
	PLTLABEL	Label on/off	[s] [t]	1, 0
	PLTD1PEN	PEN select CH1 data	[d] [u] [t]	D
	PLTM1PEN	PEN select CH1 mem	[d] [u] [t]	D
	PLTD2PEN	PEN select CH2 data	[d] [u] [t]	D
	PLTM2PEN	PEN select CH2 mem	[d] [u] [t]	D
	PLTSCLPEN	PEN select scale	[d] [u] [t]	D
	PLTLBLPEN	PEN select label	[d] [u] [t]	D
	PLTAT	PLOTTER type (AT)	[t]	1, 0
	PLTHP	PLOTTER type (HP)	[t]	1, 0
- SAVE/RECALL -		See section 4.1 of main instruction manual for description of basic functions.		
SAVE/RECALL	SAVEREG1	Data save to reg1	[t]	... ...
	SAVEREG2	Data save to reg2	[t]	... ...
	SAVEREG3	Data save to reg3	[t]	... ...
	SAVEREG4	Data save to reg4	[t]	... ...
	RECLREG1	Data recall to reg1	[t]	1, 0
	RECLREG2	Data recall to reg2	[t]	1, 0
	RECLREG3	Data recall to reg3	[t]	1, 0
	RECLREG4	Data recall to reg4	[t]	1, 0
	RECLPOFF	Power off recall	[t]	1, 0

Table 2-2 GPIB Program Code (11/13)

Item	Code	Contents	Descriptive format	Response format
- SAVE/RECALL -		See section 4.1 of main instruction manual for description of basic functions.		
SAVE/RECALL	CLRREG1 CLRREG2 CLRREG3 CLRREG4	clear reg1 clear reg2 clear reg3 clear reg4	[t] [t] [t] [t]	... ...
- SAVE/RECALL(FILE) -		See section 4.1 of main instruction manual for description of basic functions.		
LOAD FILE	LDFILE	LOAD FILE	[strings] [t]	... ... *8 *26
STORE FILE	STFILE1	STORE FILE	[strings] [t]	... ... *8 *26
PURGE INITIALIZE	PURGE INITIAL	Purge Initialize	[strings] [t] [t]	... ... *8 *26
- SRQ -				
	SRQE SRQD	SRQ enable SRQ disable	[t] [t]	1, 0 1, 0
- REAL TIME CLOCK -		See section 3.3.7 of main instruction manual for description of basic functions.		
REAL TIME CLOCK	RTC30ADJ YEAR MONTH DAY WEEK HOUR MINUTE	30sec ADJUST YEAR MONTH DAY WEEK HOUR MINUTE	[t] [d] [u] [t] [d] [u] [t] [d] [u] [t] [d] [u] [t] [d] [u] [t] [d] [u] [t]	... ... D *25 D *25 D *25 D *25 D *25 D *25
DEFINE STORE	RAWARY CORARY DATAARY MEMARY	RAW DATA on/off CORR DATA on/off DATA on/off MEM on/off	[s] [t] [s] [t] [s] [t] [s] [t]	1, 0 1, 0 1, 0 1, 0
- SCREEN -				
EDIT	EDIT	EDIT mode (on/off)	[s] [t]	1, 0 *10
- Marker Point Display -				
MKRPOINT	MKRPOINT	MKR Point on/off	[s] [t]	1, 0

Table 2-2 GPIB Program Code (12/13)

GPIB code	Contents	
- TRACE DATA (OUTPUT) -		
OT1DRAT	CH1 input meas and raw data following AVG	
OT1MRAT	CH1 mem raw data	☆
OT2DRAT	CH2 input meas and raw data following AVG	
OT2MRAT	CH2 mem raw data	☆
OT1CORDI	CH1 directional error coefficient	△
OT1CORSO	CH1 source match error coefficient	△
OT1CORTR	CH1 tracking error coefficient	△
OT1CORNR	CH1 normalized averaging data	
OT2CORDI	CH2 directional error coefficient	△
OT2CORSO	CH2 source match error coefficient	△
OT2CORTR	CH2 tracking error coefficient	△
OT2CORNR	CH2 normalized averaging data	
OT1CORED	CH1 data after error correction	
OT2CORED	CH2 data after error correction	
OT2CORNR	CH2 normalized averaging data	
OT1NORED	CH1 data after data/mem operation	
OT2NORED	CH2 data after data/mem operation	
OT1DFOR	CH1 data after formatting	
OT1MFOR	CH1 mem after formatting	☆
OT2DROR	CH2 data after formatting	
OT2MFOR	CH2 mem after formatting	☆
- TRACE DATA (INPUT) -		
IN1DRAT	CH1 input meas and raw data following AVG	
IN1MRAT	CH1 mem raw data	☆
IN2DRAT	CH2 input meas and raw data following AVG	
IN2MRAT	CH2 mem raw data	☆
IN1CORDI	CH1 directional error coefficient	△
IN1CORSO	CH1 source match error coefficient	△
IN1CORTR	CH1 tracking error coefficient	△
IN2CORDI	CH2 directional error coefficient	△
IN2CORSO	CH2 source match error coefficient	△
IN2CORTR	CH2 tracking error coefficient	△
IN1CORNR	CH1 normalized averaging data	△
IN2CORNR	CH2 normalized averaging data	△
IN1CORED	CH1 data after error correction	
IN2CORED	CH2 data after error correction	
IN1NORED	CH1 data after data/mem operation	☆
IN2NORED	CH2 data after data/mem operation	☆

☆ : No input or output permitted if mem is not ON.
△ : No input or output permitted if correction is not ON.

Table 2-2 GPIB Program Code (13/13)

GPIB code	Contents
IN1DFOR	CH1 data after formatting
IN1MFOR	CH1 mem after formatting
IN2DROR	CH2 data after formatting
IN2MFOR	CH2 mem after formatting

*1 : Response given as character string.
*2 : Response of 1 if MEM already stored, but 0 if not.
*3 : Sweep from beginning.
*4 : Partial sweep on/off is selected in type column.
*5 : Response of latest setting
*6 : ON not possible if MEM not stored.
*7 : ON not possible if OPEN, SHORT, LOAD, or DONE not run.
*8 : Append character string after GPIB code.
*10: Measuring menu set by EDITOFF, and EDITOR menu set by EDITON.
*11: When setting FSTPA, a value 1/10th of SPAN is automatically set instead.
*12: If already executed, there is no operation until CLEAR is run.
*13: No execution unless in DISPDM mode
*14: Because of delta between multimarkers, there is no execution unless several markers are ON.
*15: No execution unless fixed marker is ON
*16: No execution unless format is in LOGMAG mode
*17: No execution unless format is in LOGMAG or GDELAY mode
*18: ON not possible unless in DMKRC or DMKRA mode
*19: Command for setting marker number which will serve as active marker in inter-multimarker delta mode
*20: Cannot be executed when format is in phase mode.
*21: Cannot be executed when format is in phase or unwrap mode.
*22: MRK → Freq. when sweep type is LINFRQ
*23: MRK → level when sweep type is level sweep
*24: No valid data is returned if search command is not executed.
*25: Always insert a wait of at least 1 second after executing this command.
*26: Always insert a sufficient wait period to ensure end of floppy disk access after executing this command.
*27: Not executed in SINGLE SWEEP, SWEEP HOLD, or EXTERNAL TRIGGER mode.
After execution of this command, wait the next processing until SRQ of SWEEP END appears.
*28: Insert a wait of 5-second after executing IP.

☆: No input or output permitted if mem is not ON.
△: No input or output permitted if correction is not ON.

*29: When FLTANA is OFF, D(s,r,s,s,) ... (BW,Loss, Δf_L, Δf_R) is returned.
When FLTANA is ON, D(s,r,s,s,s,c,c,) ... (BW,Loss,cf,Lf,Rf,Q, sf,) is returned.

*30: For MKR1A? to MKR10A?, the number of data items which returned depending on the measuring condition at that time is different.

<table>
<tr><th colspan="3" rowspan="2">FORMAT
SMITH
MKR
Parameter conversion</th><th colspan="2">SMITH</th><th rowspan="2">POLAR</th><th rowspan="2">When other than SMITH and POLAR</th></tr>
<tr><th>LIN MKR
LOG MKR
Re/Im MKR</th><th>R+jX
G+jB</th></tr>
<tr><td colspan="3">OFF</td><td>D(s, r, i)</td><td>D(s, r, i, lc)</td><td>D(s, r, i)</td><td>D(s, r)</td></tr>
<tr><td rowspan="3">ON</td><td colspan="2">DEFAULT MKR</td><td colspan="2">D(s, r, i)</td><td>D(s, r, i)</td><td>D(s, r)</td></tr>
<tr><td rowspan="2">LIN MKR
Re/Im MKR</td><td>LorC OFF</td><td colspan="2">D(s, r, i)</td><td>D(s, r, i)</td><td>D(s, r, i)</td></tr>
<tr><td>LorC ON</td><td colspan="2">D(s, r, i, lc)</td><td>D(s, r, i, lc)</td><td>D(s, r, i, lc)</td></tr>
</table>

*31: FOR MAXSRCH?, MINSRCH?, LMAXSRC?, LMINSRC? — The number of data items which is returned depending on the measuring condition at that this is different.

The same as the table of *30.
* However, for MODE, the data for lc is not returned.

☆: No input or output permitted if mem is not ON.
△: No input or output permitted if correction is not ON.

2.5 Service Request

The status register is outlined in Figure 2-1 below.

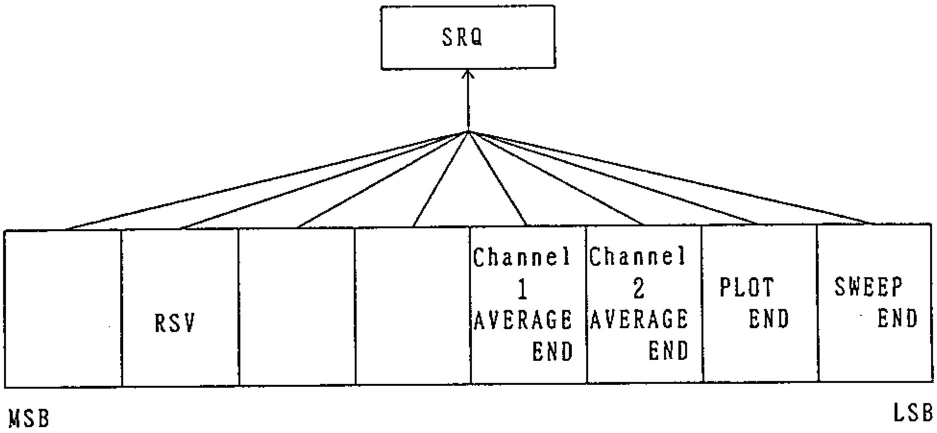


Figure 2-1 Status Register

2.6 Program Examples

2.6.1 Program for Determining Difference between Very Large and Very Small Points within Same Specified Frequencies, and Maximum Value of Difference Between Adjacent Inflection Points

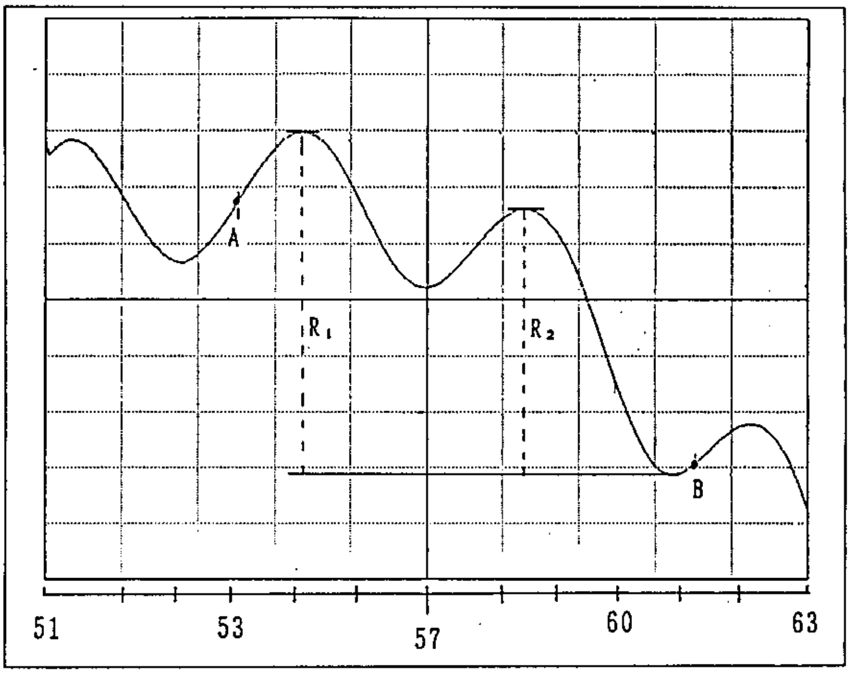
To run this program, set the GPIB address to 11 with R4611 in TALKER/ LISTENER mode.

< HP200 Series >

```
100  !
110  !       SAMPLE PROGRAM
120  !
130  OUTPUT 711; "CH1 ARIN LOGMAG"
140  OUTPUT 711; "SPANF     12 MHZ"
150  OUTPUT 711; "CENTERF   57 MHZ"
160  OUTPUT 711; "SDIV      10 DB"          ! SET PER DIVISION
170  OUTPUT 711; "REFV       0 DB"          ! SET REF LEVEL
180  OUTPUT 711; "REFP     100 PER"         ! SET REF POSITION
190  OUTPUT 711; "OUTLEV     0 DB"          ! SET OUTPUT LEVEL
200  OUTPUT 711; "AI50A0   RBW1KHZ"         ! ATT/IMP & BAND WIDTH
210  OUTPUT 711; "M301P"                    ! RESOLUTION 301 POINT
220  OUTPUT 711; "MKRCMPON"                 ! MARKER COMPENSATE MODE ON
230  OUTPUT 711; "LINFREQ"                  ! LINEAR SWEEP
240  OUTPUT 711; "MKR1A     53 MHZ"         ! MARKER 1 ON
250  OUTPUT 711; "DMKRC"                    ! CHILD MARKER ON
260  OUTPUT 711; "MKR1A      9 MHZ"         ! DELTA OFFSET
270  OUTPUT 711; "DLTX      40 MHZ"         ! DELTA X
280  OUTPUT 711; "DLTY    0.01 DB"          ! DELTA Y
290  OUTPUT 711; "DRIPPL1"                  ! RIPPLE 1 RUN
300  OUTPUT 711; "DRIPPL1?"
310  ENTER  711;Ripl1                       ! READ RIPPLE 1
320  OUTPUT 711; "DRIPPL2"                  ! RIPPLE 2 RUN
330  OUTPUT 711; "DRIPPL2?"
340  ENTER  711;Ripl2                       ! READ RIPPLE 2
350  PRINT  Ripl1,Ripl2
360  END
```

Commentary

Address	Contents
130	Channel 1 INPUT A/R LOGMAG
140	SPAN 12MHZ
150	CENTER 57MHZ
160	/DIV Set to 10 dB
170	REF LEVEL Set to 0 dB
180	REF Position Set to 100%
190	OUTPUT LEVEL Set to 0 dB
200	Impedance 50 ohms Attenuator 0 dB RESOLUTION band width 1 kHz
210	Set to measuring point 301
220	MARKER COMPENSATE mode ON
230	Linear sweep
240 250	) Set point A
260	Set (plus B point) OFFSET 9 MHz at point A
270	Differential coefficient (ΔX)
300 310	) Read RIPPLE1 from R4611
320	Compute RIPPLE2 (R_2)
330 340	) Read RIPPLE2 from R4611
350	Display
360	End



2.6.2 Trace Data Input/Output

- TRACE DATA (INPUT)

  To run this program, set the GPIB address to 11 with R4611 in TALKER/LISTENER mode.

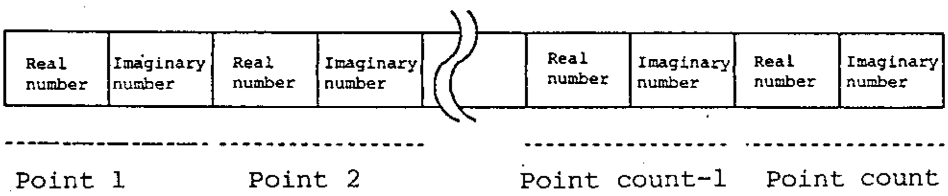
<HP200 Series>

```
100  DIM R(600)
110  Add=711
120  OUTPUT Add; "M601P"
130  OUTPUT Add; "IN1DFOR"
140  FOR I=0 TO 600
150  OUTPUT Add;R(I)
160  OUTPUT Add;Imag
170  NEXT I
180  OUTPUT Add; "TREND"
190  END
```

<Commentary>

Address	Contents
100	Array declaration
110	GPIB address setting
120	Specify measuring points as 601 points
130	Request input of TRACE DATA
140	Loop for the number of points
150	Data output to R4611 (real number)
160	Data output to R4611 (imaginary number: dummy output when not required)
170	
180	End of data output to R4611
190	End

Note: TRACE DATA input is inserted in real/imaginary number sequence at each point.



Output sequence to R4611

- Data in excess of the R4611 measurement points is disregarded. For example, if R4611N measurement points are set to 601 and data consisting of 602 or more points is sent to R4611, the excess points are disregarded.

- The "TREND" in line 180 must always be inserted when the transfer is completed.

- TRACE DATA (OUTPUT)

  To run this program, set the GPIB address to 11 with R4611 in TALKER/LISTENER mode.

<HP200 Series>

```
100  DIM R(1200)
110  Add=711
120  OUTPUT Add; "OT1DFOR"
130  ENTER Add;Po
140  FOR I=0 TO Po-1
150  ENTER Add;R(I)
160  ENTER Add;Imag
170  NEXT I
180  PRINT R(*)
190  END
```

<Commentary>

Address	Contents
100	Array declaration
110	GPIB address setting
120	Request output of TRACE DATA
130	Enter the number of points
140	Loop for the number of points
150	Data input (real number)
160	Data input (imaginary number: dummy output when not required)
170	
180	Output
190	End

Note: TRACE DATA output consists of output of the initial point, then output in real/imaginary number sequence at each point.

Real number	Imaginary number	Real number	Imaginary number		Real number	Imaginary number	Real number	Imaginary number
Point 1		Point 2			Point count-1		Point count	

Output sequence to R4611

2.6.3 SRQ

When the GPIB code "SRQE" is executed, the sweep end SRQ output is passed to the external controller.

To run this program, set the GPIB address to 11 with R4611 in TALKER/LISTENER mode.

<HP200 Series>

```
10    OUTPUT 711; "SRQE"              ! R4611 SRQ ENABLE
20    ON INTR 7 GOTO 100              !
30    ENABLE INTR 7;2
40    ! LOOP                          ! LOOP
50    GOTO 40                         ! LOOP
100   ! SWEEP END                     ! SWEEP END
110   S=SPOLL(711)                    ! SERIAL POLL
120   IF S < > 65 THEN GOTO 199       ! SWEEP END ?
130   OUTPUT 711; "MAXSRCH?"          ! YES MAX SEARCH
140   ENTER  711;S,R,I,LC             ! GET DATA
150   PRINT R                         ! PRINT LABEL
199   GOTO 30
200   END
```

<Commentary>

Address	Contents
10	R4611 sweep end SRQ output designation
20	Branch to line number 100 when SRQ arrives
30	Interrupt enable
40 50	Loop
100	

Address	Contents
110	Serial poll
120	Go to 199 if not sweep end
130	MAX SEARCH
140	Input of measurement data from R4611
150	Print label
199	GOTO 30
200	END

2.6.4 Starting BASIC from External Controller

While R4611 is in TALKER/LISTENER mode, BASIC commands can be executed from the external controller.

"@BASIC command"

Appending @ to the beginning enables BASIC commands inside R4611 to be activated from the external controller.

Description of Program Example

Certain BASIC programs are generated in advance in remote control BASIC, and saved to R4611 floppy disk under file names "FILE_1", "FILE_2", "FILE_3", and "FILE_4". Then when program example 1 is generated and executed by external controller, programs in R4611 are loaded and run one after another.

Note:
- To run these programs, set the GPIB address to 11 with R4611 in TALKER/LISTENER mode.
- The R4611 built-in BASIC REQUEST command has been included to inform the external controller when execution is completed.

Program example 1

<HP200 Series>

```
100    DIM A$(3) [6] , L$[20]
110    F=4
115    E=0
120    ON INTR 7 GOSUB 1000
130    A$(0)="FILE_1"
140    A$(1)="FILE_2"
150    A$(2)="FILE_3"
160    A$(3)="FILE_4"
200    FOR I=0 TO F-1
210    L$="@LOAD "&CHR$(34)&A$(I)&CHR$(34)
220    OUTPUT 711;L$
230    WAIT 5
240    OUTPUT 711; "@RUN"
250    ENABLE INTR 7;2
260    IF E=0 THEN 260
270    WAIT 5
280    E=0
290    NEXT I
1000   ! SRQ
1010   S=SPOLL(711)
1020   IF S=65 THEN
1030      BEEP
1040      E=1
1050      END IF
1060   RETURN
1070   END
```

- R4611 BASIC

<FILE_1>

```
100  FOR I=1 TO 24
110  PRINT I
120  NEXT I
130  REQUEST 64+1
```

<Commentary>

Address	Contents
100	Loop 24 times
110	Display I
120	
130	REQUEST to HOST

<FILE_2>

```
100  FOR I=1 TO 24
110  PRINT I*2
120  NEXT I
130  REQUEST 64+1
```

<Commentary>

Address	Contents
100	Loop 24 times
110	Display I*2
120	
130	REQUEST to HOST

<FILE_3>

```
100  FOR I=24 TO 1 STEP -1
110  PRINT I
120  NEXT I
130  REQUEST 64+1
```

<Commentary>

Address	Contents
100	Loop 24 times (minus steps)
110	Display I
120	
130	REQUEST to HOST

<FILE_4>

```
100  FOR I=24 TO 1 STEP -1
110  PRINT "ADVANTEST R4611 NETWORK ANALYZER"
120  NEXT I
130  REQUEST 64+1
```

<Commentary>

Address	Contents
100	Loop 24 times (minus steps)
110	Display ADVANTEST R4611 NETWORK ANALYZER
120	
130	REQUEST to HOST

2.6.5 Program Example Using External Controller or Built-in BASIC

When using an external controller

To run this program, set the GPIB address to 11 with R4611 in TALKER/LISTENER mode.

<HP200 Series>

```
100  OUTPUT 711; "EDITOFF "
110  OUTPUT 711; "LOGMAG"
120  OUTPUT 711; "CENTERF100MHZ "
130  OUTPUT 711; "SPANF10MHZ"
140  OUTPUT 711; "AUTO"
150  OUTPUT 711; "CENTERF ?"
160  ENTER 711;Cf
170  OUTPUT 711; "SPANF ?"
180  ENTER 711;Sf
190  OUTPUT 711; "MAXSRCH "
200  OUTPUT 711; "MAXSRCH ?"
210  ENTER 711;F,L,D1,D2
220  PRINT "Center freq.= " ,Cf
230  PRINT "Span   freq.= " ,Sf
240  PRINT "MAX   Level = " ,L
250  END
```

<Commentary>

Address	Contents
100	Switch to measurement menu
110	LOGMAG mode
120	Set central frequency to 100 MHz
130	Set frequency width to 10 MHz
140	Execute auto scale
150	Request center frequency response
160	Substitute center frequency response in variable Cf
170	Request frequency width response
180	Substitute frequency width response in variable Sf
190	Search for maximum level
200	Request maximum level response
210	Substitute maximum level response in each variable
220	Display center frequency
230	Display frequency width
240	Display maximum level
250	

When using R4611 built-in BASIC

(When the built-in BASIC is used, R4611 itself can be controlled specifying OUTPUT and ENTER address as 31.)

```
100  OUTPUT 31; "EDITOFF "
110  OUTPUT 31; "LOGMAG"
120  OUTPUT 31; "CENTERF100MHZ "
130  OUTPUT 31; "SPANF10MHZ"
140  OUTPUT 31; "AUTO"
150  OUTPUT 31; "CENTERF ?"
160  ENTER 31;Cf
170  OUTPUT 31; "SPANF ?"
180  ENTER 31;Sf
190  OUTPUT 31; "MAXSRCH "
200  OUTPUT 31; "MAXSRCH ?"
210  ENTER 31;F,L,D1,D2
220  PRINT "Center freq.= " ,Cf
230  PRINT "Span   freq.= " ,Sf
240  PRINT "MAX   Level = " ,L
250  STOP
```

<Commentary>

Address	Contents
100	Switch to measurement menu
110	LOGMAG mode
120	Set central frequency to 100 MHz
130	Set frequency width to 10 MHz
140	Execute auto scale
150	Request center frequency response
160	Substitute center frequency response in variable Cf
170	Request frequency width response
180	Substitute frequency width response in variable Sf
190	Search for maximum level
200	Request maximum level response
210	Substitute maximum level response in each variable
220	Display center frequency
230	Display frequency width
240	Display maximum level
250	

2.6.6 X'TAL FILTER Measuring Program Example

```
1000  REM ..............................
1100  REM SAMPLE PROGRAM FOR
1200  REM XTAL FILTER
1300  REM
1400  REM ..............................
1500  REM FILTER IS . . .
1600  REM 21.4MHz BPF
1700  REM ..............................
1800  REM
1900  REM
2000  REM *** INITIALIZE R4611 ***
2100  REM
2200  OUTPUT 31; "CH1 ARIN LOGMAG "
2300  OUTPUT 31; "SDIV 10 DB"
2400  OUTPUT 31; "REFV 0 DB "
2500  OUTPUT 31; "REFP 100 PER"
2600  OUTPUT 31; "REFLON PORT2"
2700  OUTPUT 31; "OUTLEV 0 DB "
2800  OUTPUT 31; "AI50A20 "
2900  OUTPUT 31; "RBW1KHZ "
```

Continued to next page

```
3000  OUTPUT 31; "FREE CONT M301P "
3100  OUTPUT 31; "MKRCMP"
3200  REM
3300  REM *** LOOP TOP ***
3400  REM
3500  OUTPUT 31; "SPANF 25 KHZ"
3600  OUTPUT 31; "CENTERF 21.4 MHZ"
3700  REM
3800  REM *** 1 SWEEP ***
3900  REM
4000  OUTPUT 31; "SINGLE"
4100  BUZZER 0 1500
4200  REM
4300  REM *** SCREEN INITIALIZE ***
4400  REM
4500  CLS
4600  FOR I=1 TO 10
4700  PRINT
4800  NEXT I
4900  REM
5000  REM *** GET INS LOSS ***
5100  REM
5200  LOSS=MAX (0,1200,0)
5300  MAXP=PMAX (0,1200,0)
5400  PRINT "LOSS" ,LOSS, "dB"
5500  REM
5600  REM *** GET RIPPLE ***
5700  REM
5800  RIPPLE=RPL1 (400,800,4,0.01,0)
5900  PRINT "RIPPLE ",RIPPLE, "dB"
6000  REM
6100  REM *** GET BW (3dB) ***
6200  REM
6300  BW3DB=BND (600,3,0)
6400  PRINT "BW (3dB)" ,BW3DB, "Hz"
6500  REM
6600  REM *** GET BW (400dB) ***
6700  REM
6800  BW40DB=BND (600,40,0)
6900  PRINT "BW (40dB) " ,BW40DB, "Hz"
7000  REM
7100  REM *** 1MHz DEVIATION LEVEL ***
7200  REM
7300  OUTPUT 31; "SPANF 2 MHZ"
7400  OUTPUT 31; "SINGLE"
7500  BUZZER 0 1500
```

Continued to next page

```
7600  LLEVEL=VALUE (0,0)
7700  RLEVEL=VALUE (1200,0)
7800  PRINT "1MHz DEV. LEVEL(dB)"
7900  PRINT LLEVEL,RLEVEL
8000  GOTO 3200
8100  REM
8200  REM *** END JOB ***
8300  REM
8400  OUTPUT 31; "CONT"
8500  END
```

<Commentary>

Address	Contents
2000 ~ 4200	Initialization
5000 ~ 5500	Measure insertion loss
5600 ~ 6000	Ripple measurement
6100 ~ 6500	Measure 3 dB band width
6600 ~ 7000	Measure 40 dB band width
7100 ~ 7700	Measure levels at ±1 MHz away from tuned frequency
8000	Return to loop top and repeat measurement

2.6.7 Example of Measuring Program Using Parallel I/O Ports

```
[EDITOR]  <................>  [MOD]   Done

1000  REM **********************************
1010  REM ***                            ***
1020  REM ***   R4611 NETWORK ANALYZER   ***
1030  REM ***                            ***
1040  REM ***  SEMI AUTO PROGRAM BY PIO  ***
1050  REM ***                            ***
1060  REM **********************************
1070  REM
1080  CURSOR 0 18
1090  PRINT "*** R4611 DEMO PROGRAM ***"
1100  PRINT ""
1110  PRINT "  * USE PIO DEMO SET"
1120  PRINT
1130  PRINT " [1] NARROW BAND TEST"
1140  PRINT " [2] WIDE BAND TEST"
1150  PRINT " [3] PHASE MEASUREMENT"
1160  PRINT " [4] G.D. MEASUREMENT"
1170  PRINT "  "
1180  OUTPUT 31; "CH1 ARIN LOGMAG"
1190  OUTPUT 31; "SDIV 10 DB"
1200  OUTPUT 31; "REFV 0 DB"
1210  OUTPUT 31; "REFP 100 PER"
1220  OUTPUT 31; "REFLON PORT2"
1230  OUTPUT 31; "OUTLEV 0 DB"
1240  OUTPUT 31; "BI1A20"
1250  OUTPUT 31; "AI1A20"
1260  OUTPUT 31; "RI50A20"
1270  OUTPUT 31; "RBW1KHZ"
1280  OUTPUT 31; "FREE CONT M301P"
1290  OUTPUT 31; "MKRCMP"
1300  OUTPUT 31; "SPLITON"
1310  OUTPUT 31; "DUALOFF"
1320  OUTPUT 31; "CENTERF 455 KHZ"
1330  BUZZER 0 1000
1340  CURSOR 2, 28
1350  *LOOPTOP
1360  CURSOR 2, 28
1370  PRINT "SELECT PIO NUMBER ?"
1380  *LOOPTOP1
1390  ENTER 32;PIO
1400  IF PIO=1 THEN GOTO *MEAS1
```

Continued to next page

```
1410  IF PIO=2 THEN GOTO *MEAS2
1420  IF PIO=4 THEN GOTO *MEAS3
1430  IF PIO=8 THEN GOTO *MEAS4
1440  GOTO *LOOPTOP1
1450  REM
1460  REM
1470  REM
1480  REM --- NARROW BAND MEASURE ---
1490  *MEAS1
1500  CLS
1510  OUTPUT 31; "SPANF 100 KHZ"
1520  OUTPUT 31; "LOGMAG"
1530  REM
1540  REM *** 1 SWEEP ***
1550  REM
1560  CURSOR 0,19
1570  BUZZER 0 1000
1580  CLS
1590  REM
1600  REM *** SCREEN INITIALIZE ***
1610  REM
1620  CURSOR 0,19
1630  REM
1640  REM *** GET INS LOSS ***
1650  REM
1660  LOSS=MAX (0,1200,0)
1670  MAXP=PMAX (0,1200,0)
1680  PRINT "LOSS" ,LOSS, "dB"
1690  REM
1700  REM *** GET RIPPLE ***
1710  REM
1720  RIPPLE=RPL1 (400,800,4,0.01,0)
1730  PRINT "RIPPLE" ,RIPPLE, "dB"
1740  REM
1750  REM *** GET BW (83dB) ***
1760  REM
1770  BW3DB=BND (600,3,0)
1780  PRINT "BW (3dB)" ,BW3DB, "Hz"
1790  REM
1800  REM *** GET BW (40dB) ***
1810  REM
1820  BW40DB=BND (600,40,0)
1830  PRINT "BW (40dB)" ,BW40DB, "Hz"
1840  GOTO *LOOPTOP
1850  REM
```

Continued to next page

```
1860  REM --- WIDE BAND MEASUREMENT ---
1870  REM
1880  *MEAS2
1890  CLS
1900  OUTPUT 31; "SPANF 2 MHZ"
1910  OUTPUT 31; "LOGMAG"
1920  BUZZER 0 1000
1930  CURSOR 0,19
1940  CLS
1950  LLEVEL=VALUE (0,0)
1960  RLEVEL=VALUE (1200,0)
1970  CLS ; CURSOR 0 20
1980  PRINT "1MHz DEV. LEVEL (dB)   "
1990  PRINT LLEVEL,RLEVEL
2000  GOTO *LOOPTOP
2010  REM
2020  REM
2030  REM
2040  END
2050  REM --- PHASE MEASUREMENT ---
2060  REM
2070  *MEAS3
2080  CLS
2090  OUTPUT 31; "SPANF 100 KHZ"
2100  OUTPUT 31; "PHASE"
2110  REM
2120  REM *** 1SWEEP ***
2130  REM
2140  CURSOR 0 19
2150  CLS
2160  REM
2170  REM *** SCREEN INITIALIZE ***
2180  REM
2190  CURSOR 0 19
2200  GOTO *LOOPTOP
2210  REM
2220  REM --- DELAY MEASUREMENT ---
2230  REM
2240  *MEAS4
2250  CLS
2260  OUTPUT 31; "SPANF 100 KHZ"
2270  OUTPUT 31; "DELAY"
2280  BUZZER 0 3000
2290  OUTPUT 31; "AUTO"
2300  REM
2310  REM *** 1 SWEEP ***
2320  REM
2330  CURSOR 0 19
2340  BUZZER 0 2000
2350  GOTO *LOOPTOP
```

< Commentary >

Address	Contents
1180 ~ 1330	Initialization
1370 ~ 1430	Set measuring function by parallel I/O input signal
1480 ~ 1840 ~ 1860	Return to loop top and repeat measurement MEAS1 measurement On basis of narrow band frequency span (Insertion loss, ripple, 3 dB band width, 40 dB band width)
1860 ~ 2000	MEAS2 measurement Measure levels of start and stop points on basis of wide band frequency span
2050 ~ 2200	MEAS3 measurement Phase measurement Return to loop top and repeat measurement
2240 ~ 2350	MEAS4 measurement Group delay measurements Return to loop top and repeat measurement

2.6.8 Example of Program Where Limited Test Function Is Used in Low-pass Filter Measurements

```
1000  !
1010  !
1020  ! INITIALIZE
1030  !
1040  OUTPUT 31; "CH1 LOGMAG"
1050  OUTPUT 31; "MKRCMP"
1060  OUTPUT 31; "SINGLE"
1070  OUTPUT 31; "STARTF 1.5MHZ"
1080  OUTPUT 31; "STOPF  6 MHZ"
1090  OUTPUT 31; "DUAL ON"
1100  OUTPUT 31; "SPLIT ON"
1110  OUTPUT 31; "COUPLE ON"
1120  OUTPUT 31; "CH2 DELAY"
1130  BUZZER 0 500
1140  OUTPUT 31; "SRQE"
1150  !
1160  ! MEASUREMENT
1170  !
1180  BUZZER 4 100
1190  OUTPUT 31; "MEAS"
1200  ON ISRQ GOTO 1240
1210  ENABLE INTR
1220  !
1230  GOTO 1220
1240  !
1250  Fr=FMIN (0,1200,0)
1260  F1=MIN (0,1200,0)
1270  F2=POINT1 (2e+06,0)
1280  L2=VALUE (F2,0)
1290  F3=POINT1 (3e+06,0)
1300  L2=VALUE (F3,0)
1310  F4=POINT1 (4e+06,0)
1320  L4=VALUE (F4,0)
1330  Fi=POINT1 (3.58e+06,0)
1340  Li=VALUE (Fi,0)
1350  !
1360  ! DELAY
1370  !
1380  BUZZER 0 500
1390  F3=POINT1 (3.58e+06,1)
1400  D3=VALUE (F3,1)
1410  F3=POINT1 (4.08e+06,1)
1420  D4=VALUE (F4,1)
```

Continued to next page

```
1430  !
1440  ! GO/NOTO CHECK !!
1450  !
1460  CURSOR 0,3
1470  N1=LMTUL1 [Fr,5.3025e+06,4.7975e+06]
1480  N2=LMTUL1 [F1,-30,-200]
1490  N3=LMTUL1 [L2,-5,-11]
1500  N4=LMTUL1 [L3,5,-1.2]
1510  N5=LMTUL1 [L4,5,-1.2]
1520  N6=LMTUL1 [Li,5,-1]
1530  N7=LMTUL1 [D3,230,170]
1540  N8=LMTUL1 [D4,330,0]
1550  N=N1+N2+N3+N4+N5+N6+N7+N8
1560  IF N=0 THEN GOTO 1590
1570  PRINT "NG !!"
1580  GOTO 1180
1590  PRINT "OK !!"
1600  GOTO 1180
1610  STOP
```

< Commentary >

Address	Contents
1020 ~ 1120	Initialization
1130	500 msec wait
1140	Enable SRQ
1200	Set internal SRQ interrupt and branch
1210	Accept interrupt
1250 ~ 1340	Measured value interrupt at frequency measurement point specified by CH1
1380 ~ 1420	Measured value interrupt at frequency measurement point specified by CH2
1470 ~ 1540	Designation of limit values for each measured value
1550	Set branching according to result of comparison value
1570	Print NG if even a single item was NG
1590	Print OK if all items are OK, and continue to measure repeatedly

```
10     REM -----------------------------------
20     REM
30     REM       XTAL EQUIVALENT CIRCUITM
40     REM
50     REM
60     REM          PI-CIRCUIT-METHOD
70     REM
80     REM -----------------------------------
90     REM
100    REM
110    REM
120    REM
130    REM
140    REM
150    REM
160    REM
170    REM
180    SPAN1$ = "SPANF 1KHZ"
190    CENTER1$ = "CENTER 11.97596430MHZ"
200    CLS : CURSOR 0 14
210    REM
220    REM -----------------------------------
230    REM
240    REM              START
250    REM
260    REM -----------------------------------
270    NA=31
280    CFLAG=0
290    OUTPUT NA; "COUPLE?"
300    ENTER NA;X
310    PRINT " [ ";X;" ] "
320    IF X=0 THEN OUTPUT NA; "COUPLEON"
330    PRINT
340    PRINT
350    PRINT "Do you need CAL?   YES;1 NO;0 "
360    INPUT QQ
370    PRINT " [ "QQ" ] "
380    IF QQ=1 THEN CFLAG=1
390    GOTO *MEAS
400    *CALUC
410    REM
420    REM *** CALCULATE ***
430    REM
440    XDEG=3
450    RR=25*(10 ^ (-LOSS/20)-1)
460    AA=1+0.50878*(RR/12.5)
```

Continued to next page

```
470   BB=2*0.50878*(RR/12.5)
480   CC=FR*PI*2*XDEG
490   DD=180*DF3
500   Q=(AA/BB)*(CC/DD)
510   C1=1/(2*PI*FS*RP*Q)
520   L=1/((2*PI*FS) ^ 2*C1)
530   PRINT "****   R4611 DEMO (XTAL)   ****"
540   PRINT "LOSS(dB)   " ,-LOSS
550   PRINT "Fs (Hz)    " ,FS
560   PRINT "Fr (Hz)    " ,FR
570   PRINT "dF (Hz)    " ,DF3
580   PRINT
590   PRINT "Q          " ,Q
600   PRINT "Rr (ohm)   " ,RR
610   PRINT "C1 (pF)    " ,C1*1e+12
620   PRINT "L  (mH)    " ,L*1000
630   PRINT "----------------------------------------"
640   GOTO *MEAS2
650   REM
660   REM *** MEASUREMENT ***
670   REM
680   *MEAS
690   OUTPUT NA; "DUALON"
700   OUTPUT NA; "SPLITOFF"
710   FOR CH=1 TO 2
720      IF CH=1 THEN GOTO 750
730      OUTPUT NA; "CH2"
740      GOTO *EX1
750      OUTPUT NA; "CH1"
760     *EX1
770      OUTPUT NA;SPAN1$
780      OUTPUT NA;CENTER1$
790      OUTPUT NA; "ARIN"
800      OUTPUT NA; "PORT2"
810      OUTPUT NA; "AI50A0"
820      OUTPUT NA; "BI50A20"
830      OUTPUT NA; "RO50A20"
840      OUTPUT NA; "RBW30HZ"
850      OUTPUT NA; "MKRCMP"
860      OUTPUT NA; "STIME 0.1 SEC"
870      OUTPUT NA; "M101P"
880      OUTPUT NA; "FREE CONT"-
890   NEXT CH
900   OUTPUT NA; "CH1 LOGMAG"
910   OUTPUT NA; "REFV 0 DB"
920   OUTPUT NA; "REFP 90 PER"
```

Continued to next page

```
930   OUTPUT NA; "CH2 PHASE"
940   OUTPUT NA; "REFV 0 DEG"
950   OUTPUT NA; "REFP 50 PER"
960   OUTPUT NA; "SINGLE"
970   REM
980   REM *** CALIBRATION ***
990   REM
1000  *CAL
1010  IF CFLAG=0 THEN GOTO *MEAS2
1020  OUTPUT NA; "CH1 NORMOFF"
1030  OUTPUT NA; "CH2 NORMOFF"
1040  CLS
1050  BEEP
1060  PRINT " >> CONNECT [THRU] "
1070  INPUT "& PRESS [RETURN] KEY" ,Q$
1080  PRINT "Calibration........"
1090  BUZZER 0 3000
1100  OUTPUT NA; "CH1 NORMON"
1110  OUTPUT NA; "CH2 NORMON"
1120  PRINT "CAL done."
1130  BEEP
1140  PRINT " >> CONNECT [DUT]
1150  INPUT "& PRESS [RETURN] KEY" ,Q$
1160  PRINT "MEASURING START "
1170  REM
1180  REM *** MEASURE START ***
1190  REM
1200  *MEAS2
1210  OUTPUT NA; "SRQE"
1220  OUTPUT NA; "MEAS"
1230  ON ISRQ GOTO 1260
1240  ENABLE INTR
1250  GOTO 1240
1260  REM
1270  REM *** GET MAG DATA ***
1280  REM
1290  OUTPUT NA; "CH1 "
1300  LOSS=MAX (0,1200,0)
1310  FS=FMAX (0,1200,0)
1320  REM
1330  REM *** GET PHASE DATA ***
1340  REM
1350  OUTPUT NA; "CH2"
1360  OUTPUT NA; "ZRPSRCH"
1370  OUTPUT NA; "MKR1A?"
1380  ENTER NA;FR
```

Continued to next page

```
1390  OUTPUT NA; "TREFZRP"
1400  OUTPUT NA; "T3DEG"
1410  OUTPUT NA; "T3DEG?"
1420  ENTER NA;DF3
1430  REM
1440  REM
1450  CLS
1460  GOTO *CALUC
1470  REM
1480  REM
1490  END
```

<Commentary>

Address	Contents
180 ~ 190	Set center frequency to 11.97596430 MHz, and span width to 1 kHz
200	Clear screen, and decide on cursor position
290 ~ 320	Switch marker couple ON
350 ~ 370	Select whether CAL is required or not (0 or 1)
390	Jump to initialization routine
420	X'TAL element constants calculation and display of result
440 ~ 520	Calculate X'TAL element constants
530 ~ 630	Display result of X'TAL element calculation
650 ~ 660	R4611 initialization
680 ~ 700	Switch dual-channel display on, and split display off
710 ~ 750	Form loop required to set two channels CH1 and CH2
770 ~ 960	Various setting conditions

Address	Contents
970 ~ 980	Calibration routine
1000 ~ 1030	Determine whether calibration is necessary, then proceed to initialization
1040	Clear screen display
1060 ~ 1080	Display short bar connection message
1100 ~ 1120	Proceed with normalization
1130 ~ 1160	Display [DUT] ... X'TAL connection message
1180 ~ 1240	Routine for repeating sweep, and output/detection of service request at end of sweep
1270 ~ 1310	Built-in function for return of maximum amplitude level and corresponding frequency in screen display during amplitude measurement mode
1340 ~ 1420	Return of value of frequency 3 dB band width for phase value of 0° in phase measurement mode
1460	Jump to calculation routine

3. CONTROL MODE

3.1 Outline

R4611 is equipped with a GPIB controller function capable of controlling external equipment. By using the BASIC programming function, both the R4611 Network Analyzer itself and external equipment connected to R4611 can be controlled.

NOTE

If the GPIB is locked when in controller mode, press the R4611 STOP key three times to initialize the GPIB port.

3.2 Setting Controller Mode

Select the system controller function by pressing the front panel LOCAL switch and selecting [SYSTEM CONTROL] from the menu. Then select [GPIB ADDRESS] and key in R4611's GPIB address (0 thru 30) by pressing the corresponding numeric keys. Addressing is also necessary when setting controller mode.

NOTE

- The GPIB address of external equipment connected to R4611 must not be the same as the R4611 address.
- The address specified at this stage is used for internal processing purposes. The address used for controlling R4611 by built-in BASIC program is fixed to "31".

3.3 Handling Floppy Disks

(1) Floppy Disk Dimensions and Component Parts

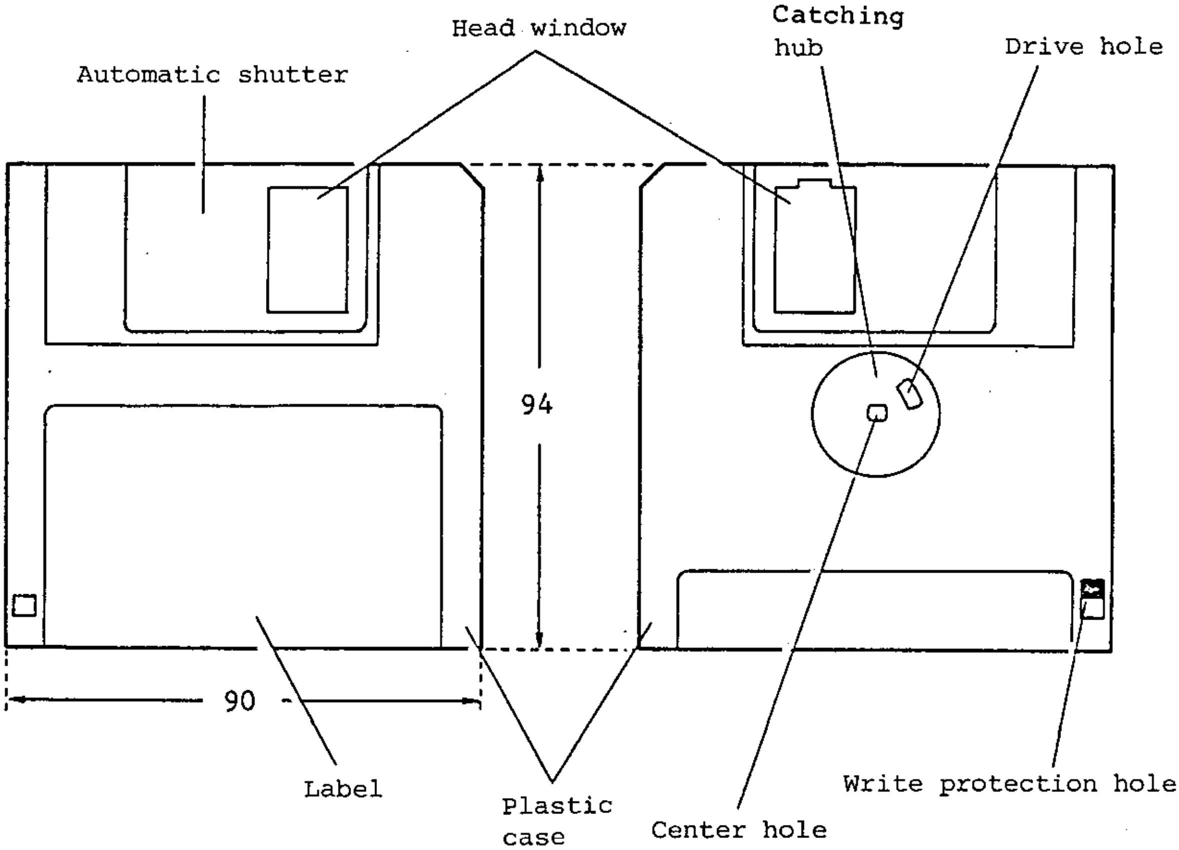


Figure 3-1 Floppy Disk Dimensions and Component Parts

- Label : The label is affixed by the user when a floppy disk is used.

- Head window : Head window apertures are located on both sides of the disk at the same position as the read/write heads. The heads move vertically across these apertures. When a floppy disk is removed from the drive slot, the automatic shutter closes to protect the disk surface.

- Catching hub (drive and center holes)
  : When a floppy disk is inserted into the drive slot, it is secured and rotated by a spindle using a catching magnet.

- Write protection hole: This hole prevents important data from being erased accidentally by operational error.

(2) Floppy Disk Loading and Other Handling Precautions

The correct way to insert a floppy disk into the disk drive is shown in Figure 3-2. Note that the label side faces the left hand side. Push the disk fully into the drive by hand, and check that it has been secured. To remove the disk, press the EJECT button.

Note: Do not press the EJECT button if the red disk drive button is flashing on and off.

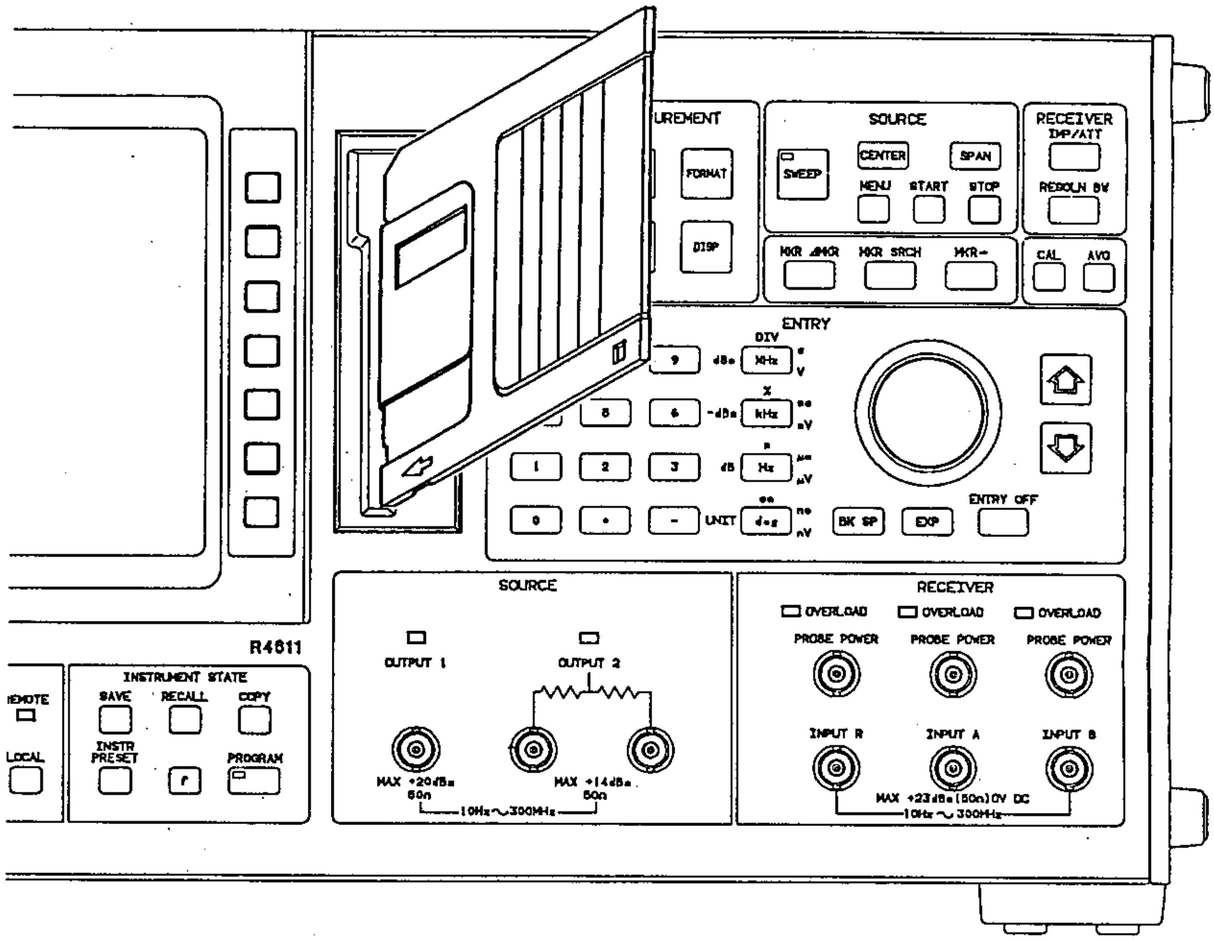


Figure 3-2 Floppy Disk Insertion Method

Take note of the following precautions when storing disks after removal from the drive.

① Keep disks away from magnetic fields and other strong magnetic materials.
Data stored on disks can be distorted by strong magnetic fields.

② Protect disks from heat sources and direct sunlight.

③ Heat, cigarette ash, and other foreign matter can also lead to disk damage.

④ Do not touch the magnetically coated surface by hand, and do not try to clean the surface by hand. Data can be lost by scratches incurred in this way.

⑤ Do not place heavy articles on top of floppy disks.

In floppy disks which are physically damaged (by wetting, creasing, warping, etc.) the head will "float" away from the coated surface, resulting in track jumping, continuous level dropping, and other errors. A disk which has been damaged or spoiled should always be replaced. And disks soiled by sticky fluids (such as soft drinks, coffee, and oil) or iron filings etc. must not be used in other drives. If the heads of other drives are become dirty, not only will the head be damaged and put out of action, but other floppy disks may also be spoiled.

NOTE

The floppy disk contents may not be read correctly if the power is switched on with a disk already mounted in the drive. In this case, switch the power off, and remove the disk before switching the power back on.

(3) Write Protect

To prevent valuable data from being erased accidentally by operational error etc., writing additional data to that disk can be inhibited by the write protect feature.

This feature is selected by moving the write protect sliding knob shown in Figure 3-3. Normally, this knob is left in the position nearest the center hole to permit writing, but is moved to the corner position to prevent writing.

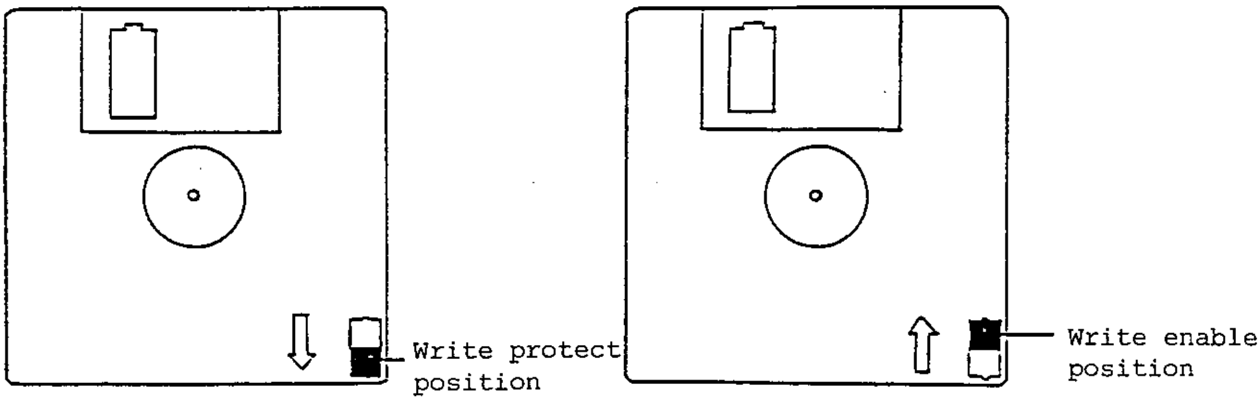


Figure 3-3 Floppy Disk Write Protect and Write Enable

3.4 File Management

3.4.1 Outline

BASIC programs, saved data, and other information stored on floppy disk are called "files". Files can be displayed, erased, and copied. The main factors involved in storage of information on floppy disks are briefly described below.

DISKNAME	:	To identify individual floppy disks, DISKNAME is written when the disk is initialized. (See section on initialization.)
FILE	:	BASIC programs, save data, and other information are stored in individual files which may take up any number of sectors.
SECTOR	:	The smallest unit in which data can be stored on disk. 1 sector corresponds to 512 bytes.
File type	:	File groups are separated into three types; BASIC, SYSTEM, and DATA. Data is a clear statements so that still more few types of file exist.
Disk capacity	:	The maximum data storage capacity per disk is:- Maximum number of files: 200 Total number of sectors: 1400 Data can be stored as long as neither of these limits is exceeded.

3.4.2 Saving and Recalling Programs

Generated programs will be lost when the power is switched off if they are not stored on floppy disk.

The SAVE command is used to store programs. And the LOAD command is used to recall programs from floppy disk.

By using the various R4611 save/recall functions, saved data can also be recorded as files on floppy disk.

3.4.3 Floppy Disk Management (Initialization)

Before a floppy disk can be used in R4611, it must first be initialized by writing data of predetermined format to that disk. Note, however, that when a used disk is initialized, all previous data stored on that disk is lost. Therefore, before initializing a disk, always check its contents. Disk director information can be checked by using CAT or CHKDSK. Floppy disks are initialized by using the INITIALIZE command.

Example:

```
INITIALIZE )             ... ADVANTEST:R4611 and disk name are
                             determined automatically.
INITIALIZE "DEMO.DISK"   ... The character string enclosed
                             between double quotation marks
                             becomes the disk name.
```

NOTE

The disk name can consist of up to 16 characters, the available characters being the same as those used in file names.

3.4.4 File Management CAT and CHKDSK

The CAT command is used to display the directory of the currently inserted disk. Directory details include (reading from left to right) registration number, file name, number of sectors used, number of characters, and file attributes.

The CHKDSK command is used to display disk information such as the disk name registered when the disk was initialized, number of files, and number of disk sectors used.

3.4.5 File Storage SAVE "File Name"

The SAVE command is used to store programs on floppy disk after appending a file name to the program. If a file name which already exists on that disk is specified, the contents of that file are updated.

3.4.6 File Recalling LOAD "File Name"

The LOAD command is used to retrieve files from floppy disk to memory.

3.4.7 File Deletion PURGE "File Name"

The PURGE command is used to remove unwanted files.

3.4.8 File Name Change RENAME "Old File Name" "New File Name"

The RENAME command is used to change the name of current files without changing their contents.

NOTE

File names can consist of up to 16 characters including alphanumeric characters and any special characters apart from those listed below.

4. BASIC PROGRAMMING

4.1 Outline

In addition to general purpose BASIC commands, the BASIC language incorporated in R4611 is also equipped with GPIB control commands and R4611 dedicated built-in functions. Small-scale GPIB systems can be readily constructed.

4.2 Activation of Program Mode

(1) Program Mode

Program mode can be activated by pressing the PROGRAM key on the R4611 front panel, or by pressing CHG MODE on the keyboard. As a result, the display shown below appears on the CRT screen. Since this is a toggle key, program mode is switched back to measuring mode if the key is pressed again.

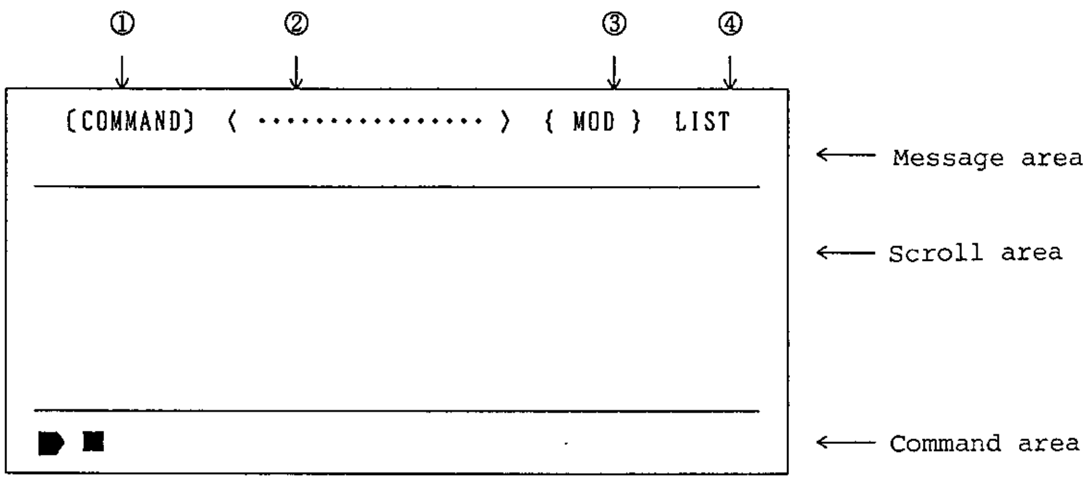


Figure 4-1 CRT Display During Program Mode

① Display current input mode

[COMMAND] ..... When cursor is on input line
[EDITOR] ..... When cursor is in scroll area

② Display file name which can currently be edited

.... Currently generating new data, or no file loaded
file-name ... Name of file currently loaded

③ Display editor mode status

OK .... File correctly loaded
NG .... File not correctly loaded
NEW .... New file being generated
MOD .... Editing existing file
APN .... Adding to existing file
? .... Command mode

④ When a function key is pressed, that function is displayed.

Input mode may be either command or editor. The initial mode set is command mode where all input data (maximum of 45 characters) is typed in on the input line. Direct input to the scroll area is not possible at this stage.

(2) Commands and Programs

When a statement following a line number is keyed in, that line becomes a program line. If a statement is typed in and executed without specifying a line number, the line is called a command.

```
Example: ▶ 10 PRINT "TR4611 BASIC" ..... Program
         ▶ LIST 10 100 ................. Command
```

(3) Input and Execution

To input a program line, type in a line number followed by a valid statement, and then press the RETURN or ENTER key. That line is then stored in memory as part of a program. That line is not executed until the program itself is executed.

When executing a new program, always remove the old program by typing in SCRATCH from the keyboard.

Example: ▶ SCRATCH

The SCRATCH statement is used to initialize previous input programs and variables.

```
SCRATCH   ..... Initialization of programs and variables
SCRATCH 1 ..... Initialization of variables
SCRATCH 2 ..... Initialization of programs
```

4.3 Editor Mode Activation

Program input in command mode requires input of line numbers. And since program lines are cleared once the end is reached, it is very difficult to know the current position within a program, or to collate a program which has already been entered. The editor mode is used to overcome this problem.

- Editor Mode

Editor mode is activated by typing in EDIT and pressing the RETURN key. As a result, the display shown below appears on the CRT screen.

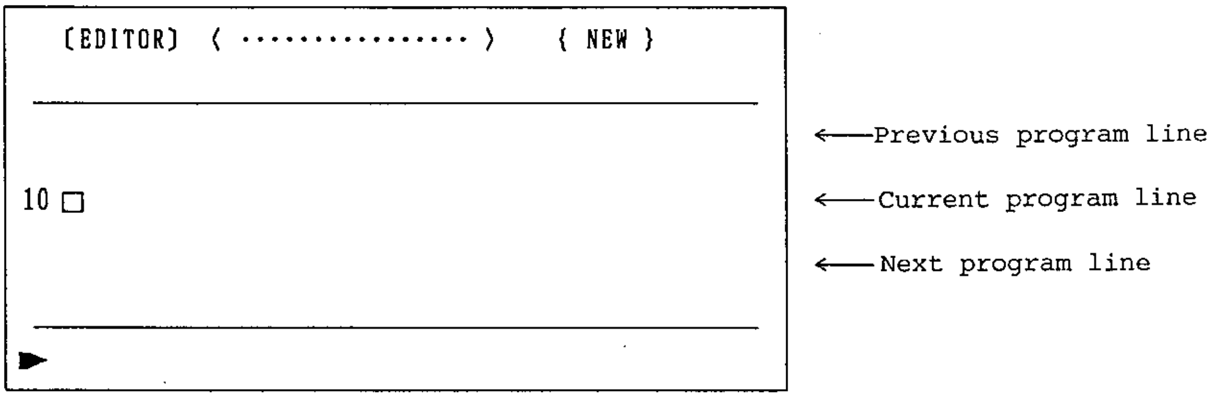


Figure 4-2 CRT Display During Editor Mode

Line numbers are displayed automatically in editor mode.
Two parameters can be specified in the EDIT command.
These are the initial line number, and the line increment.
For example, the command

```
EDIT 100
```

specifies that line 100 of the file current in the editor area be displayed in the center of the CRT screen, and that the cursor be set at the end of that line.
If no parameters are specified, the following default values are used.

```
Initial line number: 10
Line increment     : 10
```

But where a previous program is currently being edited, the line increment parameter value is disregarded.

4.4 Program Editor Keys

An optional keyboard (TR45103) is used to input programs. This keyboard is connected to R4611 which is then set to program mode. Note that apart from some panel keys and software keys, none of the R4611 functions can be used when in program mode.

NOTE

Since disconnecting the external keyboard connector during operation results in generation of an error, always switch the power off before connecting or disconnecting this connector.

The keyboard conforms with the JIS layout. Together with shift positions (with the SHIFT key depressed), standard ASCII characters including alphanumeric characters and special signs can be typed in.

(1) Special Keys

SHIFT — Used to key in characters in the shift position of each key. And when keying in alphabetic characters, the SHIFT key is used to key in upper case characters. If the CAPS LOCK key is locked, lower case characters are keyed in.

CTRL — Used in combination with other keys for input of special codes.

Table 4-1 CTRL Key Operation

Key input	Operation
CTRL + C	Suspend program or command execution
CTRL + D	Reset if editor fails
CTRL + G	Activate buzzer
CTRL + H	Delete character to left or cursor (same action as BACK SP key)
CTRL + I	Same as pressing TAB key
CTRL + J	LINE FEED Move cursor to beginning of line
CTRL + M	Terminate program input (same as RETURN key)
CTRL + Q	Same as pressing NO SCROLL key once
CTRL + S	Same as pressing NO SCROLL key twice

RETURN	Press to terminate input of one line. In editor mode, the cursor moves to the beginning of the next line. In command mode, the input line is cleared, and the cursor moves to the beginning of the line.
Kana	No function
→	Move cursor one character to the right.
←	Move cursor one character to the left.
↑	Move cursor one line upwards. If the cursor is already at the top line, the entire program is scrolled down by half a page, and the cursor moves to the center of the screen.
↓	Move cursor one line downwards. If the cursor is already at the bottom line, the entire program is scrolled up by half a page. There is no action when in command mode.
DELETE	Delete the character at the cursor position.
CAPS LOCK	When this key is locked by pressing, all subsequent input characters are keyed in as upper case characters. The key is unlocked by pressing a second time.
ESC	Used to cancel editor mode, and to switch to command mode.
TAB	Input of two spaces
BS	Delete character to the left of the cursor.

② Function Keys

First check that the function key name plate is 09. This name plate is divided into two upper rows with the function name printed on each key. Normally, only the lower row of functions is used. To use the upper row functions, the keys have to be pressed together with the SHIFT key.

Table 4-2 Function Key Operations

Function name	Command	Editor	Measuring mode
⭳	x	o	x
⇩	x	o	x
⭱	x	o	x
⇧	x	o	x
LIST	o	o	x
DEL LN	o	o	x
INS LN	x	o	x
CLR LN	x	o	x
F1 (LOAD ")	o	●	●
F2 (SAVE ")	o	●	●
F3 (SCRATCH)	o	●	●
F4	x	●	●
F5	x	●	●
F6	x	●	●
CAT	o	x	x
EDIT	o	x	x
CHKDSK	o	x	x
CHG MODE	o	x	o
NEXT	o	o	x
PREV	o	o	x
CLS	o	x	x
PAUSE	o	x	x
CONT	o	x	x
STOP	o	x	o
STEP	o	x	x
RUN	o	x	o

●: Partial functioning
o: Function activated
x: No function

● Description of Functions

⭳ Scroll up program by one line without changing cursor position.

⇩ Scroll up by half a page and move cursor to center line.

⭱ Scroll down program by one line without changing cursor position.

⇧ Scroll down by half a page and move cursor to center line.

LIST	Commence display of program from beginning when in command mode, or redisplay current screen when in editor mode.
DELIN	Delete cursor line and line number.
INSLN	Open space equivalent to one character on the line where the cursor is located, and display a suitable minimum line number in that space. If insertion between lines is not possible, a message is displayed to recommend that no insertion be attempted.
CLRLN	Clear current cursor line without erasing line number.
F1 - F6	See main instruction manual (4.6 "Function Keys"). (Note that F1 thru F3 contain commands.)
CAT	Display CAT on command line.
EDIT	Display EDIT on command line.
ACHKDSK	Display floppy disk information.
CHG MODE	Switch menu screens for command and measuring modes.
PREV	Restore previous command executed in command mode.
NEXT	Reverse the result of executing PREV in command mode.
CLS	Clear editor screen, and set display start line at beginning.

PAUSE, CONT, STOP, STEP, and RUN correspond to BASIC commands.

NOTE

1. Use of the INS LN and DEL IN function keys may on odd occasions result in cursor or line number malfunction. If this happens, press LIST (redisplay screen) once or twice to correct the display and resume editing.

2. The editor screen may deteriorate when using the CURSOR command in editor mode. In this case, press CTRL-D (reset editor) to return to normal editor display.

3. When the last line of a program is specified at the EDIT line number, the same line may appear twice on the screen. In this case, press LIST to return to normal.

4.5 Program Editing

① Input of Program Lines

To insert a program line, type the program line after the line number, and then press the RETURN key.
In editor mode, line numbers are given automatically, but input or changing of line numbers is not possible.

② Insertion of Characters

To insert a character in a line which has already been programmed or which is about to be programmed, a single character can be inserted at the position of the cursor.
When a character is keyed in to be inserted at the cursor position, all characters from that position up to the end of the line after shifted to the right by one character.
After completing character insertion, always press the RETURN key.
Although the screen display is changed, the actual program will remain unchanged if the RETURN key is not pressed.

③ Deletion of Characters

Characters can be deleted during programming by pressing the DEL or BS key. The character at the cursor position is deleted when the DEL key is pressed, and all characters to the right of that position are shifted to the left by one character.
When the BS key is pressed, the character to the left of the cursor is deleted, followed by left justification.

④ Insertion of Lines

Use INS_LN to insert a new line. For example, to insert a line between lines 130 and 140 in the following program, first move the cursor to the beginning of line 140. When INS_LN is pressed, line 131 is displayed waiting for the input data. If more than one line is inserted at this stage and RETURN is pressed, "Illegal insert line" is displayed. Therefore, first exist from editor mode, execute the REN command, and repeat the above procedure.

```
130  PRINT "KEY NUMBER ?"
140  OUTPUT 31; "CH1"

130  PRINT "KEY NUMBER ?"
131  ␣
140  OUTPUT 31; "CH1"
```

⑤ Clearing and Deletion of Lines

Lines may be removed by clearing (CLR_LN) or deleting (DEL_LN). Whereas "clearing" refers to removal of a program line without removing the line number, "deletion" refers to removal of the program line plus the line number.

```
(CLR_LN)
130  PRINT "KEY NUMBER ?"

         (Removed data)

(DEL_LN)
140  PRINT "KEY NUMBER ?"

      (Removed data)
```

And when in COMMAND mode, the DEL command is used to remove data. Two specifiers can be specified in the DEL command. The first number specifies the line number at the beginning of the block to be removed, and the second number specifies the line number at the end of the block.

```
DEL 100        Delete line 100.
DEL 100, 200   Delete 200 lines from line 100.
```

⑥ Rearranging Program Numbers

If editing involves the deletion and insertion of many lines, the line numbers can be rearranged to make the program easier to read. This feature is also useful where many additional lines are inserted. Line numbers are rearranged by using the REN command. The first line number and the line increment can be specified.

For example, specifying

```
REN 50 100 5
```

results in the lines of the entire program (where the first line number is 50) currently stored in memory being renumbered from line 100 in line increments of 5. The default line increment value is 10.

⑦ Generation of Program List

Execute the LIST statement to display the entire program (or part of it) on the CRT screen. The range of lines to be shown can be specified in the LIST statement.

```
LIST 100         Display line 100 only.
LIST 100, 200    Display from line 100 to line 200.
LIST             Display entire program.
LISTN 100, 10    Display 10 lines from line 100.
```

4.6 Programming Rules

4.6.1 Program Architecture

BASIC programs are collections of various types of statements. Statements are divided into two main types - control statements and executive statements (commands).

- Statements
  - Control statements
    - Declarative statements
    - Loop and branch statements
    - Interrupt process statements
  - Executive statements (commands)
    - Program execution control commands
    - Program editing commands
    - I/O commands
    - File control commands
    - GPIB related commands

Figure 4-3 Statement Configuration

Each statement consists of a key word and expression, and this configuration is determined by grammatical syntax rules.

BASIC words whose meaning and applications have been decided in advance are called key words. Therefore, the same names as key word names cannot be used for any other purposes.

A list of key words is given in the following table.

Table 4-3 List of Key Words

AND,	APPEND,	AS,	ASCII,	BAND,	BASIC,
BINARY,	BNOT,	BOR,	BREAK,	BUZZER,	BXOR,
CASE,	CAT,	CHKDSK,	CLEAR,	CLOSE,	CLS,
CMD,	CONT,	CONTINUE,	CONTROL,	COPY,	COPYFILES,
COUNT,	CSR,	CURSOR,	DATA,	DEL,	DELIMITER,
DIM,	DISABLE,	DSTAT,	DUMP,	ELSE,	ENABLE,
END,	ENT,	ENTER,	ENTERF,	ERROR,	FOR,
FORMAT,	GLIST,	GLISTN,	GOSUB,	GOTO,	GPRINT,
IF,	INIT,	INITIALIZE,	INP,	INPUT,	INTEGER,
INTERFACE,	INTR,	ISRQ,	KEY,	LABEL,	LIST,
LISTEN,	LISTN,	LLIST,	LLISTN,	LOCAL,	LOCKOUT,
LPRINT,	LOAD,	MERGE,	NEXT,	NEWVERSION,	NOT,
OFF,	ON,	OPEN,	OR,	OUTPUT,	OUT,
OUTPUTF,	PAUSE,	PRINT,	PRINTER,	PRF,	PRINTF,
READ,	RESTORE,	PURGE,	RENAME,	REM,	REMOTE,
REN,	REQUEST,	RETURN,	RUN,	SAVE,	SCRATCH,
SELECT,	SEND,	SPRINTF,	SRQ,	STEP,	STOP,
SYSTEM,	TALK,	TEXT,	THEN,	TIME,	TO,
TRIGGER,	UNL,	UNT,	UNTIL,	USE,	USING,
XOR,					

Shorten name is used for entering a key word. Shorten names are provided for the flequently used and long key words. Shorten name can be used as a key word. On the display, shorten name is used when control register of 3 is set to 1 by CONTROL command. To dislplay in full name, set the control register of 3 to 0.

(Correspondence of full name and shorten name)

Full name	Shorten name
CURSOR	CSR
ENTER	ET
INITIALIZE	INIT
INPUT	INP
OUTPUT	OUT
PRINTF	PRF
USING	USE

- Expressions

Expressions consist of objects and operators, and can be placed anywhere within the syntax where an expression can be specified. (To maintain compatibility with conventional BASIC, however, substitute expressions cannot be written in IF statement conditional expression since "=" is interpreted as a code.) Expressions include,

arithmetic expressions,
character string expressions,
logical expressions, and
label

which differ according to the data format in which the final calculated value is obtained. Arithmetic expressions consist of integer and real numbers. Logical expressions are determined by syntax, irrespective of whether the expression contains logical operators, the final value being evaluated as a logical value. That is, 0 is false, and anything else is true.

4.6.2 Objects

Elements subject to BASIC processing are called objects. These include constants, variables, and functions in each data format (integer numbers, real numbers, and character strings).

Arrays can be used in integer formats. Variables which have no array structure are called scalar variables and real number variables.

- Objects
  - (1) Constants
    - Integer constants
    - Real constants
    - Character string constants
    - Label constants
  - (2) Variables
    - ① Scalar variables
      - Integer variables
      - Real variables
      - Character string variables
    - ② System variables
      - Current line variables
      - Built-in variables
    - ③ Arrays
      - Integers
      - Real numbers
      - Character strings
  - (3) Functions

Figure 4-4 Object Configuration

(1) Constants

- Real Constants

  Numerical values with no decimal point are regarded as integer numbers in programs. Since these can be expressed internally in 4 bytes, numbers can be expressed from -2,147,483,648 to 2,147,483,647.

- Real Numbers

  Numerical values containing a decimal point, or expressed as an exponential number like 1E+20 are regarded as real numbers. And since these can be expressed internally by using 8 bytes (IEEE), numbers from about -1E+308 to 1E308 can be represented with an accuracy of 15 digits.

- Character String Constants

  Character strings are expressed by being enclosed between double quotation marks (").
  Character strings can be specified as a null character string (" "), or as strings containing up to 255 characters. The component character unit is 8 bits which allows a maximum of 256 different character units to be expressed. The ASCII character code is used, characters 128 thru 255 being special symbols.

Reference:
To express (by program) codes not assigned to the keyboard, and to input data by INPUT statement, (\) is used in a method called \014 (form field). Likewise, to include double quotation marks inside a character string, this may be written as \".

The following escape sequence is provided to express ASCII control characters.

	Octal	Decimal	
x b	010	8	Back space
x t	011	9	Vertical tabulation
x n	012	10	Line feed (New line)
x v	013	11	Vertical tabulation
x f	014	12	Form feed (Clearing screen)
x r	015	13	Carriage return

- Label Constants

Label constants are used instead of statement numbers, and are declared by appending an asterisk (*) at the start of a program. Although the characters which can be used as the same as those for variables, substitution is not possible because they are not variables. And places where labels can be written are restricted by syntax. The places are the part in the later section that "Lavel line number" or "Branch destination" is written.

(2) Variables

Variable names consist of up to 20 alphanumeric characters starting with an alphabetic character.

Table 4-4 Alphanumeric Characters

1, 2, 3, 4, 5, 6, 7, 8, 9, 0
a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t
u, v, w, x, y, z
A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T
U, V, W, X, Y, Z

Variable names become character string variables if $ appended to the end. And if ... is appended to the end of a variable name instead of a $, that variable becomes an array type variable. If a variable is not specifically declared by INTEGER statement, it becomes a real number type of variable.

Examples of variable types:

value, v123	Real variables
string$, s123$	Character string variables
array(3)	Array type real variable
INTEGER code	Integer variable
INTEGER week(7)	Array type integer variable

(1) Scalar Variables

- Integer variables
- Real variables
- Character string variables

Numerical variables are allocated the value 0 unless specifically initialized. Therefore, variables to initialized to a specific value must have a specific value substituted in them in the program.
The size of values which can be stored in each data type are the same as for constants.
There are no array character string variables. Like character string constants, character strings include a length attribute. The DIM statement is used to declare length.

```
DIM  string$[100]
```

If collating without a declaration, the default character string length is 18 characters.
By using a sub string operator ([]), certain parts of the character string can be handled (see sub string operator).

```
string$ = "ADVANTEST CORPORATION"
PRINT string$[1,14]; "."
```

Result:

```
ADVANTEST CORP.
```

② System Variables

- Current Line Variable @

  Storage of the program line number currently be executed. Values cannot be substituted.

  ```
  LIST @-10 @+10          : Display of the line currently
                            being executed.
  ```

- Built-in Variables

  Built-in variables are registered automatically when BASIC is started up. These are initialized by fixed values, and can be substituted by specific values. To return to the original value, either explicitly substitute that value, or initialize by using NEW 2, NEW.

  ```
  PI :  3.14152 ......
  EXP:  2.71828 ......
  ```

③ Array

Use the DIM or INTEGER statement to declare an array.

- Numerical Array

  If collating without a declaration, the default size (that is, number of elements) is 10. The result is the same as when declaring as shown below.

  ```
  DIM      array(10)
  INTEGER  array(10)

  Real number array      DIM      real(20)
  Integer number array   INTEGER  int(30)(40)
  ```

(3) Functions

All functions are built-in functions, and are divided into integer, real number, and character string types in terms of the return value. And since function calls can be described in operational expressions, functions can be handled in the same way as variables.

```
string$ = "ADVANTEST"
PRINT string$
A = NUM("A")
a = NUM("a")
FOR idx = 0 TO LEN(string$)
   b = NUM(string$[idx:1]) - A + a
   string$[idx:1] = CHR$(b)
NEXT idx
PRINT string$
```

Result:

```
ADVANTEST
advantest
```

Built-in functions

NUM(character string expression)

The ASCII code of the leading character of the character string expression is returned.
NUM("A") → 65

CHR$(arithmetic expression)

The character string expression of the single ASCII character corresponding to the arithmetic expression value is returned.
CH$(65) → "A"

LEN(character string expression)

Length of character string expression is returned.
LEN("ADVANTEST") → 9

POS(character string expression 1, character string expression 2)

The start position of a certain position in character string expression 2 is returned from character string expression 1.
POS("ADVANTEST","AN") → 4

SIN(arithmetic expression)

COS(arithmetic expression)

TAN(arithmetic expression)

ATN(arithmetic expression)

LOG(arithmetic expression)

SQR(arithmetic expression)

In addition to those listed below, a wide range of R4611 built-in functions capable of handling measured values is available. See the list of built-in functions in section 5.1 "Built-in Functions".

--- built-in function ---

Stimulus freq. → Point No.
POINT1(F,M)
POINT2(F,M)
DPOINT(F0,F1,M)

Point No. → Stimulus freq.
FREQ(P,M)
DFREQ(P0,P1,M)

Point No. → Response Value
VALUE(P,M)
DVALUE(P0,P1,M)

Stimulus freq. → Response Value
CVALUE(F,M)
DCVALUE(F0,F1,M)

Searching Maximum
MAX(P0,P1,M)
FMAX(P0,P1,M)
PMAX(P0,P1,M)

Searching Minimum
MIN(P0,P1,M)
FMIN(P0,P1,M)
PMIN(P0,P1,M)

Calculate Band width
BND(X,Ls,M)
BNDL(X,Ls,M)
BNDH(X,Ls,M)

Differential coefficient
DIFFX(deltaX,deltaY)
DIFFY(deltaX,deltaY)

Finding Ripple out(I)

```
RPL1(P0,P1,deltaX,deltaY,M)
RPL2(P0,P1,deltaX,deltaY,M)
RPL3(P0,P1,deltaX,deltaY,M)
```

Finding

```
RPLH(P0,P1,deltaX,deltaY,M)
FRPLH(P0,P1,deltaX,deltaY,M)
PRPLH(P0,P1,deltaX,deltaY,M)
RPLL(P0,P1,deltaX,deltaY,M)
FRPLL(P0,P1,deltaX,deltaY,M)
PRPLL(P0,P1,deltaX,deltaY,M)
NRPLH(P0,P1,deltaX,deltaY,M)
NRPLL(P0,P1,deltaX,deltaY,M)
PRPLHN(N,M)
PRPLLN(N,M)
FRPLHN(N,M)
FRPLLN(N,M)
VRPLHN(N,M)
VRPLLN(N,M)
```

Testing limit

```
LMTUL1(X,Up,Lo,M)
LMTUL2(P,Up,Lo,M)
LMTMD1(X,Up,Lo,M)
LMTMD2(P,Up,Lo,M)
```

4.6.3 Operational Expressions

Objects are manipulated by operators, and objects and operators are combined in expressions.

Operators
- (1) Substitution operator
- (2) Unary arithmetic operator
- (3) Binary arithmetic operator
- (4) Logical operator
- (5) Comparative operator
- (6) Sub string operator

(1) Substitution Operators

The conventional BASIC keyword "LET" has not been included. The substitution operator contains its own value to become a single expression.

```
PRINT a=1              →  1
PRINT a$="ADVANTEST"   →  "ADVANTEST"
PRINT (a=1)+a          →  2
```

The substitution operator contains the following elements.

= Normal substitution
In character string substitutions, the valid characters on the right hand side are transferred.

```
Example:  INTEGER string$[20]
          PRINT LEN(string$ = "121345")

          Result:  5
```

Substitution after conversion to data format on left hand side of =.

```
Example:  string$ = 123.456  →  "123.456"
          numeric = "123"    →  123
          integer = 123.456  →  123
```

```
+=    a += 10 <==> a = a + 10
-=    a -= 10 <==> a = a - 10
*=    a *= 10 <==> a = a * 10
/=    a /= 10 <==> a = a / 10
%=    a %= 10 <==> a = a % 10
```

=< Substitute after left justification of character string.
=> Substitute after right justification of character string.

(2) Unary Arithmetic Operators

```
-     Minus sign
+     Plus sign
++    Pre-/post-increment
         Pre-    a = 1 : b = ++a
                 Substitute in b after adding 1 to a.
         Post-   a = 1 : b = a++
                 Add 1 to a after substituting in b.
--    Pre-/post-decrement
         Pre-    a = 1 : b = --a
                 Substitute in b after subtracting 1 from a.
         Post-   a = 1 : b = a--
                 Substitute 1 from a after substituting in b.
```

Example:

```
a = 10 : PRINT a++ : PRINT a : PRINT --a : PRINT --a : PRINT a
```

Result: 10.
11.
10.
9.
9.

(3) Binary Arithmetic Operators

+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Modulo (remainder) To maintain BASIC compatibility, same as MOD. MOD, however, is converted internally to %.
^	Involution
&	Character string concatenation

(4) Logical Operators

NOT
AND
OR
XOR

(5) Bit Operators

They execute the 16-bit calculation. Only the integer type equations can be set. If a real type equation is set, an error occurs.

BNOT
BAND
BOR
BXOR

(6) Comparative Operators

The following comparative operators are used. 1 is taken if result is true, and 0 if false. When a comparative operation is executed in BASIC syntax, and the final result is 0, this is taken as false. All other results are taken as true.

=	Equal (or ==)
<>	Not equal
<	
>	
<=	
>=	

Since this comparative operator must always execute a logical operation in IF statement conditions, the "=" operator is regarded as a unconditional comparative operator. Therefore, substitution expressions cannot be included in IF statement condition expression.

To execute comparison operations apart from using an IF condition expression, "==" is used for equal operation purposes to make a distinction from "=" used in substitution operators.

```
a = (b$ == "COMPUTER")
```

If the character variable b$ is "COMPUTER", variable a is 1.

(7) Sub String Operator

Character string expression parts can be specified as a character string.

Character string expression[arithmetic expression 1
,arithmetic expression 2]

The section of a character string expression where arithmetic expression 1 has advanced from the beginning of the string expression by the indicated value up to the value where arithmetic expression 2 is indicated is the sub string.

"ADVANTEST"[1,5] → "ADVAN"

Character string expression[arithmetic expression 1
;arithmetic expression 2]

The number of characters in a character string expression where arithmetic expression 1 has advanced from the beginning of the string expression by the indicated value up to the value where arithmetic expression is indicated is the sub string.

"ADVANTEST"[6,4] → "TEST"

5. COMMAND AND STATEMENT SYNTAX AND COMMENTARY

5.1 Outline

The command and statement syntax used in R4611 is described here in combined diagrammatical/textual format to make it easier to understand.

Syntax representation

(1) Diagrammatical Representation

The syntax is divided into component elements linked up by straight lines.

Statements always proceed in the direction indicated by arrows. If branching occurs, the statement proceeds along one of those branches. And where a loop is formed, that loop may be passed any number of times.

(2) Textual Representation

The following symbols are used in textual representation.

[ ]: Sections enclosed by this symbol may be omitted.
{ }: Sections enclosed by this symbol may be used any number of times.
| : This symbol denotes "or".
(Example: <A>|<B> ... Use either <A> or <B>.)

Terminology used in these diagrammatical and textual representations is described below.

- Numerical value representation
  ... Numerical constant, numerical variable, or numerical expression
- Character string representation
  ... Character string constant, character string variable, character string function, or expression consisting of substrings.
- Device address
  ... Address of device connected to GPIB

5.2 List of Commands and Statements

* Commands

EDIT	:	Start editor mode
COPY	:	Copy file
DEL	:	Delete specified line number
CHKDSK	:	Display disk status
CAT	:	Output file name on CRT screen
INITIALIZE	:	Initialize floppy disk
LIST	:	Display program list on CRT screen
LISTN	:	Display program list on CRT screen
LOAD	:	Load BASIC program from floppy disk
MERGE	:	Load and merge program with another program
SCRATCH	:	Delete previously loaded program
GLIST	:	Output program list to GPIB
GLISTN	:	Output program list to GPIB
LLIST	:	Output program list to serial port
LLISTN	:	Output program list to serial port
PRINTER	:	Set printer GPIB address
PURGE	:	Delete file from disk
RENAME	:	Change file name
REN	:	Renumber line numbers
RUN	:	Execute a program
CONT	:	Resume program execution
STEP	:	Execute one line of program
SAVE	:	Save BASIC program to floppy disk
CONTROL	:	Set the various BASIC control variables
DUMP	:	Indication in the memory and file
FRE	:	Indication of the basic program buffer remain

* Statements

BUZZER	:	Buzzer
CURSOR	:	Cursor position control
DIM	:	Declare array variables
INTEGER	:	Define variable as integer number
DISABLE INTR	:	Disable interrupt branching
ENABLE INTR	:	Enable interrupt branching
FOR-TO-STEP	:	Execute loop processing
NEXT	:	Execute loop processing
GOSUB	:	Branch to subroutine
RETURN	:	Return from subroutine
GOTO	:	Branch to specific line
IF THEN	:	Conditional branching
INPUT	:	Input from keyboard
OFF SRQ	:	Release interrupt branching generated by SRQ
OFF ISRQ	:	Release interrupt branching generated by ISRQ
OFF KEY	:	Release interrupt branching generated by KEY input
ON SRQ	:	Define interrupt branching by GPIB external SRQ signal

(List of commands and statements - cont.)

ON ISRQ	:	Define interrupt branching by R4611 internal source
ON KEY	:	Define interrupt branching by KEY input
ON ERROR	:	Define branching to be executed if BASIC error is detected
PAUSE	:	Halts program execution temporarily
PRINT [USING]	:	Display (output) of numerical values and character strings
PRINTF	:	Display (output) of numerical values and character strings
SPRINTF	:	Replaces character strings with results of PRINTF format
GPRINT	:	Output numerical values and character strings to GPIB
LPRINT	:	Output numerical values and character strings to serial port
PRINTER	:	Set GPIB address for printer
REM	:	Comment
CLS	:	Clear screen
DATA	:	Replaces constants in the DATA statements with variables
READ	:	Defines numerical values and character strings to be read in the READ statement
RESTORE	:	Defines DATA lines to be read in the next DATA statement
SELECT	:	Branches as conditioned by values of the equation
CASE	:	Defines conditions
ERRN	:	Returns error code
ERRM$	:	Returns error message
BREAK	:	Exit FOR-NEXT block
CONTINUE	:	Branch to loop of next step value from FOR-NEXT loop

GPIB control statements

CLEAR	:	Clear device
DELIMITER	:	Specify block delimiter
ENTER	:	Input from GPIB
INTERFACE CLEAR	:	Clear GPIB interface
LOCAL	:	Release remote control
LOCAL LOCKOUT	:	Local lockout
OUTPUT	:	Output to GPIB
REMOTE	:	Remote control
REQUEST	:	Set status byte
SEND-DATA-CMD-TALK-LISTEN-UNT-UNL	:	Output of commands and data to GPIB
TRIGGER	:	Output of group execute trigger

File control statements

ENTER [USING]	:	Reads data in files
OFF END	:	Releases processing specified by the ON END statement
ON END	:	Defines end-of-file processing
CLOSE	:	Closes files for file descriptor
OPEN	:	Opens files for file descriptor
OUTPUT [USING]	:	Writes (output) data into the file
COPYFILES	:	Copies files to another floppy disk

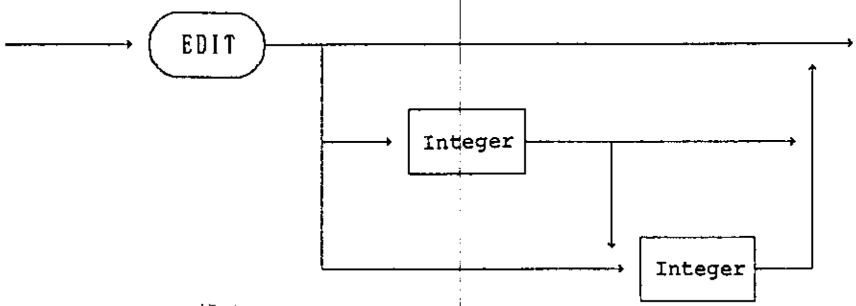
5.3 BASIC Command Syntax

1. EDIT

Outline

Start program editor mode. During input of program, line numbers appear automatically on the CRT screen.

Syntax



EDIT [Integer][Integer]

Specify any integer from 1 to 65535.

Commentary

- Display several lines before and after the current line when program editor mode is started.
- The first integer specifies the start line number, and the second integer specifies the line increment. Both values are valid only when editor mode is started with no program in the BASIC buffer (such as immediately after SCRATCH).

EDIT Start line number Increment

These integer numbers can be omitted, defaults values of 10 being set automatically for each integer.

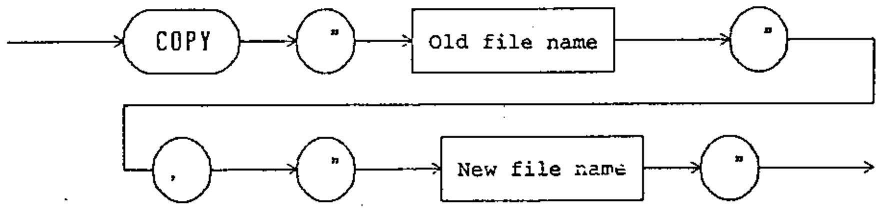
Example

```
EDIT
EDIT 100
EDIT 30 5
```

2. COPY

Outline — Copy registered file to floppy disk.

Syntax



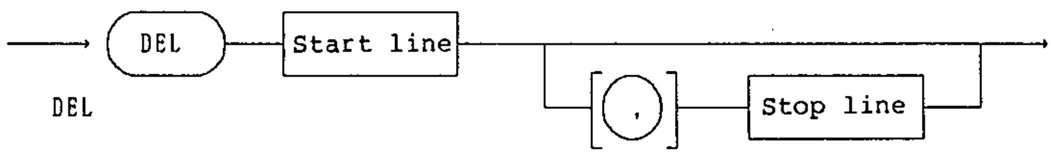
Commentary

- Copy old file name to new file name. No action taken if file name with same name as "new file name" already exists, or if the new file name is the same as the old file name. Both file names can be specified using character string representation.

3. DEL

Outline — Delete line from program.

Syntax



Commentary

- Delete the program from the start line to the stop line.
- Specify any line number from 1 to 65535.
- Deletion is not made if no number is specified.

Example

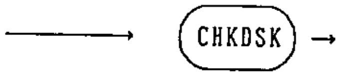
DEL 10	Deletes only the line number 10.
DEL 10, 100	Deletes the lines from 10 to 100.
DEL , 100	Deletes the program from the first line to the line number 100.
DEL 10,	Deletes the program from the line number 10 to the last line.

4. CHKDSK

Outline

Display status of disk in disk drive.

Syntax



Commentary

- Display status of disk in disk drive. This information includes:

  DISKNAME ... Disk name applied during initialization
  FILES ...... Number of files
  SECTOR ..... Number of sectors used
  DATE .... Date and time of initialization

Where:
FILES are up to 200.
SECTORS are up to 1400.
SECTOR is a unit of information stored on a disk.
1 SECTOR is equal to 512 bytes.

Example

The following display appears when CHKDSK is executed immediately after initialization.

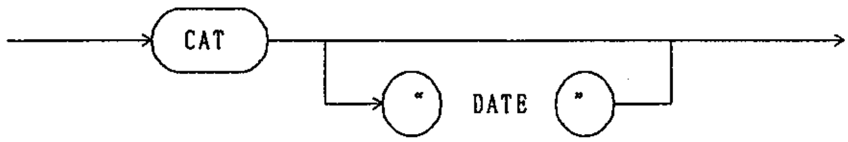
```
≪ DISK-ID ≫

[DATE     : 1988.01.15 (Fri)  13:05]
[FILE     :    0 /   200           ]
[SECTOR   :    0 /  1400           ]
[DISKNAME : ADVANTEST_R4611        ]
```

5. CAT

Outline — Display of file stored on floppy disk.

Syntax



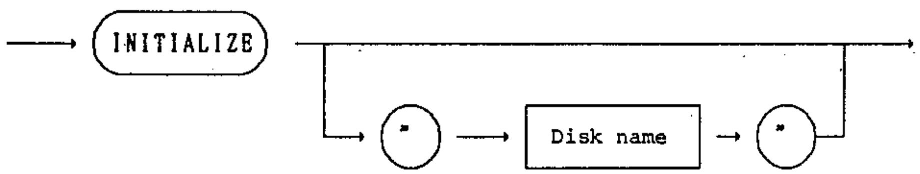
CAT

Commentary
- Display of contents of file stored on disk.
  When CAT is used, the registration number, file name, number of sectors used, number of characters, and file attributes are displayed in that order. And by using CAT "DATE", the registration number and file name are followed by the time the file was generated.

6. INITIALIZE (INIT)

Outline — Initialize a new disk, or a disk which is no longer required.

Syntax



Commentary
- Floppy disks used in R4611 must first be initialized by an initialization process specific for R4611. A disk name used to identify the disk is input at this stage. If no disk name is set, the disk name automatically becomes
  'ADVANTEST : R4611'.
  This disk name can be specified as a character string expression.

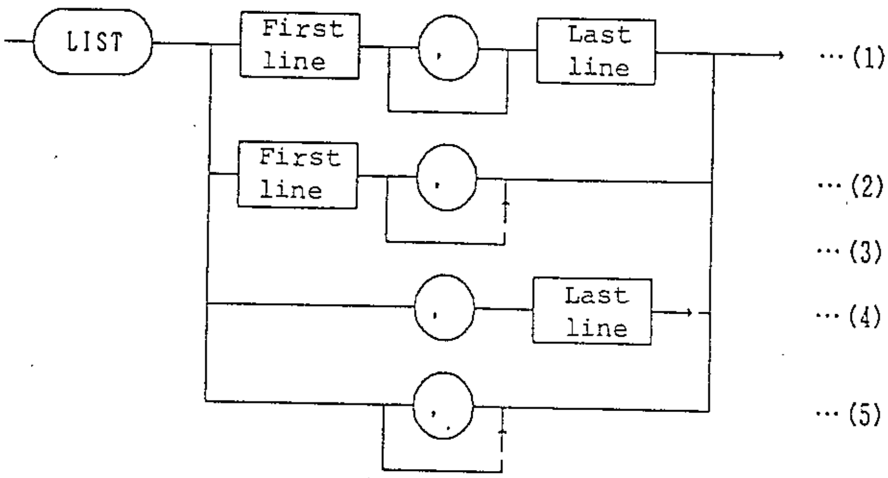
Caution — Disk names may contain up to 16 characters, and the character which may be used are the same as those which may be used in file names. (See SAVE 'Caution' note.)

7. LIST

Outline

Display program list on CRT screen.

Syntax



LIST [First line] [,] [Last line]

* When the numerical value for the first line or that of the last line is specified, the system assumes the first line.
  Specify any integer from 1 to 65535.

Commentary

The portion of BASIC program list specified by the parameter is displayed on the CRT screen. Displaying of list can be interrupted by the stop key. Unlike program execution, resumption of display from the point of interruption is impossible.
Line numbers are specified by equations. Line number zero and number 65536 or higher are given special meanings, the first line and the last line of the program.
A line number that is lower or higher than the actual program line number in the buffer is also considered the first line and the last line of the program.

To state the portion to be displayed, use one of the methods listed above.
(1) Displays the portion specified by the first line and the last line.
(2) Displays the portion specified by the first line and comma, where the comma represents the last line of the program. Display continues up to the last line, though not specified.

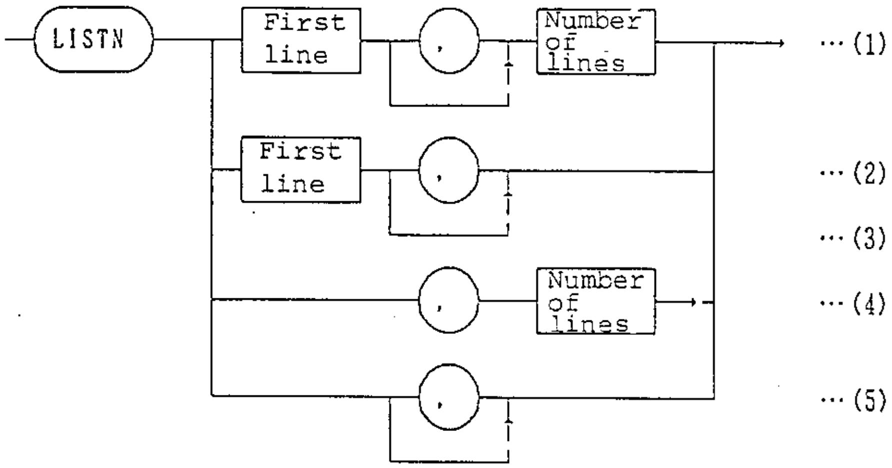
(3) Displays only the first line.
(4) Displays the first line of the program to the specified last line. Comma cannot be omitted.
(5) When both the first line and the last line are omitted, all the lines are displayed.

8. LISTN

Outline

Display program list on CRT screen.

Syntax



LISTN [First line] [,] [Number of lines]

Specify any integer from 1 to 65535.

Commentary

The portion of the BASIC program list specified by the parameter is displayed on the CRT screen. In this function, which is basically the same as the LIST command, the second parameter is the number of lines to be displayed.

(1) Displays the specified number of lines counting from the first line. When the specified number of lines has a negative value, the count is reversed.
(2) The number of lines is omitted. Displays the portion specified by the first line and the last line. The system assumes method (3) if the required comma is omitted.
(3) Displays only the first line.
(4) The first line is not specified. If the specified number of lines has a positive value, display starts from the first line, and if the specified number of lines has a negative value, the display is reversed from the last line.
(5) When the specification is the comma only, without parameters, all the lines are displayed.

Example

```
LISTN
LISTN 100 20
LISTN 200,-10
```

Caution

In BASIC command patterns apart from EDIT, either character string variables or numerical value representation can be specified. That is, numerical variables used in BASIC can also be used here. For easier reading purposes, however, integer and character string expressions are used in the following pages. The decimal places of real numbers are rounded off to the nearest whole number.

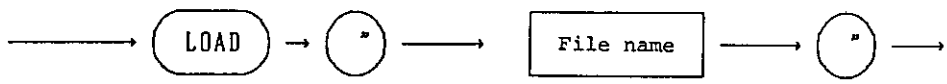
As a rule, commas (,) are not required if the boundary between successive expressions in a BASIC command can be detected in terms of command syntax.

For example, no comma is required in line 2 of the above example since the numeric values 100 and 20 can be read. But in line 3, omission of the comma results in the numeric values being read as 200 - 10 = 190. That is, line 190 would be displayed instead of the ten lines counting back from line 200.

9. LOAD

Outline Call file from floppy disk.

Syntax

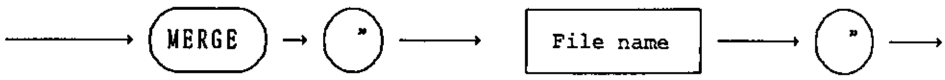


Commentary Call the file specified by file name to enable editing of that file. Non-BASIC files which cannot be edited (such as system files) cannot be called.

10. MERGE

Outline — Call file from floppy disk.

Syntax

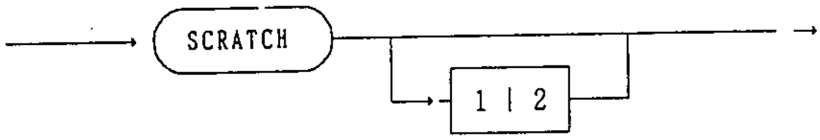


Commentary — Unlike LOAD, the BASIC buffer is not initialized prior to loading. The program already present in the BASIC buffer is not cleared unless line numbers coincide.
Combination of SCRATCH and MERGE has same function as LOAD.

11. SCRATCH

Outline — Erase BASIC program from memory.

Syntax



SCRATCH [1|2]

Commentary
- Run this program if the previously loaded BASIC program is no longer required.
- If only the data of the program present in the BASIC buffer is to be initialize, specify 1.
- If only the procedure of the program present in the BASIC buffer is to be initialized, specify 2.

Example

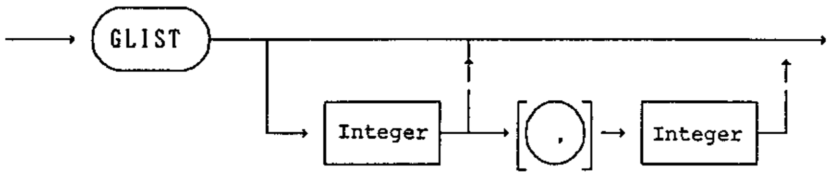
SCRATCH
SCRATCH 1
SCRATCH 2

12. GLIST

Outline

Output of program list to printer etc. via GPIB.

Syntax



GLIST [Integer][,Integer]

Specify any integer from 1 to 65535.

Commentary

- Output of BASIC program to printer etc. connected to GPIB.
- The printer GPIB address is set by PRINTER statement.
- The output program list starts from the specified line number.

Example

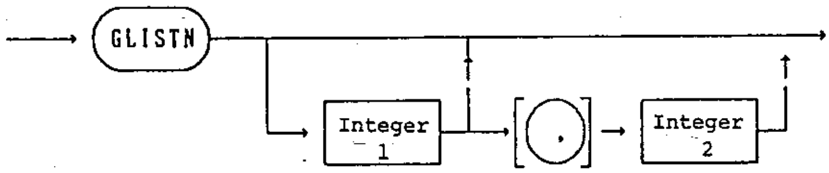
GLIST
GLIST 100,200

13. GLISTN

Outline

Output of program list to printer etc. via GPIB.

Syntax



GLISTN [Integer 1][,Integer 2]

Commentary

- Output of BASIC program to printer etc. connected to GPIB.
- The printer GPIB address is set by PRINTER statement.
- Output program list of the number of lines specified by integer 2 starting from the line number specified by integer 1.
- If integer 1 has a negative value, the number of lines counting in reverse are listed.

Example

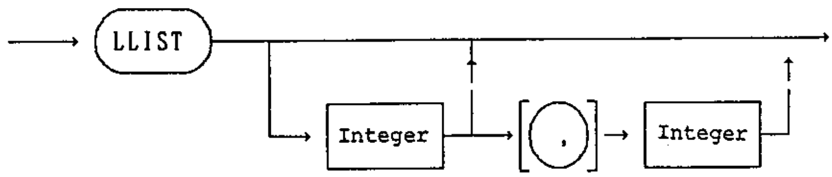
```
GLISTN
GLISTN 100,20
GLISTN 200,-10
```

14. LLIST

Outline

Output of program list to printer etc. via serial port.

Syntax



LLIST [Integer][,Integer]

Specify any integer from 1 to 65535.

Commentary

- Output of BASIC program to printer etc. connected to the serial port.
- Output of program list starting from specified line number.

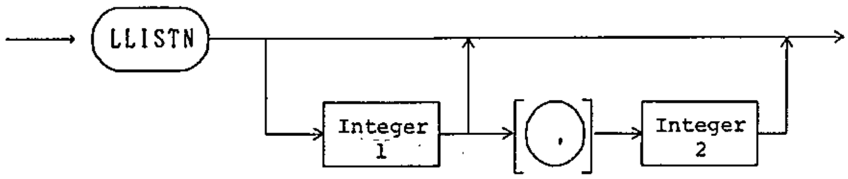
Example

```
LLIST
LLIST 100,200
```

15. LLISTN

Outline Output of program list to printer etc. via serial port.

Syntax



LLISTN [Integer 1][,Integer 2]

Commentary

- Output of BASIC program to printer etc. connected to the serial port.
- Output program list of the number of lines specified by integer 2 starting from the line number specified by integer 1.
- If integer 1 has a negative value, the number of lines counting in reverse are listed.

Example

```
LLISTN
LLISTN 100,20
LLISTN 200,-10
```

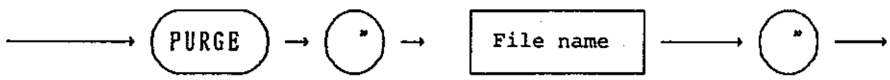
16. PRINTER

See PRINTER statement for details.

17. PURGE

Outline Erase file from floppy disk.

Syntax



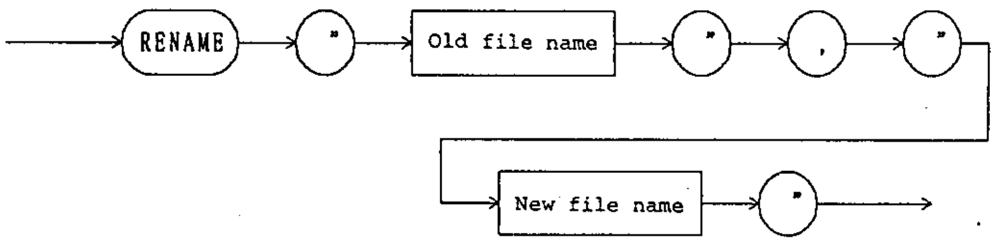
Commentary

- Erase existing files which are no longer required.
- File names stored by SAVE/RECALL but no longer required can be erased by this command.

18. RENAME

Outline Change the name of file stored on floppy disk.

Syntax



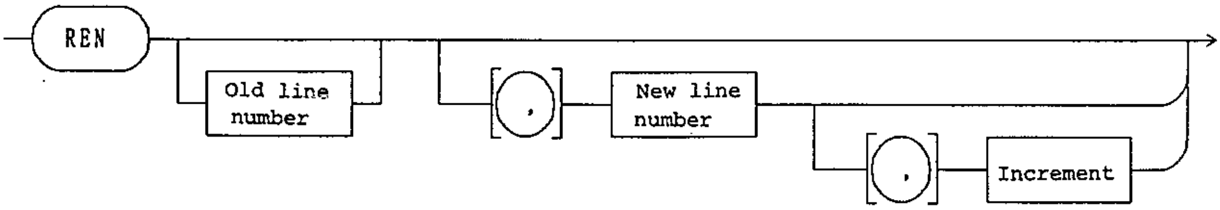
Commentary

- Change old file to new file name. The new file name must not be the same as any existing file name nor the old file name. And since only the name is changed, the contents of the new file are identical to the contents of the old file.

19. REN

Outline Renumber the line numbers of each program line.

Syntax



REN [[Old line number]][,[New line number][,[Increment]]]

* Old and new line numbers, and increment, are all integers (1 thru 65535).
* The default value for the new line number and increment is 10.
* If the old line number is omitted, a comma must be inserted before the new line number to identify that number.

Commentary

- The "old line number" is the current program line number where line renumbering is to commence.
- The "new line number" is the new start line number.
- The "increment" is the new line number increment.
- The REN command also changes line numbers used by GOTO, GOSUB etc.
- The REN command cannot generate line numbers greater than 65535. Nor is it possible to change the order of line numbers.

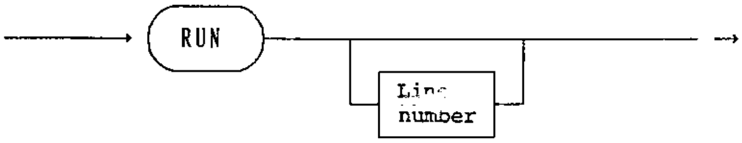
Example

REN	Program starts from line 10, and is incremented throughout in steps of 10.
REN 30,50,3	Line number 30 is changed to 50, and subsequent lines are incremented in steps of 3.

20. RUN

Outline — Run a BASIC program.

Syntax



RUN [Line number]

Commentary

- Run BASIC program from specified line.
- Run program from first line if no line is specified.
- When the RUN command is executed, all variables are cleared prior to commencement, and array declarations etc. are reset.

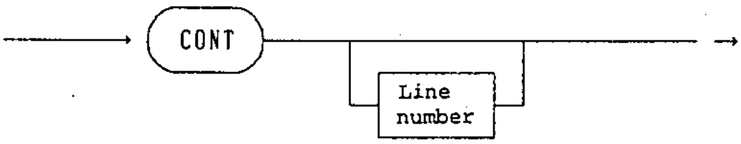
Example

```
RUN
RUN 200
```

21. CONT

Outline — Resume execution of BASIC program.

Syntax



CONT [Line number]

Commentary

- Execution of BASIC program is resumed from specified line.
- Variables are not initialized by CONT command.

Example

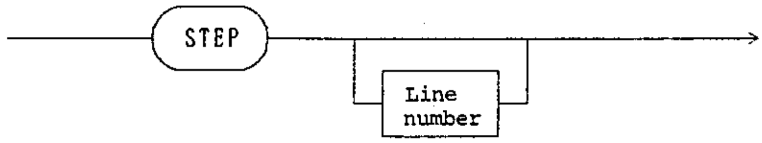
```
CONT 200
```

22. STEP

Outline

Run a single line of a BASIC program.

Syntax



STEP [Line number]

Commentary

- Run the single specified line of a BASIC program. Note that STEP cannot be run in a FOR statement.
- Execute the next line after the last executed line if no line is specified.

Example

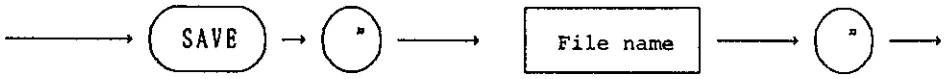
```
STEP
STEP 100
```

23. SAVE

Outline

Save file to floppy disk.

Syntax



Commentary

- An edited program (from the first statement with a line number up to the last) is registered as a file under the specified file name. If the specified file name already exists, the old file contents are updated by the new file.

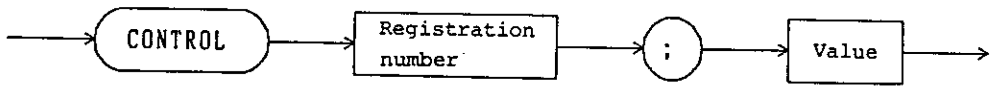
Caution

File names may consist of up to 16 characters. All characters apart from " (double quotation mark) may be used.

24. CONTROL

Outline Set various values related to BASIC control.

Syntax



CONTROL Registration number ; Value

Commentary Specify control elements to be set by registration number. Values following the semicolon are actual settings.

Registration number

(Registor 1)

Serial I/O port initialization
Specifies by the summation of the following values.

Value: Baud rate

0:	1200 baud	
1:	2400 baud	
2:	4800 baud	o
3:	9600 baud	

Character length

0;	5 bits	
4;	6 bits	
8;	7 bits	
12;	8 bits	o

Parity

0;	No parity	o
16;	Odd parity	
48;	Even parity	

Number of stop bits

0;	None	
64;	1 bit	
128;	1 1/2 bit	
192;	2 bits	o

(o denotes default setting
when power is switched on.)

(Registor 2)

The printing position from the left hand margin is specified by the number of spaces with LLIST/GLIST.

(Registor 3)

Selects whether the BASIC program is indicated in shorten name or conventional full name.
When 1 is set, BASIC program is indicated in shorten name. When 0 is set, full name indication is selected.

(Registor 5)

Register 5 us ysed ti cgabge tge ebvuribnebt ti tgat fir naubtebabce.
When register 5 is set to 1, POKE command is effective. If register 5 is set to 0, POKE command is invalid.

Example

Registration number 1

Set baud rate to 9600, character length to 8 bits, even parity, and 2 stop bits.

[CONTROL 1;3+12+48+192] or [CONTROL 1;255]

This completes the setting.

Registration number 2

Right justify LIST output
Execute the following command.

[CONTROL 2;5]

When the LLIST or GLIST command is run, 5 spaces are inserted in front of each line number before output of the list.

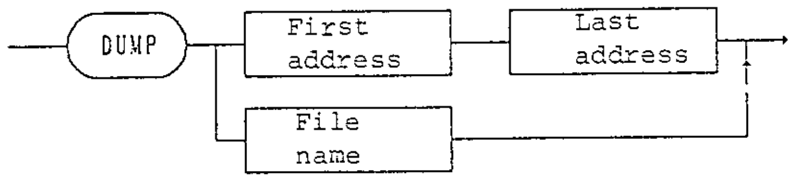
```
_____10 PRINT "ADVANTEST"
_____20 PRINT "   R4611 NETWORK"
_____30 PRINT "       ANALYZER"
_____40 END
```

25. DUMP

Outline

Displays memory and files.

Syntax



DUMP "AFILE"

Commentary

This debugger command displays the entire memory or file as is.
When two equations are specified, the system assumes them to be the first address and the last address of the memory, and displays the portion between them in hexadecimal and associated ASCII codes.
When the character string is specified, the system assumes it is the file name and displays the entire file.

If the PAUSE key is pressed to stop displaying, resumption is impossible.

26. FRE

Outline

Indicates the remaining memory capacity for the BASIC program.

Syntax

FRE (Φ)

Commentary

PRINT FRE (ϕ)

This system function indicates in alphanumerics the approximate remaining memory capacity for the BASIC program.
The system only makes a rough judgment without reconstructing the memory, thus once saved, the indicated capacity may be larger than the real capacity.

5.4 R4611 BASIC Statement Syntax

1. BUZZER

Outline Activate buzzer.

Syntax

BUZZER Integer 1 Integer 2

Commentary

- When BUZZER statement is executed, the R4611's built-in buzzer is activated in accordance with the designation.
- The buzzer tone is specified by integer 1. Specify any value from 0 (high tone) to 255 (low tone).
  Integer 2 shows time (unit: ms).

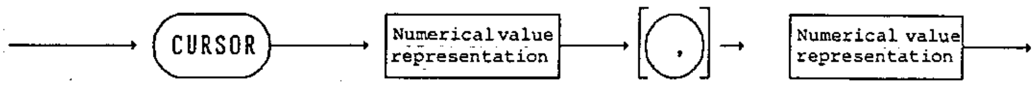
Example

```
10 FOR I = 1 TO 255
20    BUZZER I, 10
30 NEXT I
40 STOP
```

2. CURSOR

Outline Move cursor to specified coordinate position.

Syntax



CURSOR Numerical value representation
[X axis designation]
Column direction
,Numerical value representation
[Y designation]
Row direction

Commentary

- Move cursor to specified position on the CRT screen.
- The first value enclosed in parentheses indicates the X axis coordinate, and the second value indicates the Y axis coordinate.

  CURSOR X axis coordinate, Y axis coordinate

  These two values must lie within the following ranges.

  $0 \leqq$ X axis coordinate $\leqq 45$
  $0 \leqq$ Y axis coordinate $\leqq 24$

Example

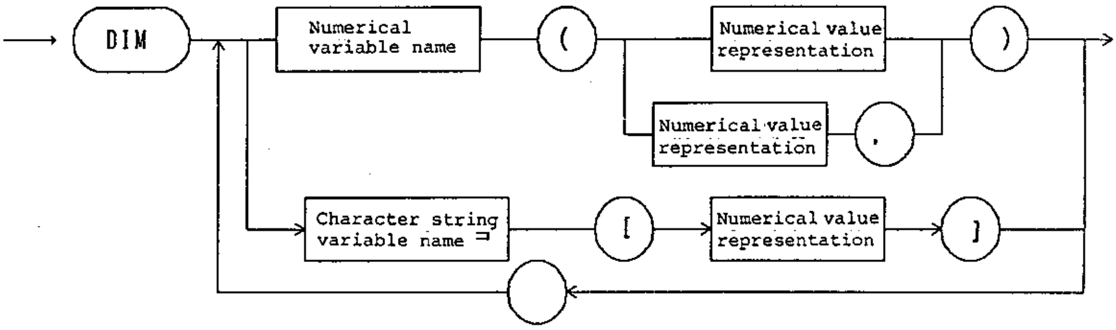
```
10 PRINT CHR$(12)
20 X=0:Y=4:X1=1:Y1=1
30 CURSOR X,Y:PRINT "*"
40 X=X+X1:Y=Y+Y1
50 IF X<=0 OR 46<=X THEN X1 *= -1
60 IF Y<=0 OR 26<=Y THEN Y1 *= -1
70 CURSOR X,Y:PRINT ""
80 GOTO 30
90 STOP
```

3. DIM

Outline

Array variable or character string variable definition declaration.

Syntax



DIM A (Numerical value representation)
{ ,<A>(Numerical value representation)}

A ::= Numerical variable

Commentary

- When an array variable or character string variable is used, the array variable name and array size must be defined by DIM statement. If name and size are not defined, the array becomes 10 elements in 1-dimension, and the character string takes a length of 18 characters.
- When an array is declared using the DIM statement, the array variable of the specified size is stored in memory. Therefore, if the declared variable is too big, there will be insufficient space left for the BASIC program. (An error is generated and program execution is stopped if the array size is greater than the memory space.)
(Out of memory)
- If the result of operation on a numerical value representation for array variable size is a real number expression, the decimal places are rounded off to an integer number expression.
- When using a character string variable, the length of the character string is declared by numerical value representation.

Example

```
10 DIM n(5)
20 FOR i = 1 TO 5
30    n(i) = i*i/2
40 NEXT i
50 FOR i = 1 TO 5
60    PRINT n(i)
70 NEXT i
```

<Execution result>

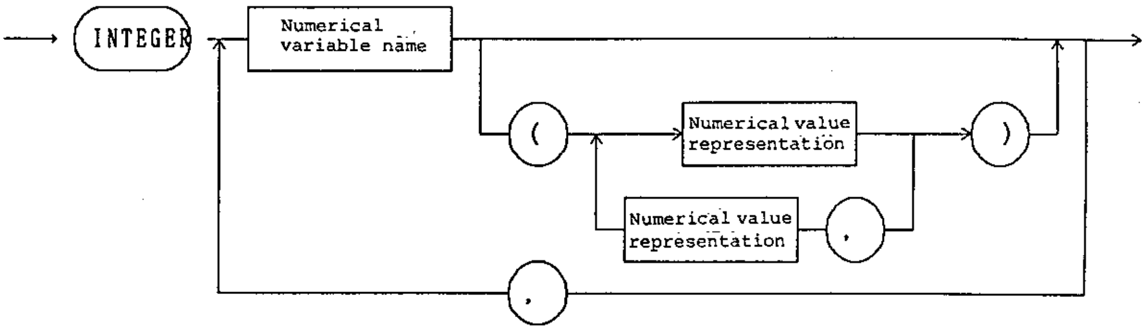
```
0.5
2.0
4.5
8.0
12.5
```

4. INTEGER

Outline

Declaration that the variable or array variable is an integer.

Syntax



INTEGER <A>(Numerical value representation)
{ ,<A>(Numerical value representation) }

<A> ::= Numerical variable

Example

```
10  INTEGER array(2,3)
20  PRINT "j \\i" ;
30  PRINT USING "X,3D,3D,3D" ;1,2,3
40  PRINT " " ;
50  FOR i = 1 TO 2
60    FOR j = 1 TO 3
70       array(i,j) = i*10 + j
80    NEXT j
90  NEXT i
100 FOR i = 1 TO 2
110 PRINT USING "-,2D,2X,#" ;i
120   FOR j = 1 TO 3
130      PRINT USING "3D,#" ,array(i,j)
140   NEXT j
150 NEXT i
```

<Execution result>

```
j\i   1  2  3

 1   11 12 13
 2   21 22 23
```

5. DISABLE INTR

Outline

Disable acceptance of interrupts.

Syntax

DISABLE INTR

Commentary

- Disable interrupts enabled by ENABLE INTR.
- To enable interrupts again after executing this statement, execute the ENABLE INTR statement. Branch conditions set by ON XXX statement are maintained unchanged in this case. If the interrupt branch conditions are to be changed, use the ON XXX or OFF XXX statement before executing the ENABLE INTR statement.
- Interrupts are disabled from immediately after execution of this program until the ENABLE INTR statement is executed.

Example

```
10 OUTPUT 31; "EDITOFF SRQE"
20 ON ISRQ GOTO 60
30 ENABLE INTR
40 ! LOOP
50 GOTO 40
60 DISABLE INTR
70 PRINT "INTERRUPT"
80 GOTO
```

6. ENABLE INTR

Outline

Cancel interrupt disable status generated by ON XXX statement or DISABLE INTR.

Syntax :

ENABLE INTR

Commentary

- If branching in generated by interrupt enabled by ON XXX statement, all interrupt generated branching is disabled temporarily. This is to prevent nesting of interrupt processing in cases where another interrupt is generated while a previous interrupt is being processed.
- If this statement is executed when interrupts are enabled again after branching generated by an interrupt has been processed, the interrupt disabled status is cancelled to enable branching by interrupt again.
- If interrupt processing is placed in a subroutine, execution of the processing can be made smoother by inserting this statement immediately before the RETURN statement.
- Also execute this statement if interrupts are to be enabled again after the DISABLE INTR statement is executed.
- Interrupts are disabled from immediately after program execution up to execution of this statement.

Example

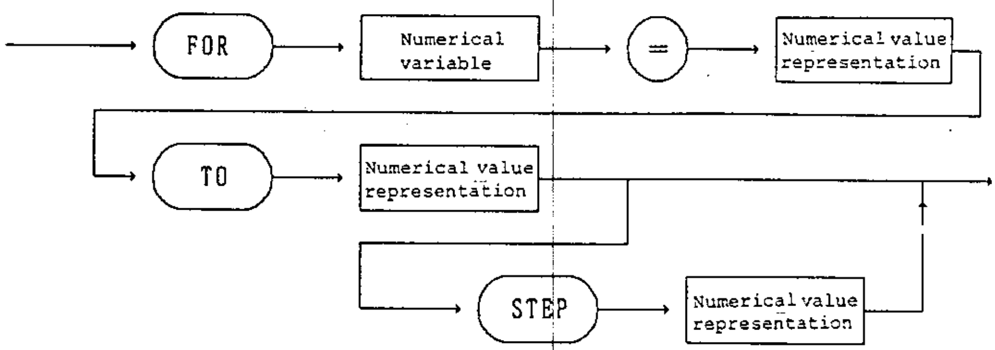
```
10 OUTPUT 31; "EDITOFF SRQE"
20 ON ISRQ GOTO 60
30 ENABLE INTR
40 ! LOOP
50 GOTO 40
60 DISABLE INTR             ! INTERRUPT
70 PRINT "INTERRUPT"        !
80 END
```

7. FOR-TO-STEP
NEXT

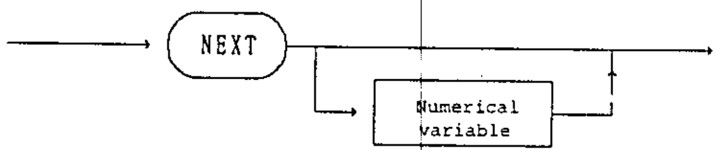
Outline

Program loops are formed by using the FOR and NEXT pair of statements.

Syntax



FOR Numerical variable = Numerical value representation
TO Numerical value representation
[STEP Numerical value representation]



NEXT [Numerical variable]

Commentary:

- The specified numerical variable is used as a loop counter with changes made one step (increment) at a time from initial to final value. The loop is stopped when the counter value is greater than the final value. Counter increase/decrease is made by the NEXT statement. Therefore, the section of program between the FOR and NEXT statements is processed repeatedly.
- The initial and final values and the increment are specified in the following way.

```
FOR A = (Initial value)    TO (Final value)
                                  STEP (Increment)
```

- If STEP (increment) is omitted, the increment automatically becomes +1.

- The FOR statement to NEXT statement section can be nested.
- The variable name of the loop counter used with a pair of FOR and NEXT statements must be the same in both statements. An error is generated if the name is different.
  (NEXT without FOR)
- And if the value of the numerical variable used in the loop counter while processing the program between the FOR and NEXT statements is changed, the repetition processing will not proceed in the normal way.
- If the numerical variable after the NEXT statement is omitted, the value for the previous FOR statement is adopted automatically.
- FOR-NEXT looping can be escaped by BREAK statement.
- The program can be branched by CONTINUE statement from the FOR-NEXT loop to the loop of the next step value.

Example.

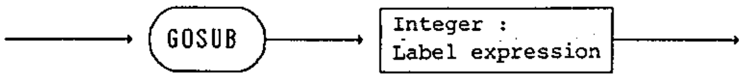
```
10 FOR R = 11 TO 0 STEP -5
20   FOR I = 0 TO PI STEP PI/180
30      X=SIN(I)*R+23
40      Y=COS(I)*R+15
50      CURSOR X,Y:PRINT "*"
60   NEXT I
70 NEXT R
80 STOP
```

8. GOSUB
RETURN

Outline

Branch to and return from the specified subroutine.

Syntax



GOSUB Numerical value representation|Label expression

RETURN

Commentary

- Transfer process control to subroutine starting from the line number specified by integer or label expression.
  Return to next statement after the GOSUB statement by using the RETURN statement.
- Always include the RETURN statement at the end of the subroutine to ensure return to the main program.
- An error is generated if a RETURN statement is executed without subroutine branching.
- Since the GOSUB statement to RETURN statement section can be nested, branching to another subroutine from the first subroutine is possible. Too much nesting, however, can use up memory space and result in error.
  If a label expression is used in GOTO or GOSUB, and the corresponding line number does not exist, the
  <<< Undefined line: Enter CORRECT line. >>>
  message appears on that line. No further processing is possible since the branch destination does not exist. Insert the correct line number. If this error message line is deleted accidentally, the value of the GOTO or GOSUB label expression is cleared to 0, and any further attempt to execute the program results in the
  Undefined line
  error message appearing. To enable processing to proceed insert the correct label expression value in the GOTO or GOSUB statement.

Example

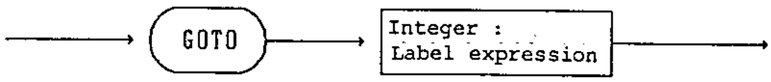
```
10  FOR I = 1 TO 9
20     GOSUB 60
30     GOSUB *PRT
40  NEXT I
50  STOP
60  ! SUB ROUTINE
70  X = I * I
80  RETURN
90  *PRT ! SUB ROUTINE
100 PRINT I; " * " ;I; " = " ;X
110 RETURN
```

9. GOTO

Outline

Branch to the specified line number.

Syntax



GOTO Integer|Label expression

Commentary

- Branch unconditionally to the specified line number.
- If LIST is executed when the specified line number is found not to exist in the program, a REM statement is automatically inserted in the position corresponding to the missing line number.

Example

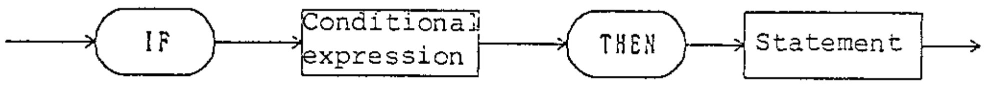
```
10  FOR I = 1 TO 9
20     GOTO 60
30     GOTO *PRT
40  NEXT I
50  STOP
60  !
70  X = I * I
80  GOTO 30
90  *PRT
100 PRINT I; "*" ;I; "=" ;X
110 GOTO 40
```

10. IF THEN

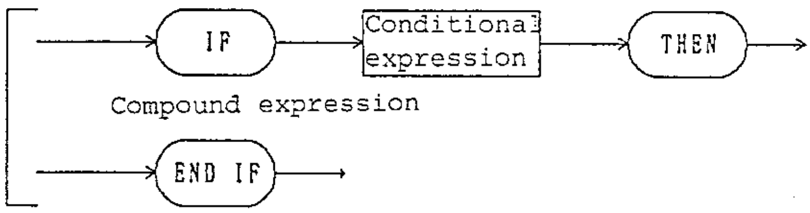
Outline

Branch to and execute the specified statement depending on conditions.

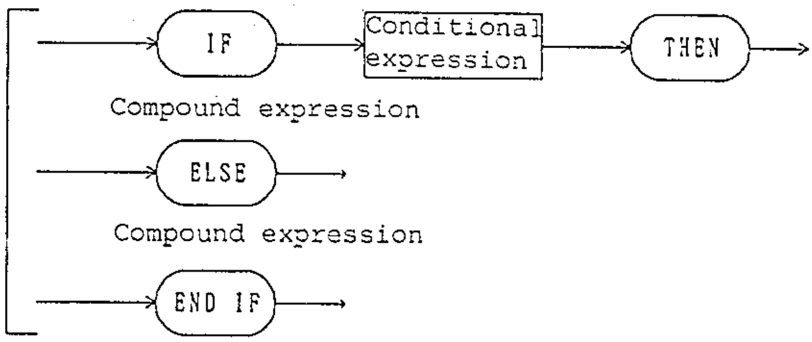
Syntax



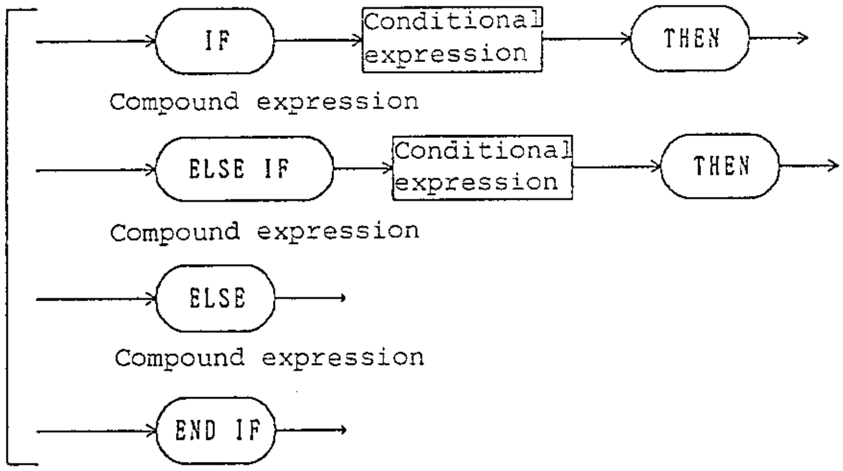
IF <Conditional expression> THEN <Statement>



IF <Conditional expression> THEN
Compound expression
END IF



IF <Conditional expression> THEN
Compound expression
ELSE
Compound expression
END IF



IF <Conditional expression> THEN
Compound expression
ELSE
Compound expression
END IF

Commentary

- Although the conditional expression is a logical expression, a numerical value representation can also be written here apart from logical expressions using comparison operators. In this case, the operation result is false only if the value is 0, but true if any other value.
- The program is branched and processed according to the logical expression conditions.
- The THEN statement is executed once the logical expression relationship is established. The THEN statement can include successive statements, followed by execution of the next statement.
- If the logical expression relationship is not established, the next line is processed.
- The following six types of logical operators can be used.

A=B (A==B)	Established if A and B are equal
A>B	Established if A is greater than B
A<B	Established if A is smaller than B
A>=B	Established if A is equal to or greater than B
A<=B	Established if A is equal to or smaller than B
A<>B (A!=B)	Established if A and B are not equal

Expressions in parentheses can also be used.

In the above logical expressions, both A and B may be numerical value representations. And numerical value representations can be compared with character string expressions.

Example

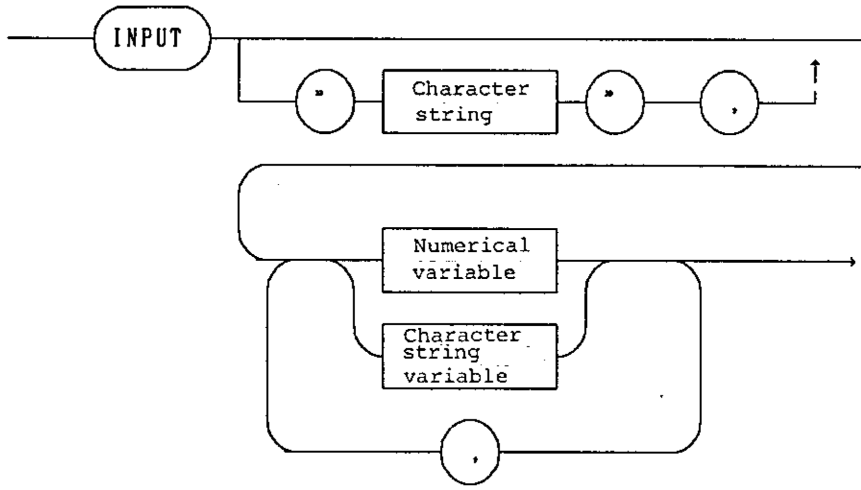
```
10  FLG = 0
20  FOR I = 0 TO
30     PRINT I;
40     IF (I % 2) = 0 THEN FLG = 1
50     IF FLG = 1 THEN
60                     PRINT "  EVEN" ;
70                     FLG = 0
80                     END IF
90     PRINT
100 NEXT I
110 STOP
```

11. INPUT

Outline

Substitute keyboard input data in numerical variable.

Syntax



INPUT ["<Character string>",]{Numerical variable | Character string}

Commentary

- When the INPUT statement is executed, the program is stopped temporarily to wait for input of data from the keyboard. This input wait status is maintained until the ENTER key is pressed, resulting in the key input data being substituted in a variable.
- The INPUT statement can handle both numerical and character string variables. However, if the input contains non-numerical characters (such as alphabetic characters and symbols), all non-numerical characters are disregarded. And if there are no numerical characters at all, a value of 0 is substituted in the variable. No substitution takes place if only the ENTER key is pressed. That is, the value prior to input remains unchanged.
- Character constant inputs do not have to be enclosed between quotation marks.

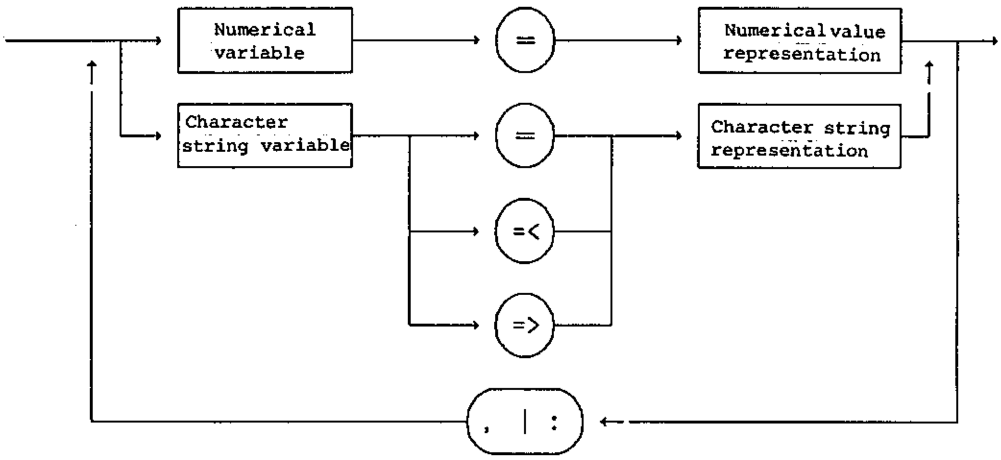
Example

```
10  OUTPUT 31; "SINGLE EDITON"
20  INPUT "CENTER FREQUENCY(MHz) ?" ,CF
30  INPUT "SPAN FREQUENCY(KHz) ?" ,SF
40  OUTPUT 31; "EDITOFF"
50  OUTPUT 31; "CENTERF" ,CF, "MHZ"
60  OUTPUT 31; "SPANF" ,SF, "KHZ"
70  OUTPUT 31; "SINGLE"
80  OUTPUT 31; "MAXSRCH"
90  OUTPUT 31; "MAXSRCH ?"
100 ENTER 31; F,L,D1,D2
110 OUTPUT 31; "EDITON"
120 PRINT "MAX = " ,L
130 STOP
```

12. LET
LET is not used in programs. Direct substitution statements are written.

Outline	Substitute in variables.

Syntax



<A>|<B>{,<A>|<B> }

<A>, <B> ::= Numerical variable = Numerical value representation

Commentary

- The "=" sign used here denotes substitution. It is not the mathematical equal sign. If the left hand side of this sign is a numerical value, character strings too can convert and substitute the numerical value section. Especially when substituting a character string, the most that can be substituted is the length of the right hand side when "=" is used. With "=>", however, where the character string on the right hand side may be shorter than the character string on the left hand side, the length is substituted in the left hand side with spaces filling the lead.
With "=<", on the other hand, spaces are filled in behind. That is, "=>" and "=<" are valid substitution operators only for character strings.

Example

```
10 DIM STR$
20 PRINT "123456789012345678"
30 STR$ = "ABC" :PRINT STR$
40 STR$ =< "OPQ" :PRINT STR$
50 STR$ => "XYZ" :PRINT STR$
```

<Execution result>

```
123456789012345678
ABC
OPQ
               XYZ
```

13. OFF SRQ [Only in controller mode]
OFF ISRQ

Outline

Cancel branch function and definition by SRQ or ISRQ interrupt.

Syntax

OFF SRQ
OFF ISRQ

Commentary

- Cancellation of branching generated by an interrupt enabled by ON SRQ statement.

Example

```
100 OUTPUT 31; "EDITOFF SRQE"
110 ON ISRQ GOTO *MAX
120 OUTPUT 31; "SINGLE"
130 ENABLE INTR
140 ! LOOP
150 GOTO 140
160 *MAX
170 DISABLE INTR
180 OUTPUT 31; "MAXSRCH"
190 OUTPUT 31; "MAXSRCH?"
200 ENTER 31;F,L,D1,DL2
210 PRINT L
220 GOTO 130
```

<Commentary>

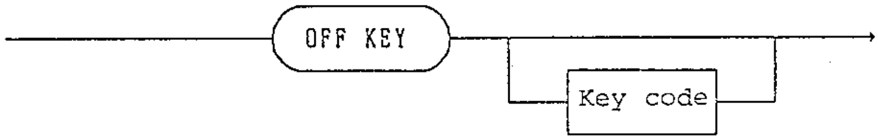
Address	Details	Address	Details
100	Set measuring screen, and enable SRQ	170	Disable interrupt
110	Set internal SRQ interrupt branching	180	Search for maximum level
120	Single sweep	190	Request return of maximum level
130	Accept interrupt	200	Substitute returned data in respective variables
		210	Display level

14. OFF KEY

Outline

Cancel branch function and definition by KEY input interrupt.

Syntax



OFF KEY Key code

Commentary

- Cancellation of branching generated by R4611 key input interrupt enabled by ON KEY statement.

Example

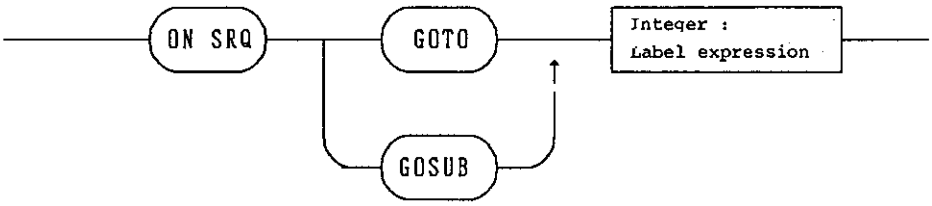
```
10  ON KEY 2 GOTO 100
20  ENABLE INTR
30  ! LOOP
40  GOTO 30
100 OFF KEY
110 PRINT "OFF KEY"
120 STOP
```

15. ON SRQ [ON SRQ only in controller mode]
ON ISRQ

Outline

Enable interrupt branching by external SRQ signal via GPIB. (ON SRQ)
Or, enable interrupt branching by when an internal interrupt source is generated. (ON ISRQ)

Syntax



ON SRQ GOTO| GOSUB Integer| Label expression

Commentary

- Execute branching by interrupt during execution of program.
- Branching is executed after the statement being executed at the time of the interrupt has been completed.
- And the return destination required after branching to a subroutine becomes the next statement to be executed after the statement being executed at the time the interrupt was generated.
- ON SRQ is capable of interrupt branching by SRQ signal from external GPIB only when executing in controller mode.

Note* ON SRQ is valid in controller mode.

Example

Search for MAX during each single sweep.

```
100 OUTPUT 31; "EDITOFF SRQE"
110 ON ISRQ GOTO *MAX
120 OUTPUT 31; "SINGLE"
130 ENABLE INTR
140 ! LOOP
150 GOTO 140
160 *MAX
170 DISABLE INTR
180 OUTPUT 31; "MAXSRCH"
190 OUTPUT 31; "MAXSRCH?"
200 ENTER 31;F,L,D1,D2
210 PRINT L
220 GOTO 130
```

<Commentary>

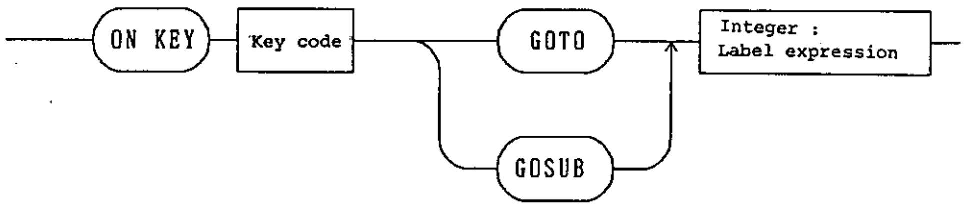
Address	Details	Address	Details
100	Set measuring screen, and enable SRQ	170	Disable interrupt
110	Set internal SRQ interrupt branching	180	Search for maximum level
120	Single sweep	190	Request return of maximum level
130	Accept interrupt	200	Substitute returned data in respective variables
		210	Display level

16. ON KEY

Outline

Enable branching by KEY input interrupt.

Syntax



ON KEY Key code GOTO|GOSUB Integer|Label expression

Commentary

- Branch by KEY input interrupt during program execution.
- Branching is executed after the statement being executed when the interrupt was generated has been completed.
- And the return destination required after branching to a subroutine becomes the next statement to be executed after the statement being executed at the time the interrupt was generated.
- Key codes are numerical values from 1 to 6, and correspond to the soft key and function keys F1 thru F6 on the left hand side of the CRT screen.

Example

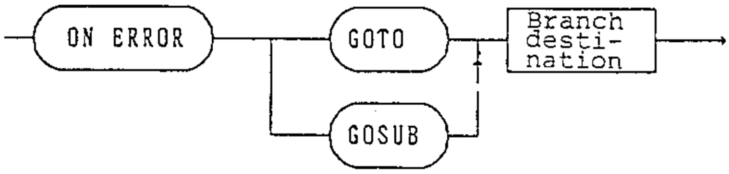
```
1    CLS
10   ENABLE INTR
20   ON KEY 1 GOTO 1000
30   ON KEY 2 GOTO 1100
40   ON KEY 3 GOTO 1200
50   ON KEY 4 GOTO 1300
60   ON KEY 5 GOTO 1400
70   ON KEY 6 GOTO 1500
75   COUNT = 10
80   *HERE:
85   I = 0: PRINT ""
90   IF I = COUNT THEN GOTO *HERE
100  ++I: PRINT ">" ;
101  GOTO 90
1000 PRINT "FIRST KEY"
1001 COUNT = 1
1010 GOTO *HERE
1100 PRINT "SECOND KEY"
1101 COUNT = 10
1110 GOTO *HERE
1200 PRINT "THIRD KEY"
1201 COUNT = 20
1210 GOTO *HERE
1300 PRINT "FOURTH KEY"
1301 COUNT = 30
1310 GOTO *HERE
1400 PRINT "FIFTH KEY"
1401 COUNT = 40
1410 GOTO *HERE
1500 PRINT "SIXTH KEY"
1501 COUNT = 50
1510 GOTO *HERE
```

17. ON ERROR

Outline

Specifies branch destination on error.

Syntax



ON ERROR GOTO 1000

Commentary

When an error is generated during BASIC program execution, the system displays the line number and error message and stops execution.
In case of built-in function (requests for measuring equipment services) errors, program execution resumes immediately after display of the error message.
To troubleshoot such errors, use the ON ERROR statement.
Specify branch destination with a numeric constant, numeric variable, or label. ERRN system variables that keep record of error codes classifies the errors. If unable to recover from the error immediately after generation, use the OFF ERROR statement to avoid resulting in an endless loop.

18. PAUSE

Outline

Temporarily halts program execution.

Syntax

Commentary

This BASIC command temporarily halts the BASIC program execution, thus resumption from the interrupted line by the CONT command is possible.
To halt execution from outside the program, press the nearest key in the leftmost column.

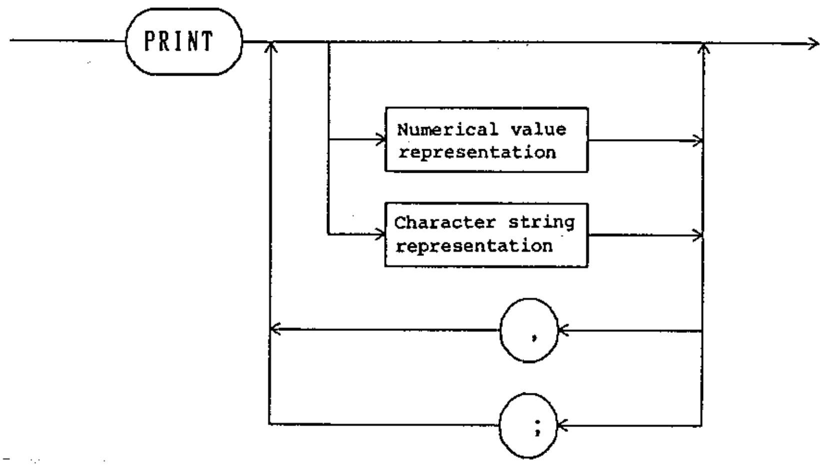
Example

```
10  FOR I = 1 TO 9
20    GOTO 60
30    GOTO *PRT
40  NEXT I
50  PAUSE
60  !
70  X = I * I
80  GOTO 30
90  *PRT
100 PRINT I; "*" ;I; "=" ;X
110 GOTO 40
```

19. PRINT [USING]

Outline Display numerical or character string data.

Syntax




```
PRINT [Numerical value representation
      |Character string representation
          {,|; Numerical value representation
              |Character string representation}]
```

Commentary

- Display specified numerical data or character string.
- If numerical values and character strings are partitioned by commas (,) successive values and strings can be output without executing a carriage return.
- And if a semicolon (;) is placed at the end of a PRINT statement, there is no carriage return at the end of the printer output. Therefore, printing is continued on the same line as the last printing when the next PRINT statement is executed.

Example

```
10 PRINT 123*456
20 PRINT "ABC"
30 PRINT "Freq.=" , A, "Hz"
40 PRINT I,
```

- PRINT USING Format designation expression; [Expression [...]]

  The format designation expression is a character string representation where the format is specified with image specifications partitioned by commas.

<Image specifications>

D Display space in the remaining part of specified field.
Z Specify 0 in the remaining part of specified field.
K Display expression value without change.
S Always append + or - sign flag.
M Append - sign flag, or take a space when positive.
. Display decimal point.
E Display e, sign, and exponential part.
H Display expression value without change, but with decimal point displayed in European format.
R Display European format decimal point.
* Specify * in the remaining part of specified field.
A Display single character.
k Display character string without change.
X Display space.
Use " to enclose sections to be written literally in literal format designation expressions.
B Display expression value as ASCII code.
@ New page
+ Shift display position to start of same line.
- Shift display position to start of next line.
No final carriage return
n Output in n-digit precision. When specified for character string, this value becomes the length of the actual character string.

Example.

```
10 PRINT USING "4Z,2X,5D,2X,5*" ;123,-444,567
```

<Results of execution>

```
0123    -444  **567
```

Example

```
10 PRINT USING "S3D,X,S3D" ;-4.5,465
20 PRINT USING "M3Z,Z,S,M3ZR3Z" ;1.26,-5.452
```

<Results of execution>

```
 -4 +465
001.3 -005,452
```

Example

```
10 PRINT USING "K,X,H" ;5.03884e+22,4.5563
```

<Results of execution>

```
5.03884e+22 4,5563
```

Example

```
10 PRINT USING "k,#" ; "character:"
20 PRINT USING "B" ;69
```

<Results of execution>

```
character:E
```

Example

```
10 PRINT USING "\" ............  \",+,A" ; "*"
20 PRINT USING "k,-, \" .END.  \"    " ; string"
```

```
<Results of execution>
*............
string
.END.
```

Example

```
100 PRINT USING "DDD.DD" ;1.2
110 PRINT USING "ZZZ.ZZ" ;1.2
120 PRINT USING "K" ;1.2
130 PRINT USING "SDDD.DD" ;1.2
140 PRINT USING "MDDD.DD" ;1.2
150 PRINT USING "MDDD.DD" ;-1.2
160 PRINT USING "H" ; 1.2
170 PRINT USING "DDDRDD" ; 1.2
180 PRINT USING "***.**" ; 1.2
190 PRINT USING "A" ; "A" ; "a"
200 PRINT USING "k" ; "string"
210 PRINT USING "B" , 42
220 PRINT USING "3D.2D" ;1.2
```

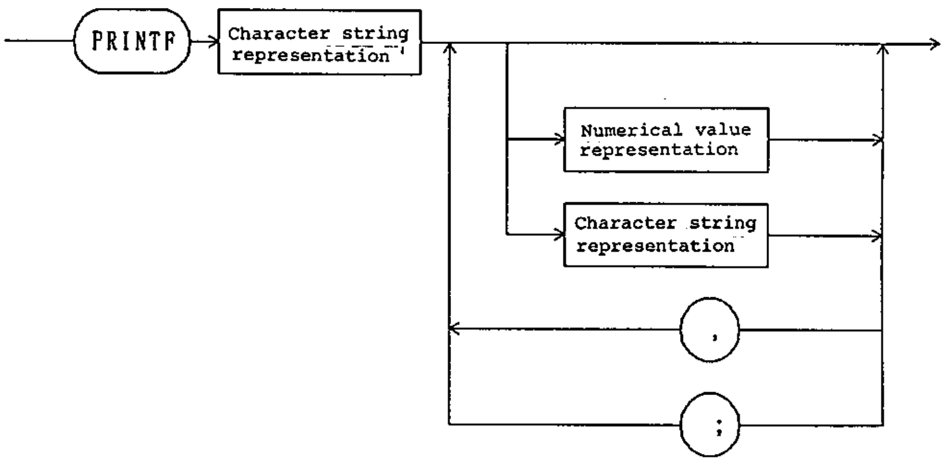
```
<Results of execution>
  1.20
001.20
1.2
  +1.20
   1.20
  -1.20
1,2
  1,20
**1.20
a
string
*
  1.20
Program ended normally.
```

20. PRINTF

Outline

Display numerical or character string data.

Syntax



Commentary

- Display specified numerical data or character string.
- If numerical values and character strings are partitioned by commas (,) successive values and strings can be output without executing a carriage return.
- And if a comma (,) or semicolon (;) is placed at the end of a PRINTF statement, there is no carriage return at the end of the printer output. Therefore, printing is continued on the same line as the last printing when the next PRINTF statement is executed.
- The character string representation in the first parameter is used to specify the format of subsequent parameters.
  The format designation method is outlined below.

- PRINTF Format designation expression;[Expression[Expression[...]]]

The format designation method resembles the Printf function in C language.
The format designation expression is a character string type expression, and the output format is specified by the following parameters following %. Other character strings apart from this format are simply straight forward outputs.
If output of % is required, use %%.

%	[-], [0], and [.n] characters
-	Left justify within specified field, but right justify if no designation.
0	Select 0 instead of spaces as the character used to fill up the remainder of the specified field.
+	Always append + or - sign flag.
Space	Append - sign flag, or take a space when positive.
m	Take m characters of field.
.n	Output in n-digit precision. When specified for character string, this value becomes the length of the actual character string.
Characters	d: Decimal number with sign u: Decimal number without sign o: Octal number x: Hexadecimal number s: Character string e: Floating decimal point display with sign

Example

```
10 N = 500000
20 U = LOG(1+1/N)
30 V = U - 1 / N)
40 PRINTF "%7d\t%16.5e\t%16.5e\n" ,N,U,V
50 PRINTF "%s\n" , "end "
```

< Results of execution >

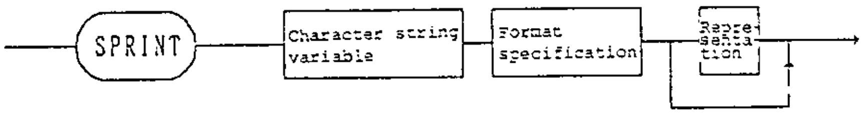
```
 50000          2.00000e-06           -1.99994e-12
end
```

21. SPRINTF

Outline

Convert the format in accordance with the format conversion specification for PRINTF command, and assign the result to the character string variable.

Syntax



Commentary

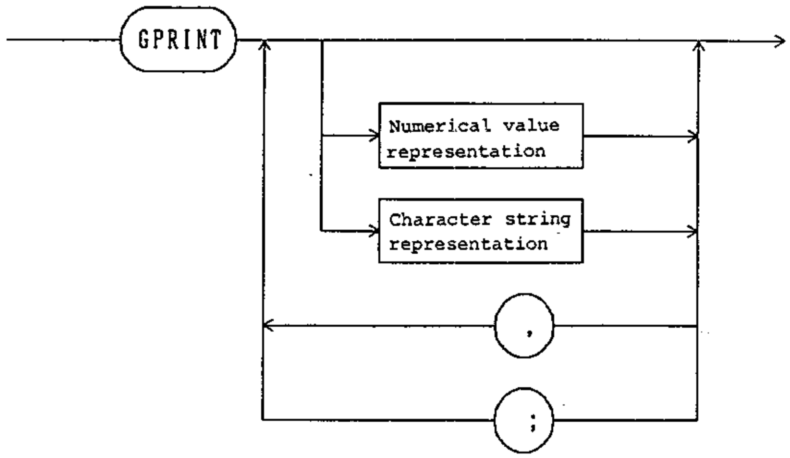
Convert the value of expression using a method of PRINTF format specification, and assign the result to the character string variable of the first parameter.
Refer to the 'PRINTF' for a method of the format specification. Special attention should be taken to the method of format specification, the number of expression, and character string variable field.
If the character string variable field is not enough to assign the result, a basic buffer will be broken.

22. GPRINT GPIB output
LPRINT Serial output

Outline

Output numerical or character string data.

Syntax



GPRINT [Numerical value representation
LPRINT |Character string representation
{,|; Numerical value representation
| Character string representation}]

Commentary

- Display specified numerical data or character string.
- If numerical values and character strings are partitioned by commas (,) successive values and strings can be output without executing a carriage return.
- And if a comma (,) or semicolon (;) is placed at the end of a PRINT statement, there is no carriage return at the end of the printer output. Therefore, printing is continued on the same line as the last printing when the next PRINT statement is executed.

Example

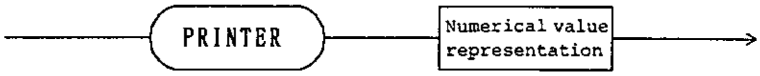
```
100 PRINTER 1
110 FOR I = 0 TO 20
120    GPRINT I
130    LPRINT I
140 NEXT I
150 STOP
```

23. PRINTER

Outline

Specify device address to be sent to the printer.

Syntax



PRINTER Numerical value representation

Commentary

- The device address of the printer connected to the GPIB is passed to R4611 by this PRINTER command. Before executing a PRINT statement, always specify (in R4611) the printer address by this PRINTER statement.
- The device address is an integer from 0 to 30.

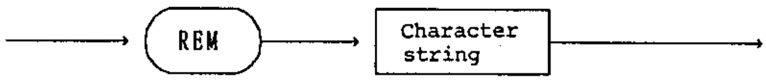
Example

```
10 PRINTER␣1
```

24. REM

Outline Program remarks.

Syntax



REM <Character string>

Commentary

- Use the REM statement to insert remarks in the program.
- Since the REM statement is not executed, any character string may be inserted after REM. Any alphanumeric character or symbol may be included.
- The REM statement can also be represented by an exclamation mark !.
- Colons cannot be used for multiple statement purposes after a REM statement. Everything including the colon is regarded as remarks.

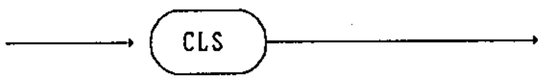
Example

```
10 REM "PROGRAM 1"
20 ! 1983-JUN-02
30 A=A+1:! INCREMENT A
```

25. CLS

Outline Clear the CRT screen.

Syntax



CLS

Commentary

- Clear all characters displayed on the CRT screen.
- At the same time that the screen is cleared, the cursor is returned to the home position.

Example

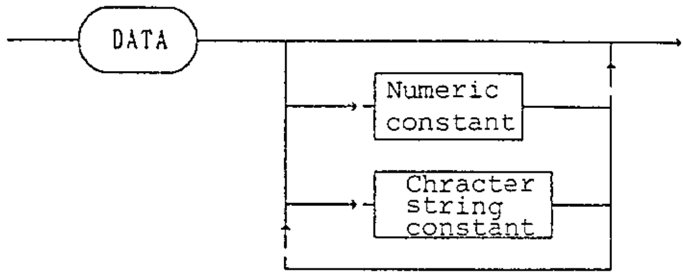
```
10 CLS
```

26. DATA

Outline

Defines numeric values and character strings to be read by the READ statement.

Syntax



Commentary

DATA statements are not executed but read by the READ statement.
Therefore though the DATA statements can be at any line number, they must be arranged in the order of reference.
To rearrange them, use the RESTORE statement.
More than one constant, separated by commas, can be specified in a single DATA statement. Put character strings in double quotations (" ") as a character string constant.

Caution

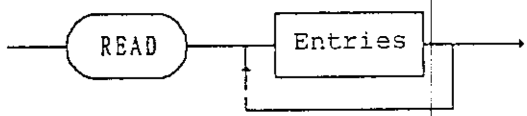
Parameters in the DATA statement cannot contain equations with variables.

27. READ

Outline

Replaces constants in the DATA statement with variables.

Syntax



READ Entries {Entries}

Commentary

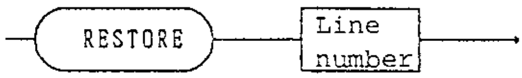
This statement replaces numerics and character strings defined by the DATA statement with variables specified by the argument.
When the system encounters a READ statement, it searches for the DATA statements.
With the first READ statement, the system starts searching each line number from the head of the program in descending order (if not rearranged by the RESTORE statement) and replaces the first argument found with the variable.
Then the system keeps on searching for DATA statement constants and replaces them one by one.
If the number of constants specified by the DATA statements is less than the number of variables in the READ statements, it results in an error.
In this case, the line numbers of the READ and DATA statements are ignored.

28. RESTORE

Outline

Specifies DATA lines to be read by the next READ statement.

Syntax



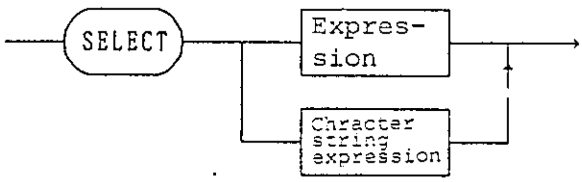
Commentary

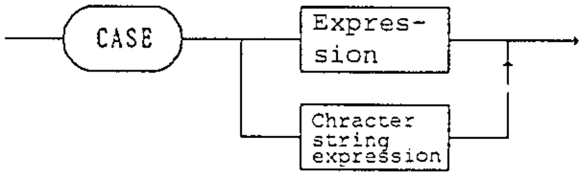
Specify the line number with an expression or label.
If not specified, the DATA statement constants are read from the head of the program to be specified by the next READ statement.
Any line number after the argument line number that is considered the starting position of the search can be specified.

29. SELECT, CASE

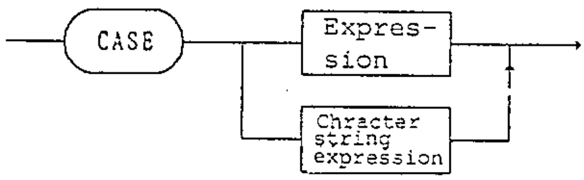
Outline Branch several times using a value in the expression.

Syntax





Compound statement



Compound statement

Compound statement

Commentary This statement executes all the compound statements following the CASE statement that has the equivalent value as specified by the SELECT statement. Execution continues until another CASE, CASE ELSE, or END SELECT statement is encountered.
Nesting of the SELECT statement is possible. Internal SELECT contains the entire external SELECT.

30. ERRN

Outline

This statement is a system variable for retaining an error number.

Syntax

Commentary

This is a system variable for retaining an error number generated when the BASIC program is executed.
The system variable is initialized to 0 at the start of the BASIC program and the value is substituted when an error occurs.
The value is initialized to 0 when 0 is substituted explicitly or the BASIC program is reexecuted.

Actual error number structure is as follows:

Error class * 256 + Error message number

Error class

1	Associated with the data I/O.
2	Associated with the data operation.
3	Associated with the build-in function.
4	Associated with the BASIC statement.

31. ERRM$

Outline

This statement is a system function for returning an error message of the specified number.

Syntax

Commentary

The system function returns an error message specified in a parameter.
When specifying 0 as a parameter, it returns the last displayed error message.

The error number structure is as follows:

Error class * 256 + Error message number

Only the error message number is referred to internally although an error number including an error class is specified. Therefore, ERRN can be specified for an error number.

32. PEEK

Outline

The PEEK system function is used for maintenance of the tester. This function reads the contents of built-in tester memory.

Syntax

```
PEEK (side, address, type)
side        0: I/O CPU board
            1: main CPU board
address     The address from which data is read
type        0: Single-byte unit (char)
            1: Two-byte unit (short)
            Others: Four-byte unit (long)
```

Commentary

This function is used for maintenance only.
It is not used for ordinary measurement.
The PEEK function reads data from the specified address of the specified board and returns it as the return value.

Example

```
10 side    = 0        ! I/O CPU board
20 address = 0x5ff80
30 type    = 0
40 FOR i = address TO 0x5ffff
50    PRINT "%c", PEEK(side, i, type)
60 NEXT i
```

33. POKE

Outline

The POKE command is used for maintenance of the tester. This command writes data in the tester built-in memory.

Syntax

POKE side address data type

side	0: I/O CPU board
	1: main CPU board
address	The address where the data is written
data	The data to be written in the specified address
type	0: Single-byte unit (char)
	1: Two-byte unit (short)
	Others: Four-byte unit (long)

Commentary

This function is used for maintenance only. It is not used for ordinary measurement. The POKE function writes data in the unit specified by "type". It writes data in the specified memory address of the specified board. The user should know the memory contents before using this command. To protect the important system data, this function is enabled only when control register 5 is set to 1. (See the CONTROL command section.)

Example

```
POKE 0 0x100000 0xFF 0
```

A single byte of X'FF' is written in address X'100000.

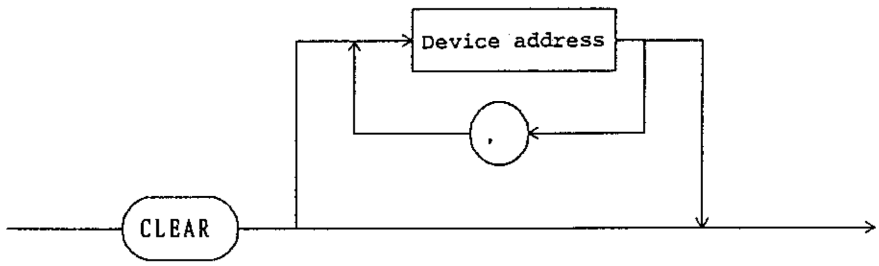
5.5 R4611 BASIC GPIB Control Statement Syntax and Activity

1. CLEAR

Outline

Initialization of all devices, or a specifically selected device connected to the GPIB.

Syntax



CLEAR [Device address{,Device address}]

Commentary

- If only CLEAR is executed without specifying any device address, the universal command "device clear" (DCL) is sent to the GPIB. All devices connected to the GPIB are thus initialized.
- If a device address is specified after CLEAR, only the device specified by the device address is addressed, and the address command "select device clear" (SLC) is sent.
  Hence, only the specified device is initialized. And more than one specific device address can be specified at the same time.

Example

```
10 CLEAR
20 CLEAR 2
30 CLEAR 1 3 5 7
```

Caution

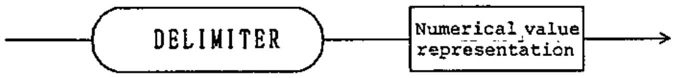
CLEAR does not function when in TALKER/LISTENER mode.

2. DELIMITER

Outline

Statement for selecting and setting one of four delimiters.

Syntax



DELIMITER Numerical value representation

Commentary

- The delimiter corresponding to the number indicated in the numerical value representation is set. The delimiter selection numbers and types are listed below.

Selection number	Type of delimiter
0	Output of "CR" and "LF" 2-byte code. Or "LF" output together with "EOI" single wire output.
1	Output of "LF" 1-byte code.
2	Output of "EOI" single wire output together with last byte of data.
3	Output of "CR" and "LF" 2-byte code.

- An error is generated if the Numerical value representation result does lie in the 0 to 3 range. And the value is regarded as an integer with decimal places disregarded.
- "DELIMITER=0" is set automatically when the power is switched on.

Example

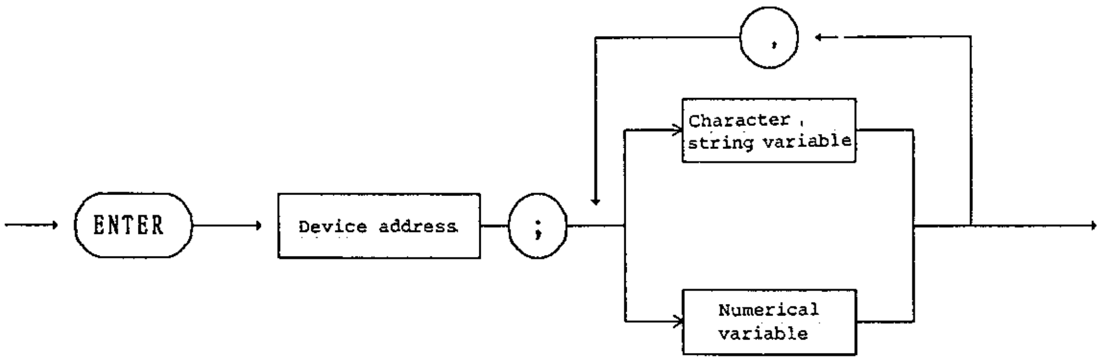
```
10 DELIMITER 0
20 DELIMITER 1
30 DELIMITER A*10
```

3. ENTER

Outline

Entry of data from GPIB.

Syntax



ENTER Device address:Numerical variable
|Character string variable

Device address
- 0 thru 30: Address of external device connected to the GPIB
- 31 : Data input from R4611 measuring section
- 32 : Data input from parallel port

Commentary

- Input of data via GPIB from device specified by device address, and storage as numerical value or character string within BASIC variable. Note, however, that if the device specified by device address does not have a talker function, the program is stopped without the controller being able to complete the handshake. And if a character string variable is used, that character string must be declared in advance by DIM statement.
- When input is by character string, the length of the character string variable used in the destination must be sufficient to prevent overflow of the input data and disregarding of data which cannot fit in.

Example

```
10 ENTER 1;A
20 DIM A$(100), B$(20)
30 ENTER 2;A$
40 ENTER 3;B$
```

Caution

- Function when in controller mode
  Specify the designated address function as TALKER, and accept data.
- Function when in TALKER/LISTENER mode
  Time out error is generated if R4611 is not specified as TALKER within one minute by external controller.

4. INTERFACE CLEAR

Outline

Initialization of entire GPIB interface connected to R4611.

Syntax

INTERFACE CLEAR

Commentary

- Execution of this statement results in output of GPIB single wire signal IFC for about 100 microseconds. When the GPIB interface of all devices connected to the R4611 GPIB receives the IFC signal, the talker or listener status is cancelled.

Example

10 INTERFACE CLEAR

Caution

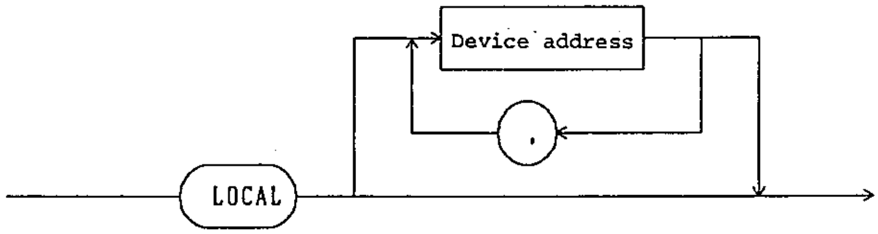
Does not function when in TALKER/LISTENER mode.

5. LOCAL

Outline

Release of specified device from remote control status, or making the remote enable (REN) line to false.

Syntax



LOCAL [Device address{,Device address}]

Commentary

- If LOCAL is executed without specifying a device address, the GPIB remote control (REN) line becomes false (high level), and all devices connected to the GPIB are switched to local mode. While REN is false, note that GPIB devices cannot be set by OUTPUT command (since GPIB control is no longer effective). To make REN true (low level) again, execute the REMOTE statement.
- If a device address is specified after LOCAL, remote mode can be canceled by addressing only the device specified by that device address.

Example

```
10 LOCAL
20 LOCAL 1
30 LOCAL 1, 2, 3
40 LOCAL A*10+J
```

Caution

Does not function when in TALKER/LISTENER mode.

6. LOCAL LOCKOUT

Outline

Cancellation of the function which enables devices connected to the GPIB to be switched to local mode by front panel operation.

Syntax

LOCAL LOCKOUT

Commentary

- When each device connected to the GPIB is in remote mode (that is, when controlled by remote control via the GPIB) the panel keys on each device are locked to prevent local setting of data. The LOCAL key, remains effective, however, and if pressed, the respective devices are returned to local mode where local setting of data is possible. Consequently, various interruptions during remote control operations are possible, and accurate control may not be possible. By executing the LOCAL LOCKOUT statement, however, the LOCAL key on all devices connected to GPIB can be locked to prevent all local control operations at each device.
- When the LOCAL LOCKOUT statement is executed, the universal command "local lockout" (LLO) is sent to the GPIB.

Example

```
10 LOCAL LOCKOUT
```

Caution

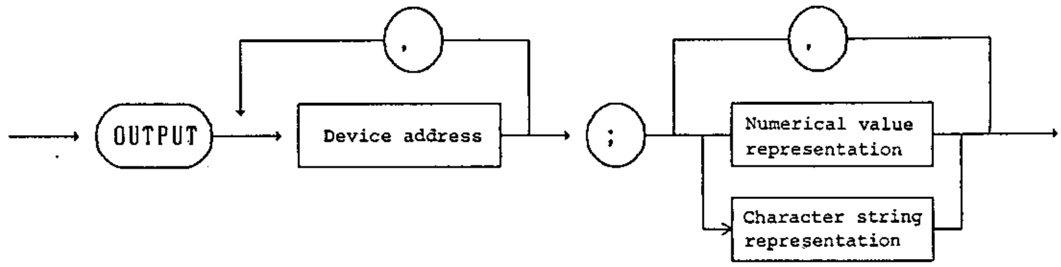
Does not function when in TALKER/LISTENER mode.

7. OUTPUT

Outline

Output of data to GPIB.

Syntax



OUTPUT Device address ,Device address A

<A> ::= Numerical value representation
|Character string representation
{ ,Numerical value representation
|Character string representation}

Device address
0 thru 30: Address of external device connected to the GPIB
31 : Output to R4611 measuring section
32 : Output to parallel port

Commentary

- Numerical and character string data is sent as ASCII data to the device specified by device address. More than one device can be specified at once by partitioning device addresses with commas, and numerical value representation and character string representation can even be mixed by also partitioning with commas.
- If the OUTPUT statement is executed when the REN line is true (low level), devices specified by device address are automatically set to remote mode. Remote mode can be cancelled by executing the LOCAL statement.

Example

```
10 OUTPUT 3:123
20 A=5
30 B=6
40 OUTPUT A; "STARTF" , B, "MHz"
```

Caution

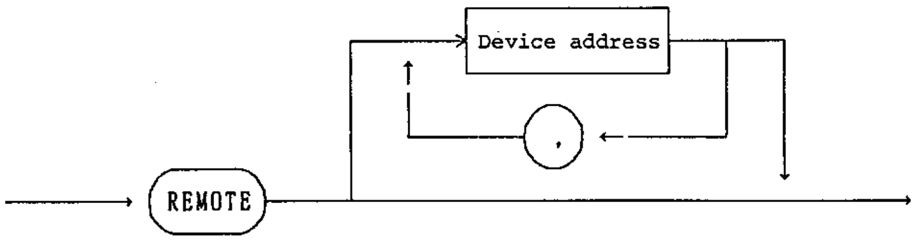
- When in controller mode
  Specify the designated address function as LISTENER, and output data.
- When in TALKER/LISTENER mode
  Time out error is generated if R4611 is not specified as LISTENER within one minute by external controller.

8. REMOTE

Outline

Set specified device to remote mode, or make the GPIB remote enable (REN) line true.

Syntax



REMOTE [Device address{,Device address}]

Commentary

- If only REMOTE is executed without specifying a device address, the GPIB remote enable (REN) line becomes true (low level) and remote control of the devices connected to GPIB becomes possible. The REN line can be made false (high level) by executing the LOCAL statement.
- If a device address is specified after REMOTE, the corresponding device is put into remote mode (as long as the REN line is true (low level)). More than one device address can be specified together. And remote mode can be canceled by executing the LOCAL statement.
- Although the purpose of the REMOTE statement is to put selected devices into remote mode, specified devices are automatically set to remote mode (without executing the REMOTE statement) when any of the following statements is executed (but only as long as the REN line is true (low level).

```
CLEAR [Device address{,Device address}]
OUTPUT Device address{,Device address}:
                         <output data>{,<output data>}
REMOTE [Device address{,Device address }]
SEND LISTEN Device address{,Device address
TRIGGER Device address{,Device address }
```

Example

```
10 REMOTE 1
20 REMOTE 5
30 REMOTE 1, 2, 3, 4
40 REMOTE A*100+I
```

Caution

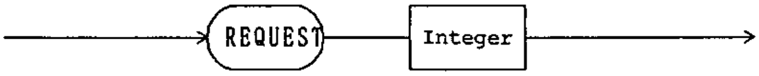
Does not function when in TALKER/LISTENER mode.

9. REQUEST

Outline

Set status byte to be sent to external GPIB when in TALKER/LISTENER mode.

Syntax



REQUEST Integer

Integer value: 0 thru 255

Commentary

- Set status byte to be sent to external GPIB when in TALKER/LISTENER mode.
- Set a value greater than 64 when generating SRQ.

Example

```
10 REQUEST 65
```

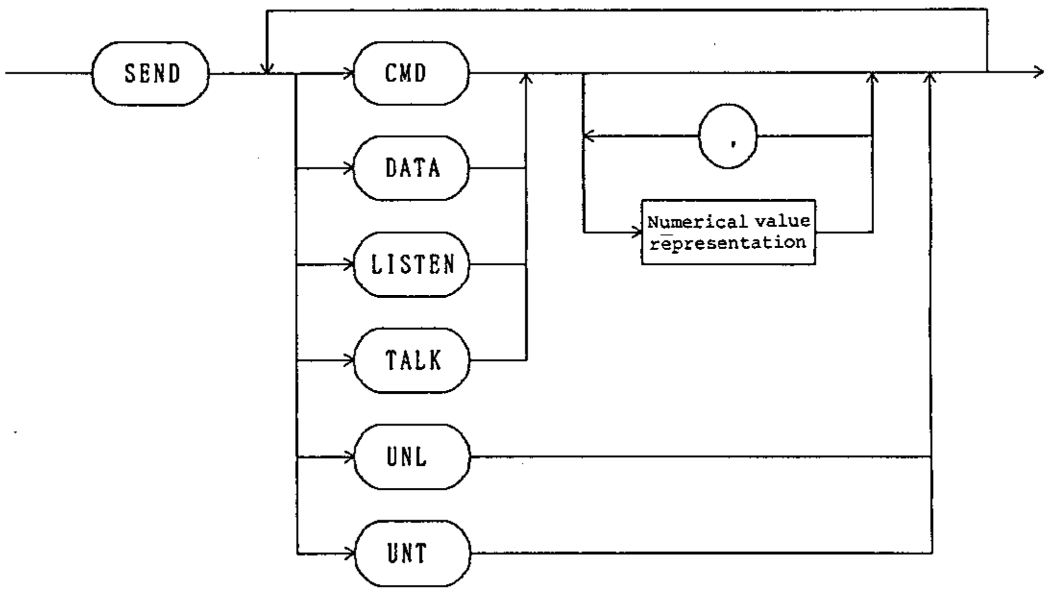
Caution

Does not function when in controller mode.

10. SEND

Outline — Output of command and data to GPIB.

Syntax



SEND <A>|<B>{,<A><B>}

<A> ::= CMD DATA|LISTEN TALK[<C>{,<C>}]
<B> ::= UNT UNL
<C> ::= Numerical value representation

Commentary

- Statement for sending universal commands, address commands, and data independently to the GPIB.

  CMD : Make the attention (ATN) line true (low level), and send the given numerical values to the GPIB. Since the numerical values are converted to 8-bit binary data and output to the GPIB, the numbers handled must not exceed the 0 thru 255 range. And numerical values expressed as decimal numbers are automatically converted to integer numbers.

  DATA : Make the ANT line false (high level) and sent the given numerical values to the GPIB. The numerical values handled here are subject to the same restrictions as those handled by "CMD".

LISTEN: Send the given numerical values to the GPIB as listener address group (LAG). Multiple numbers can also be specified.

TALK : Send the given numerical values to the GPIB as talker address group (TAG). Multiple numbers can also be specified.

UNT : Send the untalk (UNT) command to the GPIB. Talker mode of the device specified as talker before this command was executed is canceled.

UNL : Send the unlisten (UNL) command to the GPIB. Listener mode of the device specified as listener before this command was executed is canceled.

Example

```
10 SEND UNT UNL LISTEN 1, 2, 3 TALK 4
20 SEND UNT CMD 10, 200 DATA 30, 54
```

Caution

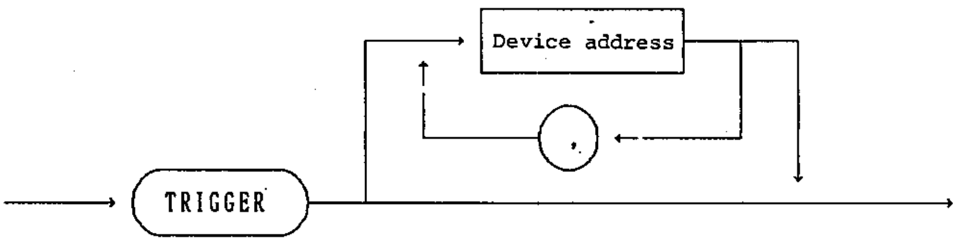
Does not function when in TALKER/LISTENER mode.

11. TRIGGER

Outline

Send the address command group (ACG) group execute trigger (GET) to all devices, or specifically selected devices connected to the GPIB.

Syntax



TRIGGER [Device address{,Device address}]

Commentary

- If TRIGGER alone is executed without specifying a device address, only the address command "group execute trigger" (GET) is sent to the GPIB. In this case, devices where a trigger is to be applied must be set to listener in advance.
- If a device address is specified after TRIGGER, the GET command is only sent to the specified device.

Example

```
10 TRIGGER 1
20 TRIGGER
30 TRIGGER 2, A*100-J, 30
```

Caution

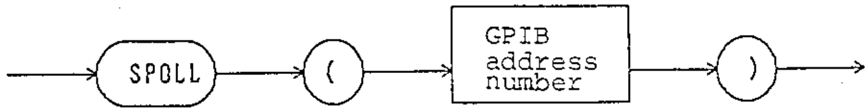
Does not function when in TALKER/LISTENER mode.

12. SPOLL

Outline

This statement executes serial polling of the specified GPIB equipment to read a status byte.

Syntax



SPOLL (equipment address)

Commentary

- The statement executes serial polling of the other GPIB equipment when the R4611 network analyzer is in the controller mode.
- The statement executes serial polling of equipment corresponding to each address when the equipment adress is 0 to 30.
- The statement takes out a status byte for the R4611 network analyzer regardless of the mode, such as controller mode and TALKER/LISTENER mode, when the equipment address is 31.

Example

```
10     ON ISRQ GOSUB 100
20     ON SRQ GOSUB 200
30     ENABLE INTR
40     !
50     GOTO 40
100    S=SPOLL (31)
110    PRONT S
120    RETURN
200    S=SPOLL (1)
210    PRONT S
220    RETURN
```

Caution

' ' is returned when the equipment address 0 to 30 is specified in the TALKER/LISTENER mode and SPROLL is executed.

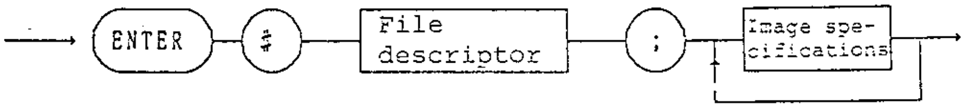
5.6 Syntax of the R4611 Network Analyzer BASIC File Control Statement

1. ENTER

Outline

This statement reads data from the file and substitutes it for the entry item.

Syntax



ENTER #File descriptor ; Entry item

Commentary

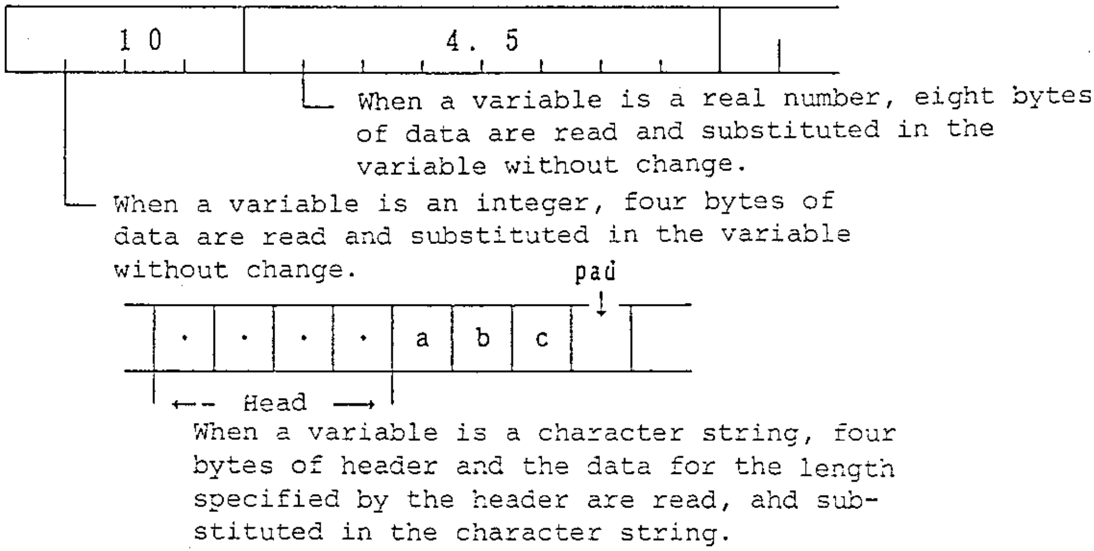
The statement reads data in the data type format of the corresponding entry item from the file assigned to the file descriptor, and substitutes it for the entry item.

Example

① BINARY file
The BINARY file expresses the internal data without change.
The BINARY file reads four bytes of header when an entry item is an integer or character string, or eight bytes of header when an entry file is a real number. Then, it reads the data for the length specified by the header. Since the number of bytes to be read depends on the entry item type, correct data cannot be obtained unless the same entry type as for output is entered.

```
10 INTEGER I
20 DIM R
30 OPEN "FILE" FOR INPUT AS #FD
40 ENTER #FD;I,R,S$
```

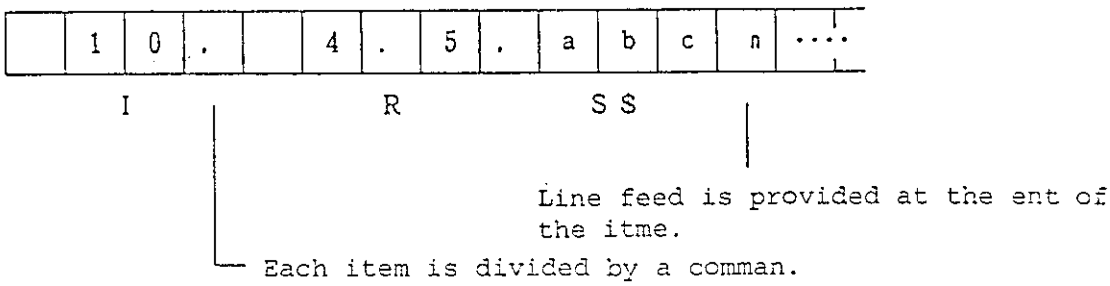
Number of bytes to be read depends on the entered variable type.



② TEXT file

The TEXT file reads up to line feed regardless of the number of entry items. Data up to comma (,) is assumed to be one item of data, converted to the corresponding entry item type, and substituted.
When the number of entry items are larger than the actual data, the last stored data item remains in the excessive variables. Inversely, when the number of variables is smaller than the actual data, the excess data is discarded.

```
10 INTEGER I
20 DIM R
30 OPEN "FILE" FOR INPUT AS #FD;TEXT
40 ENTER #FD;I,R,S$
```



③ ASCII file

The ASCII file reads two bytes of header and the data for the length specified by the header. It converts the data according to the variable type, and substitutes it for the variable.

```
10 INTEGER I
20 DIM R
30 OPEN "FILE" FOR INPUT AS #FD;ASCII
40 ENTER #FD;I,R,S$
```

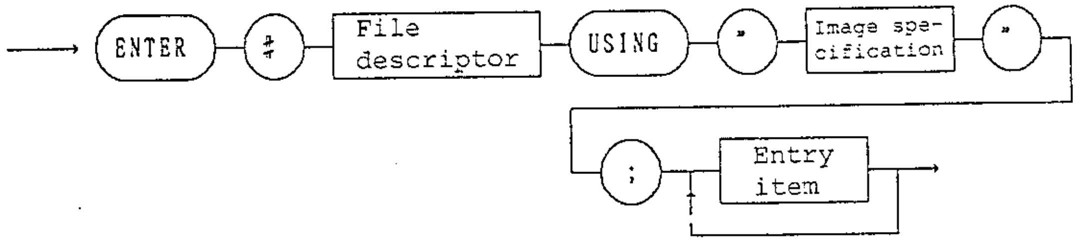
·	·		1	0		·	·		4	.	5	·	·	a	b	c	
Header		Data				Header		Data									

2. ENTER (ENT) USING (USE)

Outline

This statement enters data from the file to an entry item in the image specifications format.

Syntax



ENTER #File descriptor [USING image specifications]; Entry item

Commentary

The statement enters data from the file assigned to the file descriptor to an entry item in the image specifications format.

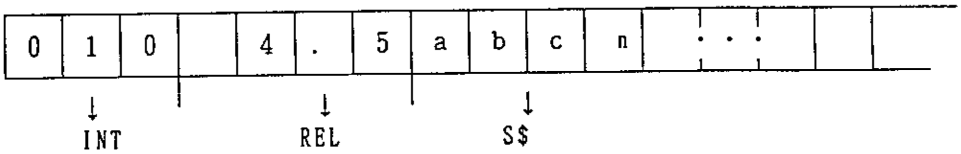
Image specifications

D	:	A value is read assuming that the number of Ds is the number of digits of that value, and substituted for a variable of an entry item.
Z	:	The same as D.
K	:	One line is read, converted to numerical data, and substituted for a variable for an entry item.
S	:	The same as D.
M	:	The same as D.
.	:	The same as D.
E	:	The same as D.
H	:	The same as K, but the value is converted to the European numerical format (a comma is used as decimal point).
*	:	The same as D.
A	:	Characters are read for the number of As and substituted for the character string variable.
k	:	One line is read and substituted for a character string variable.
X	:	One character data is skipped.
Literal	:	A character string closed by \" is skipped.
B	:	A character is read and substituted for an entry item as an ASCII code.
@	:	One byte data is skipped.

\+ : The same as the @.
\- : The same as the @.
\# : It is ignored by the ENTER statement.
n : The later image specifications is repeated n times.

Example

```
10 INTEGER INT
20 DIM     REL
30 ENTER $FD USING "ZZZ,DD.D,3A";INT,REL,S$
```

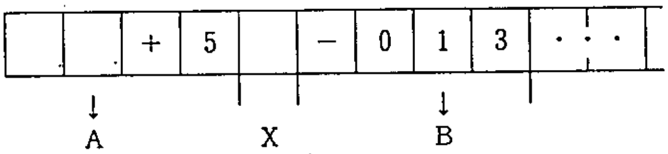


INT: Three bytes of data are read, converted to the integer type of the INT data type and substituted for the INT. The INT value is set to 10 after execution.

REL: 'DD.D' of the image specifications corresponds to the REL of an entry item.
Four bytes data are read, converted to the real number type, and substituted for the REL. The REL is set to 4.5 after execution.

S$: Three bytes of data are read and substituted for S$. The S$ is set to abc after execution.

```
10  DIM A,B
20  ENTER #FD USING "SDDD,X,MZZZ";A,B
```



A,B: Four bytes of data are read, converted to the real number type, and substitutes for A and B. A and B are set to 5.0 and 13.0 after execution.
One byte for X of the image specifications is read, but no data is substituted for a variable.
Data entered in the SDDD format is read and substituted for A.
X does not need a variable, and one character is skipped.
Four bytes are entered, converted to the real number type, and substituted for B assuming that 'MZZZZ' corresponds to B.

```
10  DIM A
20  ENTER #FD USING "K";A
```

S	T	R	I	N	G	1	2	3	.	5	#	#	n	· ·

A is set to 123.5 after execution.
'STRING123.5##' is read and converted to the real number type of the entry variable A.

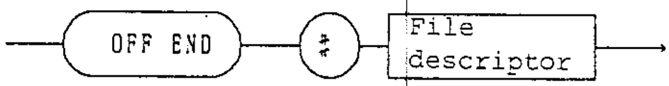
When an entry item is the real number type, characters other than preceding values, codes (+, -), and indexes E and e are ignored, and only numerals are accepted.
Conversion to numerals stops at the position where a character other than numerical is encountered.
Since line feed is used as a terminator for K, E, k, and H of the image specifications, the data is substituted to a variable assuming that the data from the current file pointer to line feed is one item.

3. OFF END

Outline

This statement clears the processing for the end of file specified in the ON END statement.

Syntax



OFF END #File descriptor

Commentary

When the end of file occurs after the destination of the branch defined in the file descriptor is cleared, the error message below is displayed and the system control ends.

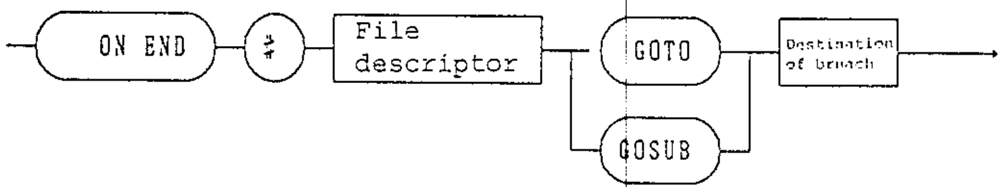
    end of "DATAFILE" file

4. OFF END

Outline

This statement defines the processing (destination of branch) for the end of file.

Syntax



ON END #File descriptor

Commentary

End of file occurs when data is read from the file by the ENTER statement until the end of file is reached and no data to be entered is found. The error message is displayed and the system control ends after the file is closed unless the processing is declared by the ON END statement.

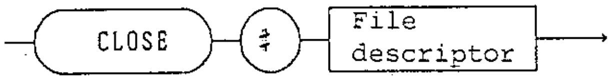
Destination of the branch is specified in a numerical variable, numerical constant, or label.

5. CLOSE

Outline

This statement closes the file assigned to the file descriptor.

Syntax



CLOSE #File descriptor

Commentary

File opened by the OPEN command must be closed before a floppy disk is removed or the power to the equipment is turned off. Otherwise, data in a file opened for writing is destroyed.

A file is not closed automatically when the BASIC program is stopped by the PAUSE or STOP key. All files are closed when the program ends when it is stopped by a key other than the above. A file is closed when the program ends in error. If the ON ERROR is set, a file is not closed for the erroneous end.

Execute the following close operation explicitly when the program ends in error:

CLOSE *

The above is a specification method to close all files by executing a command.

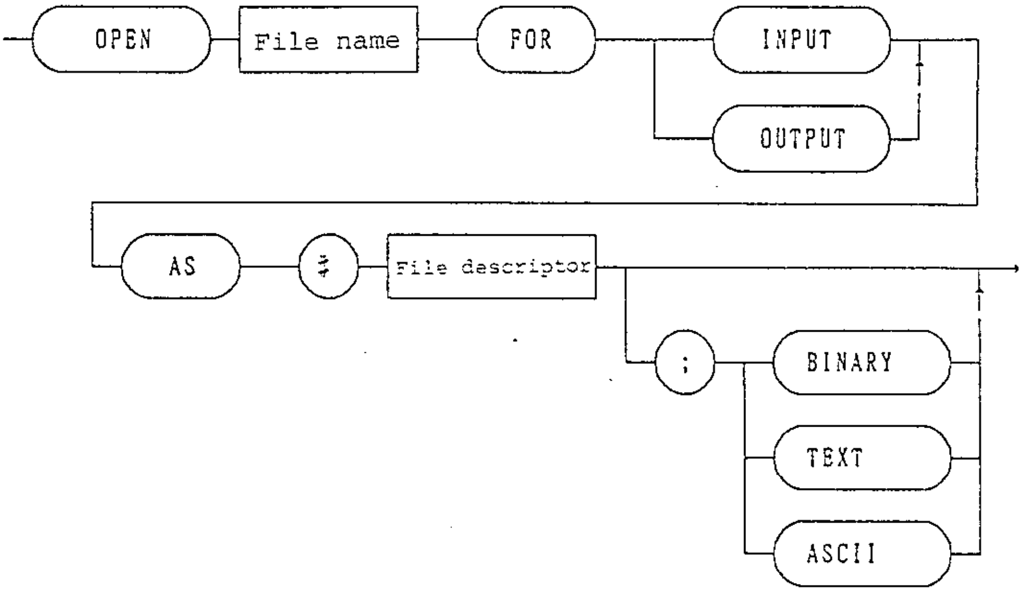
A file is closed automatically when the SCRATCH or LOAD is executed.

6. OPEN

Outline

This statement assigns the file descriptor to the file and opens it in the specified processing mode.

Syntax



OPEN "file name" FOR Processing mode AS #File descriptor; Type

Commentary

The statement assigns the file descriptor to the file to make the program recognize the file and opens it in the specified processing mode.

Processing mode

Processing mode has two types: OUTPUT and INPUT.
OUTPUT is used to write the file II data and INPUT used to read data from the file.

#File descriptor

ENTER/OUTPUT is used to write/read an actual file. The file descriptor is used to make these commands recognize the file to be processed.
The file descriptor name is described by alphanumerics after #.

File type

File type consists of BINARY, TEXT, and ASCII.
If no file type is specified, BINARY is assumed.

BINARY is used to record data with internal expression. Four bytes or eight bytes are recorded if the data is an integer or real number. Four bytes of header are followed by ASCII data if the data is a character string. Space for one byte is provided after the data if the number of data characters is an odd number.

TEXT is used to convert data to ASCII code and output.
"-" or a space is provided before a value.
USING can be specified in the TEXT file.

ASCII is used to express entry and output items with ASCII codes after two bytes header. "-" or a space is provided before a value. One byte of space is provided after the data if the number of data characters is an odd number.

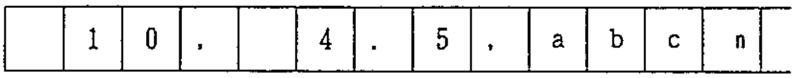
- When the file descriptor assigned to the other file is opened, the last assigned file is closed and the newly specified file is opened.

- The same file cannot be opened at the same point by multiple file descriptors.

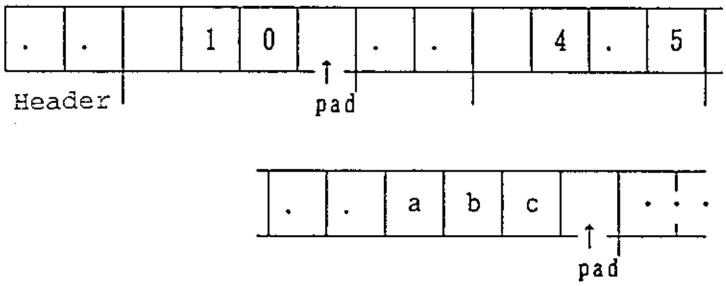
- If an existing file is opened in the OUTPUT mode, an error message is displayed and the program stops. This operation avoids deleting a necessary file erroneously. To create a new file whose name is the same as that of an existing one, delete an existing file by the PURGE command.

Example

```
10 OPEN "DATA.BAS" FOR OUTPUT AS #FD ; TEXT
20 OUTPUT #FD;10,4.5,"abc"
```




```
10 OPEN "DATA.BAS" FOR OUTPUT AS #FD ; ASCII
20 OUTPUT #FD;10,4.5,"abc"
```

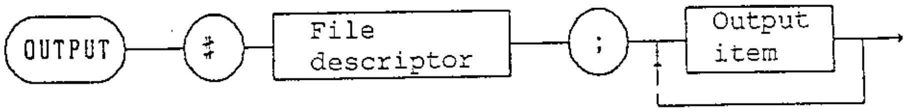


7. OUTPUT (OUT)

Outline

This statement outputs (or writes) the data assigned to the #file descriptor.

Syntax



OUTPUT #File descriptor ; [Output item]

Commentary

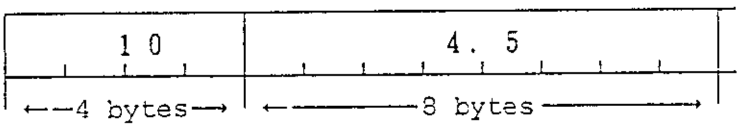
The statement converts output items to the BASIC standard format to be output.

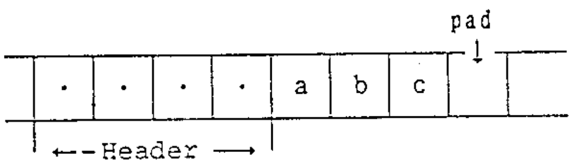
The file descriptor specified when the file is opened is used. The file descriptor is assigned to the file to be processed when the file is opened. The subsequent processing for the file is always performed via this file descriptor.

Example

① BINARY file
The data is output in the same type as the internal expression. The character string is output with a four-byte header indicating the length of the character string. When the number of characters of the character string is an odd number, a space for one character is provided at the end of the characters.

```
10 OPEN "FILE" FOR OUTPUT AS #FD
20 OUTPUT #FD; 10,4.5,"abc"
```

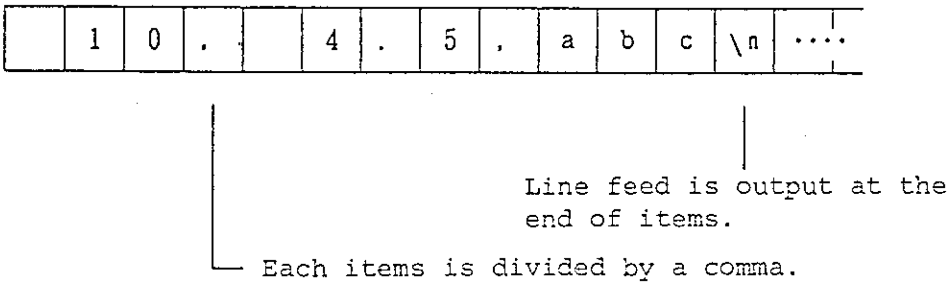




The length of the header is the same as the data.

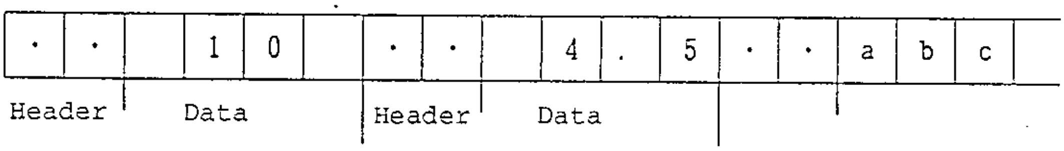
② TEXT file
Data is converted to ASCII code and output. "-" or a space is followed by numerical data.

```
10 OPEN "FILE" FOR OUTPUT AS #FD ;TEXT
20 OUTPUT #FD; 10,4.5,"abc"
```



③ ASCII file
Data is converted to ASCII code and output. "-" or a space is followed by numerical data. A space is provided at the end of the data when the number of bytes of data is an odd number.

```
10 OPEN "FILE" FOR OUTPUT AS #FD ;ASCII
20 OUTPUT #FD; 10,4.5,"abc"
```



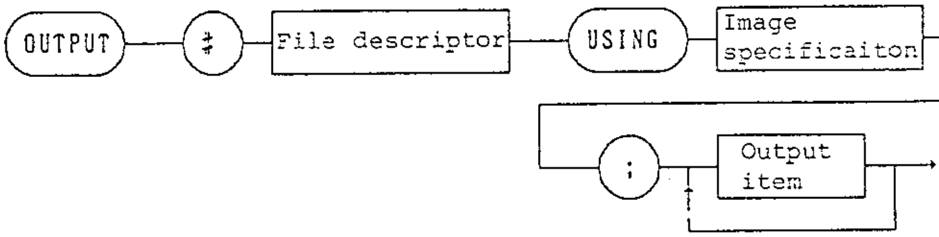
The length of the header is the same as that of the data.

8. OUTPUT (OUT) USING

Outline

This statement outputs (writes) data to the file assigned to the #file descriptor in the specified format.

Syntax



OUTPUT #File descriptor USING image specifications; [Output item]

Commentary

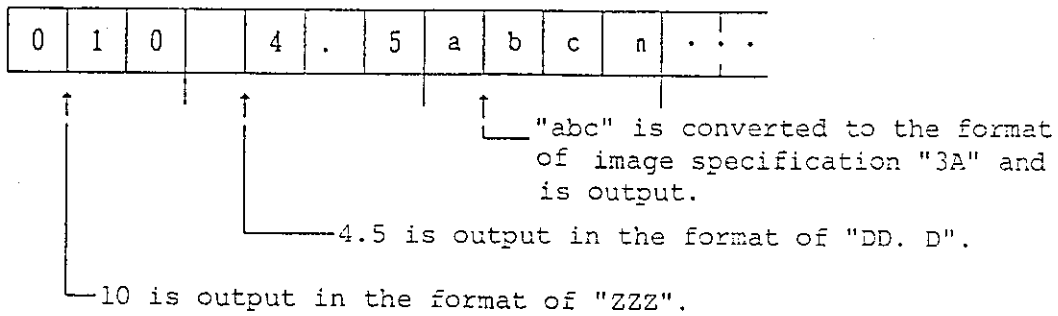
The statement converts the format freely to output data by specifying the USING and the image specifications. The image specifications are specified in the character string format.
The file descriptor specified when the file is opened is used. The file descriptor is assigned to the file to be processed when the file is opened. The subsequent processing for the file is always performed via this file descriptor.

Image specifications

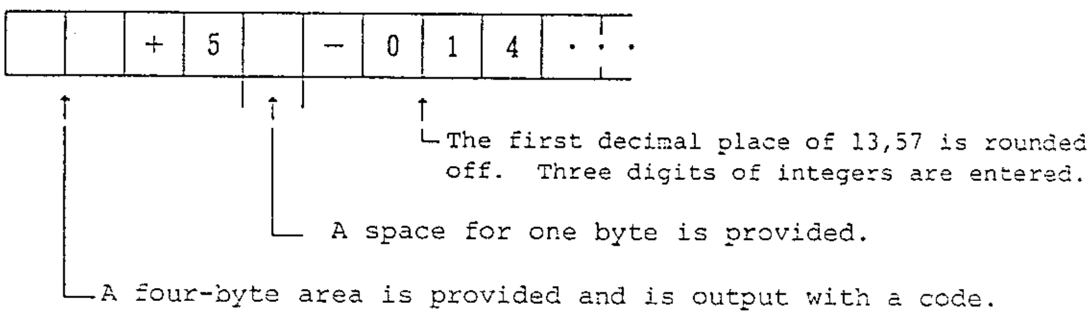
D	:	The number of digits to output a value is specified by the number of Ds. A blank in the specified field is provided by a space.
Z	:	The number of digits to output a value is specified by the number of Zs. A blank in the specified field is provided by a 0.
K	:	The expression value is output in the BASIC standard format (the same as the PRINT).
S	:	Plus (+) or minus (-) is output to the S position.
M	:	Minus (-) for a negative value or a space for a positive value is output to the M position.
.	:	Alignment is done so that a decimal point is on the position ".".
E	:	Outputs the format e code exponent.
H	:	The same as K, but a comma is used as a decimal point.
R	:	The same as ".", but a comma is used as a decimal point.

*	:	The number of digits to output a value is specified by the number of asterisks (*). * is output to a blank in the specified field.
A	:	One character is output to the position A.
k	:	The value of a character string is output without change.
Literal:		A character string closed by \" is output without change regardless of the output item.
X	:	A space is provided for the X position.
B	:	An expression value is accepted as an ASCII code.
@	:	Form feed is output.
+	:	Carriage return is output.
-	:	Line feed is output.
#	:	Line feed is provided at the end of items automatically. Line feed is not provided if this image is specified.
n	:	The number of repetitions of each image specification is specified by a numeral. For example, 3D.2D means DDD.DD and 4A means AAAA.

Example OUTPUT #FD USING "ZZZ,DD.D,3A";10;4.5;"abc"



OUTPUT #FD USING "SDDD,X,MZZZ";+5,-13.57



9. COPYFILES

Outline

This statement copies all files in the floppy disk to the other floppy disk by one command.

Syntax

—(COPYFILES)—→

Commentary

The statement copies all files in a floppy disk to the other floppy disk. Since the system is provided with only one floppy disk, the actual operation needs the following operation in addition to execution of the above command.
Operation to change media is needed. Operation instructions are displayed on the CRT in sequence when the COPYFILES command is specified. Follow these instructions, and the processing will be completed.

The processing is as follows:
1. Obtain a file name to be copied and size from the directory by executing the command.
2. Check that the BASIC buffer is provided with an empty area for the above file size.
3. If the BASIC buffer is provided with an empty area, read a file to the buffer. Continue this operation until no empty area is found in the buffer or no file to be copied is found in the floppy disk to be copied (source). If the buffer is provided with no empty area, a request to insert a floppy disk to copy (target) is made.
4. Set a target floppy disk and press the Y and RETURN keys.
5. Output all files copied to the BASIC buffer to the target floppy disk.
6. If any file is left in the source file, inserting the source floppy disk is requested and the processing is repeated from item 1.

If the capacity of all files to be copied does not exceed the BASIC buffer size, copying can be completed only by inserting a source floppy disk, then a target floppy disk once. When a large number of files is copied, the above cycle must be repeated several times until copying of all the files is completed.

Caution

Care must be taken not to insert the source and target floppy disks inversely during copying.
Avoid removing the floppy disk during read/write.
The temporary storage area uses a different buffer than that used for executing the BASIC program.
Executing SCRATCH for the programs in the buffer is recommended to reduce the number of new floppy disks inserted. The reason is that the COPYFILES cannot use the buffer used for these programs.
This command has a limitation. The data in one floppy disk must be completely stored in the BASIC buffer. Data stored in the BASIC buffer cannot be copied. Such data is ignored by this command.
Note that the STOP key is not effective during the COPYFILES operation.

10. DSTAT

Outline

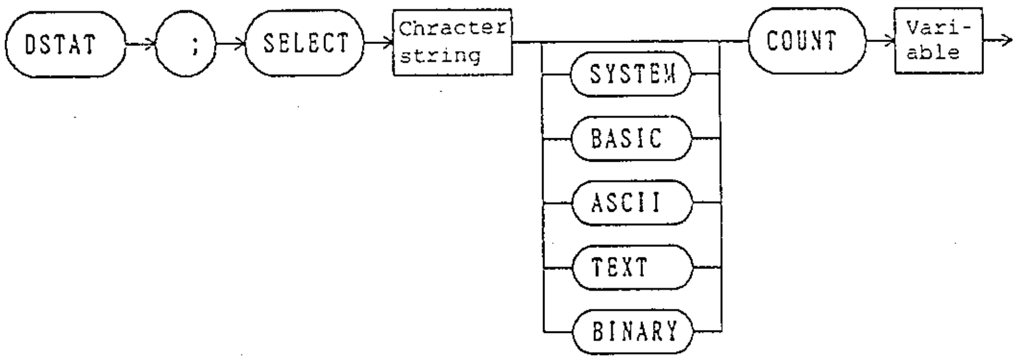
This statement inserts data from the directory to the BASIC variable.

Syntax

① DSTAT index numeric variable
index : 0

② DSTAT <index><filename><filetype><size><sectors><year>
<month><day><week><hour><minute><start-sector>
<index>: 1..200

③



DSTAT [;SELECT File name{[File type], File type, COUNT variable]

Commentary

Syntax ① is for a command to check the number of files catalogued in the file system directory. The index specifies an expression resulting in 0. The second parameter specified is a numerical variable. The execution result is substituted for a numerical variable.
Syntax ② is for a command to enter the file system directory information to the BASIC variable. The first <index> specifies an index in the directory by an expression. Values which can be obtained by Syntax 0 to Syntax 1 are available.
The file name specifies a character string variable. Since a file name uses no more than sixteen characters, the length need not be declared.
The third and later parameters specify numerical variables. The following data is substituted:

filetype	File type 1 BASIC 2 SYSTEM 3 ASCII 4 TEXT 5 BINARY 6 DATA
size	File size (the number of bytes)
sectors	Number of sectors
year,month,day	File creation year and date 1988 is assumed to be 1.
week	Sunday is assumed to be 0.
hour,minute	

Variable specification can be omitted for an unnecessary value. File name and creation year and date can be obtained as follows:

```
DSTAT 1 FNAME$,,,,year,month,day
```

The above syntax is substituted in a variable to specify the number of the following files after the COUNT: files of character strings specified by the SELECT and files whose file types are specified in numerical expressions.

Example

```
DSTAT ; SELECT "FILE", COUNT NUM
```

SELECT
This statement searches a character string after the SELECT from the disk as a file name. When a character string includes the following characters (metacharacters), that character string has a special meaning. The following characters used in a file name are also assumed to be metacharacters:

? : Matches one character.
* : Matches one or more characters.
[]: Matches a character in a character string surrounded with brackets, []. Matches a character in a range from the first character to the second character by specification of [character - character].

```
DSTAT ; SELECT "PROG?.*",COUNT A
```

The file type specifies one of SYSTEM, BASIC, ASCII, TEXT, or BINARY. A file of the specified file type is searched from the floppy disk.

COUNT
This statement substitutes the number of the file searched by the SELECT for a variable.

6. LIST OF BUILT-IN FUNCTIONS

6.1 Outline

Built-in functions are functions incorporated in R4611 for use in CPU high-speed calculations and evaluations of various different operations ranging from analysis of input data to GO and NG judgments.

Since the 64-bit high-speed operations executed in R4611 do not require the wasteful data transfers common in more conventional chips, processing efficiency has been greatly improved.

6.2 List of R4611 Built-in Functions

(1) Stimulus Frequency → Measurement Point No.

	Input	Output
POINT1(F,M)	(meas.point)	Free
POINT2(F,M)	(1201 point)	
DPOINT(F_0,F_1,M)	(1201 point)	

(2) Measurement Point No. → Stimulus Frequency

FREQ(P,M)	(1201 point)	F of that point
DFREQ(P_0,P_1,M)	(1201 point)	

(3) Measurement Point No. → Response Value

VALUE(P,M)	(meas.point)	Level of that point
DVALUE(P_0,P_1,M)	(meas.point)	

(4) Stimulus Frequency → Response Value

CVALUE(F,M)
DCVALUE((F_0,F_1,M)

(5) Functions Which Include Search Functions

① Max Search Function

MAX (P_0,P_1,M)	(meas.point) → Max response value
FMAX(P_0,P_1,M)	(meas.point) → F of max response value
PMAX(P_0,P_1,M)	(meas.point) → P of max response value

② Min Search Function

MIN (P_0,P_1,M)	(meas.point) → Max response value
FMIN(P_0,P_1,M)	(meas.point) → F of max response value
PMIN(P_0,P_1,M)	(meas.point) → P of max response value

③ Band Width Calculation Function

BND (P,X,M)	(compensate) → Band width
BNDL(P,X,M)	(compensate) → Band width low frequency
BNDH(P,X,M)	(compensate) → Band width high frequency

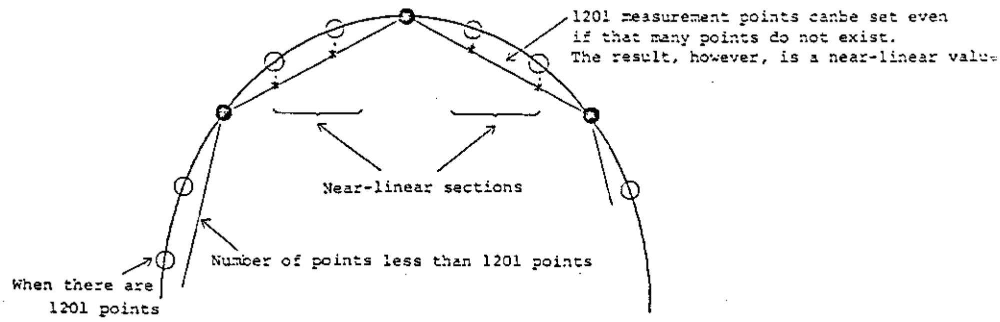
④ Differential Coefficient

DIFFX(ΔX,ΔY,M)	(1201 point) → ΔX measurement point count
DIFFY(ΔX,ΔY,M)	(1201 point) → ΔY

	Input	Output
⑤ Ripple Detection Function (I)		
$RPL1(P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Greatest maximum value - smallest minimum value
$RPL2(P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Maximum difference between adjacent maximum and minimum values
$RPL3(P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Maximum internal value to which difference between adjacent maximum and minimum values has been added
⑥ Ripple Detection Function (II)		
$RPLF(P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Frequency difference between maximum and minimum values
$RPLR(P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Response value difference between maximum and minimum values
⑦ Maximum point frequency		
$RPLH\ (P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Maximum value
$FRPLH\ (P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Maximum point frequency
$PRPLH\ (P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Point no. of maximum point
$RPLL\ (P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Minimum value
$FRPLL\ (P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Minimum point frequency
$PRPLL\ (P_0,P_1,\Delta X,\Delta Y,M)$	(1201 point) →	Point no. of minimum point
$NRPLH\ (P_0,P_1,\Delta X,\Delta Y,M)$	→	Number of maximum values
$NRPLL\ (P_0,P_1,\Delta X,\Delta Y,M)$	→	Number of minimum points
PRPLHN(N,M)	(meas.point) →	Point no. of Nth maximum point
PRPLLN(N,M)	(meas.point) →	Point no. of Nth minimum point
FRPLHN(N,M)	(meas.point) →	Frequency of Nth maximum point
FRPLLN(N,M)	(meas.point) →	Frequency of Nth minimum point
VRPLHN(N,M)	(meas.point) →	Response value of Nth maximum point
VRPLLN(N,M)	(meas.point) →	Response value of Nth minimum point
⑧ Limit Test		
LMTUL1(X,Up,Lo)		
LMTUL2(P,Up,Lo,M)	(1201 point) →	Free
LMTMD1(X,Md,D1)		
LMTMD2(P,Md,D1,M)	(1201 point) →	Free

⑨ Zero Phase Detection Function

ZEROPHS(P_0,P_1,M)	(meas.point) Frequency of Zero Phase



⑩ Direct Search Functions

DIRECT (P_0, P_1, X, M)	(1201 point)→Measuring point of the response value
CDIRECT (F_0, F_1, X, M)	(Frequency) →Frequency of the response
DDIRECT (P_0, P_1, X, M)	(1201 point)→Difference of measuring point of the response
CDDIRECT (F_0, F_1, X, M)	(Frequency) →Frequency difference of the response

NOTE

(a) The following functions cannot be used for Log Sweep .

POINT2, DPOINT, CVALUE, DCVALUE, BND, BNDL, BNDH, CBND, CBNDL, CBNDH, ZEROPHS, functions referring to Ripple, CDIRECT and CDDIRECT

(b) The following functions cannot be used for Cw Sweep.

POINT2, DPOINT, DFREQ, DCVALUE, BND, BNDL, BNDH, CBND, CBNDL, CBNDH, ZEROPHS, functions referring to Ripple, DIRECT, DDIRECT, CDIRECT and CDDIRECT

(c) The following fucntions cannot be used for Level Sweep.

BND, BNDL, BNDH, CBND, CBNDL, CBNDH, ZEROPHS and functions referring to Ripple

(d) The following functions cannot be used during parameter conversion is ON.

BND, BNDL, BNDH, CBND, CBNDL, CBNDH and functions referring to Ripple.

(e) The following functions cannot be used in the user sweep mode:

POINT2 and DPOINT

6.2.1 Stimulus Frequency ⟶ No. of Measurement Points

POINT function: If the frequency is specified, that frequency is taken as the measurement point inside the measuring device to calculate the point to which it corresponds.
(This is required to operate system functions at high speed.)

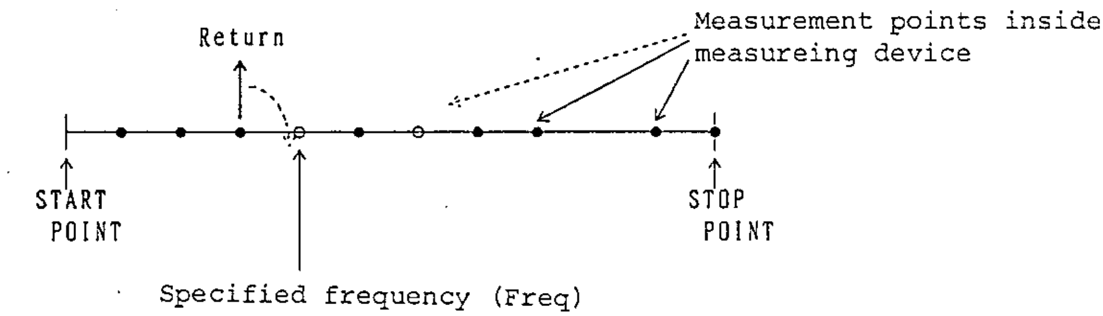
POINT1(F,M) POINT2(F,M)

M — Measurement channel designation
F — Specified frequency
POINT1 / POINT2 — Point

(MEAS POINT) (1201 POINT)

M=0 (1CH), M=1 (2CH) — Data
M=2 (1CH), M=3 (2CH) — Memory

< POINT1 description >



The no. of the measurement point closest to the specified frequency is returned (see above diagram).

But if the channel is undefined due to the specified frequency lying outside the range between the start and stop points indicated above, an error message and -1 are returned.

<POINT2 description>

Unlike the POINT1 function, the 1201 point no. is returned regardless of the number of measurement points in the measuring device.

But again, if the channel is undefined due to the specified frequency lying outside the range between the start and stop points indicated above, an error message and -1 are returned.

DPOINT function: If the frequency width is specified, that frequency width is taken as the measurement point inside the measuring device to calculate the point to which it corresponds.

DPOINT(F_0,F_1,M)

- M — Measurement channel designation
- F_0, F_1 — Specified frequency width
- DPOINT — Point

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory

(1201 POINT)

The value obtained by dividing the range (frequency span) by 1200 is the frequency width per measurement point.

Note:
- When freq0 > freq1, process by interchanging freq0 and freq1.
- 0 is returned when freq0 = freq1.
- When the channel is undefined, and the specified frequency lies outside the range, an error message and -1 are returned.

6.2.2 Measurement Point No. → Stimulus Frequency

FREQ function: If the measurement point no. inside the measuring device is specified, the stimulus frequency corresponding to that measurement point is calculated and returned.

FREQ(P,M)

- M — Measurement channel designation
- P — Specified measurement point no.
- FREQ — Stimulus frequency

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory

(1201 POINT)

The start and stop frequencies indicate the upper and lower limits of the measuring device stimulus specified frequency. A maximum of 1201 points of data are taken in this range.

Hence, conversion from measurement point no. to stimulus frequency complies with the following simple equation.

$$\text{Stimulus frequency} = \text{Start frequency} + \frac{\text{Stop frequency} - \text{Start frequency}}{1201} \times \text{Measurement point no.}$$

Note: If channel is undefined while the specified measurement point no. is in the 0 thru 1200 range, an error message and an unspecified value are returned.

DFREQ function: If the measurement point no. inside the measuring device is specified, the stimulus frequency corresponding to the measurement point width is calculated and returned.

$DFREQ(P_0, P_1, M)$

- M — Measurement channel designation
- P_0, P_1 — Specified region measurement point no.
- DFREQ — Frequency width

M=0 (1CH), M=1 (2CH): Data
M=2 (1CH), M=3 (2CH): Memory

(1201 POINT)

Note:
- When point0 > point1, process by interchanging.
- 0.0 is returned when point0 = point1.
- When the channel is undefined, and the specified frequency lies inside the range, an error message and an unspecified value are returned.

6.2.3 Measurement Point No. ⟶ Response Value

VALUE function: If the number of measurement points is specified, the measurement response value at that measurement point is returned.

VALUE(P,M)

- M — Measurement channel designation
- P — Specified region measurement point no.
- VALUE — Response Value

M=0 (1CH), M=1 (2CH): Data
M=2 (1CH), M=3 (2CH): Memory

(MEAS POINT)

Note: When the channel is undefined, and P is not a value inside the 0 thru 1200 range but is a point where a measurement has not been made inside the measuring device, an error message and an unspecified value are returned.

DVALUE function: If two measurement points are specified, the difference in measurement response value at that measurement point is calculated and returned.

$DVALUE(P_0, P_1, M)$

- M — Measurement channel designation
- P_0, P_1 — Specified region measurement point no.
- DVALUE — Response value difference

M=0 (1CH), M=1 (2CH) — Data
M=2 (1CH), M=3 (2CH) — Memory

(MEAS POINT)

Note:
- When the channel is undefined, and P_0 and P_1 are not values inside the 0 thru 1200 range but are points where measurements have not been made inside the measuring device, an error message and an unspecified value are returned.
- When point0 > point1, process by interchanging.
- 0.0 is returned when point0 = point1.

6.2.4 Stimulus Frequency ⟶ Response Value

CVALUE function: If frequency is specified, the measurement response value at that frequency is displayed.

CVALUE(F,M)

- M — Measurement channel designation
- F — Specified frequency
- CVALUE — Response value at specified frequency

M=0 (1CH), M=1 (2CH) — Data
M=2 (1CH), M=3 (2CH) — Memory

Note: <If arguments are unsuitable>

- If specified frequency is outside range
- When channel is undefined

} Error message and unspecified value are returned.

DCVALUE function: If two frequencies are specified, the difference between the measurement response values at those frequencies is displayed.

$DCVALUE(F_0, F_1, M)$

- M — Measurement channel designation
- F_0, F_1 — Specified frequency
- DCVALUE — Response value difference at specified frequency

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory

Note: < If arguments are unsuitable >

- If specified frequency is outside range
- When channel is undefined

... Error message and unspecified value are returned.

- If $F_0 > F_1$ .... Execute after interchanging F_0 and F_1

6.2.5 Functions Which Include Search Functions

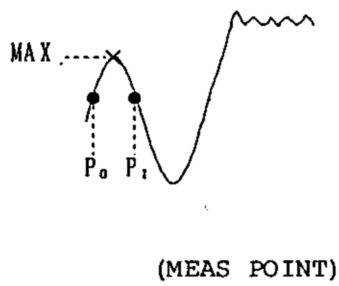
(1) Max Search Function

MAX function: If the measurement point region is specified, the maximum response value in that region is returned.

$MAX(P_0, P_1, M)$

- M — Measurement channel designation
- P_0, P_1 — Specified region measurement point no.
- MAX — Max Response Value

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory



Note: < If arguments are unsuitable >

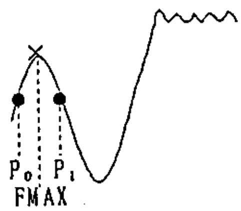
- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200 ... Error message and unspecified value are returned.
- When $P_0 = P_1$ ... Execute as is
- When $P_0 > P_1$ ... Execute after interchanging P_0 and P_1

FMAX function: If the measurement point region is specified, the stimulus frequency of the point with the maximum response value in that region is returned.

FMAX(P_0,P_1,M)

- M — Measurement channel designation
- P_0, P_1 — Specified region measurement point no.
- 8 — Stimulus frequency of point with maximum response value

M=0 (1CH)) Data
M=1 (2CH)
M=2 (1CH)) Memory
M=3 (2CH)



(MEAS POINT)

Note: If arguments are unsuitable

- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200 ... Error message and unspecified value are returned.
- When $P_0 = P_1$ ... Execute as is
- When $P_0 > P_1$ ... Execute after interchanging P_0 and P_1

PMAX function: If the measurement point region is specified, the point no. with the maximum response value in that region is returned.

PMAX(P_0,P_1,M)

- M — Measurement channel designation
- P_0, P_1 — Specified region measurement point no.
- PMAX — Measurement point no. with maximum response value

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory

(MEAS POINT)

Note: < If arguments are unsuitable >

- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200

... Error message and -1 are returned.

- When $P_0 = P_1$ ... Execute as is
- When $P_0 > P_1$ ... Execute after interchanging P_0 and P_1

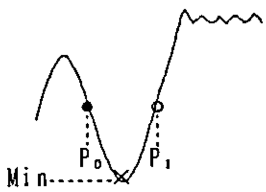
(2) Min Search Function

MIN function: If the measurement point region is specified, the minimum response value in that region is returned.

MIN(P_0,P_1,M)

- M — Measurement channel designation
- P_0, P_1 — Specified region measurement point no.
- MIN — Min Response Value

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory



(MEAS POINT)

Note: < If arguments are unsuitable >

- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200

  ... Error message and unspecified value are returned.
- When $P_0 = P_1$ ... Execute as is
- When $P_0 > P_1$ ... Execute after interchanging P_0 and P_1

FMIN function: If the measurement point region is specified, the stimulus frequency of the point with the maximum response value in that region is returned.

FMIN(P_0,P_1,M)

- M: Measurement channel designation
- P_0, P_1: Specified region measurement point no.
- FMIN: Stimulus frequency with minimum response value

M=0 (1CH), M=1 (2CH): Data
M=2 (1CH), M=3 (2CH): Memory

(UNCOMPENSATE)

Note: <If arguments are unsuitable >

- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200

  ... Error message and unspecified value are returned.
- When $P_0 = P_1$ ... Execute as is
- When $P_0 > P_1$ ... Execute after interchanging P_0 and P_1

PMIN function: If the measurement point region is specified, the point no. with the maximum response value in that region is returned.

PMIN(P_0,P_1,M)

- M: Measurement channel designation
- P_0, P_1: Specified region measurement point no.
- PMIN: Measurement point no. with minimum response value

M=0 (1CH), M=1 (2CH): Data
M=2 (1CH), M=3 (2CH): Memory

(MEAS POINT)

Note: <If arguments are unsuitable>

- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200

... Error message and -1 are returned.

- When $P_0 = P_1$ ... Execute as is
- When $P_0 > P_1$ ... Execute after interchanging P_0 and P_1

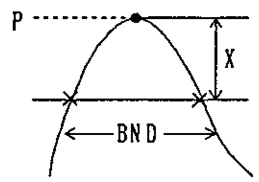
(3) Band Width Calculation Function

BND function: If the reference data measurement point no. and LOSS level are specified, the band width is calculated and returned.

BND(P,X,M)

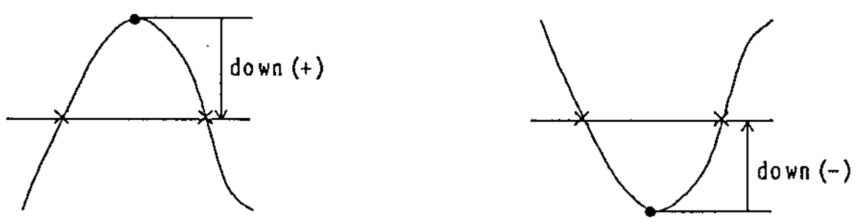
- M: Measurement channel designation
- P: Reference data measurement point no.
- X: Specified loss level
- BND: Band width

M=0 (1CH), M=1 (2CH) ... Data
M=2 (1CH), M=3 (2CH) ... Memory



(COMPENSATE)

Note: Argument (down) handles the following signs.



< If arguments are unsuitable >

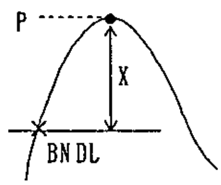
- When P is not in 0 thru 1200 range
- When channel is undefined

] Error message and unspecified value are returned.

BNDL function: If the reference data measurement point no. and LOSS level are specified, the low frequency of the band width is searched for and returned.

BNDL(P,X,M)

- M — Measurement channel designation
  - M=0 (1CH), M=1 (2CH)) Data
  - M=2 (1CH), M=3 (2CH)) Memory
- P — Reference data measurement point no.
- X — Specified loss level
- BNDL — Band width low frequency



(COMPENSATE)

Note: < If arguments are unsuitable >

- When P is not in 0 thru 1200 range
- When channel is undefined

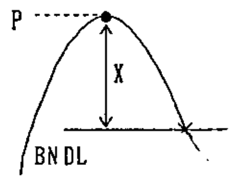
] Error message and unspecified value are returned.

BNDH function: If the reference data measurement point no. and LOSS level are specified, the high frequency of the band width is searched for and returned.

BNDH(P,X,M)

- M — Measurement channel designation
- P — Reference data measurement point no.
- X — Specified loss level
- BNDH — Band width high frequency

M=0 (1CH) } Data
M=1 (2CH)
M=2 (1CH) } Memory
M=3 (2CH)



(COMPENSATE)

Note: <If arguments are unsuitable>

- When P is not in 0 thru 1200 range
- When channel is undefined

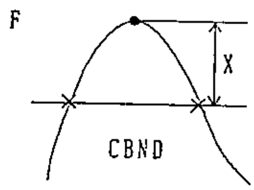
} Error message and unspecified value are returned.

CBND function: If time base-frequency and LOSS level are specified, the band width is calculated and returned.

CBND(F,X,M)

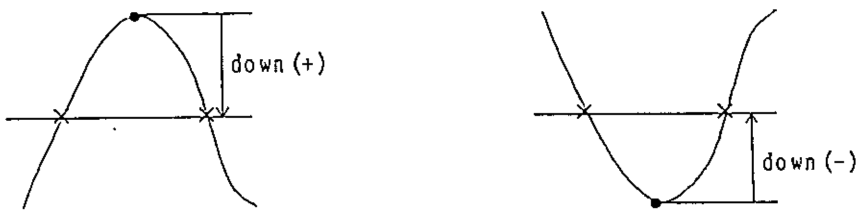
- M — Measurement channel designation
- F — Time base-frequency
- X — Specified Loss level
- CBND — Band width

M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory



(COMPENSATE)

Note: Argument (down) handles the following signs.

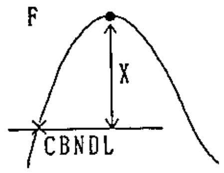


< If arguments are unsuitable >

- When channel is undefined } Error message and unspecified value are returned.

CBNDL function: If time base-frequency and LOSS level are specified, the low frequency of the band width is searched for and returned.

```
CBNDL(F,X,M)
 |    | | |
 |    | | └──── Measurement channel designation     M=0  (1CH) ) Data
 |    └──────── Time base-frequency                 M=1  (2CH)
 |      └────── Specified Loss level                M=2  (1CH) ) Memory
 └──────────── Low frequency of the band width      M=3  (2CH)
```



(COMPENSATE)

Note: <If arguments are unsuitable>

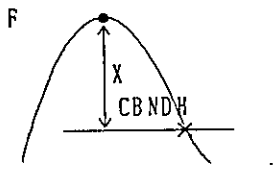
- When channel is undefined } Error message and unspecified value are returned.

CBNDH function: If time base-frequency and LOSS level are specified, the high frequency of the band width is searched for and returned.

CBNDH(F,X,M)

- M — Measurement channel designation
- F — Time base-frequency
- X — Specified Loss level
- CBNDH — Low frequency of the band width

M=0 (1CH) } Data
M=1 (2CH) } Data
M=2 (1CH) } Memory
M=3 (2CH) } Memory



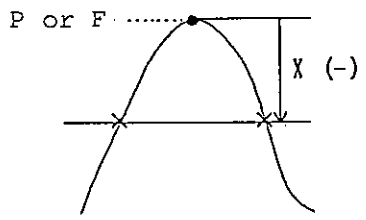
(COMPENSATE)

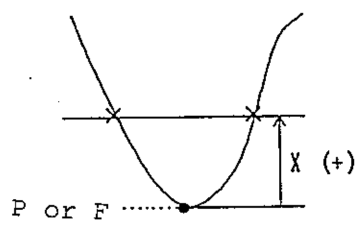
Note: <If arguments are unsuitable>

- When channel is undefined } Error message and unspecified value are returned.

The explanations of BND, BNDL, BNDH, CBND, CBNDL, and CBNDH above are for the case when FORMAT is LOG MAG.

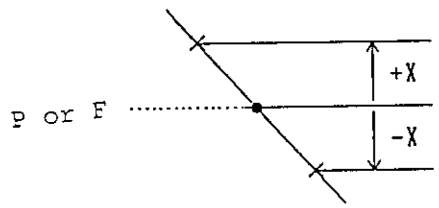
When FORMAT IS G. DELAY, the following curves are shown.





(Be careful of polarity. It is the inverse of LOG MAG)

When FORMAT is PHASE and PHASE (-∞, +∞), the following curve is shown. (It becomes ±Xo search).



(4) Differential Coefficient

DIFF function: Differential coefficients are converted to match the internal format of the measuring device to enable their use as arguments in any system function.

DIFFX (ΔX,ΔY,M)

- M: Measurement channel designation
  - M=0 (1CH), M=1 (2CH) — Data
  - M=2 (1CH), M=3 (2CH) — Memory
- ΔY: Differential coefficient ΔY designation
- ΔX: Differential coefficient ΔX designation
- DIFFX: Number of ΔX measurement points converted to match internal format of measuring device

DIFFY (ΔX, ΔY,M)

- M: Measurement channel designation
- ΔY: Differential coefficient ΔY designation
- ΔX: Differential coefficient ΔX designation
- DIFFY: ΔY converted to match internal format of measuring device

Note: Contract for use of same arguments in both functions (1201 POINT)

Note: If arguments are unsuitable

DIFFX function
- When ΔX is negative ... Execute after inverting sign
- When ΔX is 0 .... Error message and -1 are returned
- When ΔY is 0 .... Error message and -1 are returned
- When ΔY is negative ... Execute after inverting sign
- When channel is undefined ... Error message and -1 are returned

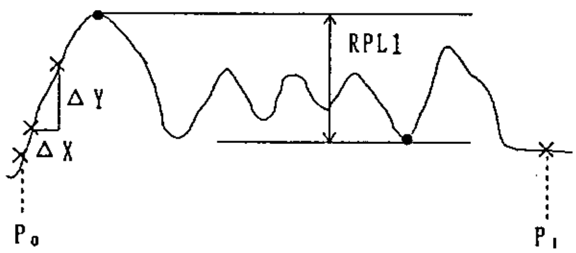
DIFFY function
- When ΔX is negative ... Execute after inverting sign
- When ΔX is 0 .... Error message and unspecified value are returned
- When ΔY is 0 .... Error message and unspecified value are returned
- When ΔY is negative ... Execute after inverting sign
- When channel is undefined ... Error message and unspecified value are returned

(5) Ripple Detection Function (I)

RPL1 function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum and minimum values in that region. The difference between the greatest maximum and the smallest minimum is calculated and returned.

RPL1(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH)) Data; M=2 (1CH), M=3 (2CH)) Memory
- ΔX,ΔY — Differential coefficient designation
- P_0,P_1 — Region specified by measurement point no.
- RPL1 — Greatest maximum value - smallest minimum value



ΔX: Number of points
ΔY: Level (dB)

(Value already converted internally by DEFER function)

(1201 POINT)

Note: <If arguments are unsuitable>

- When M is undefined data
- When P_0 and P_1 are negative with a value larger than 1200

... Error message and unspecified value are returned.

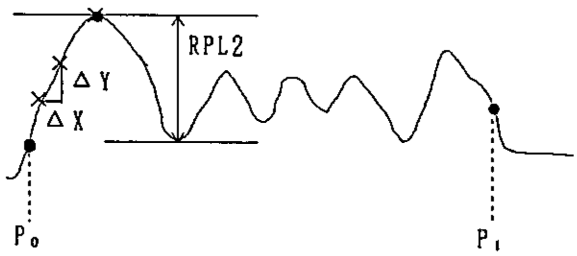
- When P_0 = P_1 .... Execute as is
- When P_0 > P_1 .... Execute after interchanging P_0 and P_1
- When ΔX is negative, when value is larger than 1200, when 0 ... Error message and unspecified value are returned.
- When ΔY is negative ... Execute after inverting the sign
- When ΔY is 0 .... Error message and unspecified value are returned.

RPL2 function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum and minimum values in that region. The maximum difference between adjacent maximum and minimum values is calculated and returned.

$RPL2(P_0, P_1, \Delta X, \Delta Y, M)$

- M — Measurement channel designation
- $\Delta X, \Delta Y$ — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- RPL2 — Maximum difference between adjacent maximum and minimum values

M=0 (1CH) } Data
M=1 (2CH) }
M=2 (1CH) } Memory
M=3 (2CH) }



ΔX: Number of points
ΔY: Level (dB)
(Value already converted internally by DEFER function)

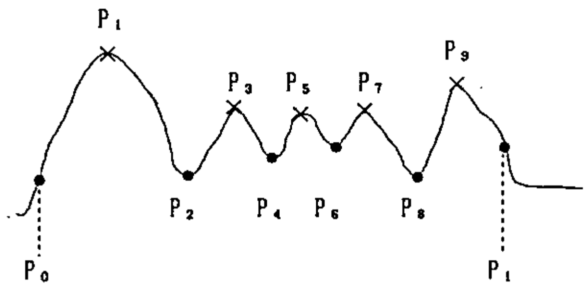
(1201 POINT)

Note: Same as for RPL1.

RPL3 function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum and minimum values in that region. The maximum value obtained by adding the difference between adjacent maximum and minimum values is calculated and returned.

RPL3(P_0,P_1,ΔX,ΔY,M)

- M: Measurement channel designation — M=0 (1CH), M=1 (2CH): Data; M=2 (1CH), M=3 (2CH): Memory
- ΔX, ΔY: Differential coefficient designation
- P_0, P_1: Region specified by measurement point no.
- RPL3: Maximum value obtained by adding difference between adjacent maximum and minimum values



ΔX: Number of points
ΔY: Level (dB)
(Value already converted internally by DEFER function)

$|(P_2-P_1)+(P_2-P_3)|$, $|(P_4-P_3)+(P_4-P_5)|$, $|(P_6-P_5)+(P_6-P_7)|$,
... Maximum of these values

(1201 POINT)

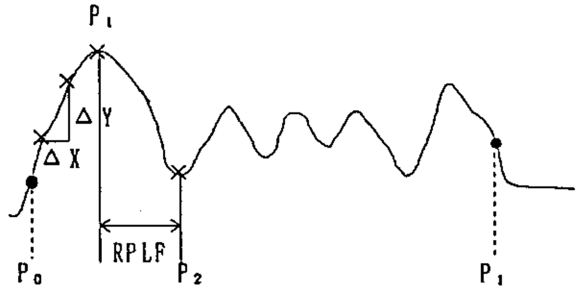
Note: Same as for RPL1.

(6) Ripple Detection Function (II)

RPLF function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum and minimum values in that region. The frequency difference between the first maximum and minimum values found is calculated and returned.

RPLF(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH) — Data; M=2 (1CH), M=3 (2CH) — Memory
- ΔX,ΔY — Differential coefficient designation
- P_0,P_1 — Region specified by measurement point no.
- RPLF — Frequency difference between maximum and minimum values



ΔX: Number of points
ΔY: Level (dB)
(Value already converted internally by DEFER function)

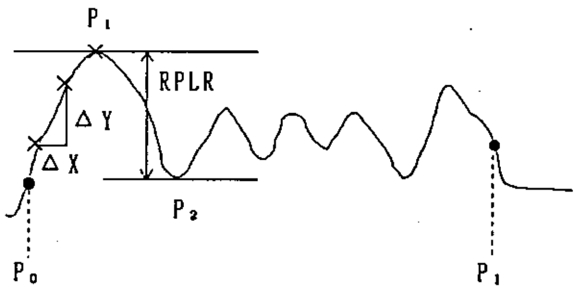
(1201 POINT)

Note: Same as for RPL1 function.

RPLR function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum and minimum values in that region. The response value difference between the first maximum and minimum values found is calculated and returned.

RPLR(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH) — Data; M=2 (1CH), M=3 (2CH) — Memory
- ΔX,ΔY — Differential coefficient designation
- P_0,P_1 — Region specified by measurement point no.
- RPLR — Difference in response value between maximum and minimum values



ΔX: Number of points
ΔY: Level (dB)
(Value already converted internally by DEFER function)

(1201 POINT)

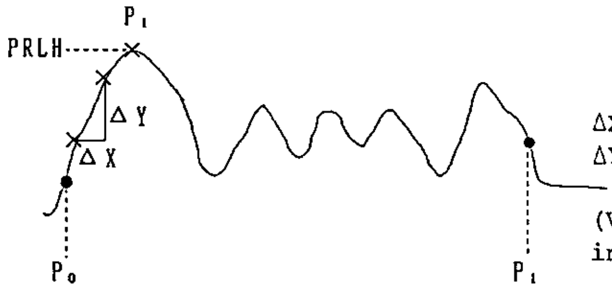
Note: Same as for RPL1 function.

(7) Maximum and Minimum Detection Function

RPLH function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum and minimum values in that region. The first maximum value found is calculated and returned.

RPLH(P_0, P_1, ΔX, ΔY, M)

- M — Measurement channel designation
  - M=0 (1CH), M=1 (2CH) } Data
  - M=2 (1CH), M=3 (2CH) } Memory
- ΔX, ΔY — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- RPLH — Maximum value



ΔX: Number of points
ΔY: Level (dB)

(Value already converted internally by DEFER function)

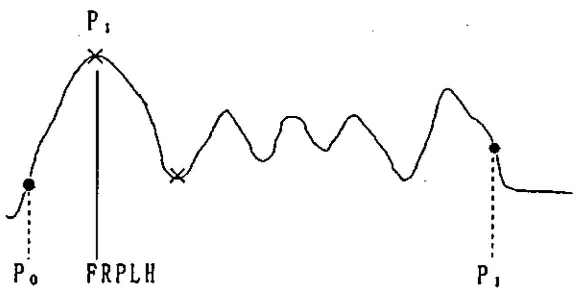
(1201 POINT)

Note: Same as for RPL1 function.

FRPLH function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum value in that region. The frequency of the first maximum value found is returned.

FRPLH(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH)) Data; M=2 (1CH), M=3 (2CH)) Memory
- ΔX, ΔY — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- FRPLH — Frequency of maximum value



ΔX: Number of points
ΔY: Level (dB)

(Value already converted internally by DEFER function)

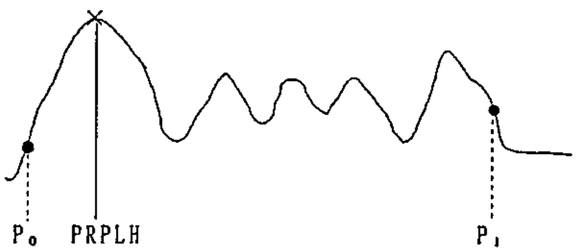
(1201 POINT)

Note: Same as for RPL1 function.

PRPLH function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the maximum value in that region. The measurement point no. of the first maximum value found is returned.

PRPLH(P_0,P_1,ΔX,ΔY,M)

- M: Measurement channel designation — M=0 (1CH), M=1 (2CH): Data; M=2 (1CH), M=3 (2CH): Memory
- ΔX, ΔY: Differential coefficient designation
- P_0, P_1: Region specified by measurement point no.
- PRPLH: Measurement point no. of maximum value



ΔX: Number of points
ΔY: Level (dB)
(Value already converted internally by DEFER function)

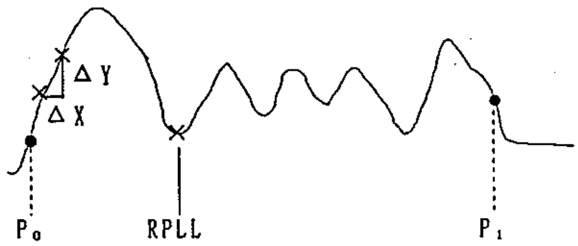
(1201 POINT)

Note: Same as for RPL1 function. (But error message and -1 are returned if error is generated.)

RPLL function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the minimum value in that region. The first minimum value found is returned.

RPLL(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH) — Data; M=2 (1CH), M=3 (2CH) — Memory
- ΔX,ΔY — Differential coefficient designation
- P_0,P_1 — Region specified by measurement point no.
- RPLL — Minimum value



ΔX: Number of points
ΔY: Level (dB)
(Value already converted internally by DEFER function)

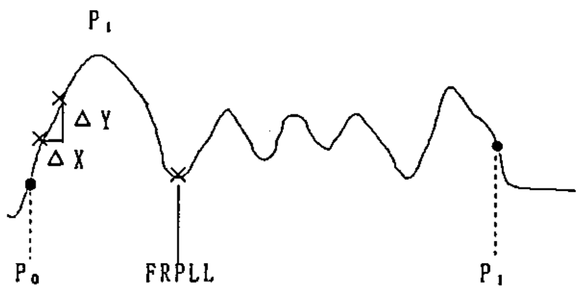
(1201 POINT)

Note: Same as for RPL1 function.

FRPLL function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the minimum value in that region. The frequency of the first minimum value found is returned.

FRPLL(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH) Data; M=2 (1CH), M=3 (2CH) Memory
- ΔX, ΔY — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- FRPLL — Frequency of minimum value



ΔX: Number of points
ΔY: Level (dB)

(Value already converted internally by DEFER function)

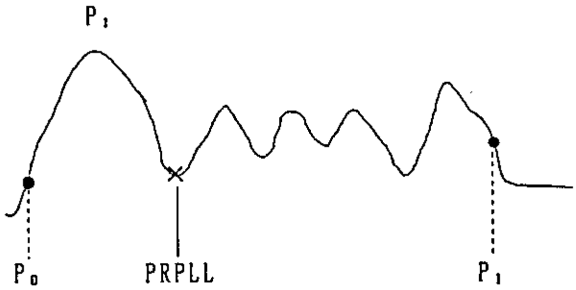
(1201 POINT)

Note: Same as for RPL1 function.

PRPLL function: If the region is specified by measurement point no. and if the differential coefficient is specified, a search is made for the minimum value in that region. The measurement point no. of the first minimum value found is returned.

PRPLL(P_0, P_1, ΔX, ΔY, M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH) Data; M=2 (1CH), M=3 (2CH) Memory
- ΔX, ΔY — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- PRPLL — Measurement point no. of minimum value



ΔX: Number of points
ΔY: Level (dB)

(Value already converted internally by DEFER function)

(1201 POINT)

Note: Same as for RPL1 function. (But error message and -1 are returned if error is generated.)

NRPLH function: If the measurement point no. and the differential coefficient are specified, a search is made for the maximum value in the region. The number of maximum values is determined.

NRPLH(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH)) Data; M=2 (1CH), M=3 (2CH)) Memory
- ΔX, ΔY — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- NRPLH — Number of maximum values

ΔX: Number of points (Value already converted internally
ΔY: Level (dB) by DEFER function)

Note: Same as for RPL1 function. (But error message and -1 are returned if error is generated.)

NRPLL function: If the measurement point no. and the differential coefficient are specified, a search is made for the minimum value in the region. The number of minimum values is determined.

NRPLL(P_0,P_1,ΔX,ΔY,M)

- M — Measurement channel designation: M=0 (1CH), M=1 (2CH)) Data; M=2 (1CH), M=3 (2CH)) Memory
- ΔX, ΔY — Differential coefficient designation
- P_0, P_1 — Region specified by measurement point no.
- NRPLL — Number of minimum values

ΔX: Number of points (Value already converted internally
ΔY: Level (dB) by DEFER function)

Note: Same as for RPL1 function. (But error message and -1 are returned if error is generated.)

PRPLHN function: If the maximum point no. (indicating the nth maximum point) is specified after executing the NRPLH function, that maximum point is displayed.

PRPLHN(N,M)

- M: Measurement channel designation
- N: Designation of the nth maximum point
- PRPLHN: Nth maximum point

M=0	(1CH)	Data
M=1	(2CH)	
M=2	(1CH)	Memory
M=3	(2CH)	

ΔX: Number of points (Value already converted internally
ΔY: Level (dB) by DEFER function)

Note: <If arguments are unsuitable>

- When channel is undefined ... Error message and -1 are returned
- When N is not within the range from N to [Number of maximum values determined by NRPLH] .... Error message and -1 are returned

PRPLLN function: If the minimum point no. (indicating the nth minimum point) is specified after executing the NRPLL function, that minimum point is displayed.

PRPLLN(N,M)

- M: Measurement channel designation
- N: Designation of the nth minimum point
- PRPLLN: Nth minimum point

M=0	(1CH)	Data
M=1	(2CH)	
M=2	(1CH)	Memory
M=3	(2CH)	

ΔX: Number of points (Value already converted internally
ΔY: Level (dB) by DEFER function)

Note: <If arguments are unsuitable>

- When channel is undefined ... Error message and -1 are returned
- When N is not within the range from N to [Number of minimum values determined by NRPLL] .... Error message and -1 are returned

```
FRPLHN function:  If the maximum point no. is specified after executing
                  the NRPLH function, the frequency of that maximum point
                  is displayed.

  FRPLHN(N,M)
  |    | |
  |    | └────── Measurement channel designation      M=0 (1CH)) Data
  |    └──────── Designation of the nth maximum       M=1 (2CH)
  |              point                                M=2 (1CH)) Memory
  └───────────── Frequency of Nth maximum point       M=3 (2CH)

  ΔX:  Number of points   (Value already converted internally
  ΔY:  Level (dB)          by DEFER function)
```

Note: <If arguments are unsuitable>

- When channel is undefined data ... Error message and unspecified value are returned
- When N is not within the range from N to [Number of maximum values determined by NRPLH] .... Error message and unspecified value are returned

```
FRPLLN function:  If the minimum point no. is specified after executing
                  the NRPLL function, the frequency of that minimum point
                  is displayed.

  FRPLLN(N,M)
  |    | |
  |    | └────── Measurement channel designation      M=0 (1CH)) Data
  |    └──────── Designation of the nth minimum       M=1 (2CH)
  |              point                                M=2 (1CH)) Memory
  └───────────── Frequency of Nth minimum point       M=3 (2CH)

  ΔX:  Number of points   (Value already converted internally
  ΔY:  Level (dB)          by DEFER function)
```

Note: <If arguments are unsuitable>

- When channel is undefined data ... Error message and unspecified value are returned
- When N is not within the range from N to [Number of minimum values determined by NRPLL] .... Error message and unspecified value are returned

VRPLHN function: If the maximum point no. is specified after executing the NRPLH function, the response value of that maximum point is displayed.

```
VRPLHN(N,M)
 |     | └──── Measurement channel designation      M=0 (1CH)) Data
 |     └────── Designation of the nth maximum       M=1 (2CH)
 |             point                                M=2 (1CH)) Memory
 └──────────── Response value of Nth maximum        M=3 (2CH)
               point
```

Note: Same as for FRPLHN function.

VRPLLN function: If the minimum point no. is specified after executing the NRPLL function, the response value of that minimum point is displayed.

```
VRPLLN(N,M)
 |     | └──── Measurement channel designation      M=0 (1CH)) Data
 |     └────── Designation of the nth minimum       M=1 (2CH)
 |             point                                M=2 (1CH)) Memory
 └──────────── Response value of Nth minimum        M=3 (2CH)
               point
```

Note: Same as for FRPLHN function.

CAUTION

1. When the above functions are used together with the RPL1, RPL2, and RPL3 functions, P_0, P_1, ΔX, and ΔY must be set together.

2. The settings to be made when the RPL1, RPL2, and RPL3 functions are executed after executing the above functions can be made as desired.

(8) Limit Test

LMT function: If the upper and lower limits, and detected data are given, the fact whether the data lies between the limits or not is checked and the result returned.

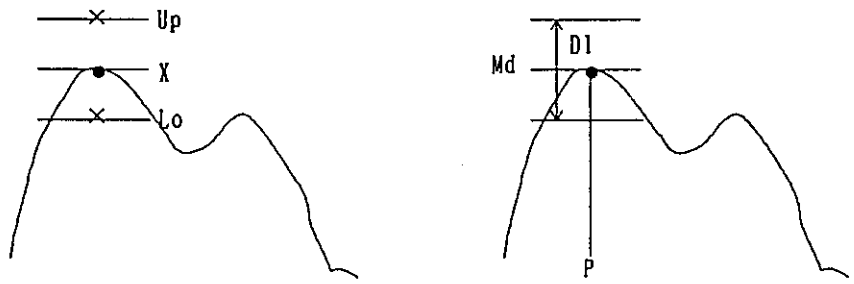
M=0 (1CH), M=1 (2CH)) Data
M=2 (1CH), M=3 (2CH)) Memory

LMTUL1(X,Up,Lo)
- Up, Lo: Upper/lower limit values
- X: Detected data
- LMTUL1: Limit test result

LMTUL2(P,Up,Lo,M)
- M: Measurement channel designation
- Up, Lo: Upper/lower limit values
- P: Detected data indicated by measurement point no.
- LMTUL2: Limit test result

LMTMD1(X,Md,D1)
- Md, D1: Middle/delta limit value
- X: Detected data
- LMTMD1: Limit test result

LMTMD2(P,Md,D1,M)
- M: Measurement channel designation
- Md, D1: Middle/delta limit value
- P: Detected data indicated by measurement point no.
- LMTMD2: Limit test result



(1201 POINT)

Results: When inside range : 0
When above upper limit: 1
When below lower limit: 2
When specified point is not measured after specifying point : -1

Note: <When arguments are unsuitable>

- When Lo > Up .... Execute after interchanging Lo and Up
- When channel is undefined data
  ... Error message and −1 are returned
- When P is not within 0 thru 1200 range
  ... Error message and −1 are returned
- When D1 is negative ... Execute after inverting sign

(9) Zero Phase Detection Function

ZEROPHS function: Zero Phase is searched in the specified region by P_0 and P_1 and the frequency is returned.

ZEROPHS(P_0,P_1,M)

- M — Measurement channel designation
- P_0, P_1 — Measurement point No. of specified region
- ZEROPHS — Frequency of Pero Phase

M=0 (1CH)) Data
M=1 (2CH))
M=2 (1CH)) Memory
M=3 (2CH))

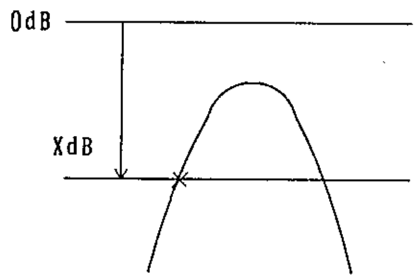
(10) Direct Search functions

DIRECT function: Calculates the measuring point of the specified response and returns it.

DIRECT (P_0,P_1,X,M)

- M — Measurement channel designation
- X — Response
- P_0, P_1 — Measuring point of the specified area

M=0 (1CH)] Data
M=1 (2CH)]
M=2 (1CH)] Memory
M=3 (2CH)]

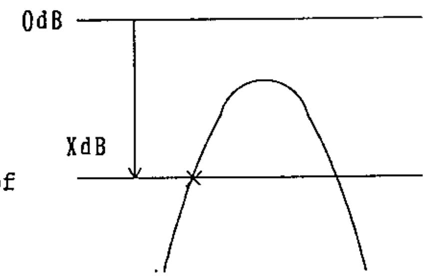


CDIRECT function: Calculates the frequency of the specified response and returns it.

CDIRECT (F_0,F_1,X,M)

- M: Measurement channel designation
- X: Response
- F_0,F_1: Measuring frequency of the specified area

M=0 (1CH) ┐ Data
M=1 (2CH) ┘
M=2 (1CH) ┐ Memory
M=3 (2CH) ┘

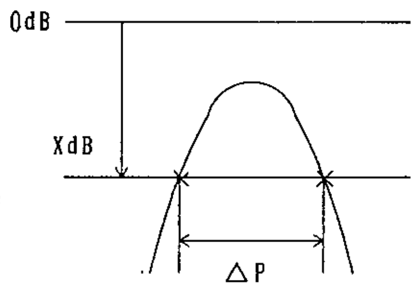


DDIRECT function: Calculates the measuring point difference of the specified response and returns it.

CDIRECT (P_0,P_1,X,M)

- M: Measurement channel designation
- X: Response
- P_0,P_1: Measuring point of the specified area

M=0 (1CH) ┐ Data
M=1 (2CH) ┘
M=2 (1CH) ┐ Memory
M=3 (2CH) ┘

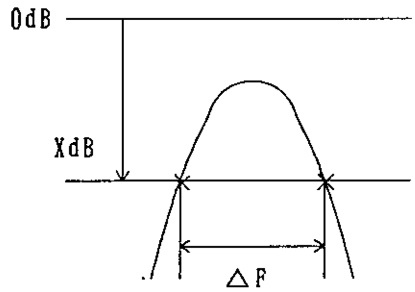


CDDIRECT function: Calculates the frequency difference of the specified response and returns it.

CDIRECT (F_0, F_1, X, M)

- F_0, F_1 — Measuring freqyency of the specified area
- X — Response
- M — Measurement channel designation

M=0 (1CH) ┐ Data
M=1 (2CH) ┘
M=2 (1CH) ┐ Memory
M=3 (2CH) ┘



Notes:
- $P_0=P_1$ (If $F_0=F_1$, and error occurs.)
- If value X is omitted, an error occurs.

LIST OF FIGURES

LIST OF TABLES

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WFU-4611E

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
CB3	DCB-RR0944X04-1		
CB4	DCB-QS0490-1		
CB5	DCB-SS2743X01-1		
CB6	DCB-SS2669X01-1		
CB7	DCB-RR0944X04-1		
CB10	DCB-RR1744X01-1		
CB11	DCB-RR2667X01-1		
CB15	DCB-FF1146X02-1		
CB16	DCB-FF1146X09-1		
CB17	DCB-FF1146X06-1		
CB21	DCB-FF1223X07-1		
CB22	DCB-FF1223X11-1		
CB23	DCB-FF1394X03-1		
CB24	DCB-FF1394X01-1		
CB25	DCB-FF1394X02-1		
CB26	DCB-FF1394X02-1		
CB27	DCB-FF1394X01-1		
CB28 -29	DCB-FF1394X13-1		
CB30	DCB-FF1394X14-1		
CB31	DCB-FF1394X13-1		
CB32	DCB-FF1394X12-1		
CB33	DCB-QS2739X02-1		
CB34	DCB-SS2742X02-1		
CB35	DCB-RR1353X05-1		
CB36 -38	DCB-SS2203X01A-1		
CB39	DCB-SS2740X01-1		
CB40	DCB-QS2741X01-1		
CB41 -42	DCB-QS2741X01-1		

R4611

BGB-014192 1/2

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1	CCP-BA1000P50V	J4	JCF-AC001JX02-2
C2	CCP-BBR1U50V	L1 -2	LCL-T00084A
C3	CCP-AC3P50V	L3 -4	LCL-C00013
C4	CCP-AC3P50V	L5 -6	LCL-B00371
C5	CCP-BBR1U50V	L7 -9	LCL-B00052
C6	CCP-BBR1U50V	L10	LCL-A00514
C7	CCK-BJ220U10V	L11 -12	LCL-C00011
C8	CCP-BA1000P50V	L13	LCL-A00507
C9	CCP-BBR1U50V	L14	LCL-A00506
C10	CCP-BA1000P50V	L15	LCL-A00506
C11	CCP-BBR1U50V	L16	LCL-A00507
C13 -15	CCK-AR47U25V	L17	LCL-A00506
C16	CSM-AGR1U50V	L18	LCL-A00506
C17	CCP-BA1000P50V	Q1	STN-2SC2585
C18	CCP-AW820PR1K	Q2	STP-2SA1015
C19	CCP-AT5PR1K	Q3	STN-2SC2369-2
C20	CTM-BL10P	Q4	STN-2SC1815-55
C21	CSM-AGR1U50V	Q5	STP-2SA1015
C22	CCP-BA1000P50V	R1	RCB-AP51
C23	CCP-AV100PR1K	R2	RCB-AP68
C24	CCP-ATR5PR1K	R3	RCB-AP150
C25	CCK-AR47U25V	R4	RCB-AP68
C26	CSM-AGR1U50V	R5	RCB-AP270
C27 -28	CTA-AB22U16V	R6	RCB-AP18
C29	CCP-BBR1U50V	R7	RCB-AP270
C30	CFM-AHR1U100V	R8	RCB-AP270
C31 -35	CSM-AGR1U50V	R9	RCB-AP18
C36 -37	CCP-BA1000P50V	R10	RCB-AP270
C38	CCP-BBR1U50V	R11	RCB-AP270
C39 -40	CCP-BA1000P50V	R12	RCB-AP18
C41	CCP-BBR1U50V	R13	RCB-AP270
C42	CCP-BA1000P50V	R14	RCB-AP270
C43	CCP-AC3P50V	R15	RCB-AP18
C44	CCP-AC3P50V	R16	RCB-AP270
C46 -47	CCP-BA1000P50V	R17	RCB-AP270
C48 -49	CCK-AR22U25V	R18	RCB-AP18
C50	CMC-AB82PR3K-4	R19	RCB-AP270
C51	CSM-AGR1U50V	R22	RCB-AG270
C52	CTA-AC3R3U16V	R23 -24	RCB-AG470
C53	CCP-BBR1U50V	R25	RCB-AP51
C54	CCP-BBR1U50V	R26	RCB-AG120
C55	CCP-AC3P50V	R27	RCB-AG330
C56	CCP-BA4P50V	R28 -30	RCB-AG33
C57	CCP-BA4P50V	R31	RCB-AG680
C58	CCP-BA5P50V	R32	RCB-AG12K
C59 -60	CCP-BA4P50V	R33	RCB-AG100K
C61	CCP-BA5P50V	R34	RCB-AG56K
D4	SDZ-W110-5	R35	RCB-AP270
D5 -6	SDS-1SV153	R36	RCB-AG10K
FL1 -3	DNF-001052	R37	RCB-AP22K
J1	JCF-AC001JX02-2	R38	RCB-AG5R6K
J2 -3	JCF-AN001JX01	R39	RCB-AG5R6K

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
R40	RCB-AG10K		
R41	RCB-AG820		
R45	RCB-AP51		
R46 -48	RCB-AP51		
R67	RHB-000016		
U1	SIC-565		
U7	SIA-1651		
U8	SIA-TL072		
U9 -11	SIA-1651		

R4611

BLB-014572

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CSM-AGR1U50V		
C3	CMC-AB39PR5K		
CB1	DCB-QS1271X03		
FL1 -2	DNF-001052-1		
J1	JCF-AC001JX04		
Q1	STP-2SA1206		
R1	RCB-AG1R5K		
R2	RCB-AG220		
U1	SIA-7805L-6		
X1	DXC-000123-1		

R4611

BLK-014219

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
D1 -2	NLD-000111		
D3 -5	NLD-000003		
D6 -8	NLD-000111		
J1	JCS-AA056PX04-2		
J2 -4	JCB-BF010PX02-1		
R1 -2	RAY-AL560Q4		

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R4611

BLB-014217

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
D1 -4	NLD-000111		
D5	NLD-000111		
J1 -2	JCB-BF010PX02-1		
R1	RAY-AL560Q4		

R4611

BLD-014556

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CCK-AR100U16V		
C3 -7	CSM-AGR1U50V		
C8	CCK-AR3R3U50V		
C9	CSM-AGR1U50V		
C10	CCK-AR3R3U50V		
C11	CSM-AGR1U50V		
C12	CCK-AR10U16V		
C13	CCK-AR3R3U50V		
C14 -22	CSM-AGR1U50V		
D1	SDS-1SS270		
J1	JCR-AV034PX02-1		
J2	JCS-AA056JX04-2		
L1	LCL-T00084A		
Q1	STN-2SC1815-55		
Q2 -9	STP-2SA1015		
R1	RCB-AG4R7K		
R2	RCB-AG10K		
R3	RCB-AG1K		
R4	RCB-AG100		
R5 -6	RCB-AG8R2K		
R7	RCB-AG10K		
R8 -9	RCB-AG1K		
R10	RCB-AG100K		
R11 -14	RAY-AL33K4		
R15	RCB-AG47K		
U1	SIM-61H06B23F-1		
U2	SIM-74HC245		
U3	SIM-74HC14		
U4	SIM-74HC273		
U5	SIM-74HC174		
U6	SIM-74HC32		
U7	SIM-74HC4538		
U8 -9	SIM-74HC14		
U10 -11	SIM-74HC86		
U12	SIM-74HC30		
U13	SIM-74HC74		
U14	SIM-74HC244		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C2	CSM-AG1U50V	R27	RCB-AG820
C3	CSM-AGR1U50V	R28	RCB-AG1R2K
C4 -5	CTA-AC3R3U16V	R29	RCB-AG2R2K
C6	CCK-AR100U10V	R30	RCB-AG4R7K
C7 -8	CTA-AC3R3U16V	R31	RCB-AG390
C9	CCK-AR10U25V	R32	RCB-AG10K
C11	CCK-AR100U10V	R33	RCB-AG10K
C14	CCK-AR100U16V	R34	RCB-AG75
C15	CSM-AGR1U50V	R35	RCB-AG75
C16	CCK-AR100U16V	R36	RCB-AG1R5K
C18	CTA-AC3R3U16V	R37	RCB-AG10K
C19 -27	CSM-AGR1U50V	R38	RCB-AG75
C28 -31	CTA-AC3R3U16V	R39	RCB-AG75
C32 -37	CSM-AGR1U50V	R40	RCB-AG10K
C38 -41	CTA-AC3R3U16V	R41	RCB-AG10K
C42 -43	CSM-AGR1U50V	R42	RVR-CD100K
C44 -47	CTA-AC3R3U16V	R43 -44	RCB-AG10K
C48 -49	CSM-AGR1U50V	R45 -52	RAY-AL10K8
C50 -53	CTA-AC3R3U16V	R53 -55	RAY-AL10K8
C54 -64	CSM-AGR1U50V	U1	SIT-74S260
D1 -2	SDS-1SS286-2	U2	SIM-74HC27
D3	SDS-A54	U3	SIM-74HC04
D4 -5	SDS-1SS270	U4	SIM-74HC74
D6 -8	SDS-1SS270	U5	SIT-74F164
D9 -13	SDS-1SS270	U6	SIM-74HC74
D15	SDS-1SS270	U7	SIM-74HC04
J1	JCS-BQ096PX01	U10	SIA-TL7700
J3	JCB-BF010PX01-1	U12	SIM-74HC367
J4	JCB-BF010PX01-1	U13	SIM-74HC373
L1	LCL-T00083A	U14	SIM-74HC155
Q1	STN-2SC2901	U15 -16	SIM-74HC373
R1	RCB-AG82K	U17	SIM-74HC00
R2	RCB-AG10K	U18	SIM-62421
R3 -5	RCB-AG2R2K	U20	SIM-74HC04
R6	RCB-AG1K	U21	SIM-74HC14
R7 -8	RAY-AL10K8	U22	SMM-81464A-1
R9	RCB-AG10K	U23 -25	SMM-81464A-1
R10 -11	RCB-AG4R7K	U26 -27	SIM-74HC245
R12	RCB-AG820	U28	SIM-74HC74
R13	RCB-AG75	U30	SIM-74HC32
R14	RCB-AG75	U31	SIM-74HC30
R15	RCB-AG180	U32	SIM-74HC05
R16	RCB-AG180	U33	SMM-81464A-1
R17	RCB-AG270	U34	SMM-81464A-1
R18	RCB-AG390	U35 -36	SMM-81464A-1
R19	RCB-AG820	U37 -38	SIM-74HC245
R20	RCB-AG330	U39	SIM-74HC32
R21	RCB-AG1R2K	U40	SIM-74HC04
R22	RCB-AG10K	U41	SIM-74HC08
R23	RCB-AG510	U42	SIM-74HC32
R24	RCB-AG1K	U43	SIM-74HC138
R25	RCB-AG510	U44	SIM-74HC393
R26	RCB-AG680	U45 -48	SMM-81464A-1

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
U49 -50	SIM-74HC245		
U51	SIM-74HC27		
U53 -54	SIM-IDT7201A		
U55	SIM-68000A-4		
U56	SMM-81464A-1		
U57 -59	SMM-81464A-1		
U60 -61	SIM-74HC245		
U64 -67	SIM-74HC166		
U68	SIM-74HC75		
U69	SIM-63484A-1		
U70 -71	SIM-74HC373		
U72 -73	SMM-27C512A		
U74 -77	SIM-74HC166		
U78	SIM-74HC373		
U79 -80	SMM-62256A-4		
U81	SIM-74HC157		
U82	SIM-74HC166		
U83	SIM-74HC10		
U84 -85	SIM-74HC08		
X1	DXE-001082-1		

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1	CCK-AR10U16V	J2	DCB-FF1147X02-1
C2 -3	CSM-AGR1U50V	J3	DCB-FF1147X09-1
C6 -13	CSM-AGR1U50V	J5	DCB-FF1147X04-1
C16 -17	CSM-AGR1U50V	L2 -4	LCL-C00013
C18	CMC-AB22PR5K	L5 -6	LCL-T00084A
C19	CMC-AB56PR3K	L9	LCL-T00084A
C20	CSM-AGR1U50V	Q1	STN-2SC1815-55
C21	CMC-AB22PR5K	Q3 -6	STP-2SA1206
C22	CMC-AB56PR3K	Q7	STN-2SC2026
C23 -25	CSM-AGR1U50V	Q8 -9	STP-2SA1206
C26	CCK-AR47U25V	Q10 -11	SFP-2N2609
C27	CSM-AGR1U50V	Q13	SFN-2N4859-18
C28	CCK-AR47U25V	Q14	STT-FT5712
C29	CSM-AGR1U50V	Q15	SFT-A71
C30	CCK-AR47U25V	Q16	STN-2SC1815-55
C31 -32	CCK-AR47U16V	Q17	STP-2SA1015
C34 -47	CSM-AGR1U50V	Q18	STP-2SA1206
C48	CSM-AGR01U50V	R1	RCB-AG10K
C49	CFM-AM330P100V	R2	RCB-AG4R7K
C50	CCK-AR100U25V	R3	RCB-AG1K
C51	CCK-AR47U25V	R5	RCB-AG10K
C52 -53	CCK-AR100U25V	R6	RCB-AG150
C54	CCK-AR47U25V	R7	RCB-AG82
C55	CCK-AR100U25V	R8	RCB-AG47
C56	CTA-AG10U16V-3	R9	RCB-AG510
C57 -58	CSM-AGR1U50V	R10	RCB-AG47
C59	CMC-AC470PR3K	R11	RCB-AG150
C60	CMC-AB330PR3K	R12	RCB-AG82
C61	CFM-AHR1U100V	R13	RCB-AG47
C62 -67	CSM-AGR1U50V	R14	RCB-AG1K
C68 -69	CCK-AA100U25V	R15	RCB-AG510
C70 -73	CCK-AR47U25V	R16	RCB-AG47
C74 -75	CCK-AA100U25V	R17 -18	RCB-AG560
C76 -77	CCK-AR47U25V	R19	RCB-AG47
C78	CCK-AR220U10V	R20	RCB-AG680
C79 -80	CCK-AR47U16V	R21	RCB-AG47
C81 -94	CSM-AGR1U50V	R22	RCB-AG560
C95	CCP-AC12P50V	R23	RCB-AG100
C96	CCP-AC22P50V	R24	RCB-AG5R6K
C97	CCP-AC12P50V	R25	RCB-AG180
C98 -99	CCP-BBR1U50V	R26 -27	RCB-AG47
C100	CSM-AGR1U50V	R28	RCB-AG22
C101-102	CCK-AR100U10V	R29	RCB-AG220
C103-107	CSM-AGR1U50V	R30	RCB-AG470
D2 -3	SDS-1SS270	R31	RCB-AG1K
D4 -9	SDS-1SS286	R32 -33	RMF-AC1R2KFJ
D10	SDZ-W061-5	R34	RCB-AG100
D11	SDZ-W050-5	R35	RMF-AC1KFJ
D12	NLD-000016	R36	RMF-AC390QFJ
D13	SDS-1SS99	R37	RCB-AG10K
D14	SDS-1SS270	R38	RCB-AG3R3K
J1	JCS-BQ096PX01	R39 -40	RMF-AC10KFJ

Parts No.	ADVANTEST Stock No.
R41	RMF-AC5R6KFJ
R42	RMF-AC330QFJ
R43	RMF-AC22QFJ
R44 -45	RMF-AC12KFJ
R46	RCB-AG1R2K
R47	RCB-AG470
R48	RCB-AG1K
R49	RCB-AG3R9K
R50	RCB-AG820
R51 -52	RCB-AG220
R53	RCB-AG51
R54	RCB-AG8R2K
R55 -56	RCB-AG5R1K
R57	RCB-AG1K
R58 -59	RCB-AG330
R60	RCB-AG100K
R61	RCB-AG3R3K
R62	RCB-AG22K
R63	RCB-AG5R1K
R64	RCB-AG2R7K
R65	RCB-AG3R3K
R66	RVR-DS100
R67	RCB-AP220
R68	RCB-AP68
R69	RCB-AG470
R70	RCB-AG100
R71	RCB-AG470
R72	RCB-AG100
R73 -74	RCB-AG470
R75 -78	RCB-AG100
R79	RCB-AG470
R80	RCB-AG100
R81	RCB-AG470
R82	RCB-AG100
R83 -84	RCB-AG470
R85 -86	RCB-AG100
R87 -88	RCB-AG470
R89	RCB-AG120
R90	RCB-AG180
R91	RCB-AG680
R92	RCB-AG120
R93	RCB-AG180
R94	RCB-AG680
R95	RCB-AG470
R96	RCB-AG100
R97	RCB-AG470
R98	RCB-AG100
R99	RCB-AG470
R100	RCB-AG100
R101	RCB-AG470
R102	RCB-AG100
R103	RCB-AG220

Parts No.	ADVANTEST Stock No.
TP1 -4	MBM-10372A-1
TP6 -12	MBM-10372A-1
U2	SIM-74HC164
U3	SIC-12013
U4 -6	SIT-74ALS168
U7	SIT-74S260
U8	SIT-74LS74
U9	SIM-74HC273
U10	SIM-74HC175
U11	SIC-10131
U12	SIA-7805U
U15 -17	SIM-74HC283
U18	SIM-74HC273
U19	SIM-74HC175
U20	SIA-6012-2
U21	SIA-TL072
U22 -23	SIA-OP07P
U24	SIA-7805L
U25	SIA-2540
U26	SIA-5320
U27	SIA-TL072
U28 -29	SIA-7812U
U30	SIA-7912U
U31	SIA-7805L
U32	SIM-74HC367
U33	SIM-74HC244
U34	SIM-74HC74
U35	SIM-74HC86
U36	SIM-74HC74
U37	SIC-100151D
U38	SIC-10H131
U39	SIC-10H107
U40 -41	SIC-10H131

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BLB-014146

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
J1 -3	JCB-AM010JX02-1		

BGB-014103

Parts No.	ADVANTEST Stock No.
C1 -2	CSM-AFR01U50V
C3	CMC-AB100PR3K
C4	CSM-AFR01U50V
C6	CSM-AFR01U50V
C7	CMC-AB200PR3K
C8	CMC-AB100PR3K
C9	CSM-AFR01U50V
C10	CMC-AB100PR3K
C11	CSM-AFR01U50V
C12	CMC-AB100PR3K
C13	CSM-AFR01U50V
C15 -19	CSM-AFR01U50V
C20	CCK-AR10U16V
C21 -23	CCK-AR10U25V
C24 -25	CCP-ACR01U50V
C26	CSM-AFR01U50V
D1 -2	SDS-1SS97
D3	SDS-1S953
D4	SDS-1SS97
D5	SDS-1SS101
FB1	ESM-000129
FL1	DNF-000199
FL2 -4	DNF-001052-1
FL5	DNF-001052-1
J1 -3	JCF-AC001JX02-2
J4	JCF-AN001JX01-1
K1	KRL-000441-1
L1	LCL-C00105
L2	LCL-C00010
Q1	SFN-2N4859-18
Q2	STN-2SC1815-55
Q3	STN-2SC2026
Q4	SFN-2N4859-18
Q5	STP-2SA1206
R1	RCB-AG1K
R2	RCB-AG100K
R3	RCB-AG1K
R4	RCB-AG5R6K
R5	RCB-AG22K
R6 -7	RCB-AG10K
R8 -9	RCB-AG100
R10	RCB-AG33
R11	RCB-AG22
R12 -13	RCB-AG470
R14	RCB-AG5R6K
R15	RCB-AG1K
R16 -17	RCB-AG33
R18	RCB-AG120
R21	RCB-AP51
TP	MBM-10372A-1
U1	SIA-4805
U2	SIT-74LS123
U3	SIA-4805
U4	SIA-7805L-6
U5	SIA-7812L-8
U6	SIA-79L12-1
U7	SIM-74HC390
U8	SIC-572
U9	SIM-74HC14
U10	SIM-74HC390
U11	SIM-74HC390
U12	SIM-74HC73
U13	SIM-74HC00
U14	SIM-74HC74
U15	SIM-74HC164
U16	SIM-74HC86

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BGB-014102

Parts No.	ADVANTEST Stock No.
C1	CCK-AR33U16V
C2 -5	CSM-AFR01U50V
C6 -7	CTA-AB22U16V
C8	CMC-AB330PR3K-4
C9	CMC-AB24PR5K-4
C10	CSM-AFR01U50V
C11	CMC-AB220PR3K-4
C12	CSM-AFR01U50V
C13	CMC-AB330PR3K-4
C14 -19	CSM-AFR01U50V
C21 -24	CSM-AFR01U50V
C25	CCK-AR10U16V
C26 -28	CCK-AR10U25V
C29 -35	CSM-AFR01U50V
D1	SDS-1SV50-1
D2	NLD-000020-1
FB1	ESM-000129
FL1	DNF-000199
FL2 -4	DNF-001052-1
J1 -4	JCF-AC001JX02-2
L1 -2	LCL-B00161-1
L3	LCL-B00323-1
L4	LCL-C00010
Q1	STN-2SC1815-55
Q2	STN-2SC1730
Q3	SFN-2N4859-18
Q4	STN-2SC1815-55
Q5 -6	STN-2SC2901
R1 -2	RCB-AG2R2K
R3	RMF-AR3R3KFK
R4	RVR-BD2K-1
R5	RMF-AR1KFK
R6	RCB-AG10K
R7 -8	RCB-AG4R7K
R9	RMF-AR4R7KFK
R10	RCB-AG10K
R11	RCB-AG120K
R12	RCB-AG270
R13	RCB-AG4R7K
R14	RCB-AG180
R15	RMF-AR33KFK
R16	RMF-AR8R2KFK
R17	RCB-AG1K
R18	RCB-AG1M
R19	RCB-AG820
R20	RCB-AG1K
R21	RCB-AG10K
R22	RCB-AG47K
R23	RCB-AG4R7K
R24	RCB-AG2R2K
R25	RCB-AG330
R26	RCB-AG5R6K
R27	RCB-AG560
R28	RCB-AG2R2K
R29	RCB-AG270
R30	RCB-AG33
R31	RCB-AH22
R32	RCB-AG470
R33	RCB-AG10K
R34	RCB-AG4R7K
TP1 -6	MBM-10372A-1
U1	SHB-001511-1
U2	SIA-DG201
U4	SIM-74HC04
U5	SIA-TL072
U6	SIA-393
U7	SIA-7805L-6
U8	SIA-7812L-8
U9	SIA-79L12-1
U10	SIM-74HC390
X1	DXD-000153-1

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BLK-014148

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
BT1	DBP-000470-1		
C1	CSM-AGR1U50V		
C2	CCK-AR470U10V		
C3 -4	CSM-AGR1U50V		
D1	SDS-1SS270		
D3 -9	NLD-000016-1		
D11	NLD-000016-1		
J1 -7	JCB-AM018JX01-1		
J8 -10	JCP-BH003PX01-1		
J11	DCB-RR2668X04-1		
R1	RCB-AG150		
R5	RCB-AG100		
R7	RCB-AG1R8K		
R8	RCB-AG560		
R9 -10	RCB-AG2R2K		
R11	RCB-AG1R8K		
R12	RCB-AG3R9K		
R13	RCB-AG4R7K		
R15	RCB-AG560		
U1	SIA-7673		
U2	SIA-7805L		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1	CSM-AC3P50V	C110-111	CCP-AC220P50V
C2	CSM-AC2P50V	C112	CSM-AG1U50V
C4	CSM-AC8P50V	C113	CMC-AB220PR3K
C5	CSM-AG1U50V	C114-115	CCP-AE1U50V
C6 -11	CSM-AGR1U50V	C116	CCP-ADR1U50V
C12	CSM-AC5P50V	C117	CSM-AGR1U50V
C13	CFM-AHR1U100V	C118	CSM-AGR1U50V
C14 -15	CSM-AGR1U50V	C119	CSM-AGR1U50V
C16 -17	CSM-AG1U50V	C120	CSM-AC3P50V
C18 -19	CSM-AGR1U50V	CB1	DCB-FF1147X11-1
C20	CCP-AC3P50V	D1 -2	SDS-1SS99
C21	CSM-AC1P50V	D3 -4	SDS-1SS270
C22	CTA-AB22U16V	D5 -6	SDS-1SS101
C23	CCP-ADR1U50V	D7	SDZ-W081
C24	CCP-ADR47U50V	D8	SDS-1SV153
C25 -26	CCP-ADR1U50V	D9	SDS-1SV153
C27	CCP-AC1R5P50V	D10	SDZ-W081
C28	CCP-ADR1U50V	D12	SDS-A54
C29	CSM-AGR1U50V	D13	SDS-1SS270
C30	CCP-ADR47U50V	D14	SDS-1SS270
C31	CCP-ADR1U50V	D15 -16	SDS-1SS270
C32	CCP-AC5P50V	D17	SDZ-W061
C33	CFM-AHR1U100V	D18	SDS-1SS270
C34 -35	CSM-AGR1U50V	FB1	ESM-000129-1
C36	CCP-ADR1U50V	FL1 -3	DNF-001052
C37	CCP-ADR1U50V	FL4 -9	DEE-001187
C38	CCP-ADR1U50V	FL10	DEE-001187
C39	CCP-ADR1U50V	J1	JCF-AB001JX27-1
C40	CCP-AE1U50V	J2	JCF-AN001JX01
C41 -42	CMC-AD3300PR3K	J7 -8	JCI-CQ001JX01-1
C43	CMC-AD1800PR5K	J9	JCI-CQ001JX01-1
C44	CSM-AGR1U50V	J10	JCF-AC001JX04
C45	CSM-AGR1U50V	K1 -3	KRL-000350-1
C46	CTA-AC10U16V	L1	LCL-B00159
C47	CTA-AC10U16V	L2	LCL-A00509
C48	CTA-AC10U16V	L3	LCL-A00507
C49	CTA-AC10U16V	L4	LCL-C00924
C51 -52	CFM-AW5300P50V-2	L5	LCL-C00925
C53 -56	CSM-AGR1U50V	L6	LCL-C00924
C57 -75	CFM-AW5300P50V-2	L7 -9	LCL-T00084A
C76 -83	CSM-AGR1U50V	MX1	DEE-001303-1
C84	CSM-AG1U50V	Q1	SFM-3SK87-1
C85 -87	CCP-ADR1U50V	Q2 -4	STN-2SC2369-2
C88 -96	CSM-AGR1U50V	Q5	STP-2SA1223
C97 -101	CCK-AR10U25V	Q6 -7	STN-2SC2369-2
C102	CCP-AC1P50V	Q8	SFN-2N4393-18
C103	CSM-AC3P50V	Q9	STN-2SC1815-55
C104	CTM-BM3P	R1	RMF-AR900KDJ
C105	CCP-AC2P50V	R2	RMF-AR111KDJ
C106	CCP-ADR1U50V	R3	RMF-AC1MFJ
C107	CCP-ADR1U50V	R4	RMF-AC330QFJ
C108-109	CCP-ADR1U50V	R5 -6	RMF-AC10KFJ

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
R7	RMF-AC1KFJ	R67	RMF-AC680QFJ
R9	RMF-AC150QFJ	R68	RMF-AC1KFJ
R10	RMF-AC1R2KFJ	R69	RMF-AC3R3KFJ
R11	RMF-AC47QFJ	R70	RVR-DS1K
R12	RMF-AC330KFJ	R71	RVR-DS1K
R13 -14	RMF-AC1MFJ	R72 -73	RCB-AG100K
R15 -16	RCB-AG10K	R74	RCB-AG22K
R17 -18	RMF-AC10KFJ	R75	RMF-BN12KBG
R19 -20	RMF-AC560QFJ	R76	RMF-BN2R58KBG
R21 -22	RCB-AG4R7K	R77	RMF-BN4R25KBG
R23 -24	RCB-AG1M	R78	RMF-BN8R49KBG
R25 -26	RCB-AG10K	R79	RMF-BN8R49KBG
R27	RCB-AG3R3K	R80	RMF-BN12KBG
R28	RCB-AG1R5K	R81	RMF-BN2R58KBG
R29	RMF-BL61R1QFJ	R82	RMF-BN4R25KBG
R30	RMF-BL61R1QFJ	R83	RMF-BN8R49KBG
R31	RMF-BL247QFJ	R84	RMF-BN8R49KBG
R32	RMF-AV10MJM	R85	RMF-AC100QFJ
R33	RMF-BK51QFJ	R86	RMF-BN2R15KBG
R34	RCB-AP100K	R87	RMF-BN1R07KBG
R35	RMF-BK22QFJ	R88	RMF-BN2R15KBG
R36	RMF-BK1R8KFJ	R89	RMF-BN4R25KBG
R37	RMF-BK22QFJ	R90	RMF-BN12KBG
R38	RMF-BK560QFJ	R91	RMF-BN6R21KBG
R39	RMF-BK18QFJ	R92	RMF-BN12KBG
R40	RMF-BK100QFJ	R93	RMF-BN2R58KBG
R41	RMF-BK47QFJ	R94	RMF-BN4R25KBG
R42	RMF-BL3R3KFJ	R95	RMF-BN8R49KBG
R43	RMF-BK33QFJ	R96	RMF-BN8R49KBG
R44	RMF-AC220QFJ	R97	RMF-AC100QFJ
R45	RMF-BL1R2KFJ	R98	RMF-BN2R15KBG
R46	RMF-BK47QFJ	R99	RMF-BN1R07KBG
R47	RCB-AP330K	R100	RMF-BN2R15KBG
R48	RMF-AC100QFJ	R101	RMF-BN4R25KBG
R49	RMF-AC100KFJ	R102	RMF-BN12KBG
R50	RVR-DS10K	R103	RMF-BN6R21KBG
R51	RCB-AP100K	R104-105	RMF-AC12KFJ
R52	RVR-DS100K	R106	RMF-AC2KFJ
R53	RVR-DS100K	R107	RVR-DS5K
R54	RCB-AP270	R108	RMF-BN12KBG
R55	RCB-AP270	R109	RMF-BN2R58KBG
R56	RCB-AP18	R110	RMF-BN4R25KBG
R57	RMF-BK51QFJ	R111	RMF-BN8R49KBG
R58	RMF-BK10KFJ	R112	RMF-BN8R49KBG
R59	RMF-BK10KFJ	R113	RCB-AG10K
R60	RMF-BK10QFJ	R114	RCB-AG470
R61	RMF-AC6R8KFJ	R117	RMF-AC100KFJ
R62	RMF-AC4R7KFJ	R118	RMF-AC6R8KFJ
R63	RMF-AC2R2KFJ	R119	RMF-AC3R3KFJ
R64	RMF-AC100QFJ	R120	RMF-AC2R2KFJ
R65	RMF-AC100QFJ	R121	RMF-AC1KFJ
R66	RMF-AC6R8KFJ	R122	RMF-AC10KFJ

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
R123	RMF-AC82QFJ		
R124	RMF-AC10KFJ		
R125	RMF-AC47KFJ		
R126	RCB-AG10K		
R127	RCB-AG1R5K		
R128	RMF-AC51KFJ		
R129	RMF-AC39KFJ		
R130	RCB-AG10K		
R131	RMF-BK1KFJ		
R132	RMF-BK18QFJ		
R133	RMF-BK100QFJ		
R134	RMF-BK1KFJ		
R135	RCB-AP100		
R136	RCB-AP100		
R137	RCB-AP75		
R138	RCB-AP150		
R139	RCB-AP150		
R140	RCB-AP39		
R141	RCB-AQ270		
R142	RCB-AQ270		
R143	RCB-AG10K		
R144	RCB-AG4R7K		
R145	RCB-AG470		
R146	RCB-AP150		
R147	RCB-AP560		
R148	RCB-AG1M		
R149	RMF-AR100KFK		
TP1 -3	MBM-10372A-1		
TP4	MBM-10372A-1		
U1 -2	SIA-OP07P		
U3	SIA-339		
U4	SIA-1496		
U5	SIA-5532A-1		
U6	SIA-393		
U7 -10	SIA-5532A-1		
U11	SIM-74HC174		
U12	SIM-74HC138		
U13	SIM-74HC125		
U14	SIM-74HC05		
U15	SIM-74HC74		
U16	SIT-DN8650		
U17	SIA-7912U		
U18	SIA-7812U		
U19	SIA-393		
U20	SHB-001695		
W1	JTE-BV002EX01-1		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -7	CSM-AE1000P50V	C75	CCP-AC5P50V
C8 -14	CSM-AGR1U50V	C76	CCP-AE1U50V
C15	CSM-AC5P50V	C77	CCP-ADR1U50V
C16	CCP-AC6P50V	C78	CCP-AE1U50V
C17 -18	CCP-ACR5P50V	C79	CCP-ADR1U50V
C19	CCP-AC10P50V	C80	CCP-AC15P50V
C20	CCP-AC1P50V	C81	CCP-AC100P50V
C21	CCP-AC1R5P50V	C82	CSM-AG1U50V
C22	CCP-AC6P50V	C83 -84	CSM-AGR1U50V
C23 -27	CCP-AC100P50V	C85	CCP-AE1U50V
C28 -30	CCP-ADR1U50V	C86	CCK-BX1000U16V
C31	CCP-AC12P50V	C87	CCP-AE1U50V
C32	CCP-AC2P50V	C88	CCK-AR47U25V
C33	CCP-AC1R5P50V	C89	CCK-AR47U35V
C34	CCP-AC12P50V	C90 -91	CCP-AE1U50V
C35	CCP-AC2P50V	C92	CCK-BX1000U25V
C36	CCP-AC5P50V	C93	CCP-AC22P50V
C37	CCP-AC6P50V	C94	CCK-BA22U25V
C38	CCP-ACR5P50V	C95	CCP-ADR1U50V
C39	CCP-AC12P50V	C96	CCK-AR10U16V
C40	CCP-AC2P50V	C97 -102	CCP-ADR1U50V
C41	CCP-AC1R5P50V	C103	CCP-AC3P50V
C42	CCP-AC12P50V	C104	CCP-AC2P50V
C43	CCP-AC2P50V	C105	CCP-AC3P50V
C44	CCP-AC5P50V	C107	CCP-AC3P50V
C45	CCP-AC6P50V	C108	CCP-AC2P50V
C46	CCP-ACR5P50V	C109	CCP-ACR5P50V
C47	CTA-AB22U16V	C111	CCP-AC3P50V
C48	CCP-ADR1U50V	C115	CSM-AGR1U50V
C49	CCP-AE1U50V	C116	CMC-AB68PR3K
C50	CCP-ADR1U50V	C117	CMC-AB240PR3K
C51	CCP-AC2P50V	C118-119	CSM-AGR1U50V
C52	CCP-AE1U50V	C120	CFM-AS6800P50V
C53	CCP-ADR1U50V	C121	CFM-AHR1U100V
C54	CCP-AC100P50V	C122-123	CSM-AGR1U50V
C55	CSM-AG1U50V	C124	CFM-AH1U100V
C56 -57	CSM-AGR1U50V	C125-129	CSM-AGR1U50V
C58	CCP-ADR1U50V	C130	CMC-AB10PR5K
C59	CCP-AE1U50V	C131-142	CCP-ADR1U50V
C60	CCP-ADR1U50V	C143-172	CSM-AGR1U50V
C61	CCP-AC2P50V	C173-175	CCK-AR220U35V
C62	CTM-BL3P	C176-179	CCK-AR220U25V
C63	CCP-AE1U50V	C180	CCK-AR220U16V
C64 -65	CCP-ADR1U50V	C181-182	CTA-AB22U16V
C66	CCP-AE1U50V	C183-188	CSM-AGR1U50V
C67	CCP-AC100P50V	C189	CCP-AC3P50V
C68	CSM-AG1U50V	C190	CCK-AR10U16V
C69 -70	CSM-AGR1U50V	C191	CCK-AR100U16V
C71	CCP-ADR1U50V	D1 -4	SDS-1SV34
C72	CCP-AE1U50V	D5 -6	SDZ-W081
C73	CCP-ADR1U50V	D7	SDZ-W100
C74	CCP-ACR5P50V	D8	SDZ-W130

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
D9 -12	SDS-1SS99	R21	RCB-AG33
D13	SDS-1SS270	R22	RCB-AG1R2K
D14	SDZ-W100	R23	RCB-AG39
D15	SDZ-W061	R24	RMF-AC47QFJ
D16 -17	SDS-1SS270	R25 -26	RCB-AP100
D18	SDZ-W075	R27	RCB-AP75
D19	SDS-1SS270	R28 -29	RCB-AP100
D20	SDZ-W061	R30	RCB-AP75
D21	SDS-A54	R31	RMF-AC47QFJ
FB2 -25	ESM-000129-1	R32 -33	RCB-AP100
FL1 -3	DEE-001187	R34	RCB-AP75
J1 -2	JCF-AC001JX13-1	R35	RMF-AC47QFJ
J3	JCF-AC001JX04	R36 -38	RMF-AC390QFJ
J4 -6	JCI-CQ001JX01-1	R39 -40	RCB-AP270
J7	JCF-AC001JX04	R41	RCB-AP18
J8 -10	JCI-CQ001JX01-1	R42 -43	RCB-AP270
J11 -13	JCF-AB001JX27-1	R44	RCB-AP18
J14	JCP-AA003PX05-1	R45 -46	RCB-AP270
J15	JCR-AF034PX02-2	R47	RCB-AP18
K1 -6	KRL-000350-1	R48 -49	RCB-AP270
L1	LCL-A00775	R50	RCB-AP18
L2	LCL-A00774	R51	RMF-BK51QFJ
L3	LCL-A00510	R52	RMF-BK100KFJ
L4	LCL-A00775	R53	RMF-BK51QFJ
L5	LCL-A00777	R54	RMF-BK2R7KFJ
L6 -7	LCL-A00775	R55	RCB-AP51
L8	LCL-A00777	R56	RMF-BK1KFJ
L9	LCL-A00775	R57	RMF-BK10QFJ
L10	LCL-A00063	R58	RMF-BK100QFJ
L12 -16	LCL-T00084A	R59	RMF-BK22QFJ
Q1 -2	STN-2SC1815-55	R60	RMF-BK2R2KFJ
Q3	STN-2SC2026	R61	RMF-BK27QFJ
Q4 -5	STN-2SC2369-2	R62	RCB-AP330
Q6	STP-2SA1223	R63	RMF-BK33QFJ
Q7 -8	STN-2SC2369-2	R64	RMF-BK100KFJ
Q9	STP-2SA1223	R65	RCB-AP330K
Q10 -12	STN-2SC2369-2	R66	RCB-AG1M
Q13	STP-2SA1224	R67	RMF-BK100KFJ
Q14	STN-2SC1426	R68	RMF-BK510FJ
Q15	STN-FJ9215	R69	RCB-AP1R8K
Q16	STT-394	R70	RMF-BK10QFJ
Q18	STN-2SC2983	R71	RCB-AP560
R1 -2	RCB-AP100	R72	RMF-BK22QFJ
R3	RCB-AP75	R73	RMF-BK220QFJ
R4 -5	RCB-AP100	R74	RCB-AP1R8K
R6	RCB-AP75	R75	RMF-BK51QFJ
R7	RMF-AC47QFJ	R76	RMF-BK27QFJ
R8 -12	RCB-AG1K	R77	RCB-AP220
R13 -15	RCB-AG10K	R78	RCB-AP1R2K
R16	RCB-AG1R2K	R79	RMF-BK39QFJ
R17	RCB-AG1R8K	R80	RMF-BK100KFJ
R18 -20	RCB-AG10K	R81	RCB-AP330K

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
R82	RCB-AG1M	R150	RMF-AC470QFJ
R83	RMF-BK100KFJ	R151	RMF-AC2R2KFJ
R88	RCB-AP270	R152-153	RMF-AC100KFJ
R89	RCB-AP47	R154	RMF-AC390QFJ
R90	RCB-AP18	R155-156	RMF-AC1KFJ
R91	RMF-BK51QFJ	R157	RMF-AC510QFJ
R92	RCB-AP1R2K	R158	RVR-DR1K
R93	RCB-AP330	R160	RMF-AC18KFJ
R94	RMF-BK22QFJ	R162	RMF-AC1R2KFJ
R95	RMF-BK220QFJ	R163	RMF-AC1KFJ
R96 -97	RMF-BL820QFJ	R164	RMF-AC3R3KFJ
R98	RCB-AP18	R165-166	RVR-DR500
R99	RCB-AP51	R167	RMF-AC750QFJ
R100-101	RMF-BL820QFJ	R168	RMF-AC1MFJ
R102	RCB-AP33	R169	RMF-AC51KFJ
R103	RMF-BK100KFJ	R170	RMF-AC10KFJ
R104	RCB-AP1M	R171	RMF-AC100KFJ
R105	RCB-AG180K	R172	RMF-AC1KFJ
R106	RCB-AP18	R174	RMF-AC1KFJ
R107	RCB-AP330	R178-179	RMF-AC1KFJ
R108	RPW-AY50-1	R180	RMF-AC510QFJ
R109	RMF-BK15QFJ	R184	RMF-AC1R2KFJ
R110	RCB-AP75	R185	RMF-AC1KFJ
R111	RMF-BK100QFJ	R186	RMF-AC1KFJ
R112	RCB-AP390	R187	RCB-AG470
R113	RCB-AP1M	R188	RCB-AG10
R114	RMF-BK100KFJ	R189	RCB-AG100
R115-116	RMF-BL61R1QFJ	R190	RCB-AQ180
R117	RMF-BL247QFJ	R191	RMF-AC560QFJ
R118-119	RMF-BL96R2QFJ	R192	RCB-AP100
R120	RMF-BL71R1QFJ	R193	RCB-AG2R7K
R121-122	RMF-BL61R1QFJ	TP1 -8	MBM-10372A-1
R123	RMF-BL247QFJ	U1 -2	SIA-1656
R124-125	RMF-BL178QFJ	U3 -4	SIA-1654
R126	RMF-BL30R3FJ	U5	SHB-001893-1
R127-128	RMF-BL61R1QFJ	U6 -8	SIA-OP07P
R129	RMF-BL247QFJ	U9 -10	SIA-TL072
R130-131	RMF-BL51QFJ	U11	SIA-OP27GD
R132	RMF-AC10KFJ	U12 -13	SIA-TL072
R133-135	RMF-AC1KFJ	U14	SIA-TL081
R136	RMF-AC510QFJ	U15	SIA-398
R137	RMF-AC39KFJ	U16	SIA-TL072
R138	RMF-AC39KFJ	U18	SIA-TL072
R139	RVR-DR1K	U19	SIA-DA7524-2
R140	RMF-AC1KFJ	U20 -22	SIA-DG201
R141	RMF-AC1R5KFJ	U23	SIT-DN8650
R142	RVR-DR500	U24	SIM-74HC174
R143	RMF-AC510QFJ	U25	SIM-74HC138
R144-145	RMF-AC10KFJ	U26	SIM-74HC05
R146	RMF-AC18KFJ	U27 -29	SIM-74HC74
R147	RMF-AC2R2KFJ	U30	SIA-7812U
R148	REE-AR510	U31	SIA-7912U
R149	RMF-AC2R2KFJ		

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
W1 -2	JTE-BV002EX01-1		
W3	YEE-000265-1		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1	CSM-AG1U50V	L4 -5	LCL-T00084A
C2	CSM-AC10P50V	L6 -8	LCL-A00509
C3	CSM-AG1U50V	Q1 -3	STN-2SC2369-2
C4	CSM-AC10P50V	Q4	STN-2SC1426
C5	CSM-AG1U50V	Q5 -7	STN-2SC2369-2
C6	CSM-AC10P50V	Q8	STN-2SC1426
C7	CSM-AG1U50V	Q9 -11	STN-2SC2369-2
C12 -16	CSM-AGR1U50V	Q12	STN-2SC1426
C17	CSM-AE1000P50V	R1	RAY-BMX0001-1
C18 -19	CSM-AGR1U50V	R2 -3	RAY-BMX0001-1
C20	CSM-AGR1U50V	R4 -6	RCB-AH47
C21 -22	CCP-AE1U50V	R7 -10	RMF-AC20KFJ
C23	CCP-ADR1U50V	R11	RMF-AC100QFJ
C24 -25	CCP-AE1U50V	R12	RMF-AC10KFJ
C26	CCP-AC8P50V	R13	RVR-DS500-1
C27 -28	CCP-ADR1U50V	R14	RMF-AC10KFJ
C29 -30	CCP-AE1U50V	R15	RCB-AG1R2K
C31	CCP-ADR1U50V	R16 -19	RMF-BK27QFJ
C32	CTM-BM3P	R20	RMF-BK51QFJ
C33 -37	CCP-AE1U50V	R21 -22	RMF-BK5R6KFJ
C38	CCP-ADR1U50V	R23	RMF-BK1KFJ
C39 -40	CCP-AE1U50V	R24	RMF-BK51QFJ
C41	CCP-AC8P50V	R25	RMF-BK22QFJ
C42 -43	CCP-ADR1U50V	R26	RMF-BK51QFJ
C44 -45	CCP-AE1U50V	R27	RMF-BK10QFJ
C46	CCP-ADR1U50V	R28	RMF-BK18QFJ
C47	CTM-BM3P	R29	RMF-BK51QFJ
C48 -52	CCP-AE1U50V	R30	RMF-BK4R7KFJ
C53	CCP-ADR1U50V	R31	RMF-BK10QFJ
C54 -55	CCP-AE1U50V	R32	RMF-BK1R5KFJ
C56	CCP-AC8P50V	R33	RMF-BK39QFJ
C57 -58	CCP-ADR1U50V	R34	RMF-BK100QFJ
C59 -60	CCP-AE1U50V	R35	RMF-BL51QFJ
C61	CCP-ADR1U50V	R36	RMF-BL750QFJ
C62	CTM-BM3P	R37	RMF-BL750QFJ
C63 -65	CCP-AE1U50V	R38	RMF-BK10QFJ
C66 -67	CCK-AR10U25V	R39	RMF-BK51QFJ
C68 -69	CSM-AGR1U50V	R40 -41	RMF-BK5R6KFJ
C70	CTA-AC10U16V	R42	RMF-BK1KFJ
C71	CTA-AC10U16V	R43	RMF-BK51QFJ
C72 -74	CCP-AE1U50V	R44	RMF-BK22QFJ
C76	CSM-AG1U50V	R45	RMF-BK51QFJ
C77	CSM-AG1U50V	R46	RMF-BK10QFJ
D1 -4	SDS-1SS99	R47	RMF-BK18QFJ
D5	SDZ-W061	R48	RMF-BK51QFJ
D6	SDS-1SS270	R49	RMF-BK4R7KFJ
D7	SDZ-W075	R50	RMF-BK10QFJ
D8	SDS-1SS270	R51	RMF-BK1R5KFJ
FL1 -2	DNF-001052	R52	RMF-BK39QFJ
FL3	DNF-001052	R53	RMF-BK100QFJ
J1 -4	JCF-AN001JX01	R54	RMF-BL51QFJ
L1 -3	LCL-A00774	R55	RMF-BL750QFJ

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
R56	RMF-BL750QFJ		
R57	RMF-BK10QFJ		
R58	RMF-BK51QFJ		
R59 -60	RMF-BK5R6KFJ		
R61	RMF-BK1KFJ		
R62	RMF-BK51QFJ		
R63	RMF-BK22QFJ		
R64	RMF-BK51QFJ		
R65	RMF-BK10QFJ		
R66	RMF-BK18QFJ		
R67	RMF-BK51QFJ		
R68	RMF-BK4R7KFJ		
R69	RMF-BK10QFJ		
R70	RMF-BK1R5KFJ		
R71	RMF-BK39QFJ		
R72	RMF-BK100QFJ		
R73	RMF-BL51QFJ		
R74	RMF-BL750QFJ		
R75	RMF-BL750QFJ		
R76	RMF-BK10QFJ		
R77	RAY-BMX0001-1		
U1 -3	SIA-1656		
U4	SIA-TL081		
U5	SIA-7812U		
U6	SIA-7912U		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -3	CCP-AC2200P50V	R4	RCB-AH47
C4 -5	CCP-ADR1U50V	R5 -7	RCB-AH390
C6 -8	CSM-AE1000P50V	R8 -9	RCB-AP270
C9 -14	CSM-AGR1U50V	R10	RCB-AP18
C15	CSM-AE1000P50V	R11	RCB-AP100
C16	CSM-AC3P50V	R12 -16	RCB-AG1K
C17	CSM-AC5P50V	R17 -18	RCB-AG10K
C18	CSM-AGR1U50V	R19	RCB-AG1R2K
C19	CSM-AE1000P50V	R20	RCB-AG10K
C20	CCP-AC6P50V	R21	RCB-AG1R8K
C21 -22	CCP-ACR5P50V	R22 -24	RCB-AG10K
C23	CCP-AC10P50V	R25	RCB-AG33
C24	CCP-AC1P50V	R26	RCB-AG3R3K
C25	CCP-AC1R5P50V	R27	RMF-AC33QFJ
C26	CCP-AC6P50V	R28	RCB-AH47
C27	CCP-AC12P50V	R29 -30	RCB-AP270
C28	CCP-AC2P50V	R31	RCB-AP18
C29	CCP-AC1R5P50V	R32	RCB-AP270
C30	CCP-AC12P50V	R33	RCB-AP270
C31	CCP-AC2P50V	R34	RCB-AP18
C32	CCP-AC5P50V	R35	RCB-AP270
C33	CCP-AC6P50V	R36	RCB-AP270
C34	CCP-ACR5P50V	R37	RCB-AP18
C35	CCP-AC12P50V	R38 -39	RCB-AP270
C36	CCP-AC2P50V	R40	RCB-AP18
C37	CCP-AC1R5P50V	R41	RCB-AP100
C38	CCP-AC12P50V	R42	RCB-AP75
C39	CCP-AC2P50V	U1	SIA-1654
C40	CCP-AC5P50V	U2	SHB-001893-1
C41	CCP-AC6P50V	U3	SIA-1656
C42	CCP-ACR5P50V	U4	SIA-7812U
C43 -46	CCK-AR33U25V	U5	SIA-79L12-1
C47 -48	CSM-AGR1U50V		
D1 -2	SDS-1SV34		
FL1 -2	DNF-001052		
FL3	DNF-001052		
J1 -3	JCF-AN001JX01		
L1	LCL-A00510		
L2	LCL-A00775		
L3	LCL-A00774		
L4	LCL-A00775		
L5	LCL-A00777		
L6 -7	LCL-A00775		
L8	LCL-A00777		
L9	LCL-A00775		
L10 -11	LCL-C00009		
MX1	DEE-001304-1		
Q1 -2	STN-2SC1815-55		
Q3	STN-2SC2026		
R1	RCB-AP150		
R2	RCB-AP150		
R3	RCB-AP390		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CSM-AGR1U50V	R8	RMF-AC10KFJ
C4	CSM-AGR1U50V	R9	RMF-AC33QFJ
C5 -6	CCP-ADR1U50V	R11	RCB-AP270
C7	CCP-AV100PR1K-1	R12 -13	RCB-AP12
C8	CCP-AT7PR1K	R14	RCB-AP1K
C9	CCP-AT15PR1K	R15 -16	RCB-AG10K
C10	CCP-AW820PR1K-1	R17	RCB-AG820
C11	CCP-ATR5PR1K-2	R18 -19	RCB-AP270
C12 -13	CSM-AGR1U50V	R20	RCB-AP18
C14 -17	CCP-AC100P50V	R22	RCB-AG470
C18	CSM-AGR1U50V	R23	RCB-AG1K
C19 -20	CCP-AC100P50V	R24	RCB-AG1R2K
C21 -22	CCP-ADR1U50V	R25	RMF-AC2R2KFJ
C23 -25	CSM-AGR1U50V	R26	RMF-AC100QFJ
C26 -27	CSM-AGR1U50V	R27 -30	RCB-AG47K
C30 -33	CSM-AGR1U50V	R31 -32	RCB-AG1R2K
C35 -36	CSM-AGR1U50V	R33	RCB-AG390
C37	CFM-ASR01U50V	R34	RAY-BMX0001-1
C38	CFM-AS1000P50V	R35	RCB-AP27
C47	CCP-AT12PR1K	R36	RCB-AP27
C48	CCP-AW820PR1K-1	R37	RCB-AP27
C50 -53	CCK-AR10U25V	R38	RCB-AP39
C54 -56	CSM-AGR1U50V	R39	RCB-AP15
C57 -58	CCP-ADR1U50V	R40	RCB-AP15
C59	CCP-AC5P50V	R41	RCB-AP18
C60 -63	CCP-AC100P50V	R42 -43	RCB-AP270
C64 -66	CCK-AR10U25V	R44	RCB-AP39
D1	SDZ-W110	R45 -46	RCB-AP150
D2	SDS-1SV153	R48	RVR-CB10K-1
D3	SDS-1SS270	R49	RMF-AC100QFJ
D4	SDZ-W061	R50	RCB-AG390
D5	NLD-000016-1	R51	RCB-AP39
D6	SDZ-W061	R52 -53	RCB-AP150
FL1 -3	DNF-001052	R54	RCB-AP120
FL4	DNF-001052	R55	RCB-AP75
J1	JCF-AC001JX02-2	R56	RCB-AP75
J2 -4	JCF-AN001JX01-1	R57	RCB-AP120
L1 -4	LCL-B00052	R58 -59	RCB-AP75
L8	LCL-A00773-1	R60	RCB-AP18
L9 -11	LCL-C00010-1	R61	RCB-AP270
Q1	STN-2SC2150	R62	RCB-AP270
Q2	STN-2SC2369-2	U1 -2	SIA-1651
Q3	STP-2SA1015	U3	SIC-571-1
Q4	STN-2SC1730	U4	SIT-74ALS00
Q5	STN-2SC1730	U5	SIT-74ALS112
R1	RMF-BL680QFJ	U6	SHB-001510-1
R2	RMF-BL120QFJ	U7	SIA-393-1
R3	RMF-BL330QFJ	U8	SIA-TL072
R4	RMF-BL100QFJ	U9 -10	SIA-1651
R5	RMF-BK270QFJ	U11	SIA-7805L
R6	RMF-AC180QFJ	U12	SIA-7812L-8
R7	RMF-AC1KFJ	U13	SIA-79L12-1

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
W1	YEE-000265-1		
Y1	JCP-AA003PX05-1		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CSM-AGR1U50V	L6	LCL-B00499
C3 -4	CCP-ADR1U50V	L7	LCL-B00374
C5	CCP-AT7PR1K	L8	LCL-B00894-1
C6	CCP-AT15PR1K	L9 -11	LCL-C00010-1
C7	CCP-AW820PR1K-1	MX1	DEE-001304-1
C8	CCP-AV100PR1K-1	Q1	STN-2SC2150
C9	CCP-AT12PR1K-1	Q2	STN-2SC2369-2
C10	CCP-AW820PR1K-1	Q3	STP-2SA1015
C11	CSM-AGR1U50V	Q4 -5	STN-2SC2901
C12	CCK-AR10U25V-1	R1	RMF-BL680QFJ
C13	CCP-ATR5PR1K-2	R2	RMF-BL120QFJ
C14 -15	CSM-AGR1U50V	R3	RMF-BL330QFJ
C16	CCP-ADR1U50V	R4	RMF-BL100QFJ
C17 -19	CCP-AC100P50V	R5	RMF-BK270QFJ
C20	CCP-ADR1U50V	R6	RMF-AC180QFJ
C21	CCP-AC100P50V	R7	RMF-AC1KFJ
C22	CCP-AC100P50V	R8	RVR-CB10K-1
C23	CCP-ADR1U50V	R9	RMF-AC10KFJ
C24	CCP-ADR1U50V	R10	RMF-AC33QFJ
C25	CCP-AC100P50V	R11 -12	RCB-AG10K
C26	CCP-AC100P50V	R13	RCB-AG820
C27 -28	CSM-AGR1U50V	R14	RCB-AP1K
C29	CSM-AG1U50V-2	R15	RCB-AP270
C30 -33	CSM-AGR1U50V	R16 -17	RCB-AP12
C34	CCP-ADR1U50V	R18	RCB-AP15
C35	CCP-AC100P50V	R19	RCB-AP15
C37	CFM-ASR01U50V	R20	RCB-AP15
C38 -41	CSM-AGR1U50V	R21	RCB-AH47
C42	CFM-AS6800P50V-1	R22	RAY-BMX0001-1
C43	CFM-AS1500P50V-1	R23	RAY-BMX0001-1
C44	CMC-AC510PR3K-2	R24	RAY-BMX0001-1
C45	CFM-AS4700P50V-1	R27	RCB-AP100
C46 -48	CFM-ASR015U50V-1	R28	RCB-AP100
C49 -51	CSM-AGR1U50V	R29	RCB-AP75
C52 -54	CCK-AR10U25V-1	R31	RCB-AP51
C55 -57	CSM-AGR1U50V	R32 -35	RCB-AG10K
C58	CCK-AR10U25V	R36	RCB-AG100
C60	CCP-ADR1U50V	R37	RCB-AG1K
C61	CCP-AC5P50V	R38	RCB-AG470
C62 -64	CCK-AR10U25V	R39	RCB-AG1R2K
D1	SDZ-W110-5	R40	RMF-AC18KFJ
D2	SDS-1SV153	R41	RMF-AC10KFJ
D3	SDS-1SS270	R42	RMF-AC18KFJ
D4	SDZ-W061-5	R43	RMF-AC10KFJ
D5	NLD-000016-1	R44	RMF-AC180KFJ
D6	SDZ-W061-5	R45	RMF-AC3R9KFJ
FB1	ESM-000129-1	R46	RMF-AC10KFJ
FL1	DNF-001052	R47	RCB-AG12K
FL2 -4	DNF-001052	R48	RCB-AG10K
J1 -2	JCF-AN001JX01-1	R49 -50	RCB-AG1R2K
L1 -4	LCL-B00052	R51	RCB-AG10K
L5	LCL-A00773-1	R52	RCB-AG12K

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
R53	RCB-AG390		
R54	RCB-AG390		
R56 -57	RMF-AC100QFJ		
R58	RCB-AG82K		
R59	RCB-AG10K		
R60	RCB-AG2R2K		
R61	RCB-AP75		
R62	RCB-AP100		
R63	RCB-AP100		
R64	RCB-AP120		
R65	RCB-AP75		
R66	RCB-AP75		
R67	RCB-AP33		
U1	SIA-1656		
U2 -3	SIA-1651		
U4	SIA-733N-2		
U5	SIT-74LS112		
U6	SIA-TL072-1		
U7	SIA-393-1		
U8	SIT-74LS73		
U9	SIT-74LS92		
U10	SIT-74LS00		
U11	SIA-7805L		
U12	SIA-7812L-8		
U13	SIA-79L12-1		
U14	SIA-TL7700		
W1	YEE-000265-1		
Y1	JCP-AA003PX05-1		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
B1	DMF-001066-1	D4	SDP-RG2-1
C1	CMC-AC680PR3K-2	D5	NLD-000019-1
C2	CCK-BV820U250V-1	D6	SDS-S25SC6M-1
C3	CSM-AX4700P2K-1	D7 -10	SDP-D8LCA20-1
C4	CCK-BV820U250V-1	D11	SDP-D8LCA20R-1
C6 -7	CCK-AR10U25V	D12	SDP-D8LCA20-1
C8	CMC-AC680PR3K-2	D13	SDP-W02-1
C9	CCK-AR1U50V	D14	SDS-1S954-1
C10	CCK-AR33U16V	D15	NLD-000019-1
C11 -12	CCK-BW4700U10V-1	D16	SDS-1S954-1
C13 -14	CSM-ACR01U50V	D17 -18	SDZ-W150-5
C17	CCK-BW1000U50V-1	D19	SDP-RG2-1
C19	CCK-BW1000U50V-1	D20	SDZ-W061-5
C21	CCK-BW1000U25V-1	D21 -22	SDZ-W150-5
C23	CCK-BW1000U16V-1	D23	SDP-RG2-1
C25 -26	CCK-BW1000U35V-1	D24 -25	NLD-000020-1
C27	CTA-AC1U50V	D26	SEE-03P4M-1
C28	CSM-ACR01U50V-1	D27	SDS-1S953-1
C30	CCK-BN2200U35V-1	D29	SEE-03P4M-1
C31 -32	CSM-ACR1U50V	D32	SDS-1S954
C33 -34	CCK-AR47U25V	D33	SDS-1S953
C39	CSM-AC2200P50V	D34	SDZ-D360-1
C40	CFM-AS1000P50V-1	D35	NLD-000019-1
C41 -42	CCK-AR47U25V	D36	SDS-1S954
C43 -44	CCK-AR10U25V	D37	SDZ-D360-1
C49	CSM-ACR1U50V	D38	NLD-000019-1
C51 -53	CSM-ACR01U50V	D39	SDS-1S954
C55 -56	CSM-ACR1U50V	D40	NLD-000019-1
C57 -58	CCK-AR10U25V	D41	SDS-1S954
C59 -60	CSM-ACR1U50V	D43	SDZ-D360-1
C61	CCK-AR10U25V	D44	NLD-000019-1
C62	CSM-ACR1U50V	D45	SDS-1S954
C63	CCK-AR100U25V	D46	NLD-000019-1
C64	CSM-ACR1U50V	D47	SDZ-H3-5
C65	CCK-AR10U50V	D50	SDS-RB602
C66	CCK-AR10U50V	D51	SDZ-W067
C67	CSM-ACR1U50V	D52	SDS-1S954
C68	CCK-AR10U25V	D60 -63	SDS-1SS270
C70	CSM-AGR22U50V	D64	NLD-000020
C71	CSM-AGR1U50V	D65	SEE-03P4M-1
C72	CSM-AGR1U50V	D66	SDS-1SS270
C73	CSM-AGR047U50V	E1 -4	DSP-000987-1
C74	CSM-AGR1U50V	F1	DFT-AF4A
C75	CCK-AR22U10V	F2 -3	DFS-ABR1A-1
C76 -78	CSM-AGR1U50V	F4	DFT-AAR315A-1
C79	CCK-AR10U16V	J1	JCP-BG010PX02-1
C80	CSM-AGR1U50V	J2	JCP-BG008PX02
C81	CSM-AGR1U50V	J3	JCP-AA012PX07-1
C82	CCK-AR100U25V	J4	DNF-001319-1
C83	CCK-AR10U25V	K1	KRL-000839-1
D1	SDP-RG2-1	L1	LTP-000850-1
D2 -3	SDS-1S953-1	L3 -4	LCL-C00860-1

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
L5	LCL-C01036-1	R64	RCB-AG10K
L6	LCL-C00861-1	R65	RMF-BJ22KFJ-1
L7	LCL-C00857-1	R66	RMF-AC4R7KFJ-4
L8	LCL-C00858-1	R67	RCB-AH220
L9 -10	LCL-C00859-1	R68	RVR-DF1K-1
NF1	JCD-AA003PX02-1	R69	RCB-AH2R2K
Q1 -2	SFM-2SK313	R71	RCB-AG680
Q3 -4	STN-2SC1959-5	R73	RCB-AH330
Q5	STP-2SA1015	R74	RVR-DF200
Q6	STN-2SC510	R75	RCB-AH4R7K
R5	RCB-AK56K-1	R76	RCB-AG680
R6	RMF-AJ68QJM-1	R77	RCB-AG560
R7	RCB-AK56K-1	R81	RCB-AG1R5K
R9	RCB-AG4R7K	R82	RCB-AG220
R10	RMF-AJ68QJM-1	R83	RCB-AH10K
R11	RCB-AH10K	R84	RCB-AG1K
R12	RVR-DF2K	R85 -86	RMF-BJ10KFJ-1
R13	RCB-AH10K	R87	RCB-AG680-4
R14	RCB-AH4R7	R88	RCB-AG680-4
R15	RCB-AH560	R89	RMF-AC110KFJ-4
R16	RCB-AK51	R90	RCB-AF3R3
R17	RCB-AH4R7	R92 -93	RCB-AG10K-4
R20	RPW-AT2K-1	R94	RCB-AG4R7K-5
R22	RPW-AT560-1	R95 -97	RCB-AG10K-4
R24	RCB-AF220	R98	RCB-AG2R2K
R26	RCB-AK100	R99	RCB-AG10K-4
R27	RCB-AK51	R100	RCB-AG1R2K
R28 -29	RCB-AF330	R101	RMF-AR20KFK
R30	RMF-AC1KFJ-3	R102	RVR-DF10K
R31	RVR-DF500-1	R103	RMF-AR20KFK
R32	RMF-AC560QFJ-3	R104-105	RMF-AR10KFK
R33	RCB-AH1	R106	RCB-AG10K-4
R34	RCB-AG1K	T1	LTP-000851-1
R35	RCB-AG560	T2	LTP-000863-1
R36	RCB-AK22	T3	LTP-000848-1
R37	RCB-AH470	T4 -5	LTP-000862-1
R39	RCB-AG820	TF1	DST-001471-1
R41	RCB-AK22	TF2	DST-001471-1
R42	RCB-AH470	TH1 -2	DSP-000018-1
R44	RCB-AG51-4	U1	SIA-S3122-1
R45	RCB-AH68	U3	SIA-393-1
R46	RCB-AG51-4	U5	SIA-SG3524-1
R47	RCB-AG330K	U9	SIA-338-1
R48	RCB-AG82K	U10	SIA-337HV-1
R49	RCB-AG33K	U11	SIA-S3122-1
R50	RCB-AG5R6K	U12	SIA-7824U-5
R51	RCB-AG330K	U13	SIA-7805K-1
R52	RCB-AG4R7K	U21	SIA-393
R53	RCB-AG10K	U22	SIM-74HC4538
R59	RCB-AG560	U23	SIA-TL7705
R60	RCB-AG1K	U24	SIA-7805L-6
R61	RVR-DF200-1		

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Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CSM-AGR1U50V	R21	RMF-AR2R7KFK
C3	CFM-AS4700P50V	R22	RMF-AR6R8KFK
C4 -5	CSM-AGR1U50V	R23	RPW-ATR56-1
C6 -7	CSM-AG1U50V	R24	RCB-AG2R2K
C8 -9	CSM-AC1000P50V	R25	RMF-AR2R7KFK
C10	CSM-AG1U50V	R26	RMF-AR6R8KFK
C11 -12	CSM-AGR1U50V	R27	RCB-AG560
C13 -15	CSM-AG1U50V	R28 -29	RCB-AG2R2K
C16 -17	CSM-AC1000P50V	R30 -35	RAY-AL3R9K8
C18	CSM-AG1U50V	R36	RCB-AG560
C19 -20	CSM-AGR1U50V	R37	RCB-AG6R8K
C21	CSM-AC1000P50V	R38 -39	RAY-AL3R9K8
C22	CSM-AC2200P50V	R40 -43	RCB-AG3R3K
C23	CSM-AG1U50V	R44 -48	RCB-AG560
C24	CSM-AC1000P50V	U1	SIM-74HC02
C25	CSM-AC2200P50V	U2	SIM-74HC04
C26	CSM-AG1U50V	U3	SIM-74HC273
C27 -30	CCK-AR47U25V	U4	SIT-74F74
C31 -32	CSM-AG1U50V	U5	SIM-74HC74
C33 -34	CCK-AR100U10V	U6	SIM-74HC04
C35 -37	CSM-AG1U50V	U7	SIT-74F04
C38 -70	CSM-AGR1U50V	U8	SIT-74F08
D1 -3	NLD-000020	U9	SIM-74HC04
D4 -9	NLD-000016	U10	SIM-74HC164
J1	JCS-BQ096PX01-1	U11	SIM-74HC00
J2	JCF-AC001JX01	U12 -13	SIM-74HC02
J3 -5	JCP-AA003PX05-1	U14	SIT-74F244
J6 -14	JCP-AA002PX02-1	U15	SIM-74HC04
J15	JCP-AA003PX05-1	U16 -17	SIT-74F74
L1 -2	LCL-C00010-1	U18	SIT-74LS125
L3	LCL-T00083A	U19	SIT-74LS273
Q1	STP-2SA1225	U20	SIT-74F138
Q2	STN-2SC1815-55	U21	SIT-74F74
Q3	STP-2SA1015	U22 -23	SIM-74HC74
Q4	STN-2SC2983	U24 -25	SIM-74HC164
Q5	STP-2SA1015	U26	SIM-32010A
Q6	STN-2SC1815-55	U27	SIT-74F74
R1	RVR-BE1K	U28	SIM-NS32081D
R2	RVR-CB100K	U29	SIM-74HC157
R3	RVR-BE5K	U30	SIT-74F138
R4 -5	RVR-CB100K	U31	SIT-74F00
R6	RMF-AR22KFK	U32	SIM-74HC151
R7	RMF-AR1KFK	U33	SIM-74HC86
R8	RMF-AR1R5KFK	U34	SIM-74HC390
R9	RMF-AR10KFK	U35	SIM-74HC74
R10	RAY-AL4R7K4	U36 -37	SIT-74F32
R11 -12	RAY-AL4R7K6	U38	SIT-74F157
R13 -14	RMF-AE50QDG	U39	SIM-74HC08
R15	RMF-AR1R5KFK	U40	SIM-74HC175
R16	RCB-AG10K	U41	SIA-398-1
R17 -18	RMF-AR10KFK	U42	SIM-74HC86
R19	RPW-ATR56-1	U43	SIM-74HC04
R20	RCB-AG2R2K	U44	SIT-74LS395

R4611

BGP-014179 2/2

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
U45	SIM-74HC244		
U46	SIM-74HC74		
U47	SIM-74HC244		
U48	SIM-74HCT652		
U49	SIT-74LS670		
U50	SIM-74HC273		
U51	SIM-74HC74		
U52	SIT-74F04		
U53	SIA-TL081-1		
U54	SIM-74HC148		
U55 -56	SIT-74LS395		
U57	SMB-7136SK		
U58	SMB-7136SK		
U59	SIM-74HCT652		
U60	SIT-74LS670		
U61	SIM-74HC02		
U62	SIM-74HC74		
U63	SIM-74HC32		
U64	SIM-74HC193		
U65 -66	SIT-74LS395		
U67 -68	SMM-2018A		
U69	SIM-74HCT652		
U70	SIT-74LS670		
U71	SIM-74HC00		
U72	SIM-74HC138		
U73	SIM-74HC00		
U74	SIA-PGA100BG		
U75	SIA-ADC574A-1		
U76 -77	SMM-2018A		
U78	SIM-74HCT652		
U79	SIT-74LS670		
U80	SIM-74HC05		
U81	SIM-74HC138		
U82	SIM-74HC08		
U83 -85	SIM-74HC244		
U86	SIA-TL084-1		
U87	SIA-TL081-1		
U88	SIM-74HC74		
X1	DXC-000113-1		

R4611

BGG-014202

Parts No.	ADVANTEST Stock No.
C1	CSM-AGR1U50V
C2	CSM-AG1U50V
C3 -4	CCK-AA100U10V
C5 -33	CSM-AGR1U50V
D1 -9	NLD-000016
J1 -2	JCS-BQ096PX01
L1	LCL-T00084A
P121-125	DMY-000934-1
R1	RAY-AL680Q4
R2	RCB-AG560
R3	RCB-AG1K
R4 -6	RAY-AL10K8
R8	RAY-AL680Q4
R9	RAY-AL1K4
R10	RCB-AG680
R11	RCB-AG12K
R12	RCB-AG1R5K
R13	RAY-AL10K8
R14	RCB-AG680
R15 -20	RAY-AL10K8
R21 -22	RCB-AG820
R23	RCB-AG1K
R24 -25	RAY-AL680Q4
R26	RAY-AL10K8
R27	RAY-AL10K6
R28	RCB-AG10K
R29	RAY-AL10K8
R30	RCB-AG390
R31	RAY-AL1K4
R32 -33	RAY-AL10K4
SW1	KSP-000761
SW2	KSA-000273
TP1 -3	JTE-AH001JX01
U1	SIM-74HC4002
U2	SIM-8254C
U3	SIT-74F74
U4	SIM-74HC10
U5	SIM-74HC164
U6	SIM-74HC03
U7	DXC-000661
U8	SIM-74HC4075
U9	SIM-74HC393
U10	SIM-74HC04
U11 -12	SIM-74HC08
U13	SIM-74HC04
U14	SIM-74HC00
U15	SIM-74HC32
U16	SIM-68020A
U17	SIM-74HC30
U18	SIM-74HC148
U19	SIM-74HC30
U20	SIT-74LS38
U21 -22	SIT-74F245
U23 -25	SIT-74F244
U26	SIM-74HC138
U27	SIM-74HC139
U28	SIM-74HC04
U29 -30	SIM-74HC11
U32	SIM-74HC32
U33	SIM-74HC27
U34	SIM-74HC175
U35	SIM-74HC4075
U36 -37	SIM-74HC138
U38	SIM-74HC4075
U39	SIM-74HC138
U41	SIA-TL7700
U42	SIM-74HC14
U43	SIM-74HC125
U44	SIT-74LS05
U45 -46	SIT-74F245
U49 -50	SIM-74HC244
U52 -53	SIM-74HC245
U54	SIM-68881PGA
U70	SIM-74HC74
U74	SIM-8251
U76	SIM-74HC32
U81	SIM-74HC163
U83	SIM-74HC273-1
U84	SIM-74HC244

R4611

BGG-014203

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CCK-AA100U10V		
C3 -26	CSM-AGR1U50V		
C27	CCK-AA100U10V		
D1	NLD-000016		
J1 -2	JCS-BQ096PX01		
L1 -2	LCL-T00084A		
R1 -32	RCB-AG100		
R33 -48	RCB-AG51		
R49 -52	RCB-AG100		
R53 -56	RCB-AG270		
R57	RCB-AG470		
TP1 -3	JTE-AH001JX01		
U1 -20	SMM-62256A-4		
U21	SIT-74LS03		
U22	SIM-74HC138		

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R4611

BGG-014204

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1	CTA-AC1U50V	U34 -35	SIM-74HC74
C2	CFM-AHR1U100V	U37	SIM-74HC125
C3	CTM-BQ50P	U38 -41	SIM-74HC374
C4 -8	CSM-AG1U50V	U42	SIM-WD2793
C9 -30	CSM-AGR1U50V	U43	SIM-74HC04
D1	SDS-1S953	U45	SIT-74LS06
D2	NLD-000016	U46	SIT-74LS123
D3 -4	SDZ-D030	U47	SIM-74HC138
D5 -11	NLD-000016	U48 -50	SIM-74HC74
E1	DEE-001129	U52	SIM-74HC04
J1 -2	JCS-BQ096PX01	U55	SIT-74LS05
J3	JCR-AF026PX02	U57	SIT-75189
J4	JCP-AA012PX07-1	U58	SIT-75188
L1 -3	LCL-T00084A	U60	SIM-8251
R1 -3	RCB-AG680	U61	SIM-9914
R4	RAY-AL3R9K8	U62	SIT-75160
R5 -6	RCB-AH1R2K	U63	SIT-75162
R7 -8	RAY-AL10K8	U67	SIM-8254
R9	RCB-AH1K	U70	SIT-74LS374
R10 -13	RAY-AL3R9K8	U71	SIM-74HC273
R14	RCB-AG150K	U73	SIT-74LS244
R15	RCB-AG1K	U76	SIM-74HC125
R16	RCB-AH1K	U82	SIM-74HC02
R17	RVR-CB50K		
R18	RCB-AG1K		
R19	RAY-AL10K8		
R20	RCB-AG560		
R21 -28	RCB-AG100		
R29	RAY-AL10K8		
S1	KSA-000689		
SW1	KSP-000761		
TP1 -10	JTE-AH001JX01		
U1	SIM-68000PGA		
U2	SIM-74HC20		
U3	SIM-74HC138		
U4	SIM-74HC244		
U5	SIM-74HC164		
U6	SIM-74HC04		
U7	SIM-74HC138		
U8	SIM-74HC08		
U9	SIM-74HC244		
U11	DXC-000109		
U12	SIM-74HC74		
U13	SIM-74HC393		
U15	SIM-74HC390-1		
U16	SIM-74HC04		
U17	SIM-74HC00		
U19	SIM-74HC32		
U20 -21	SIM-74HC148		
U22	SIM-74HC125		
U23 -26	SIM-74HC138		
U33	SIM-74HC244		

BGG-014205

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CCK-AA100U10V		
C3 -26	CSM-AGR1U50V		
D1	NLD-000016		
J1 -2	JCS-BQ096PX01		
L1	LCL-T00084A		
R1 -32	RCB-AG100		
R33 -48	RCB-AG51		
R49 -56	RCB-AG100		
R57	RCB-AG470		
TP1 -2	JTE-AH001JX01		
U1 -8	SMM-27C1001DA		
U9 -20	SMM-62256A-4		
U21	SIM-74HC138		

R4611

BGG-015038

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1 -2	CSM-AG1U50V		
C3 -18	CSM-AGR1U50V		
C19	CSM-AG1U50V		
C20 -26	CSM-AGR1U50V		
D1	NLD-000019		
J1 -2	JCS-BQ096PX01		
JU2 -7	JCI-AN028JX01		
L1	LCL-T00084A		
R1	RCB-AH560		
TP1 -3	JTE-AH001JX01		
U1	SIM-74HC139		
U2	SIM-74HC138		
U3 -8	SMM-27C512A		
U9 -24	SMM-62256A-4		

R4611

WBL-4611F

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
CB1	DCB-DD2428X01-1		
CB2 -3	DCB-FF0981X01-1		
CB5	DCB-FF0981X04-1		
F1	DFT-AF4A		
F2	DFT-AF4A		
J1	JCF-AB001EX05-1		

3P

R4611

BLB-013635

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
C1	CCK-AA100U16V		
CB1	DCB-QS0536-1		
J1	JCB-AB010JX01		
L1	LCL-T00083A-1		

R4611

BLC-013520X02

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
J1	JCB-BF010PX02-1		
S1 -7	KSP-000783-1		

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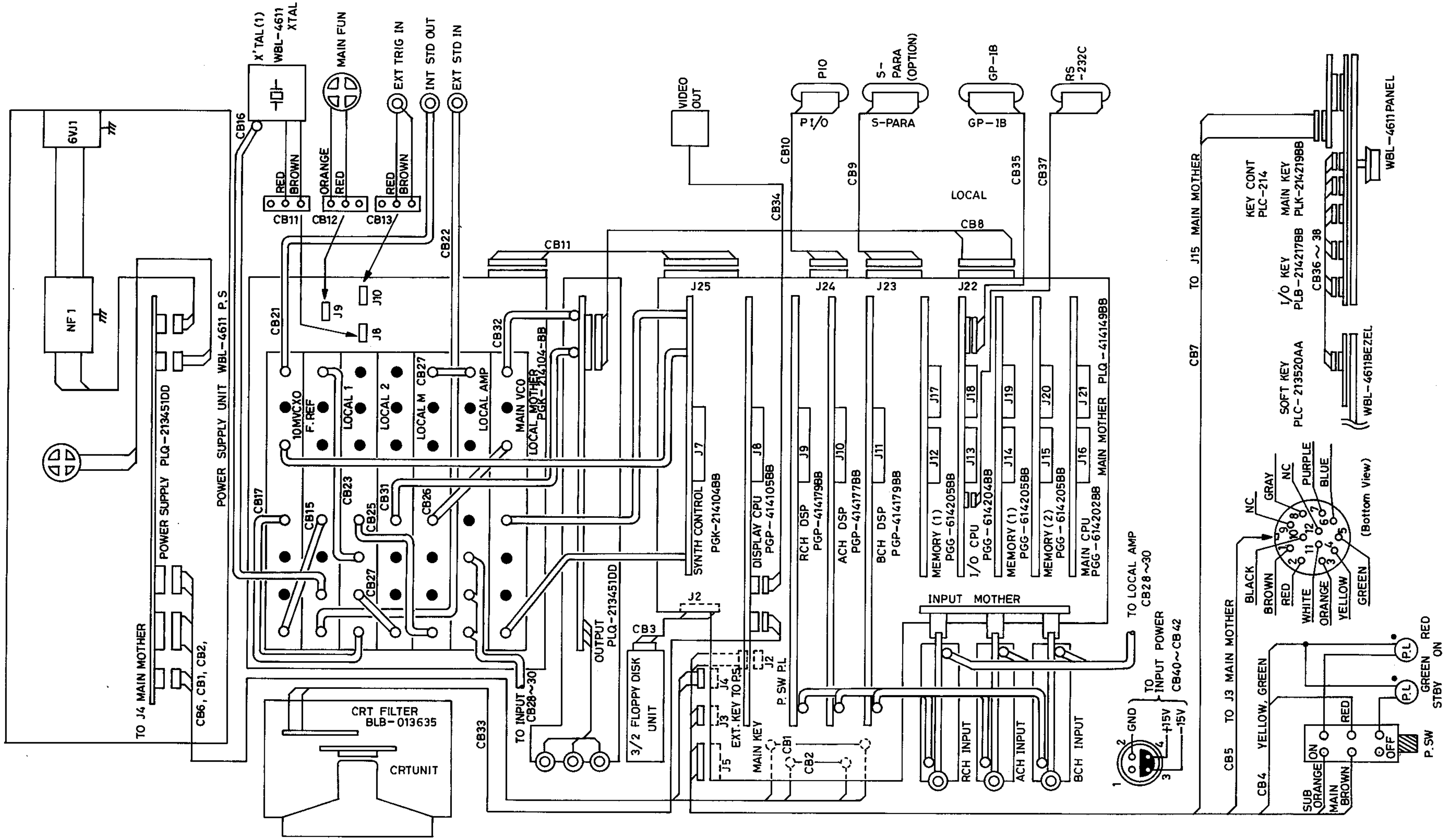
R4611

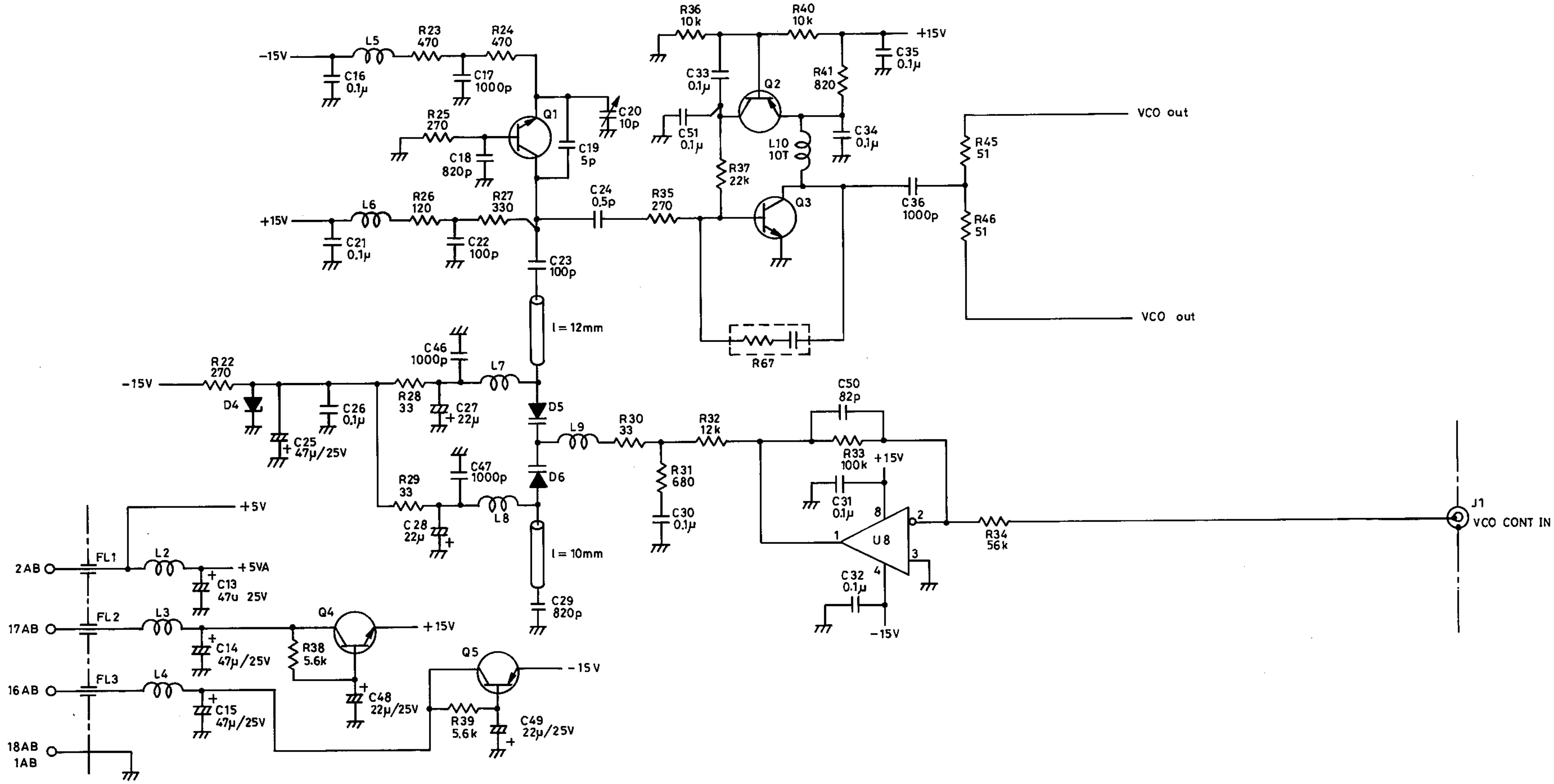
BLQ-014149

Parts No.	ADVANTEST Stock No.	Parts No.	ADVANTEST Stock No.
CB1	DCB-QS2665X01-1		
CB2	DCB-QS2666X01-1		
J1	JCR-AF034PX02-2		
J2	JCP-AA006PX03-1		
J3	JCP-AA012PX07-1		
J4	JCP-AA012PX07-1		
J5	JCR-AF034PX02-2		
J6	JCB-AM018JX01-1		
J7 -17	JCS-BQ096JX01-1		
J18	JCS-BQ096JX01-1		
J19	JCS-BQ096JX01-1		
J20	JCS-BQ096JX01-1		
J21	JCS-BQ096JX01-1		
J22	JCR-AF040PX02-2		
J23	JCR-AF016PX02		
J24	JCR-AF026PX02-2		
J25	JCR-AF034PX02-2		
R1 -3	RAY-BGX0015-1		

42*



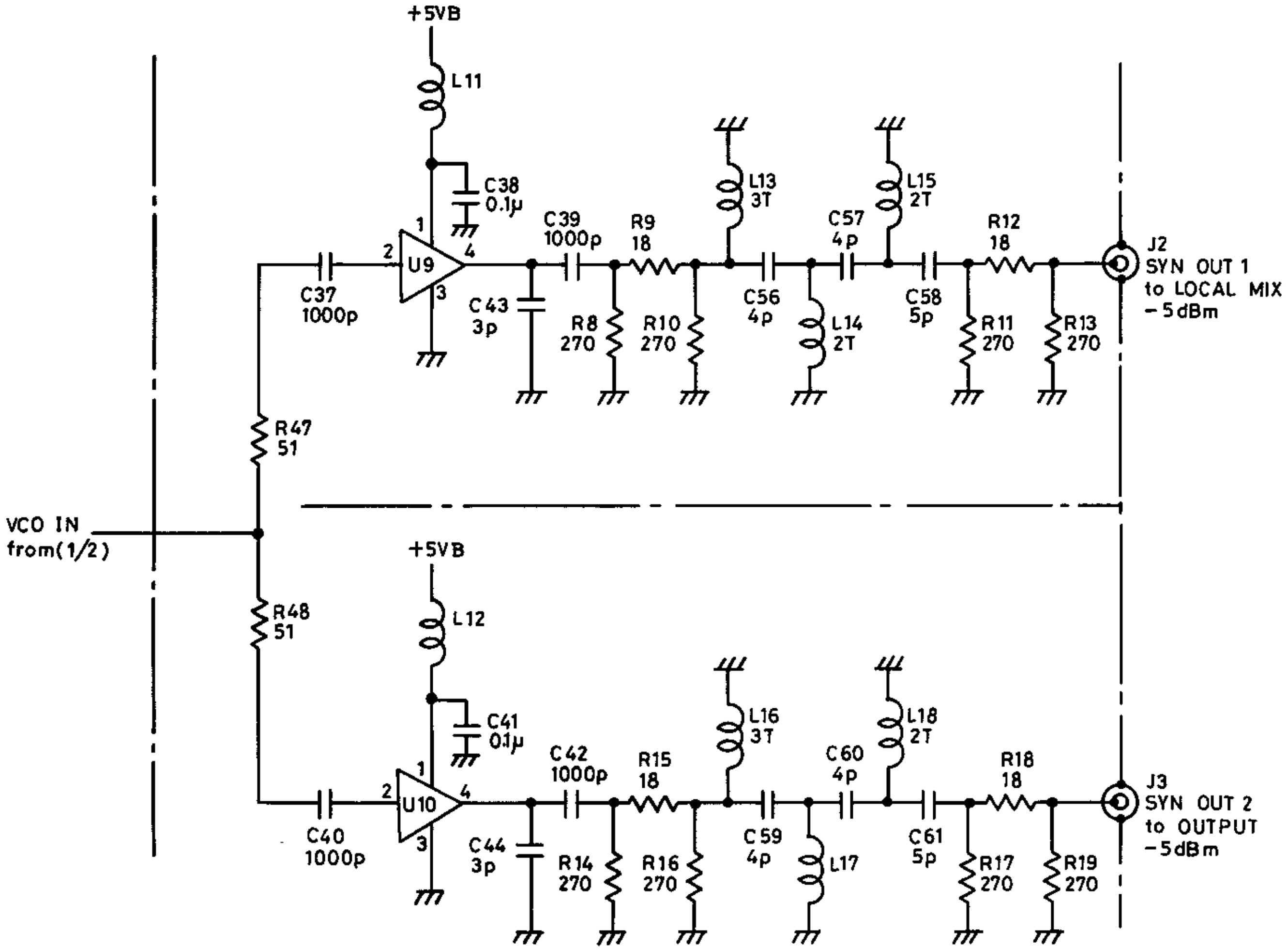
R4611
SCHEMATIC SECTION
WFU-4611E

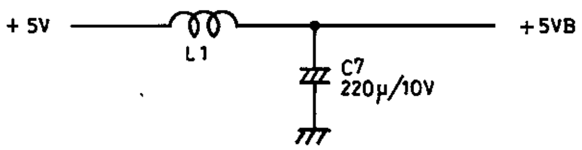


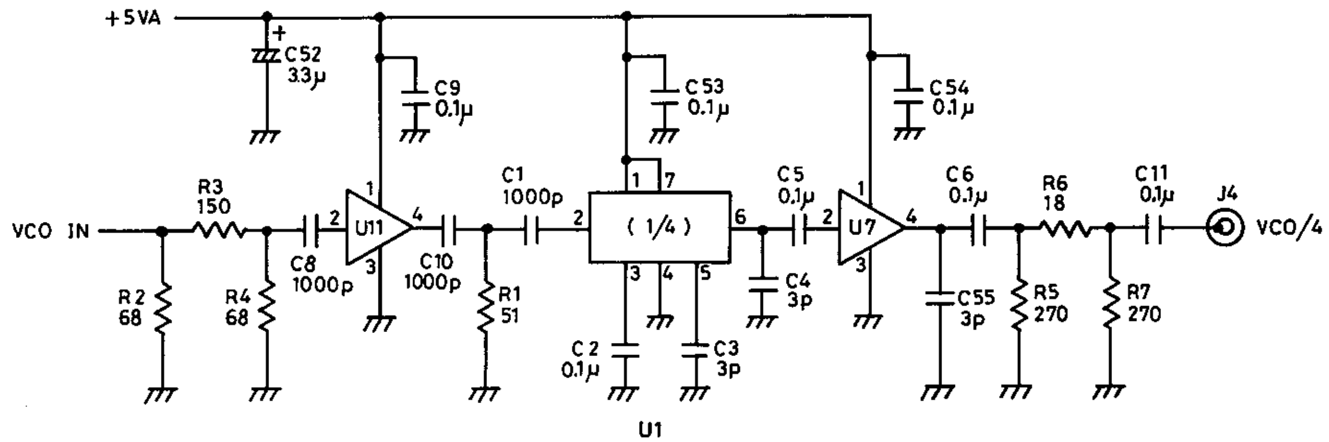
R4611

MAIN VCO (VCO)

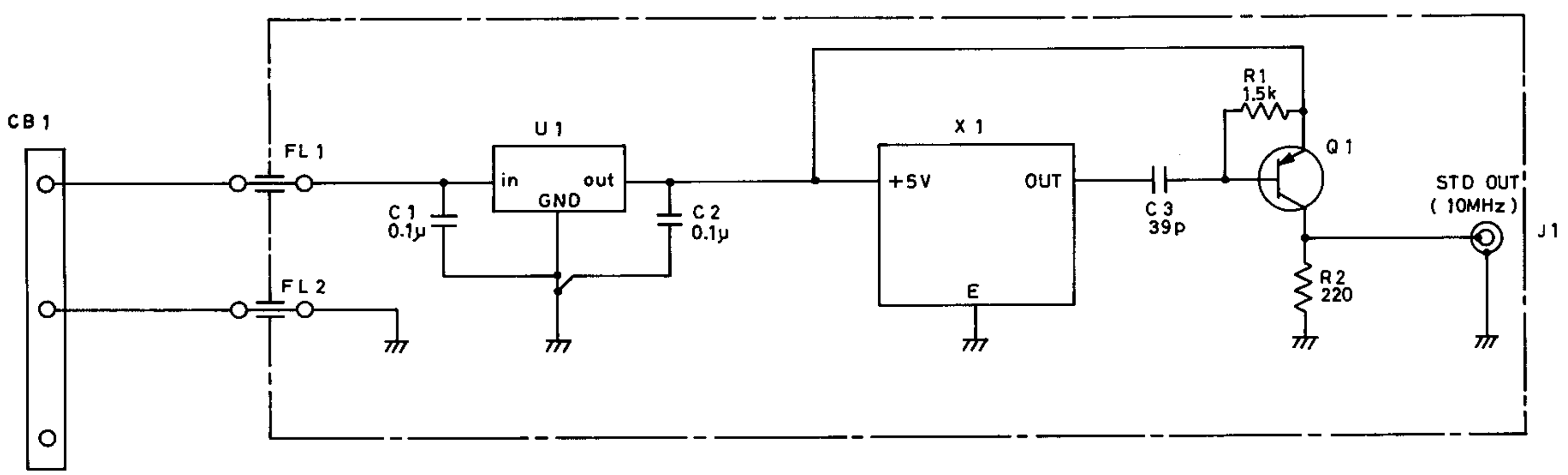
BGB-014092 1/2





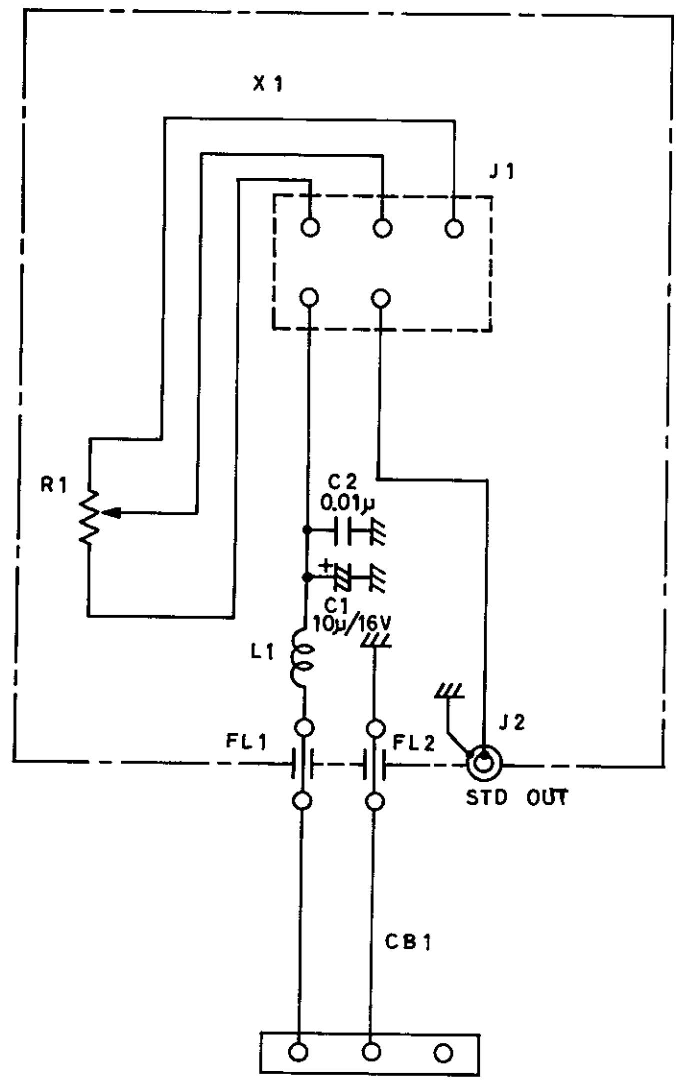


R4611
MAIN VCO (AMP)
BGB-014092 2/2

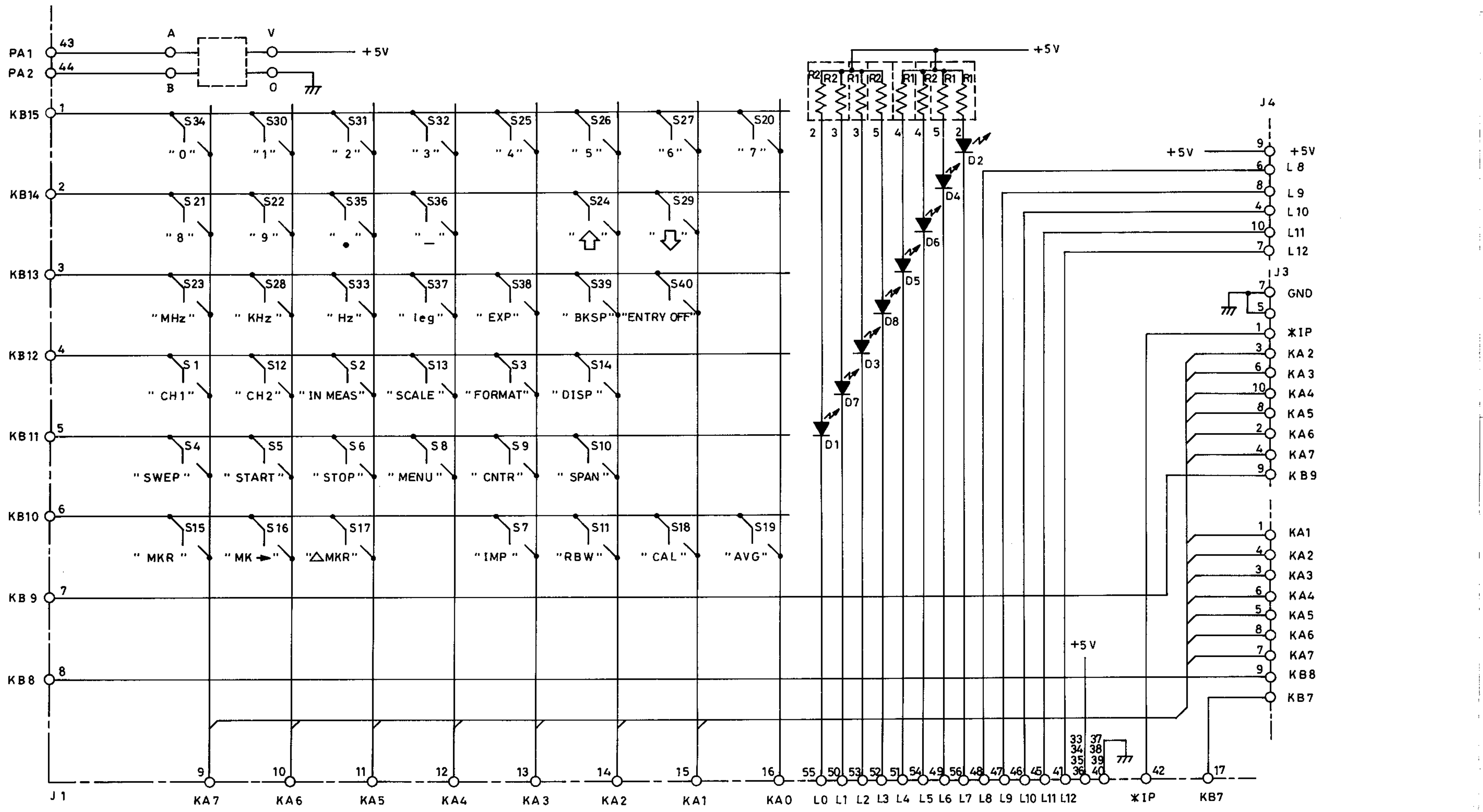


R4611
X' TAL (1)
BLB-014572

4

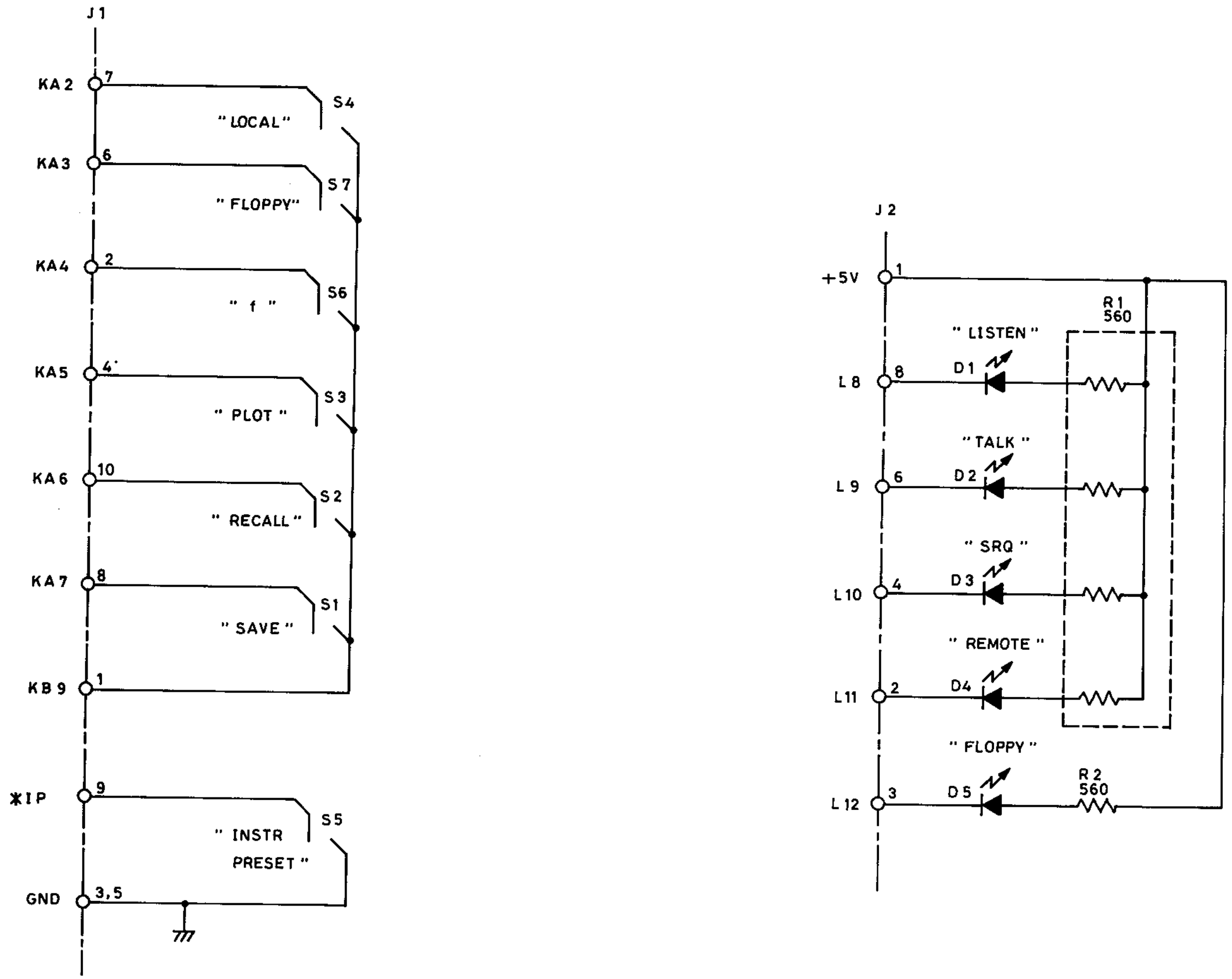


R4611
X' TAL (2)
BLB — 014147



R4611
MAIN KEY
BLK－014219

6



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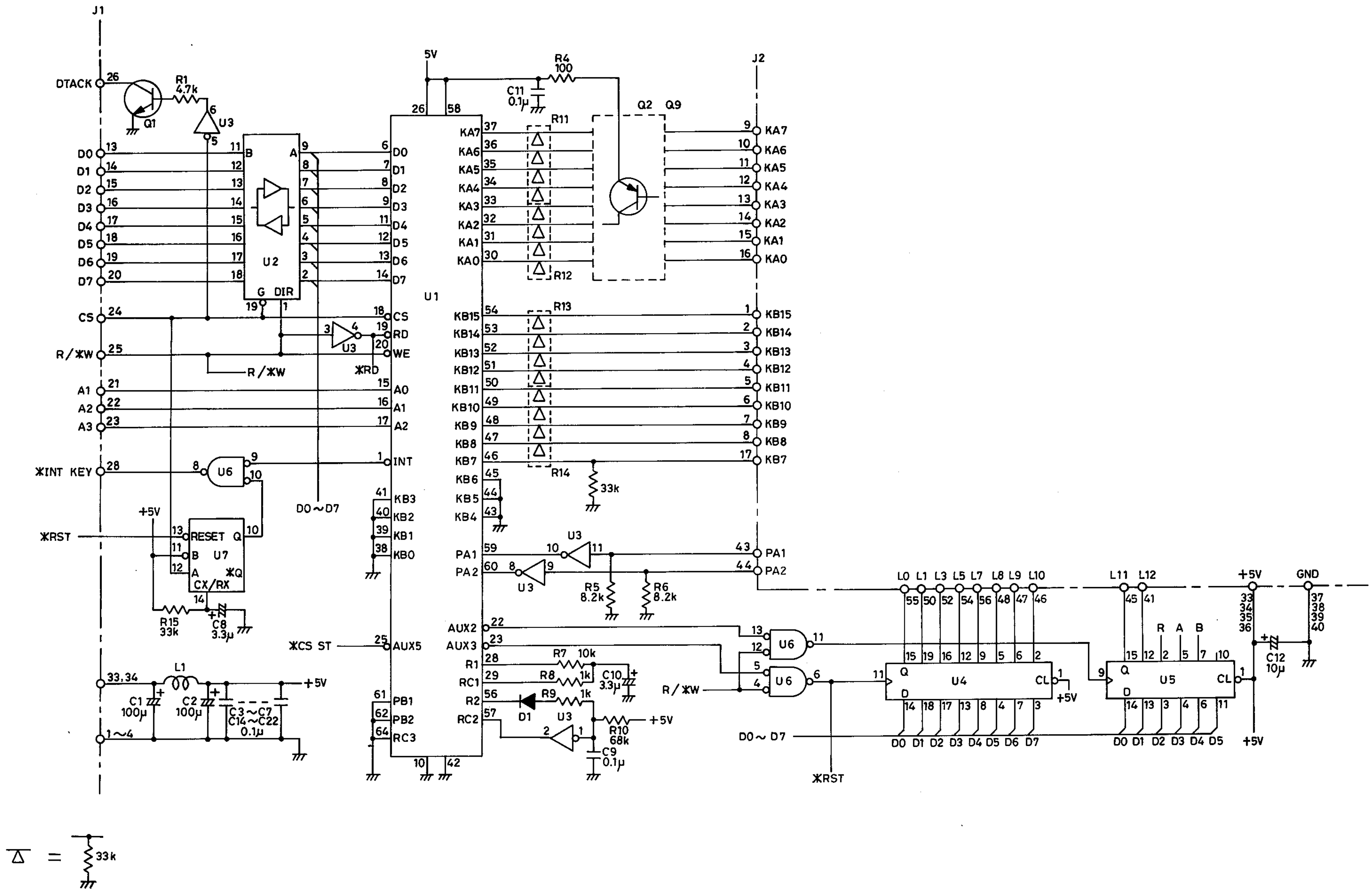
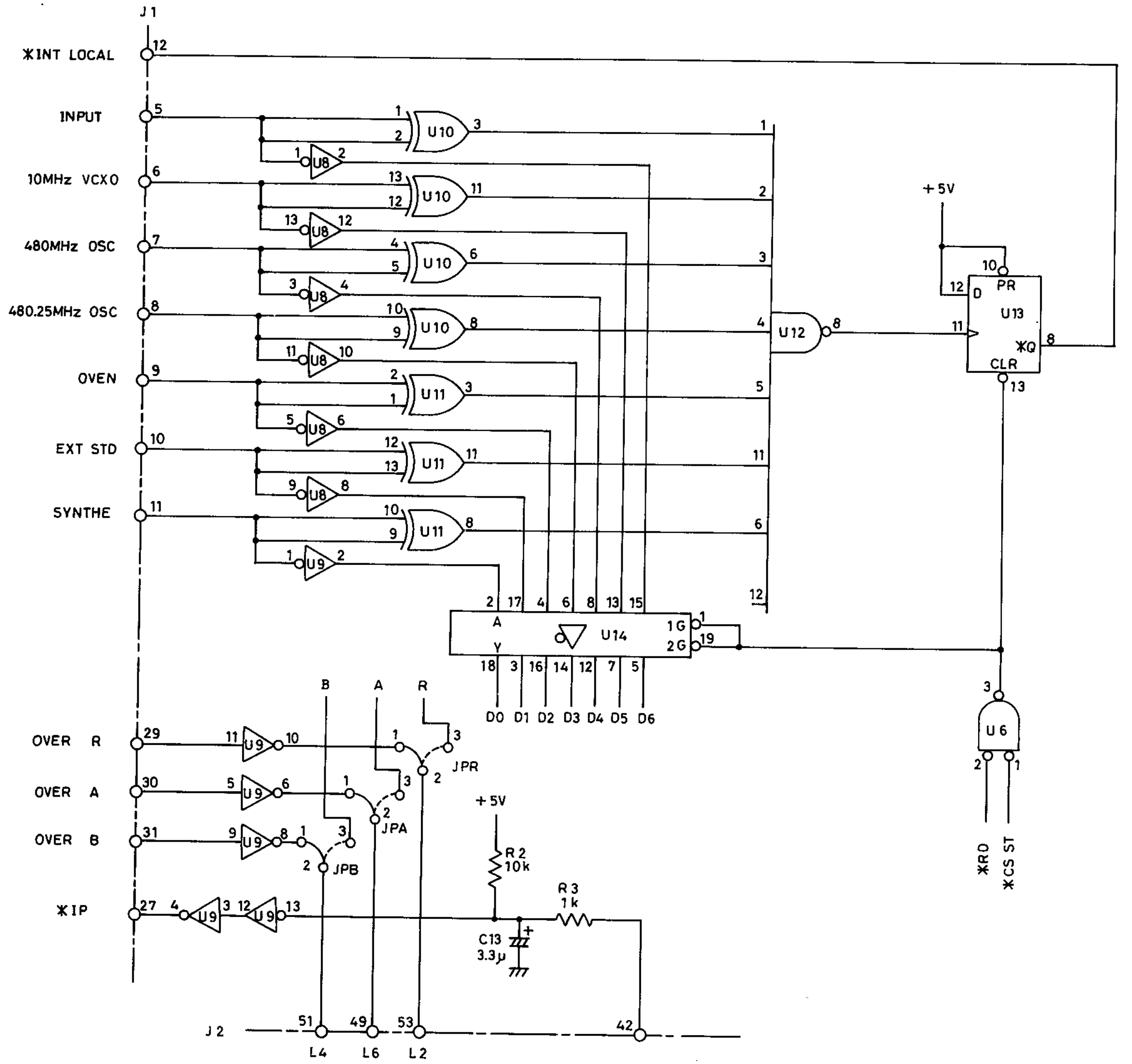
I/O KEY
BLB-014217

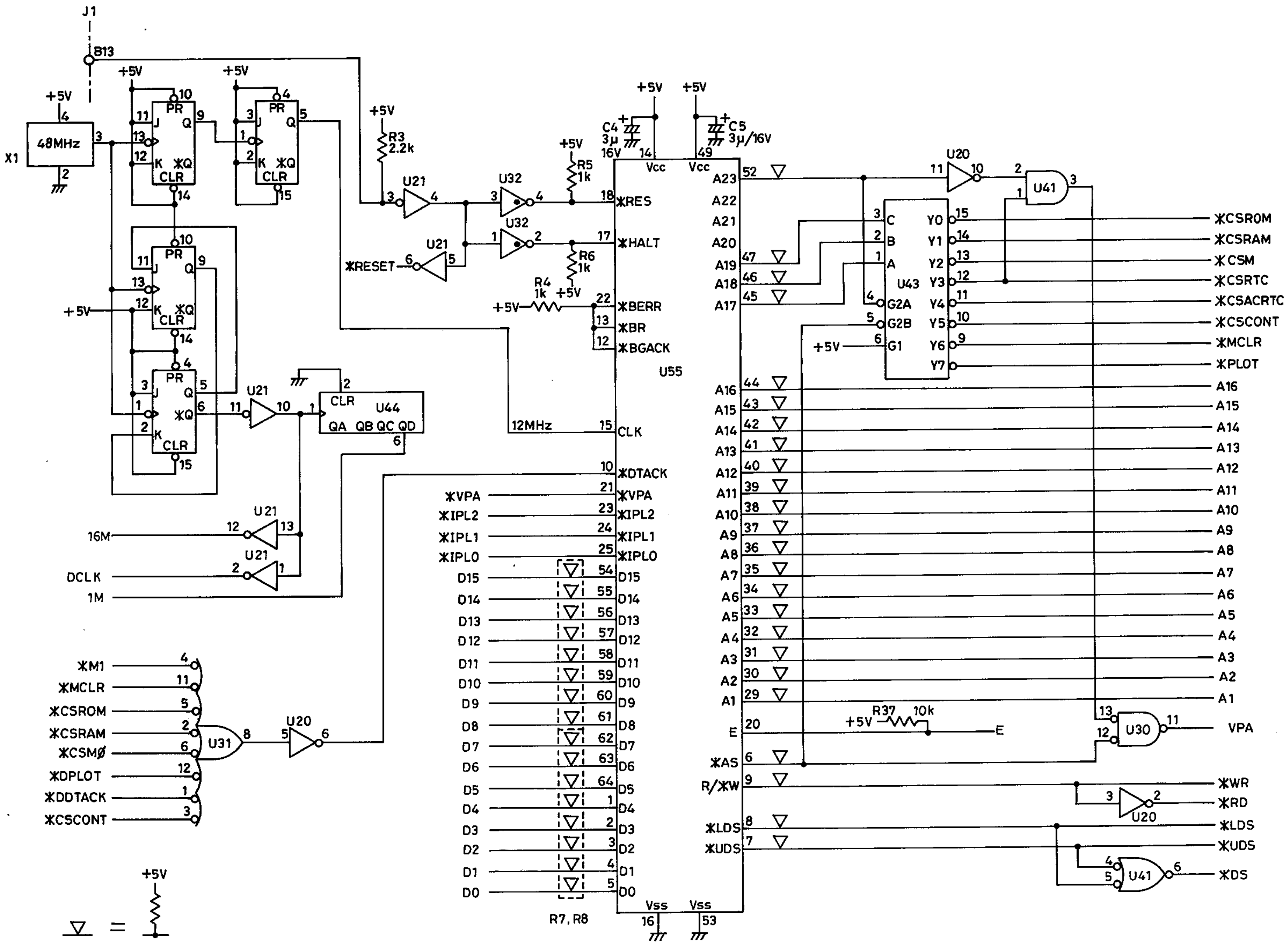
7



R4611
KEY CONT
BLD－014556 1/2



R4611
KEY CONT
BLD – 014556 2/2



R4611
DISP CPU
BGP－014105 1/10

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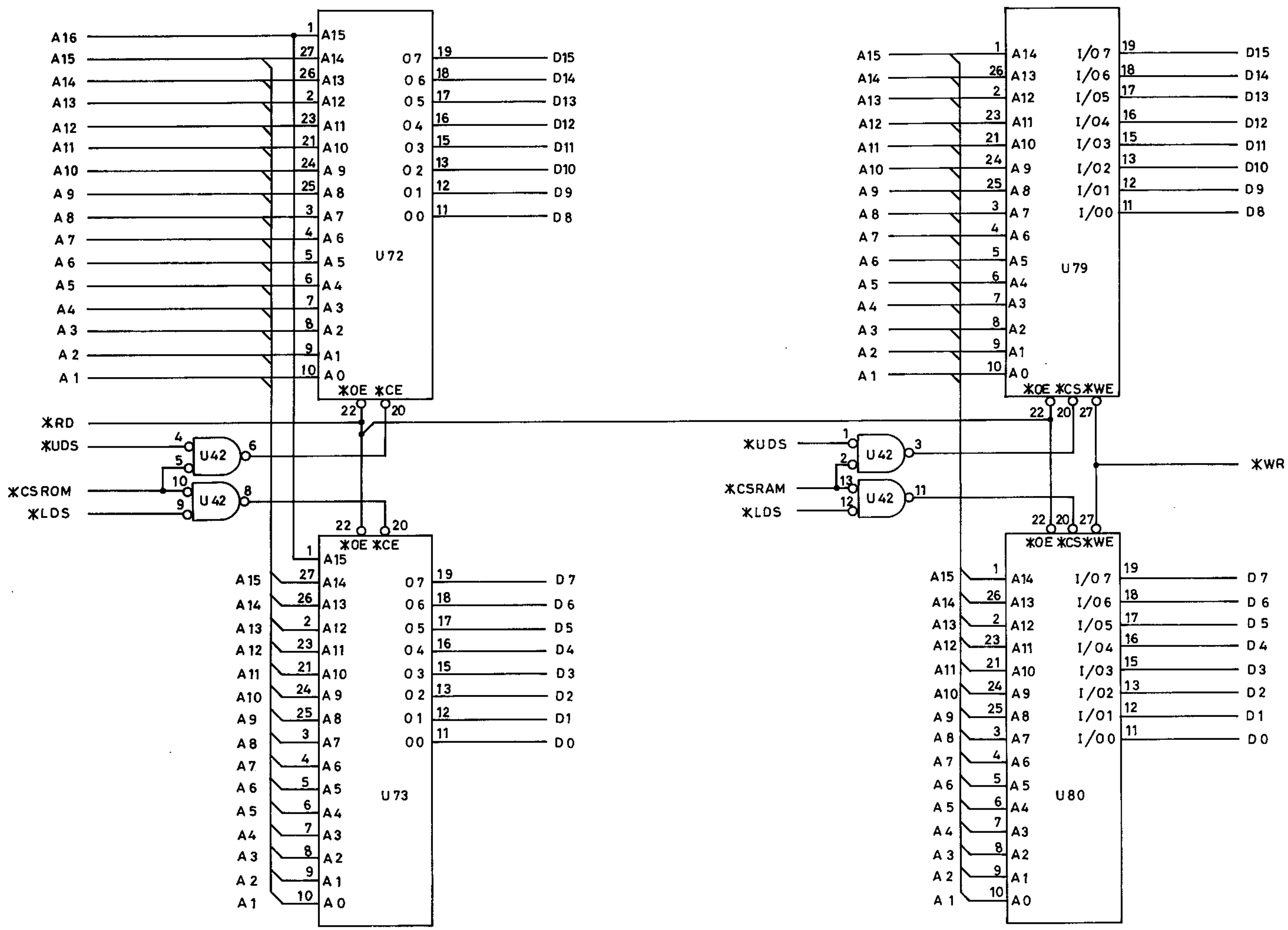

R4611
DISP CPU
BGP–014105 2/10

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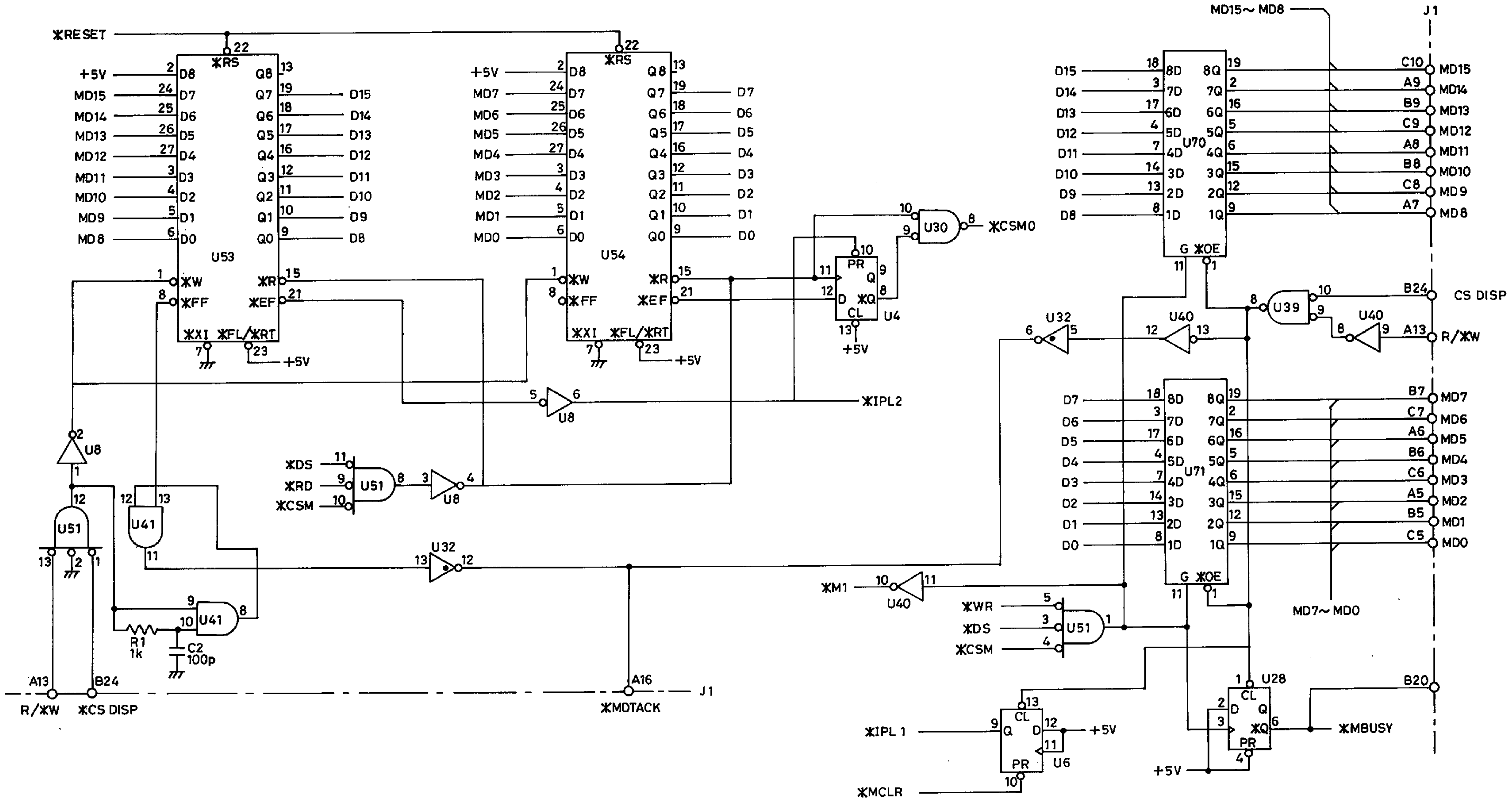
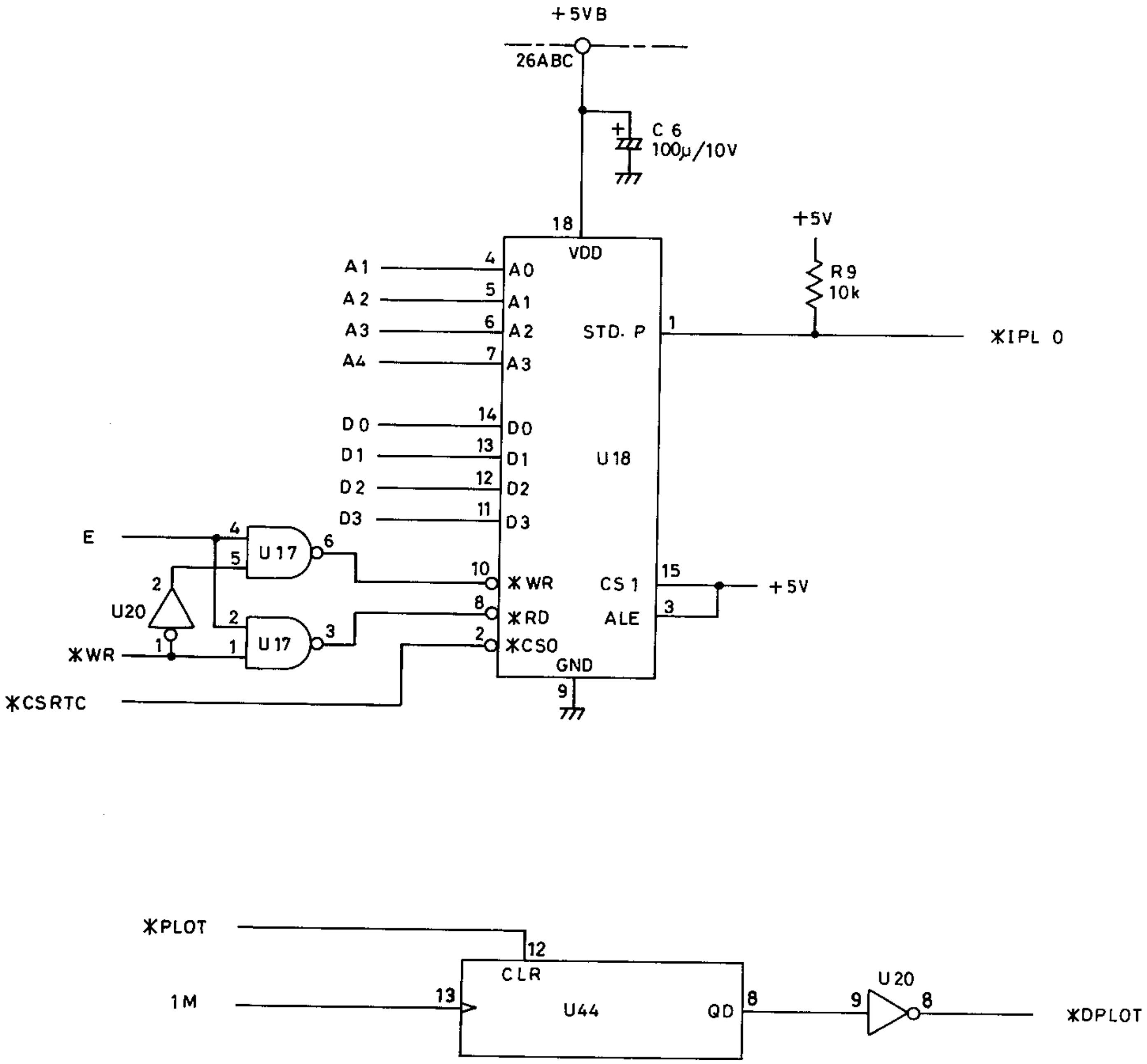


R4611
DISP CPU
BGP−014105 3/10



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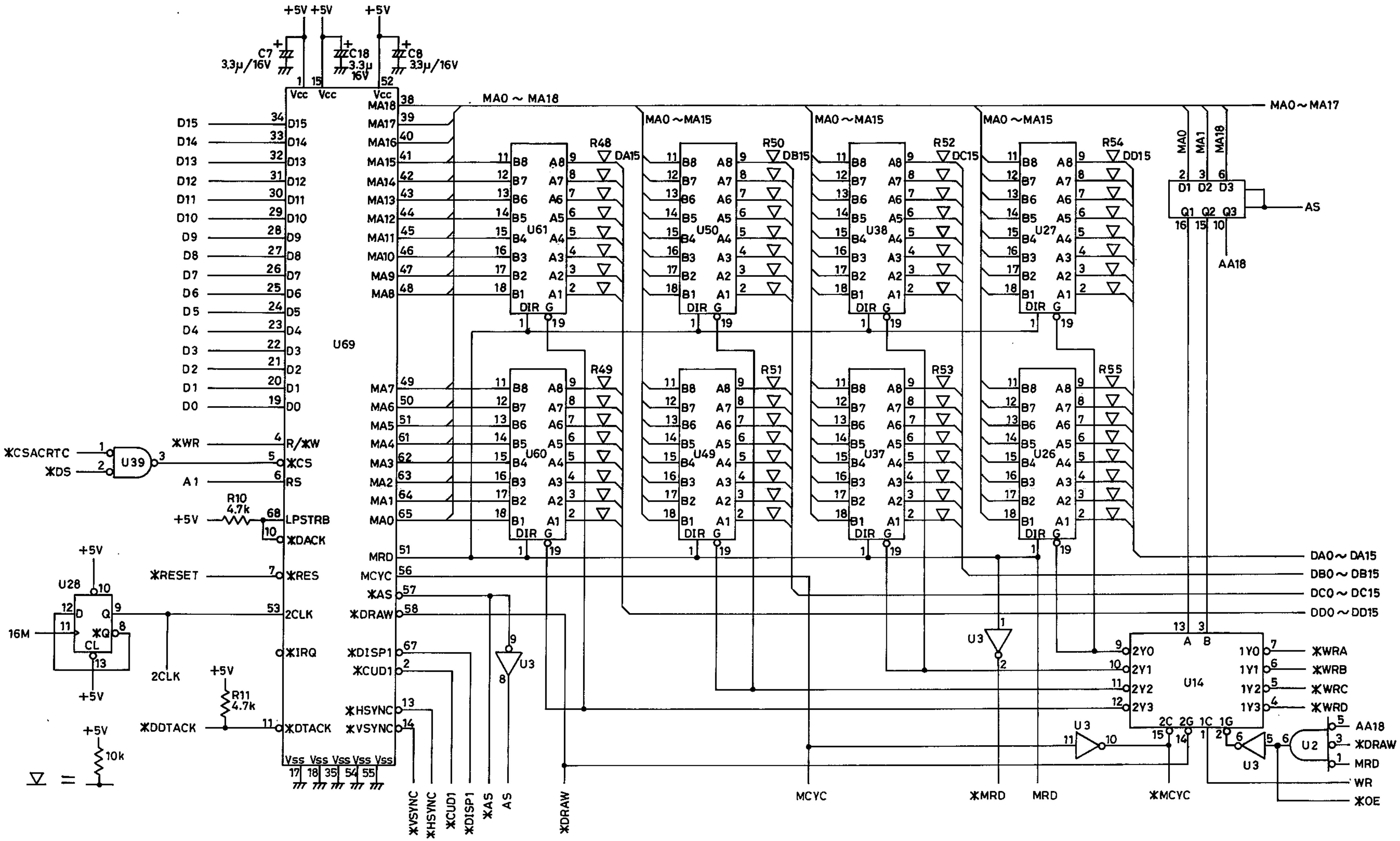
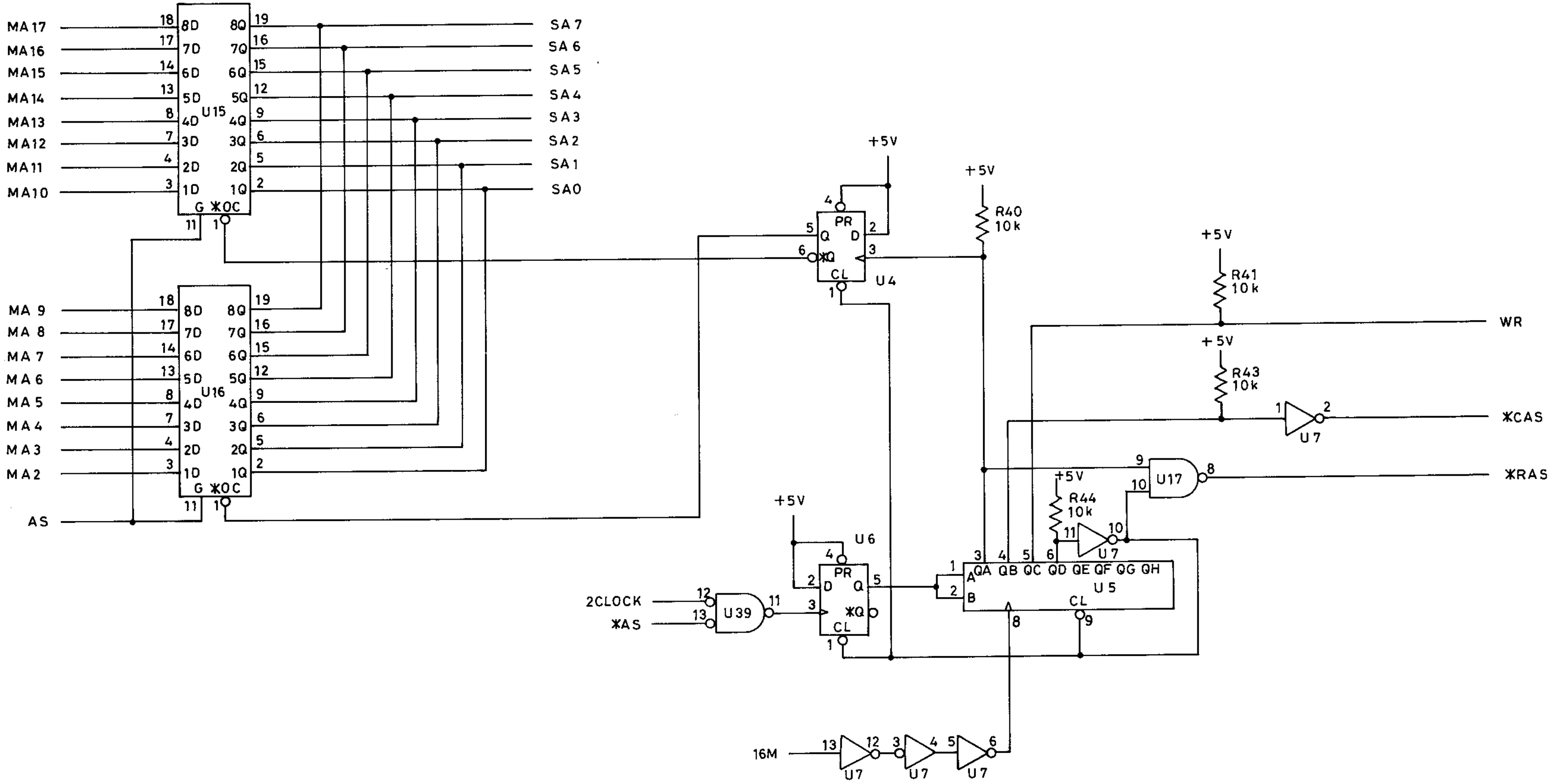
DISP CPU
BGP-014105 4/10

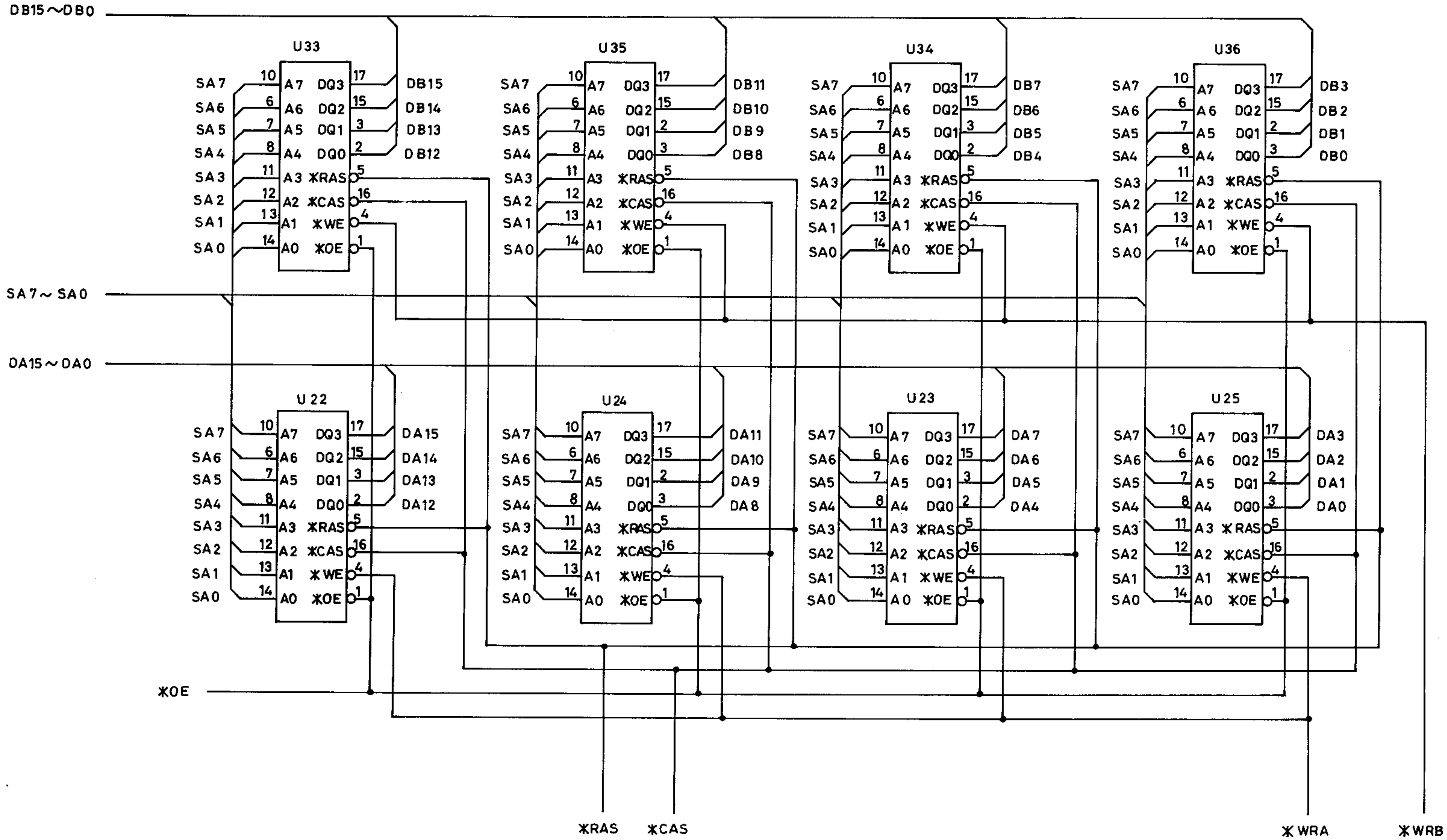


R4611
DISP CPU
BGP－014105 5/10

14

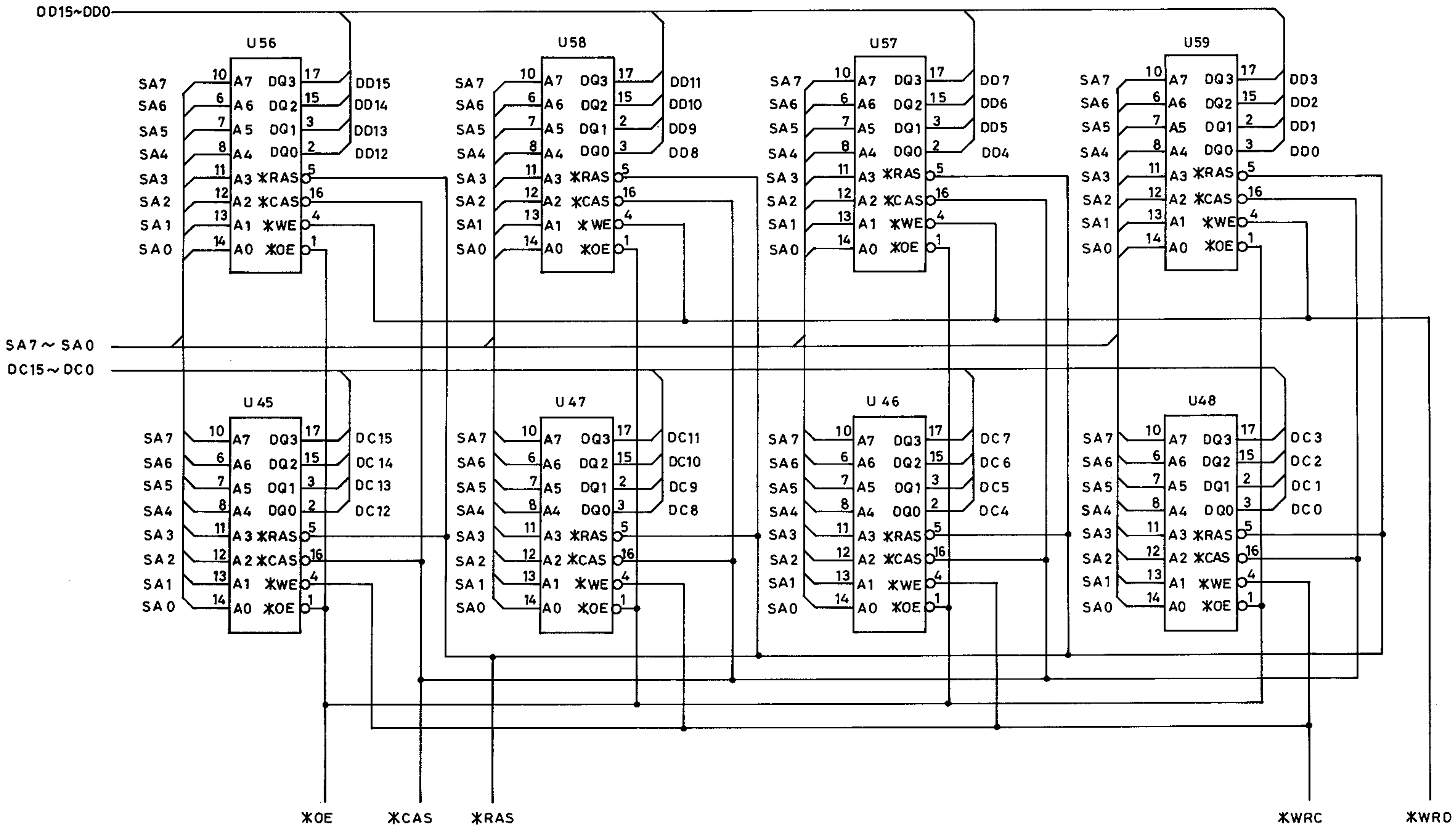


R4611
DISP CPU
BGP – 014105 6/10



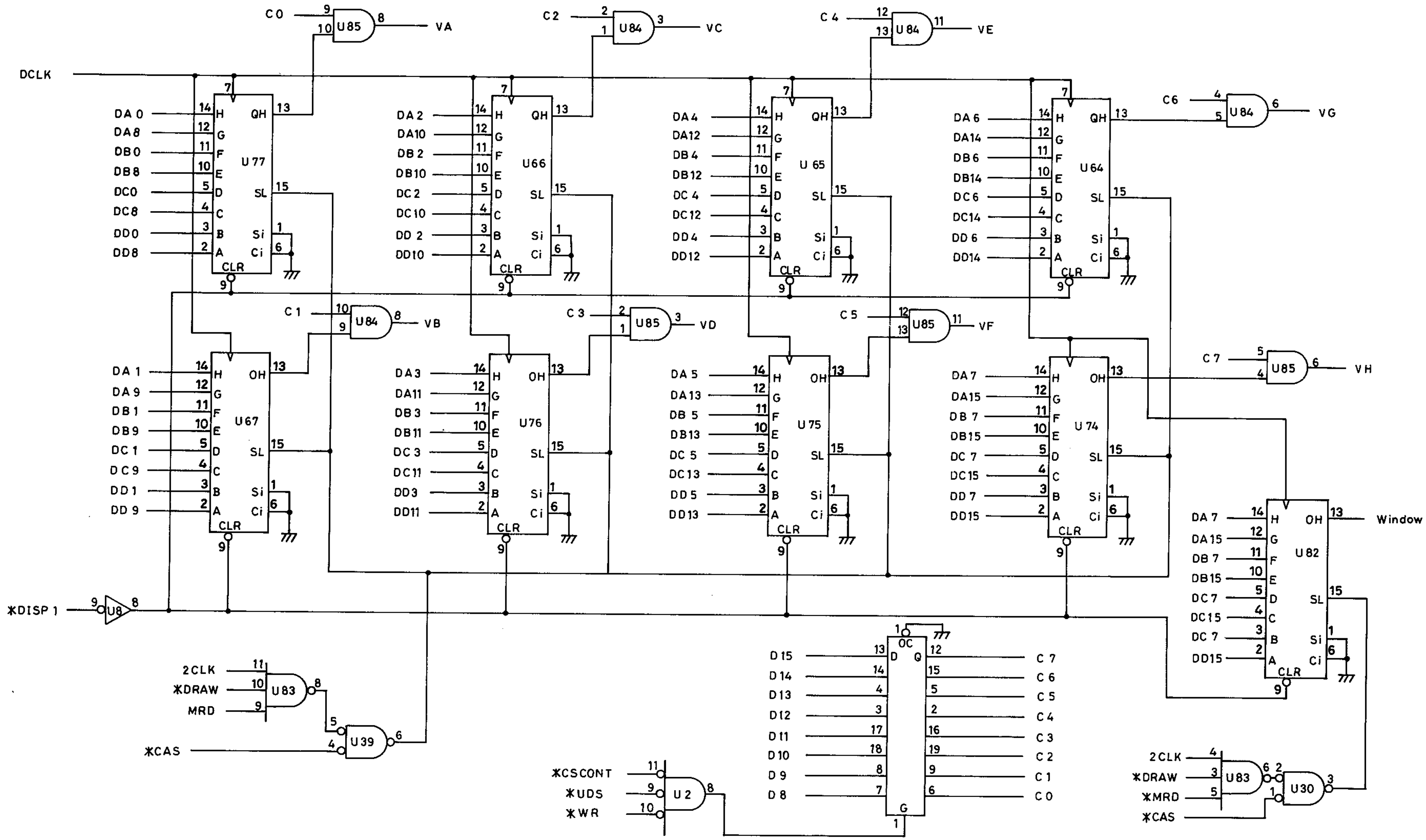
R4611
DISP CPU
BGP-014105 7/10

16



R4611
DISP CPU
BGP – 014105 8/10

17

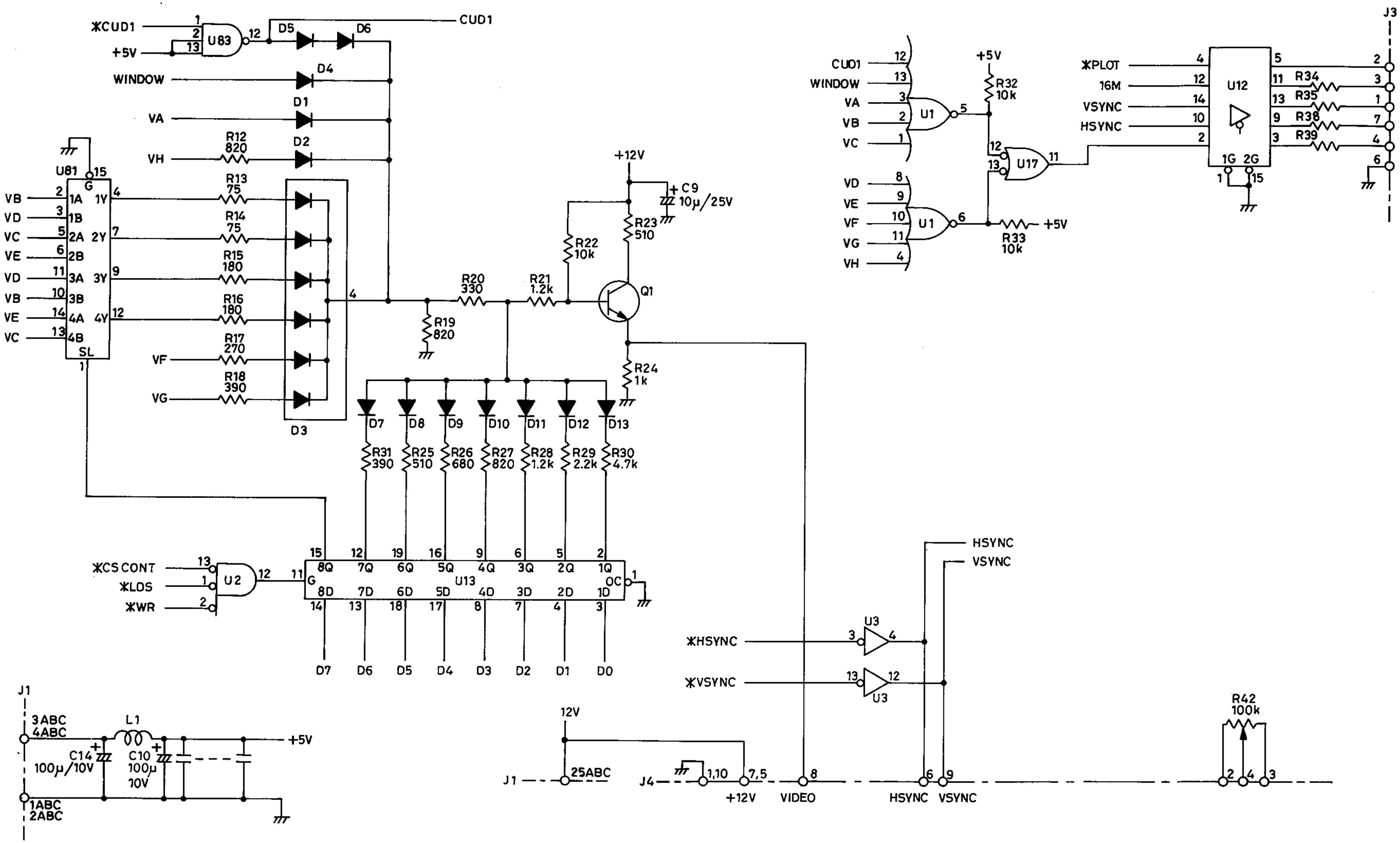


R4611

DISP CPU

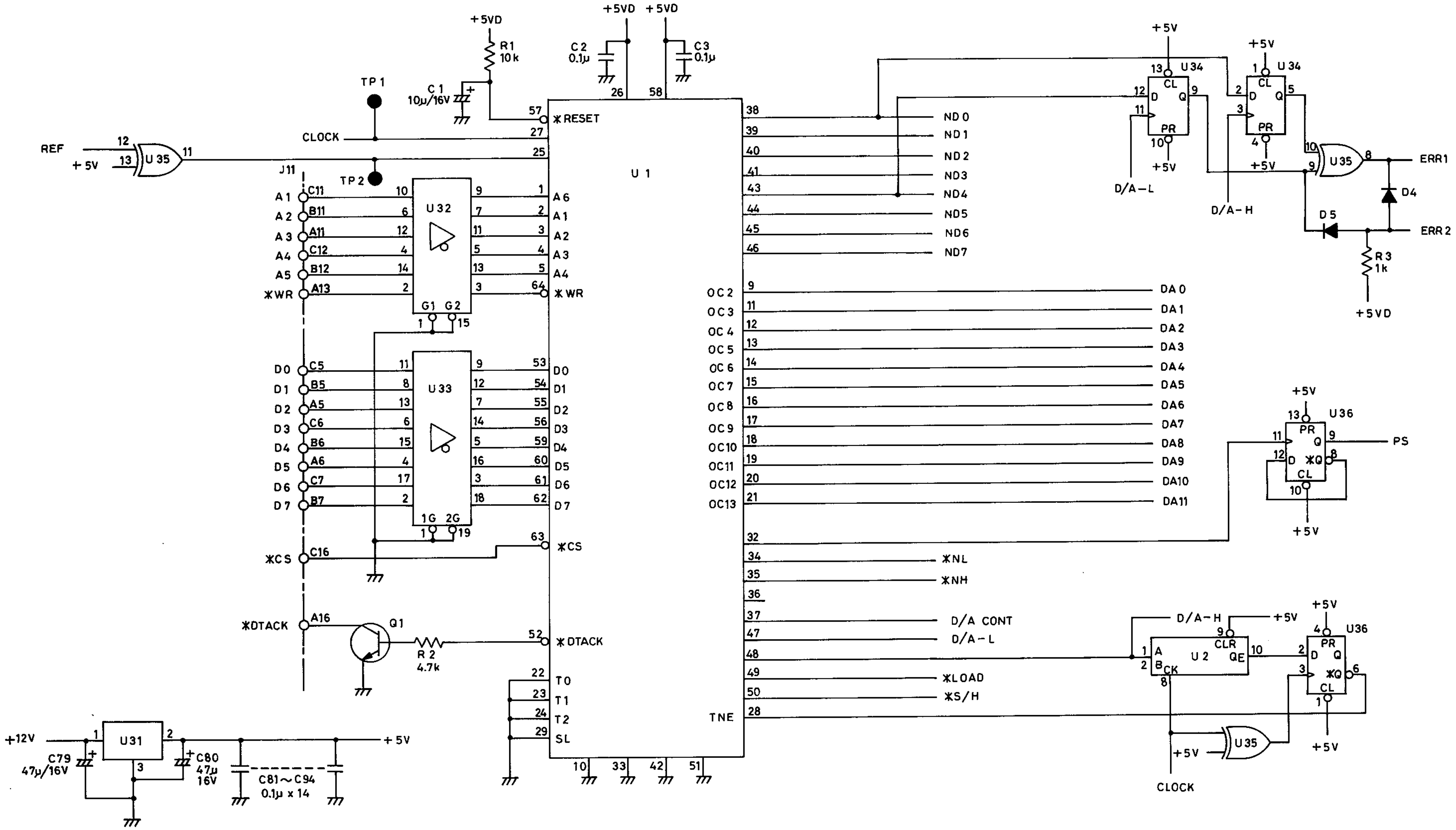
BGP—014105 9/10

18

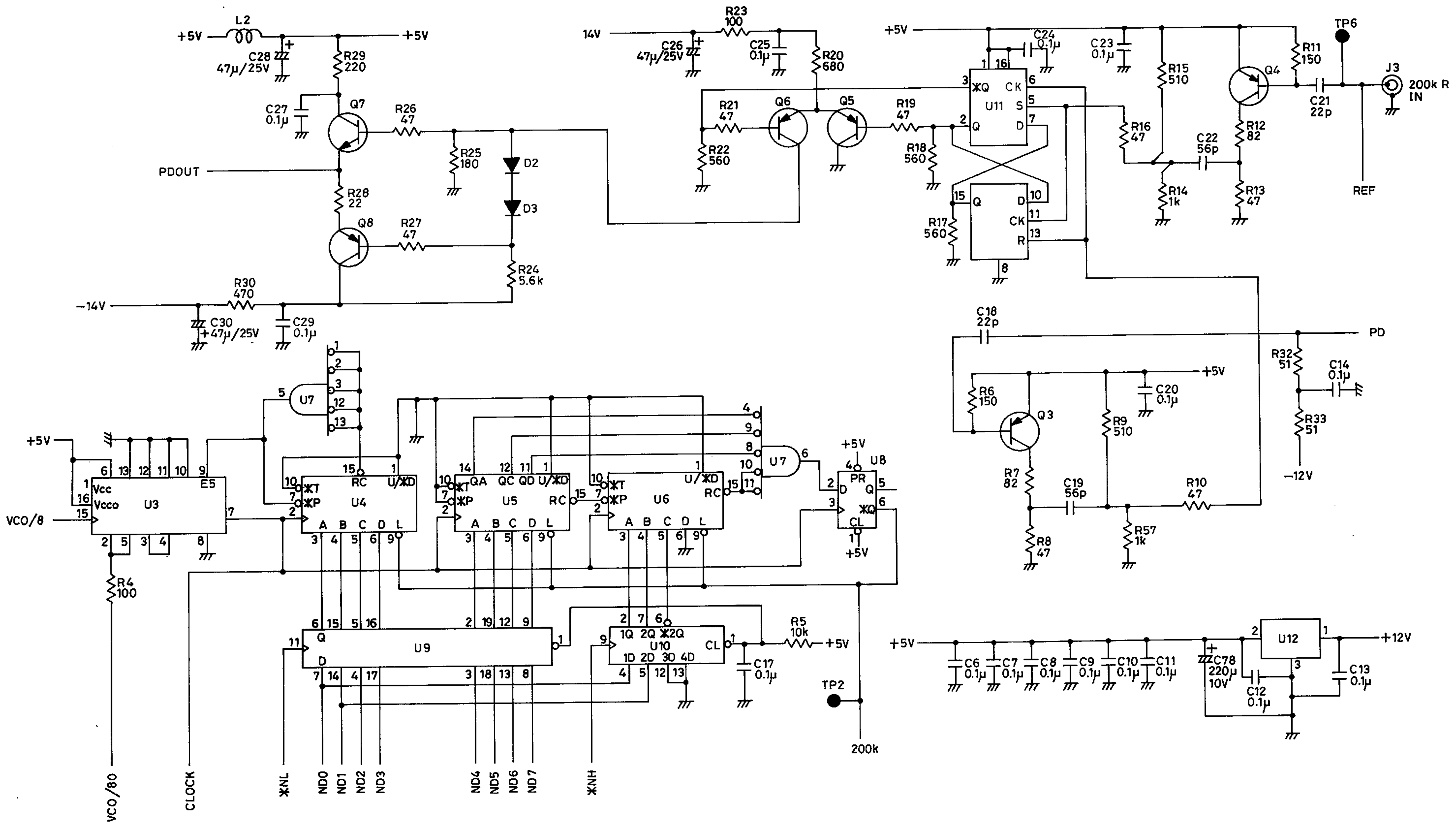


R4611
DISP CPU
BGP — 014105 10/10

9



R4611
SYNTHE CONT
BGK–014104 1/5



R4611
SYNTHE CONT
BGK−014104 2/5

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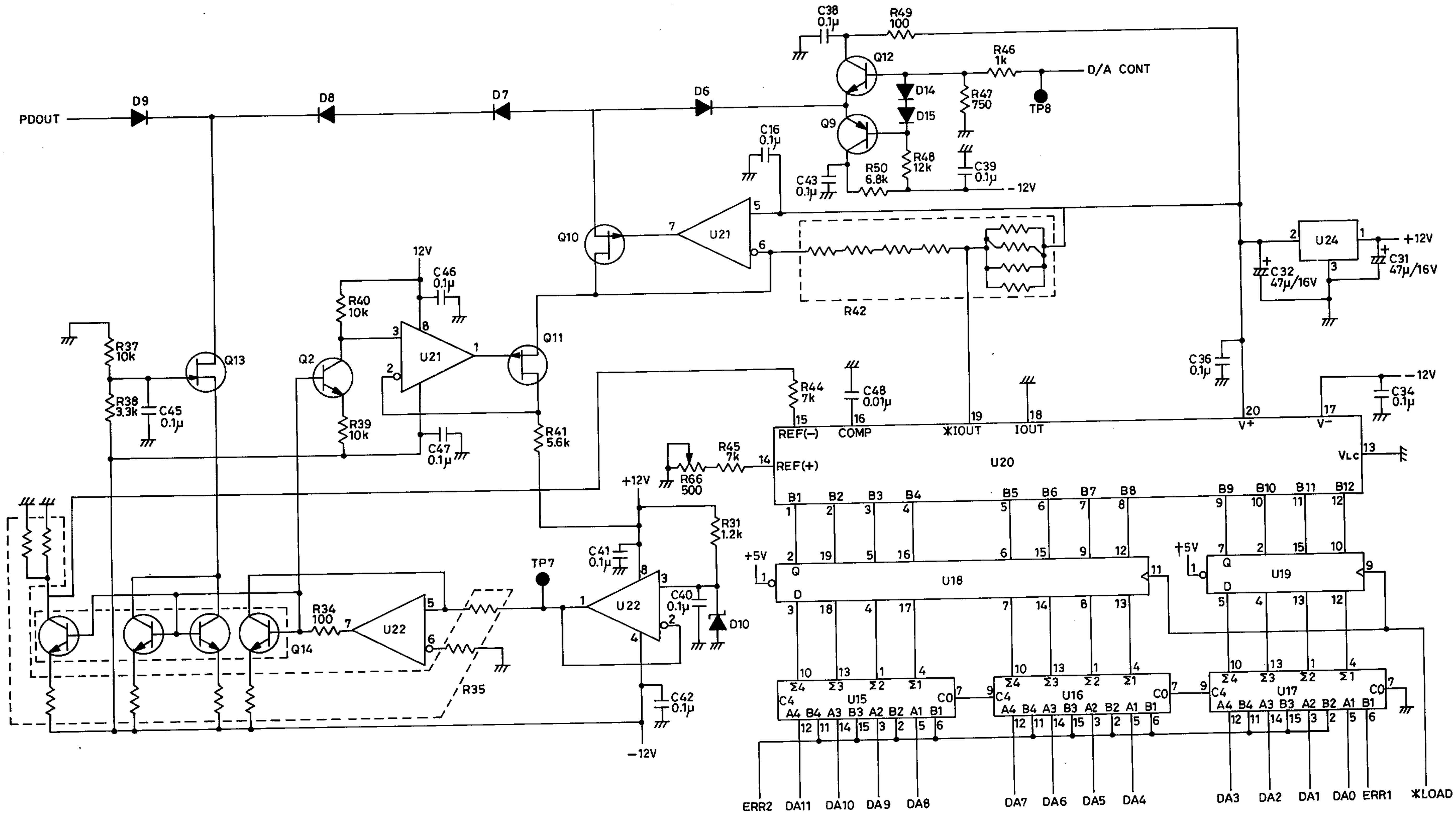
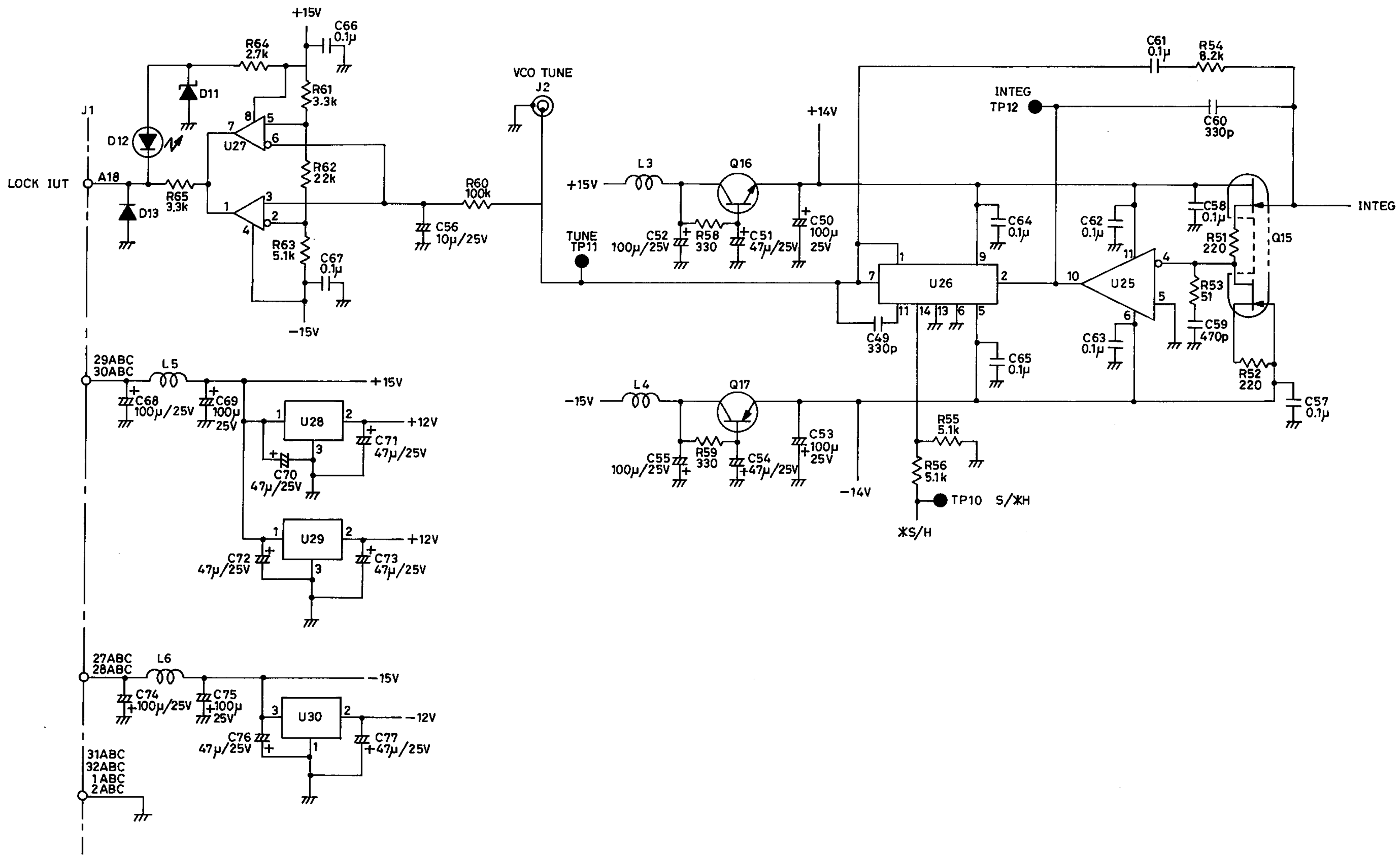
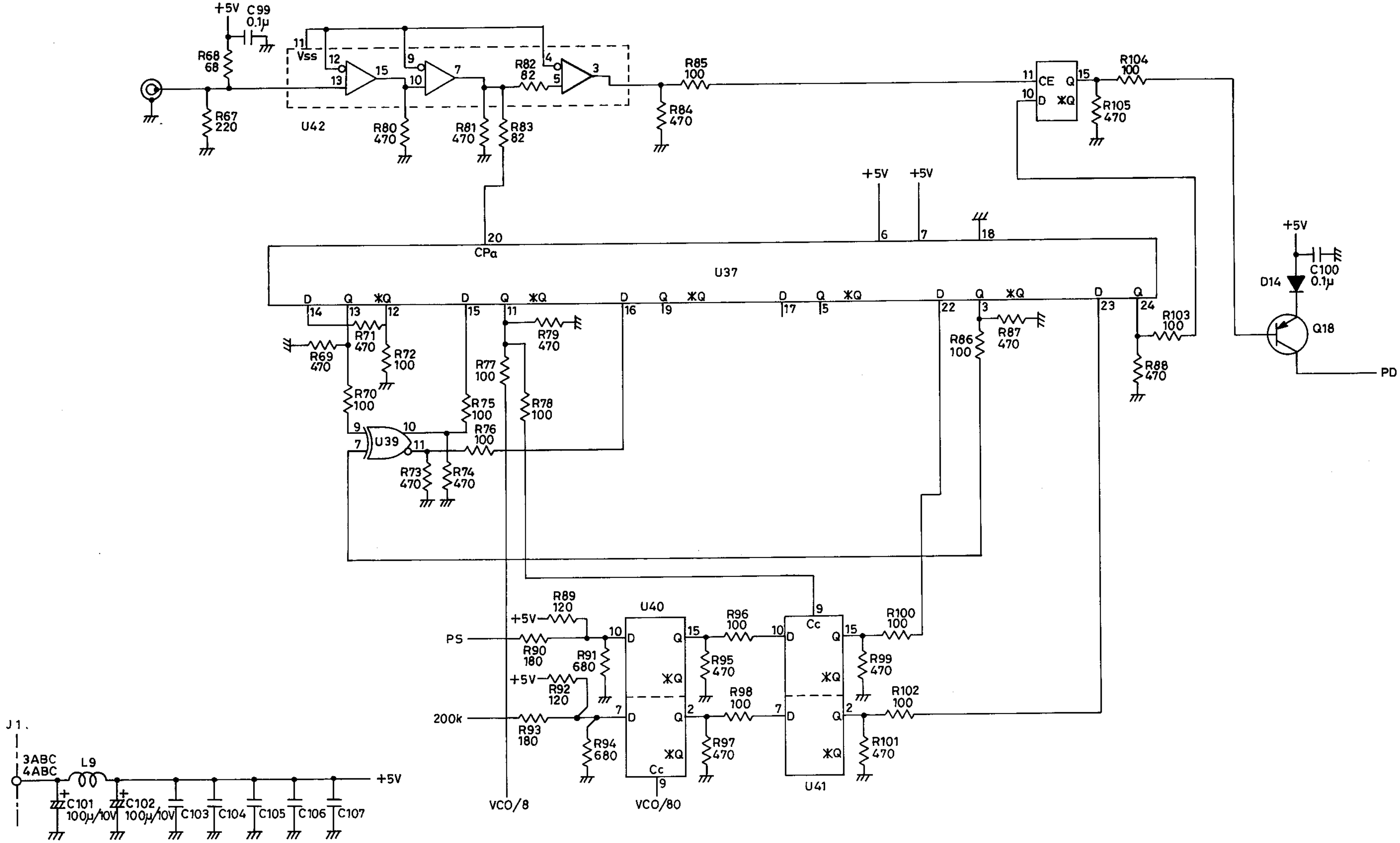


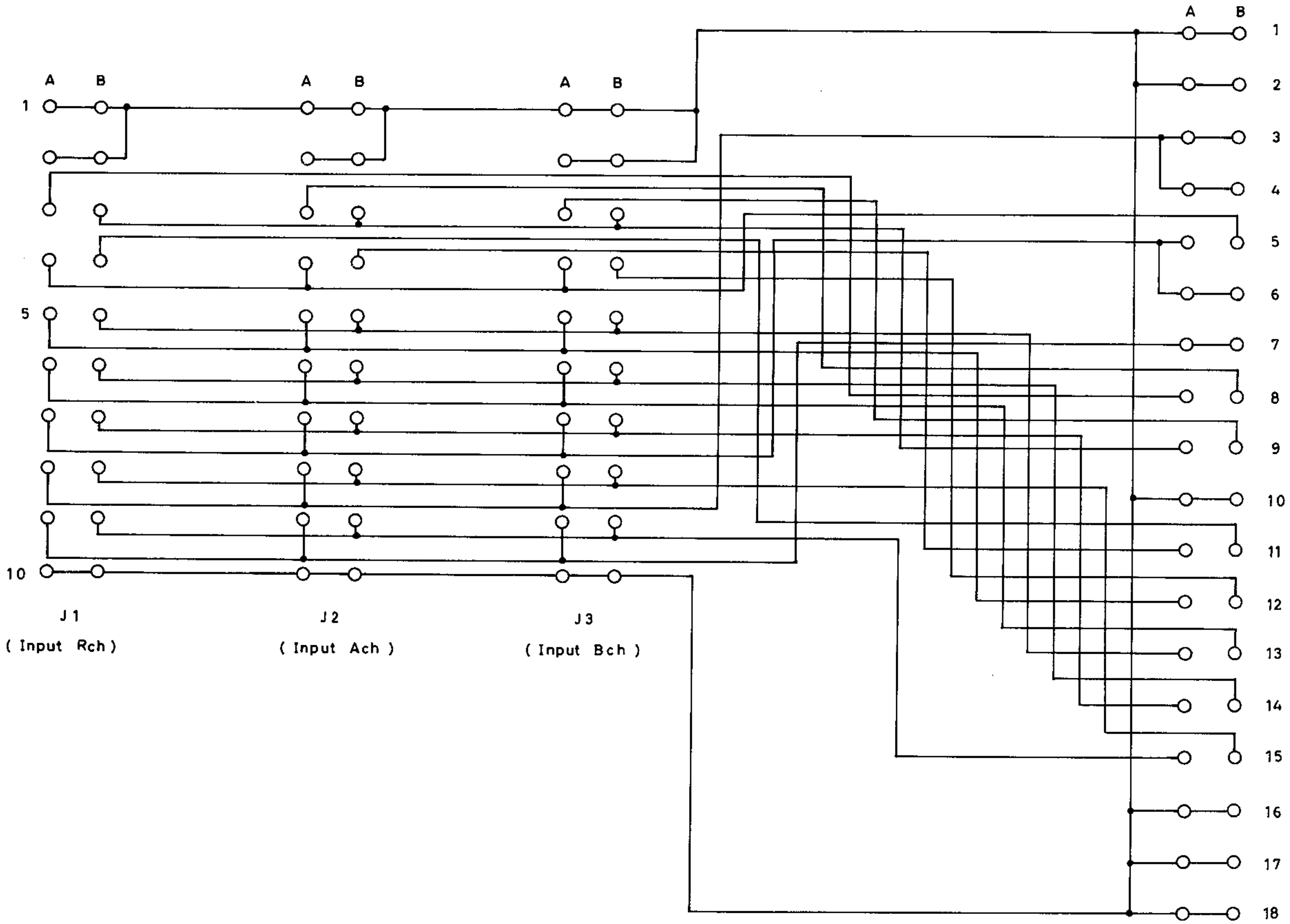
R4611
SYNTHE CONT
BGK-014104 3/5



R4611
SYNTHE CONT
BGK−014104 4/5

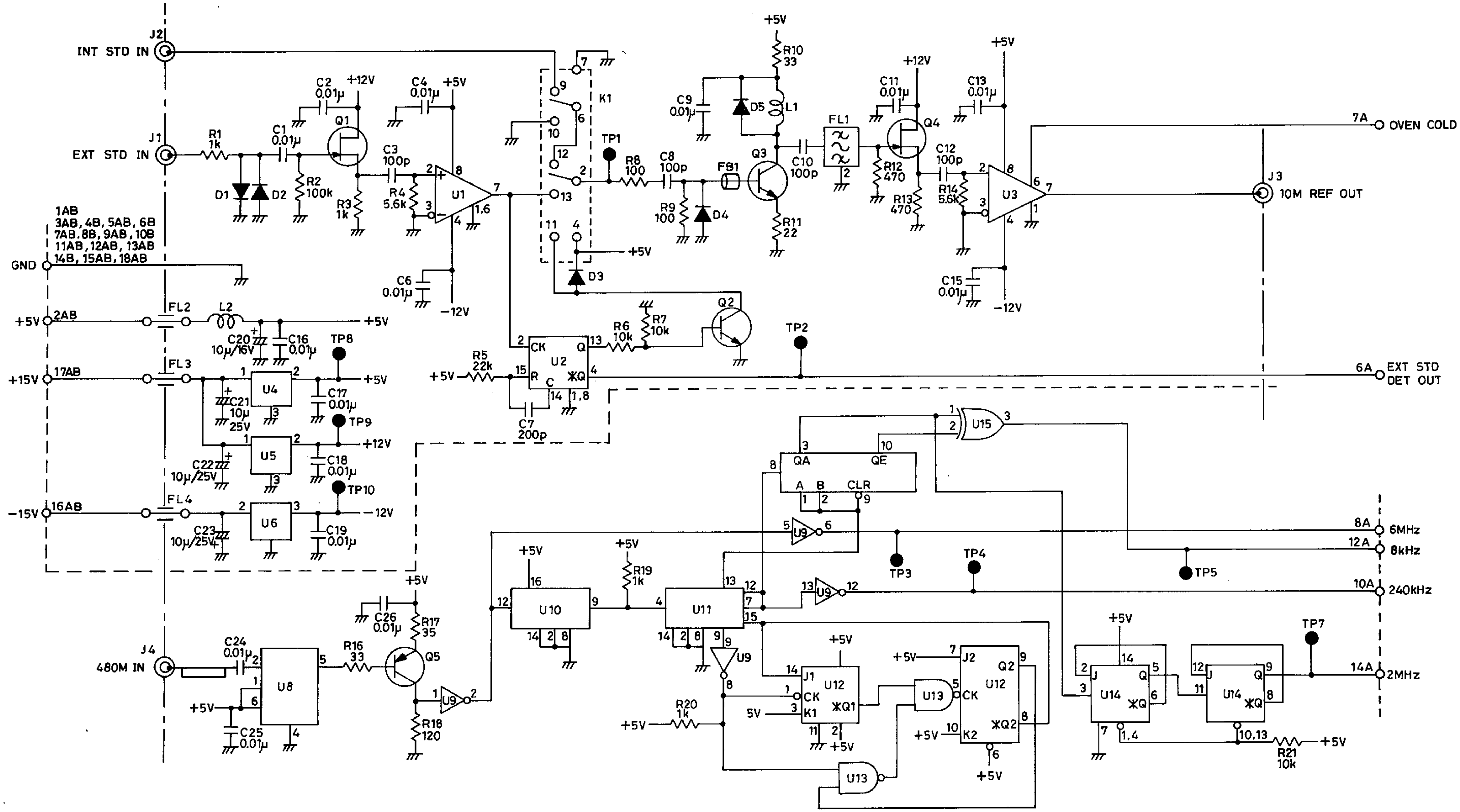


R4611
SYNTHE CONT
BGK-014104 5/5

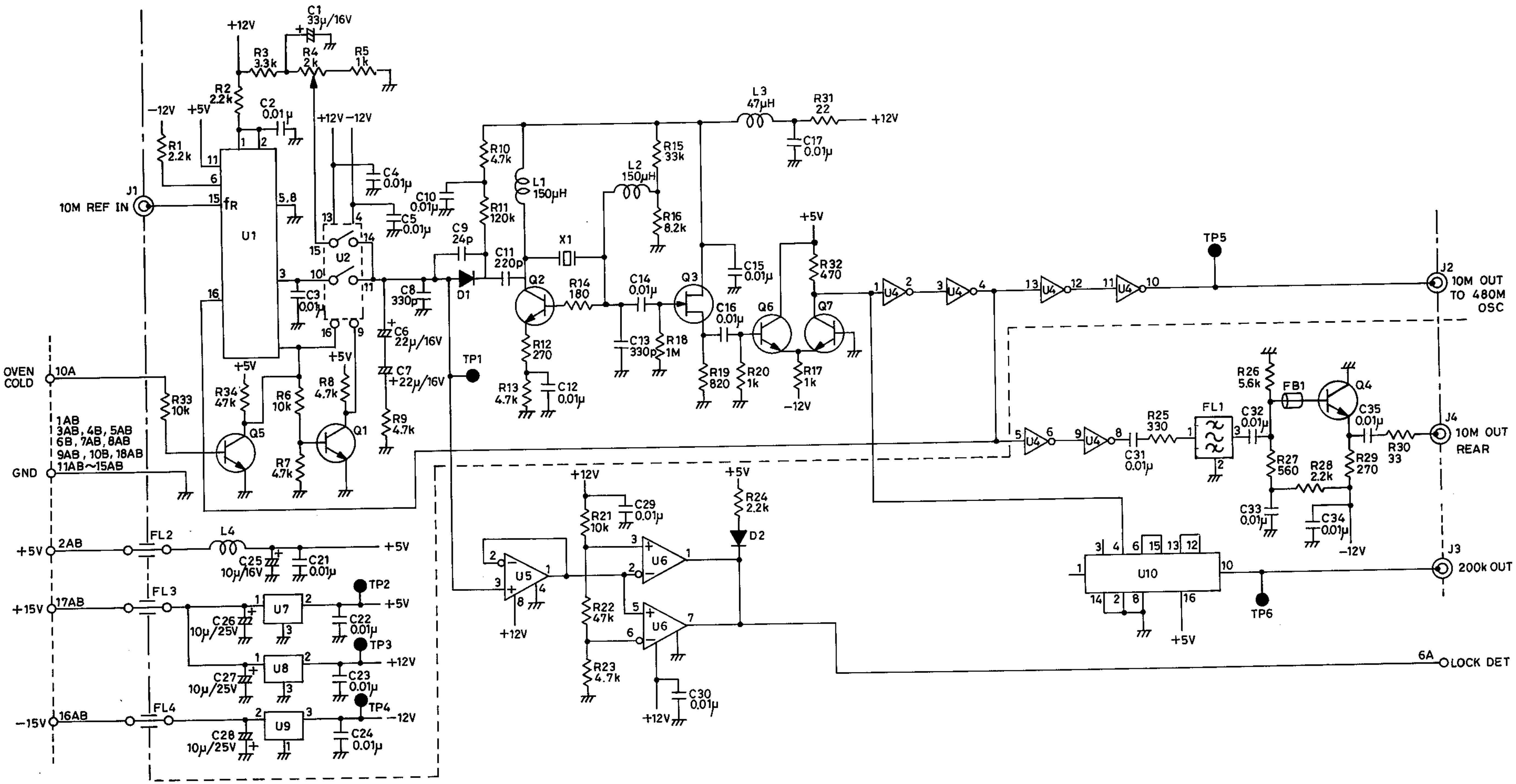


R4611
INPUT MOTHER
BLB – 014146

25

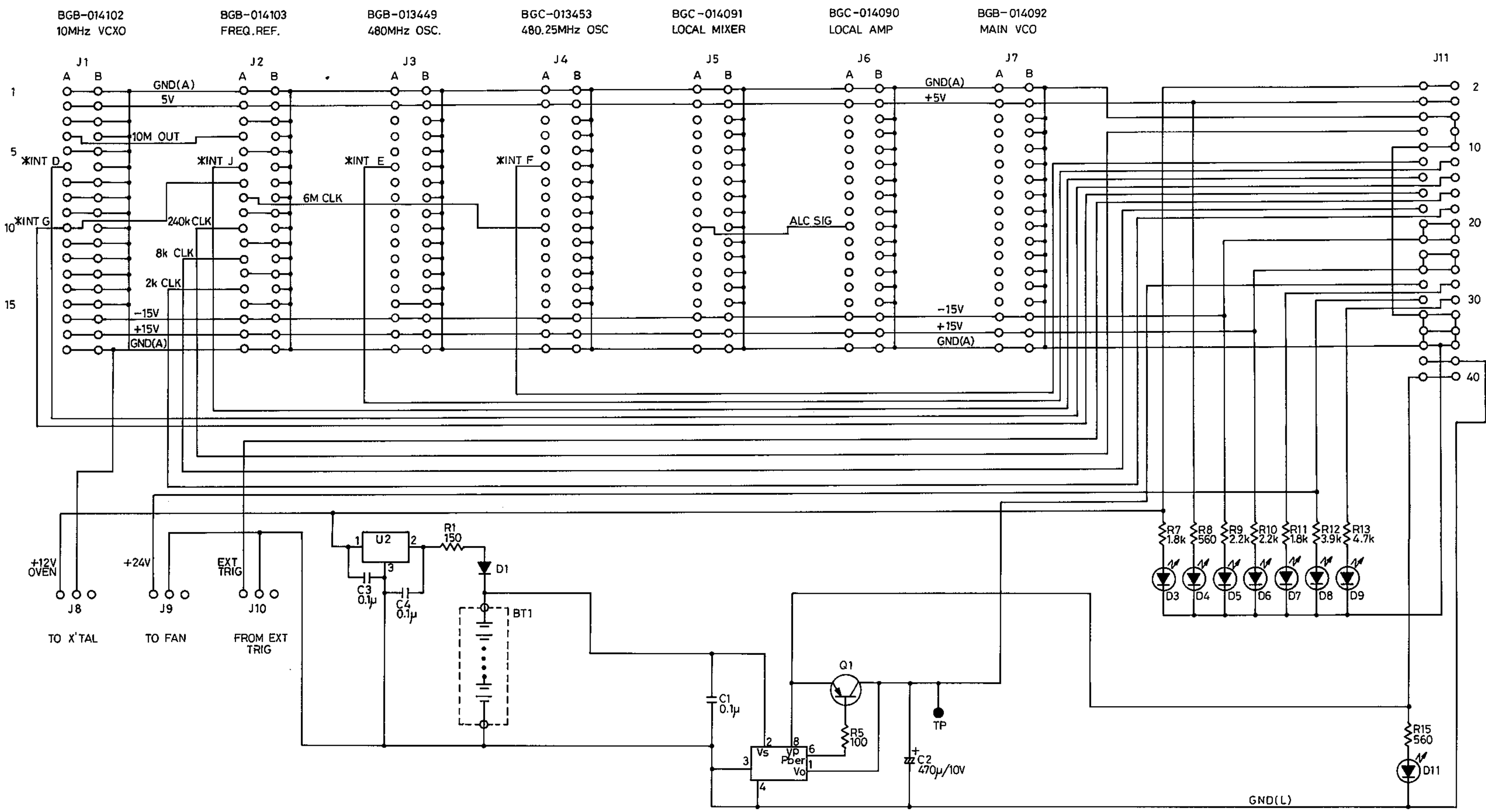


R4611
FREQ. REF.
BGB—014103



R4611
10MHz VCXO
BGB – 014102

-7

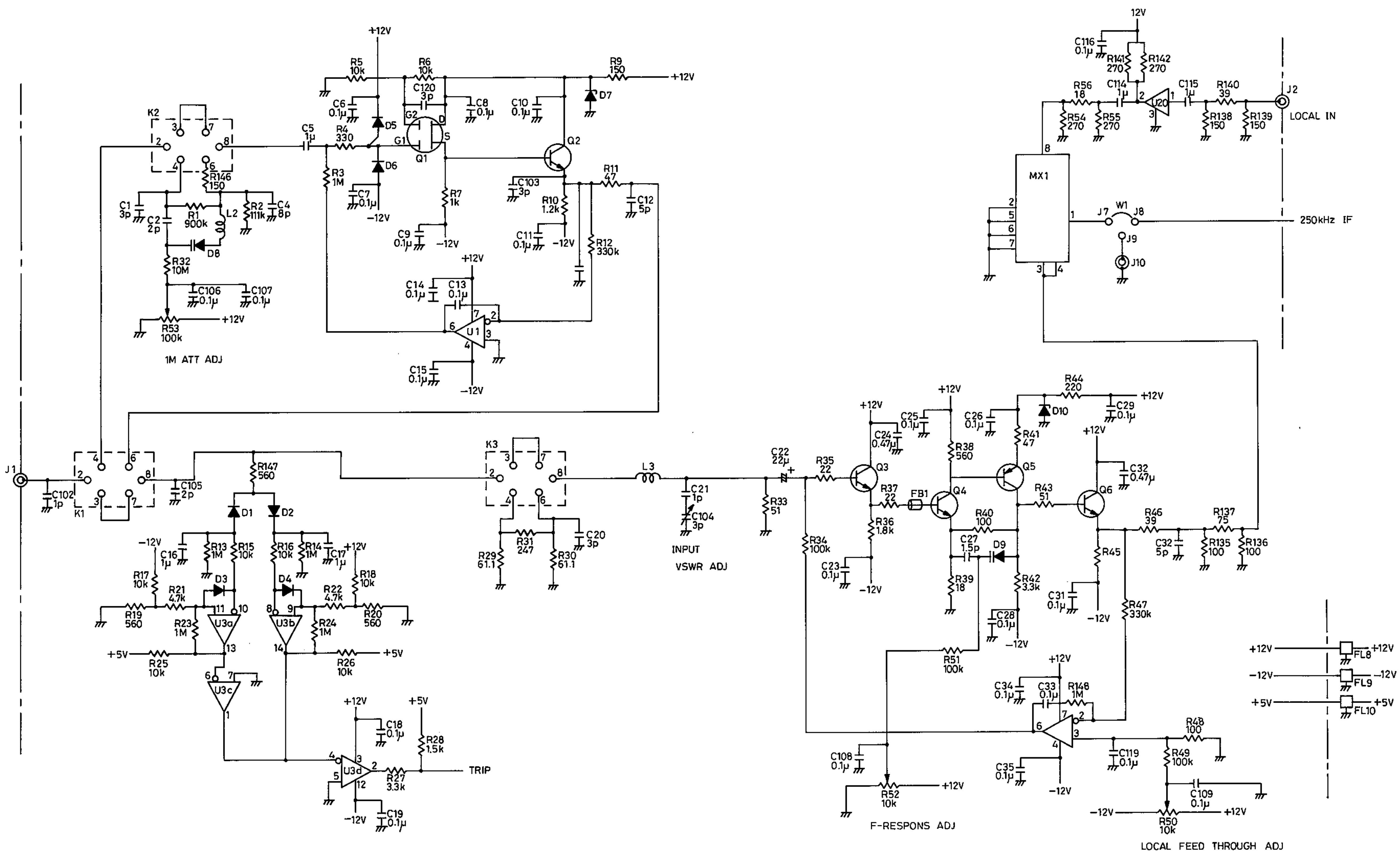


J11

1	+12V OVEN	2	+12V OVEN
3	+5V (A)	4	+5V (A)
5	GND(A)	6	GND(A)
7	240k CLK	8	GND(A)
9	GND(A)	10	GND(A)
11	*INT F	12	*INT E
13	*INT J	14	*INT D
15	*INT G	16	EXT TRIG
17	8k CLK	18	2k CLK
19	−15V	20	−15V
21	−15V	22	−15V
23	+15V	24	+15V
25	+15V	26	+15V
27	+5V BAT	28	+12V CRT
29	+24V	30	+30V
31	GND(A)	32	GND(A)
33	GND(A)	34	GND(A)
35	GND(A)	36	GND(A)
37	GND(L)	38	GND(L)
39	+5V(L)	40	+5V(L)

R4611
LOCAL MOTHER
BLK−014148

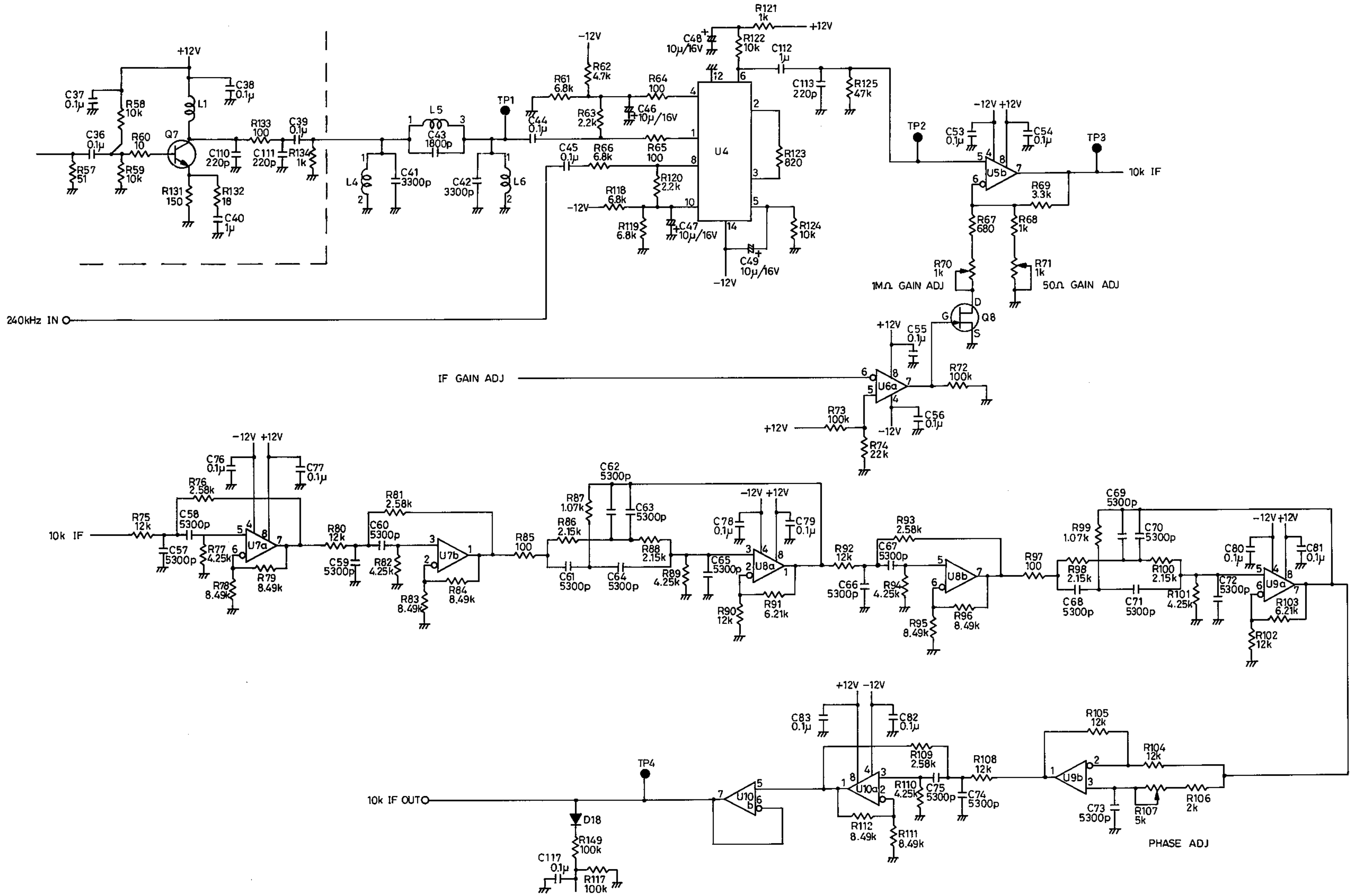
-28



R4611

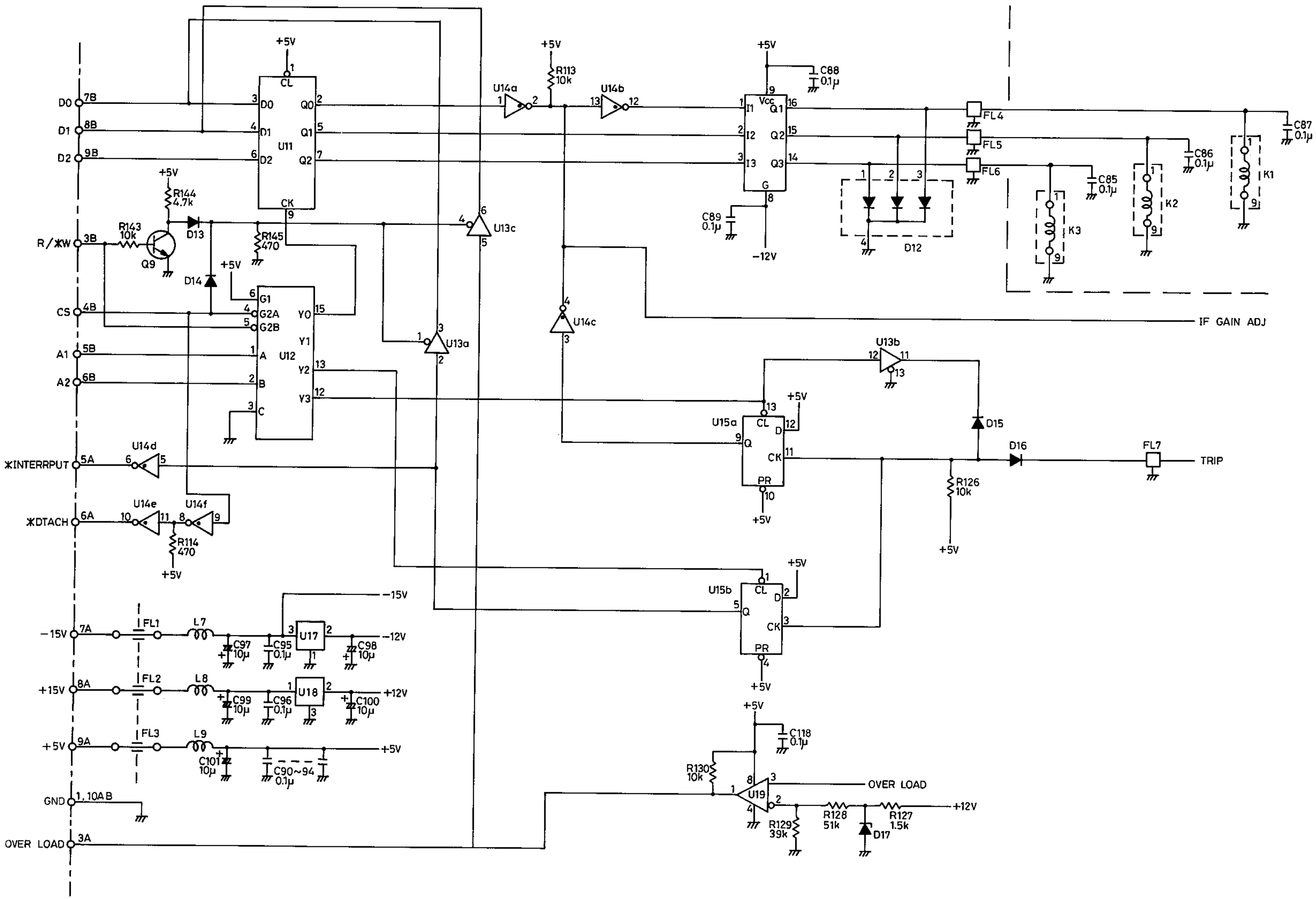
INPUT

BGG—014131 1/3



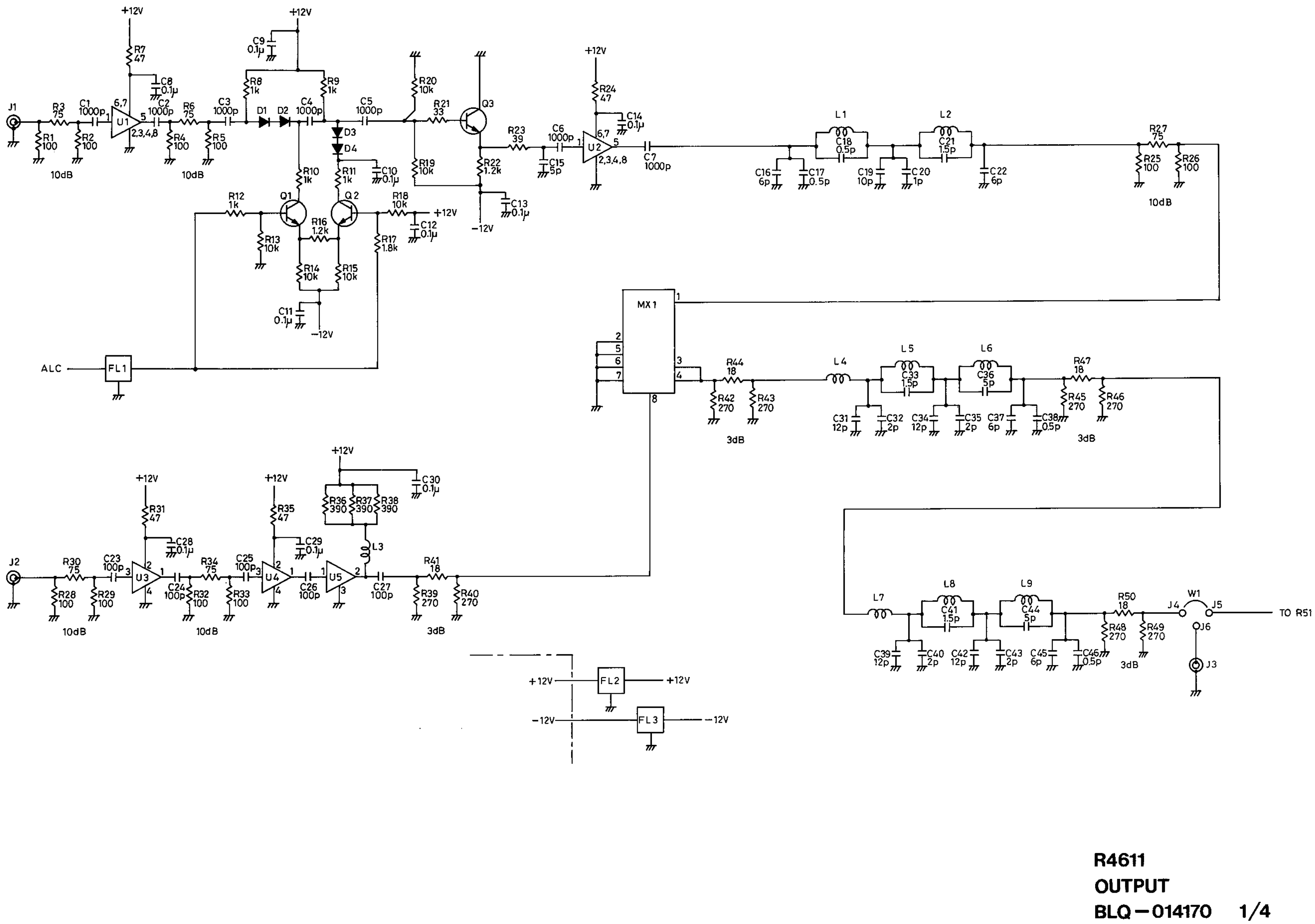
R4611
INPUT
BGG—014131 2/3

30

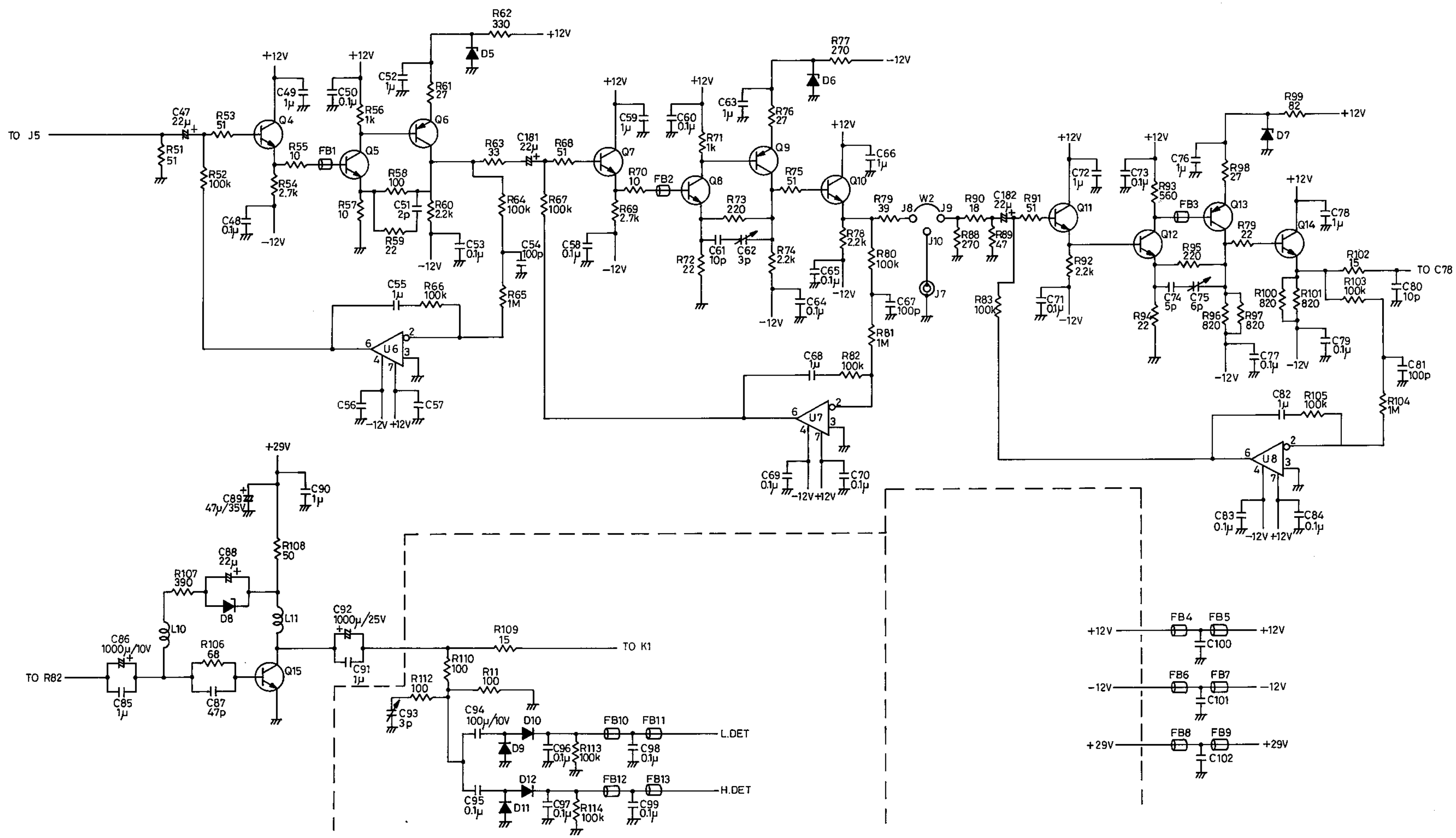


R4611
INPUT
BGG — 014131 3/3

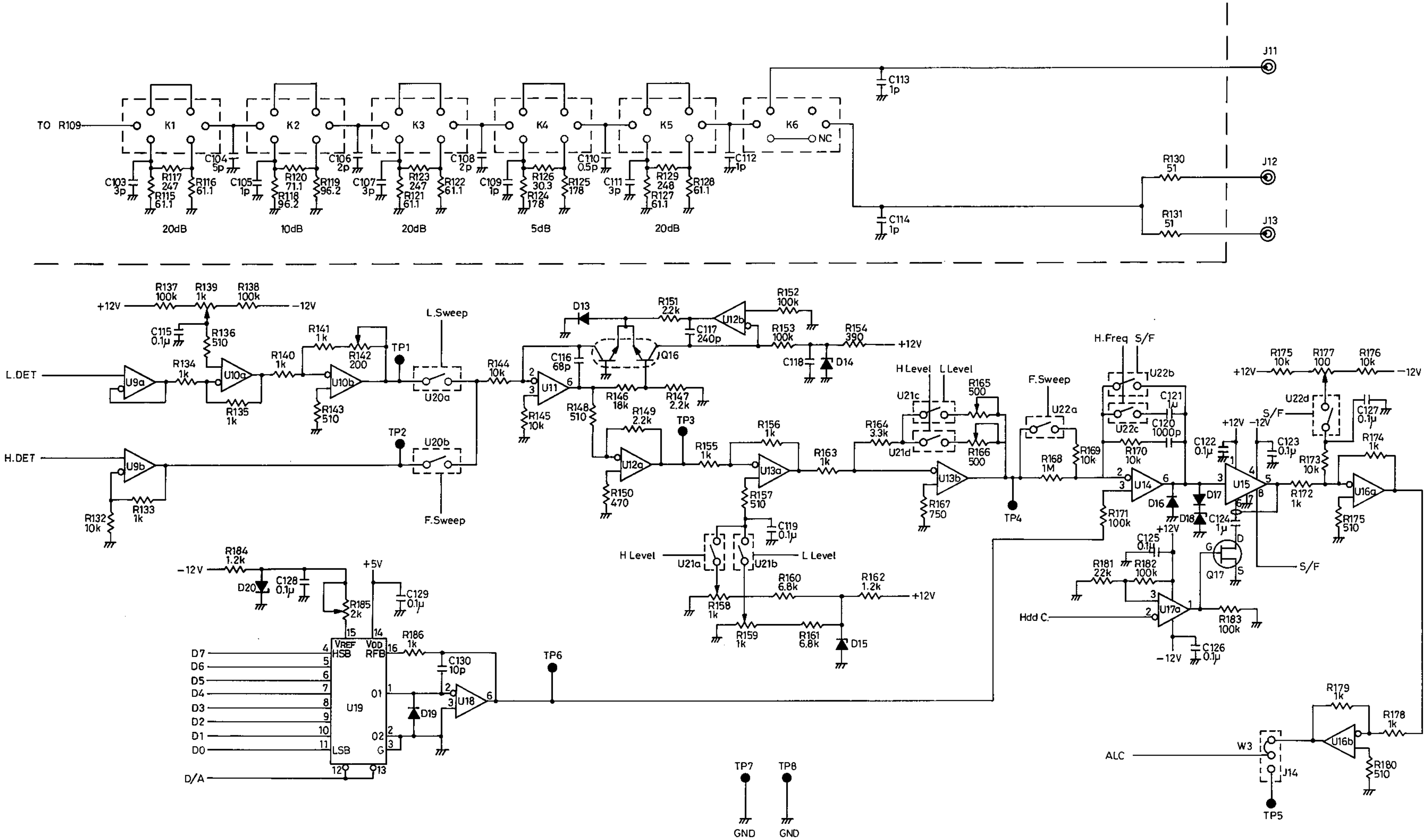
01


J1
R3 75
C1 1000p
U1
6,7
2,3,4,8
C2 1000p
R6 75
C3 1000p
D1
D2
C4 1000p
C5 1000p
R1 100
R2 100
R4 100
R5 100
10dB
10dB
+12V
R7 47
C8 0.1μ
C9 0.1μ
R8 1k
R9 1k
D3
D4
C10 0.1μ
R10 1k
R11 1k
Q1
Q2
R12 1k
R13 10k
R16 1.2k
R14 10k
R15 10k
R17 1.8k
R18 10k
C12 0.1μ
C11 0.1μ
-12V
ALC
FL1
R20 10k
R21 33
Q3
R19 10k
R22 1.2k
C13 0.1μ
R23 39
C6 1000p
C15 5p
R24 47
C14 0.1μ
U2
C7 1000p
L1
C18 0.5p
L2
C21 1.5p
C16 6p
C17 0.5p
C19 10p
C20 1p
C22 6p
R27 75
R25 100
R26 100
MX1
R44 18
R42 270
R43 270
3dB
L4
L5
C33 1.5p
L6
C36 5p
C31 12p
C32 2p
C34 12p
C35 2p
C37 6p
C38 0.5p
R47 18
R45 270
R46 270
J2
R30 75
C23 100p
U3
C24 100p
R34 75
C25 100p
U4
C26 100p
U5
C27 100p
R41 18
R28 100
R29 100
R32 100
R33 100
R39 270
R40 270
R31 47
C28 0.1μ
R35 47
C29 0.1μ
R36 390
R37 390
R38 390
C30 0.1μ
L3
L7
L8
C41 1.5p
L9
C44 5p
R50 18
J4
W1
J5
TO R51
J6
J3
C39 12p
C40 2p
C42 12p
C43 2p
C45 6p
C46 0.5p
R48 270
R49 270
FL2
FL3
R4611
OUTPUT
BLQ-014170 1/4

02

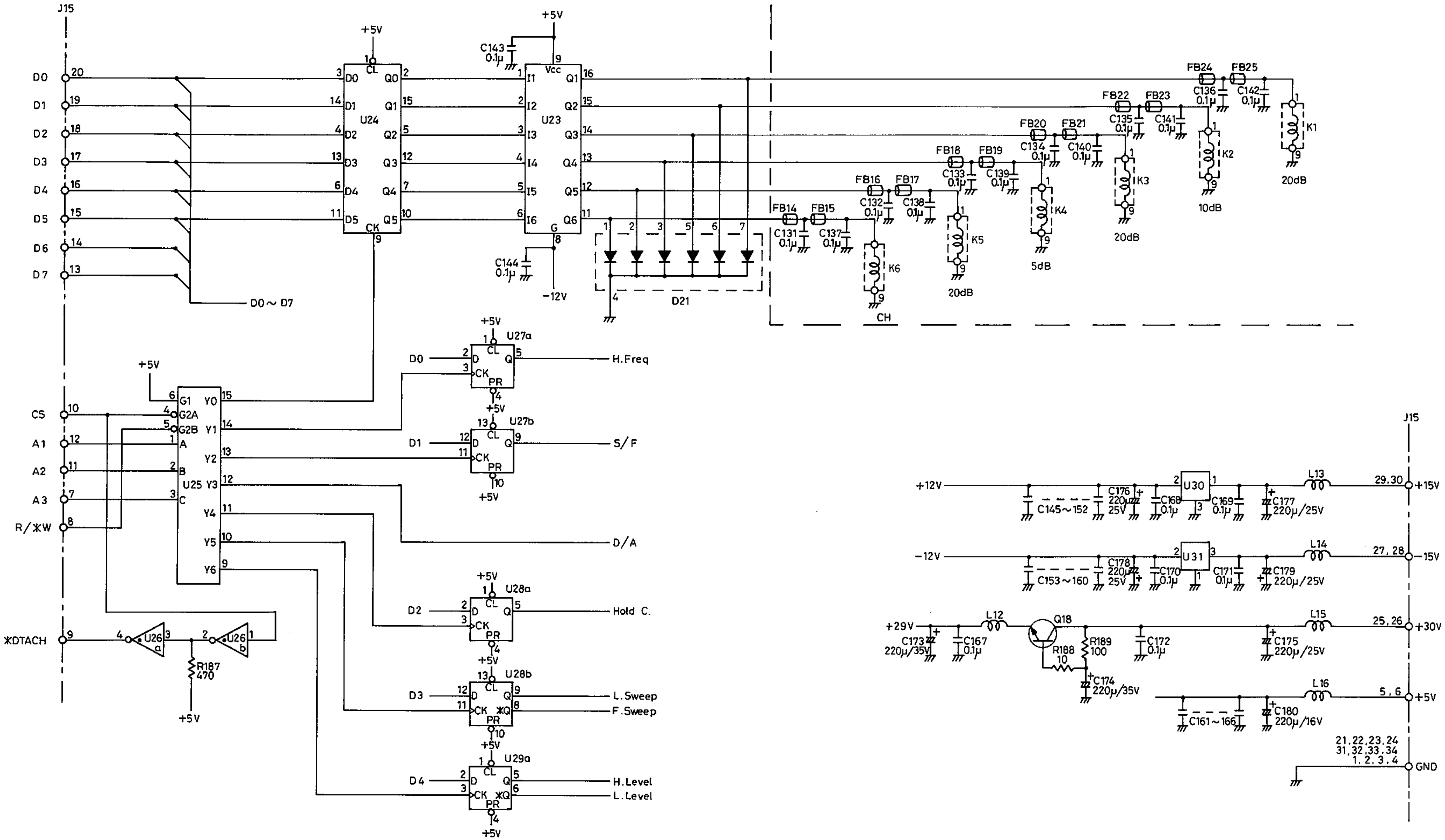


R4611
OUTPUT
BLQ – 014170 2/4



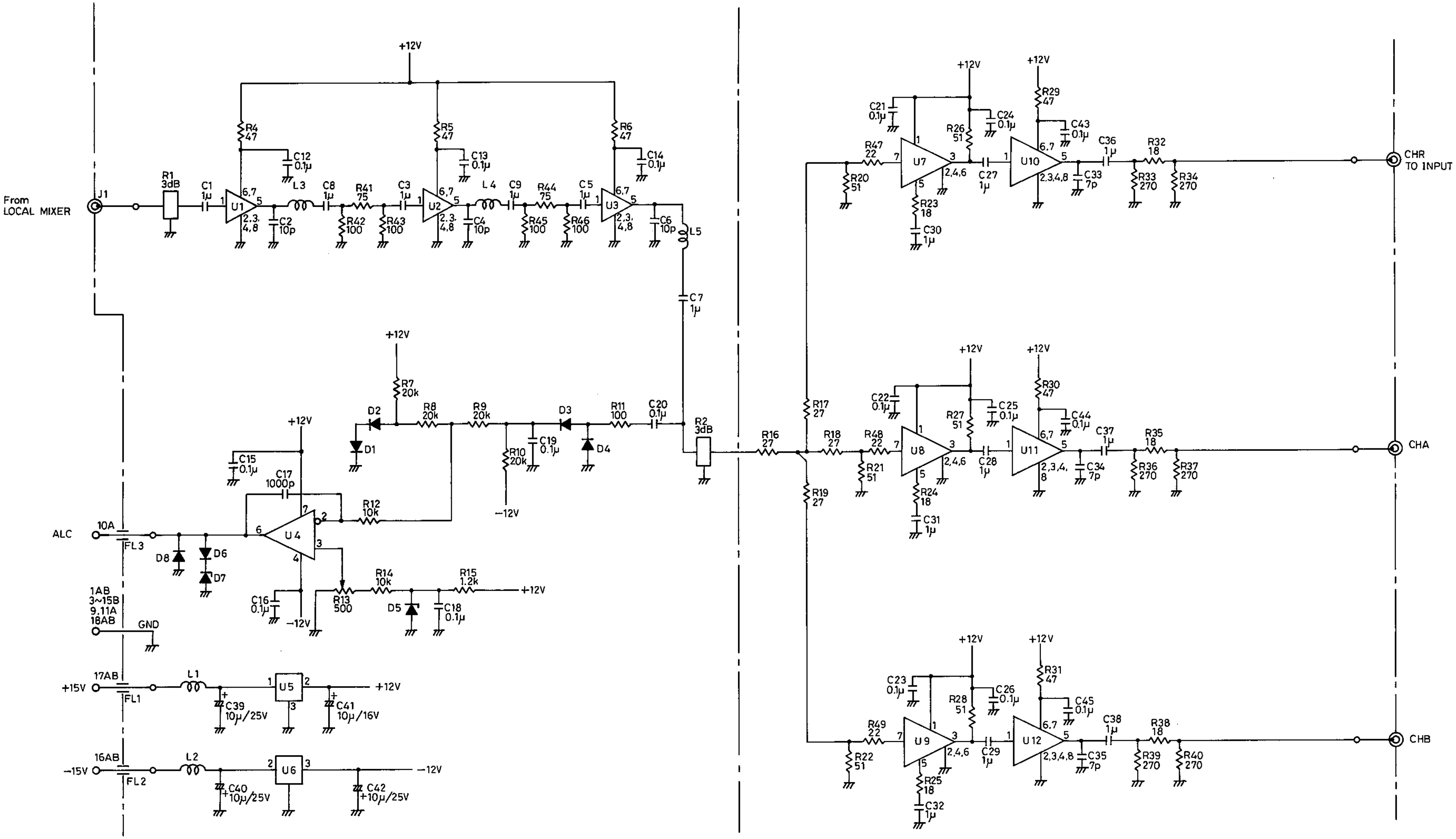
R4611
OUTPUT
BLQ－014170　3/4

34



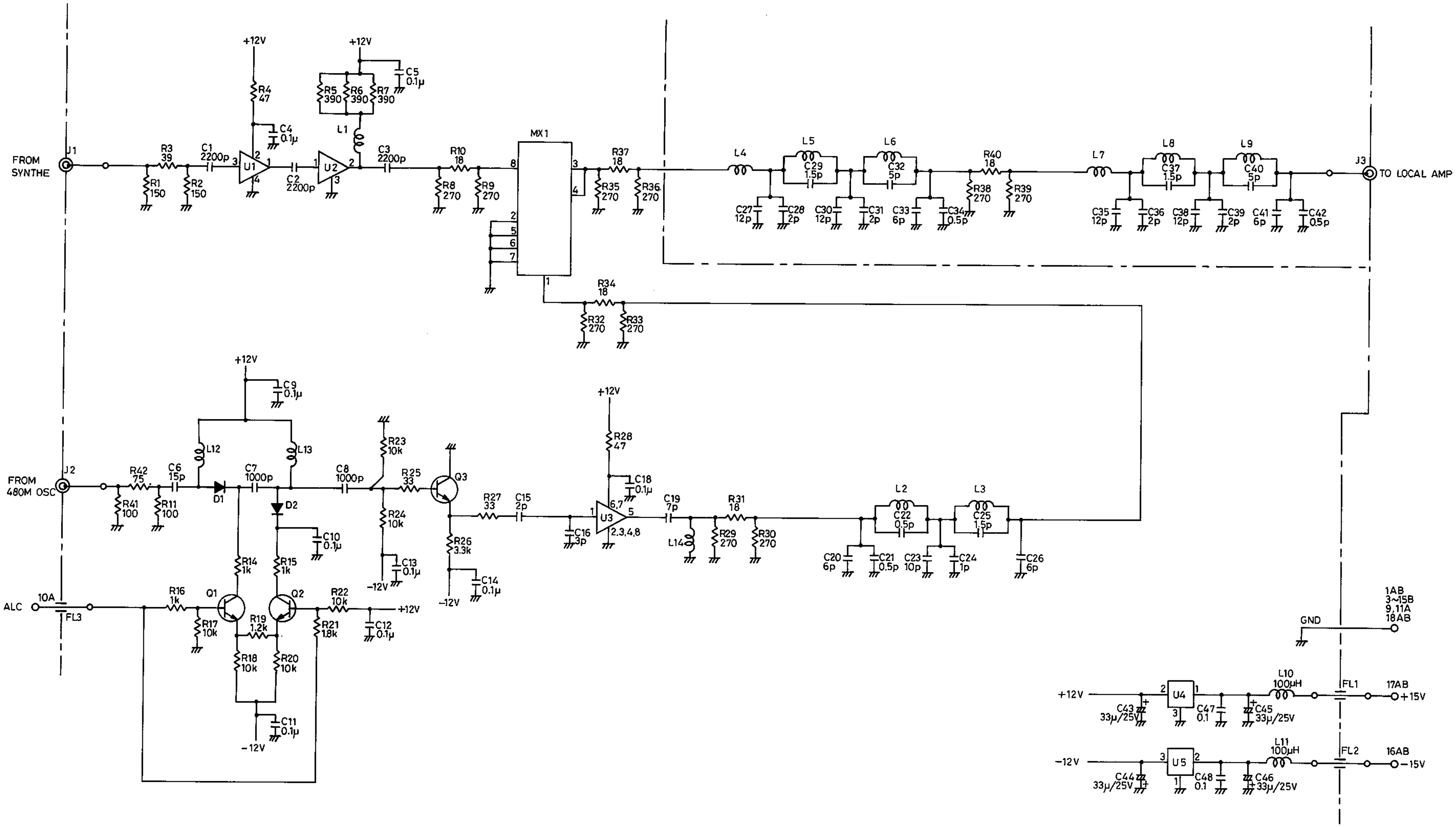
R4611
OUTPUT
BLQ — 014170 4/4

85



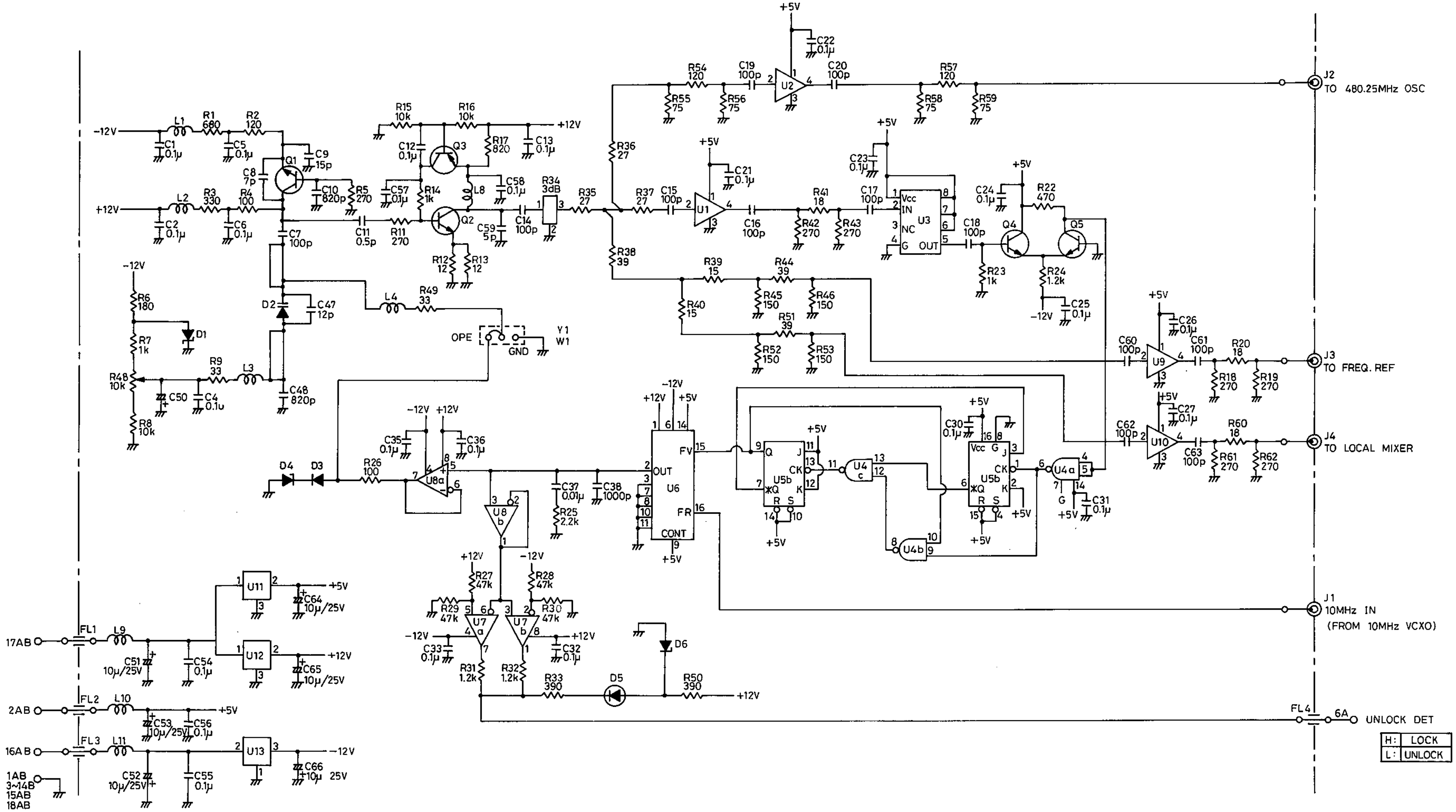
R4611
LOCAL AMP
BGC−014090

36



R4611
LOCAL MIXER
BGC-014091

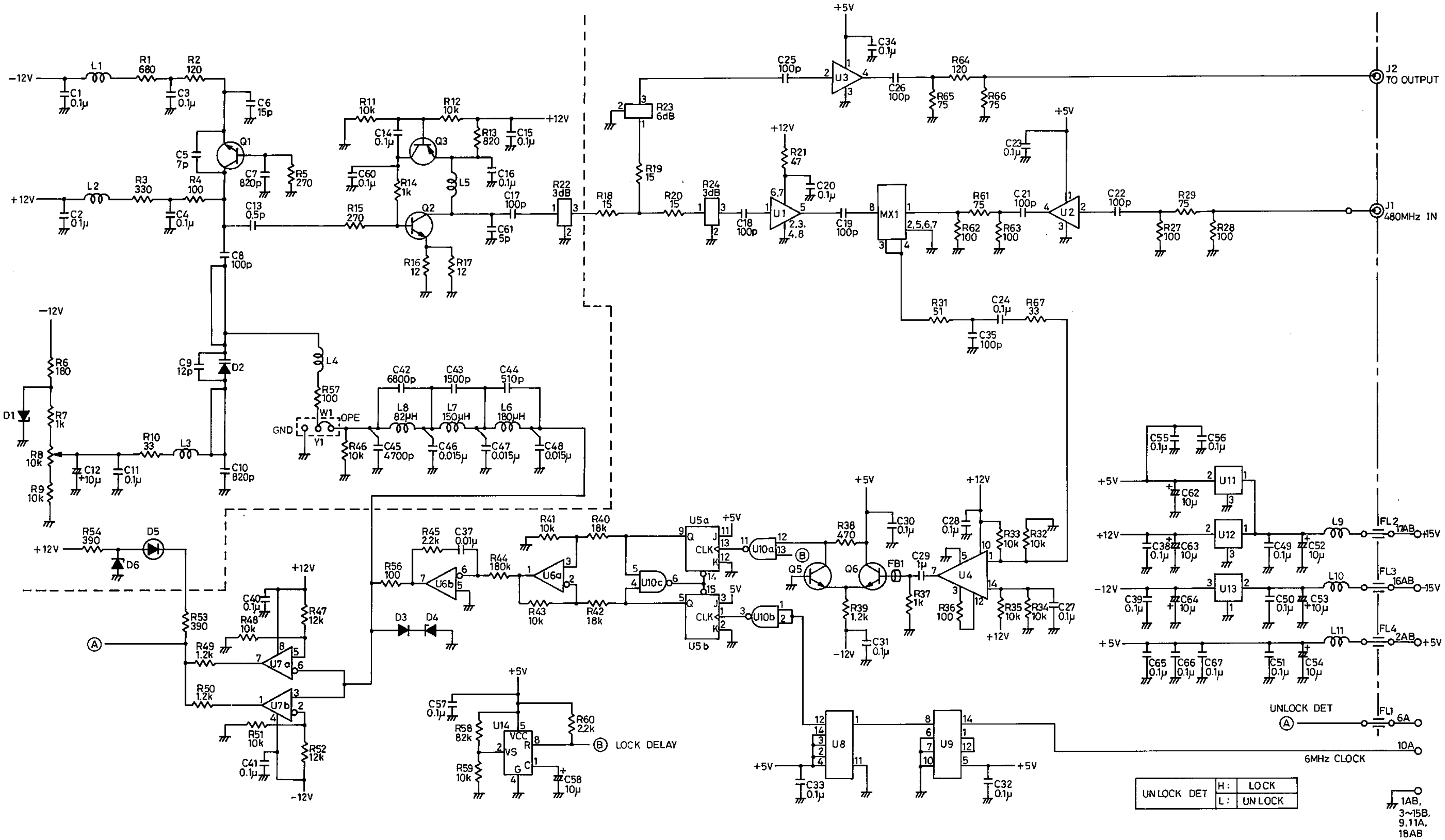
37



R4611

480MHz OSC

BGB−013449

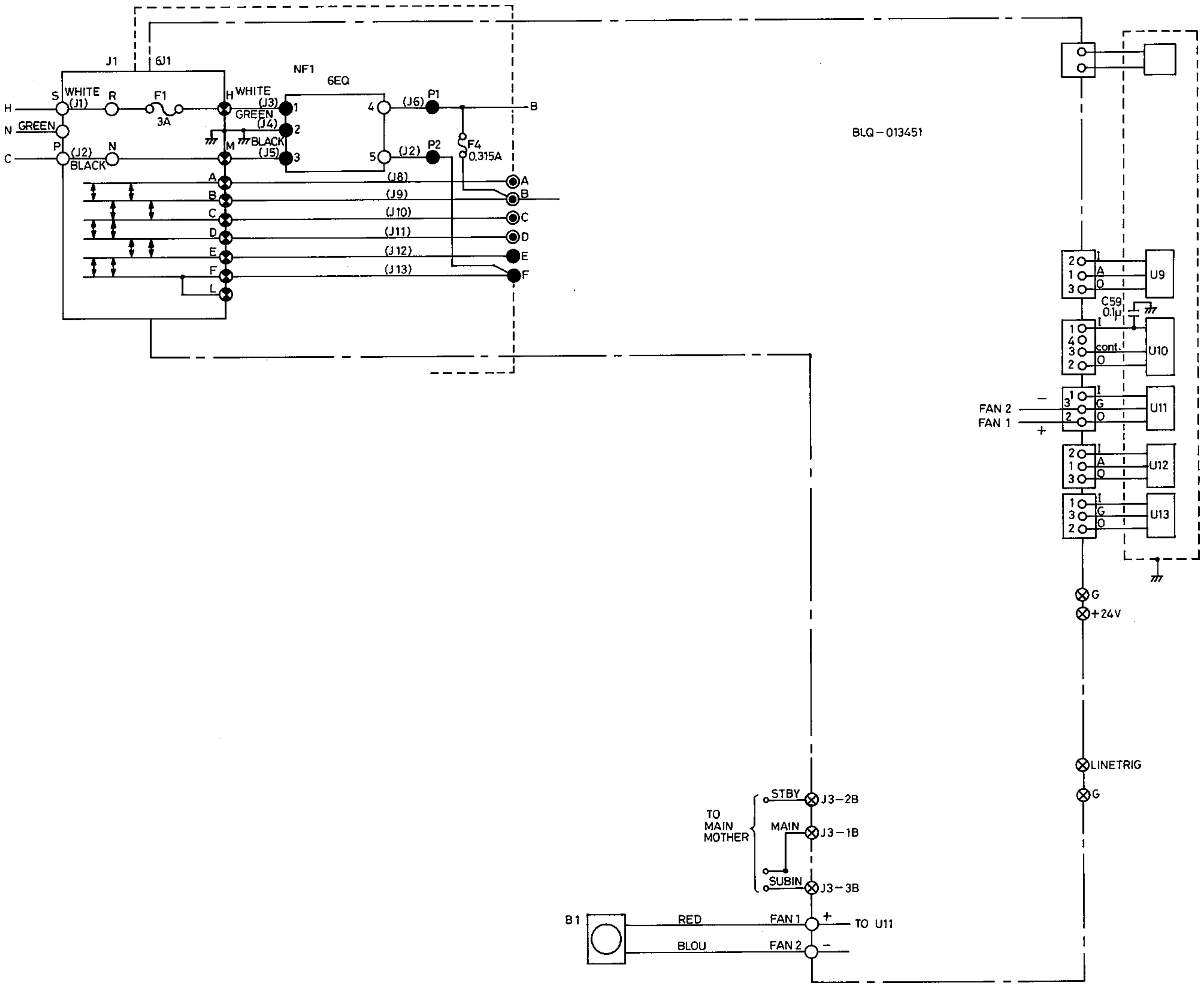


R4611

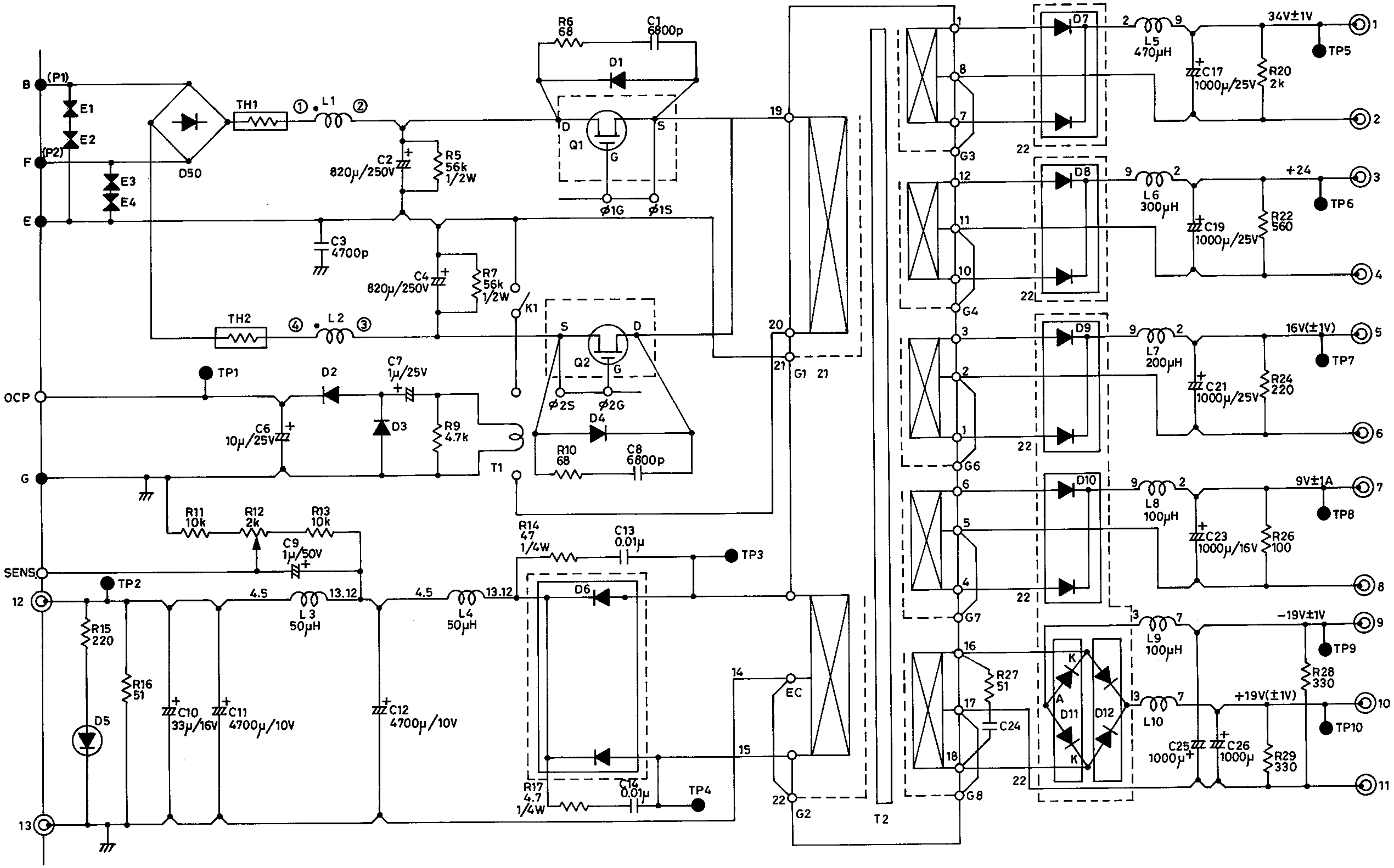
480.25MHz OSC

BGB−013453

39



R4611
POWER SUPPLY
(SCHEMATIC SECTION)
BLQ－013451 1/5



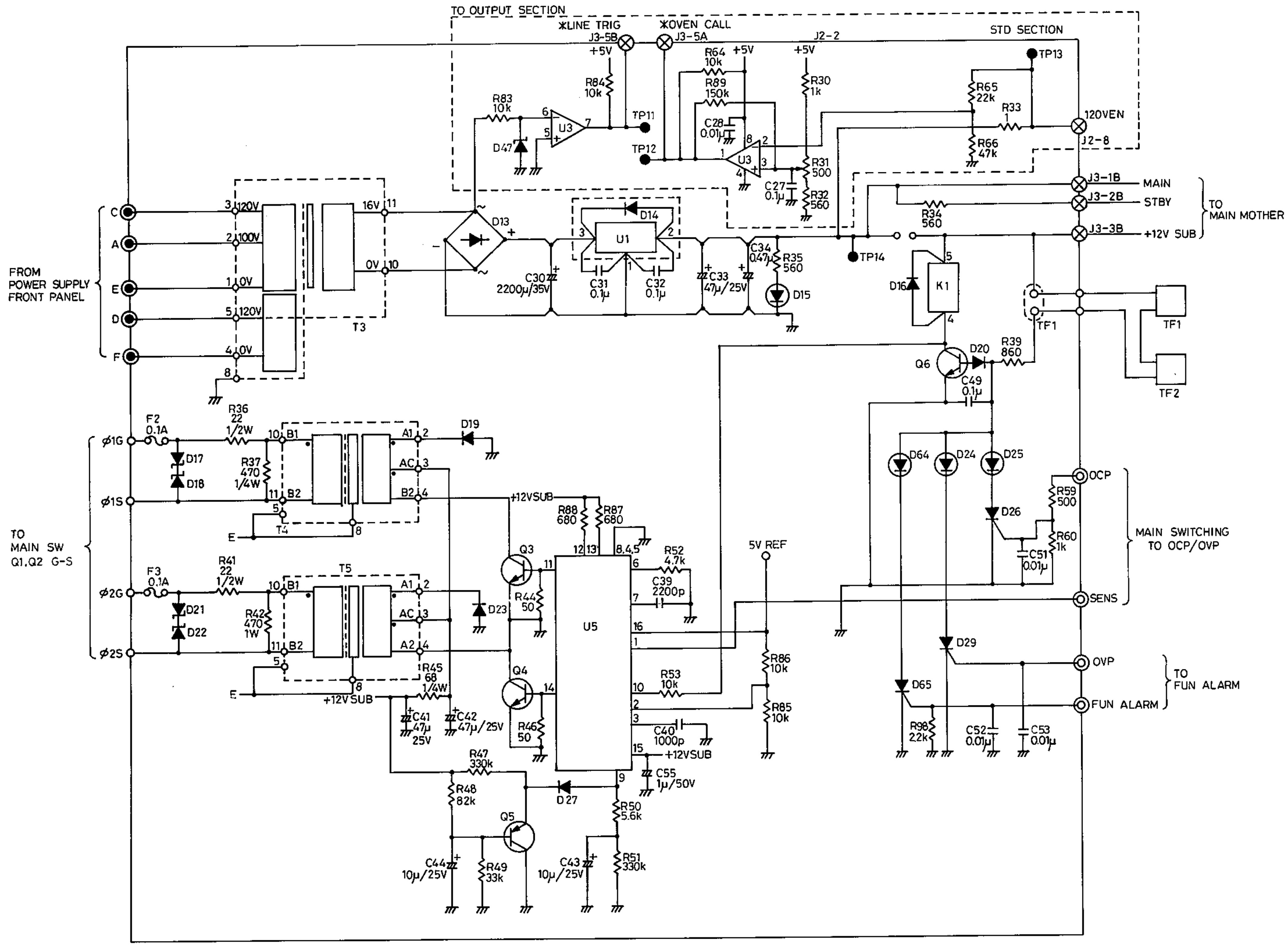
● FROM POWER SUPPLY FRONT PANEL

○ TO CONTROL SECTION

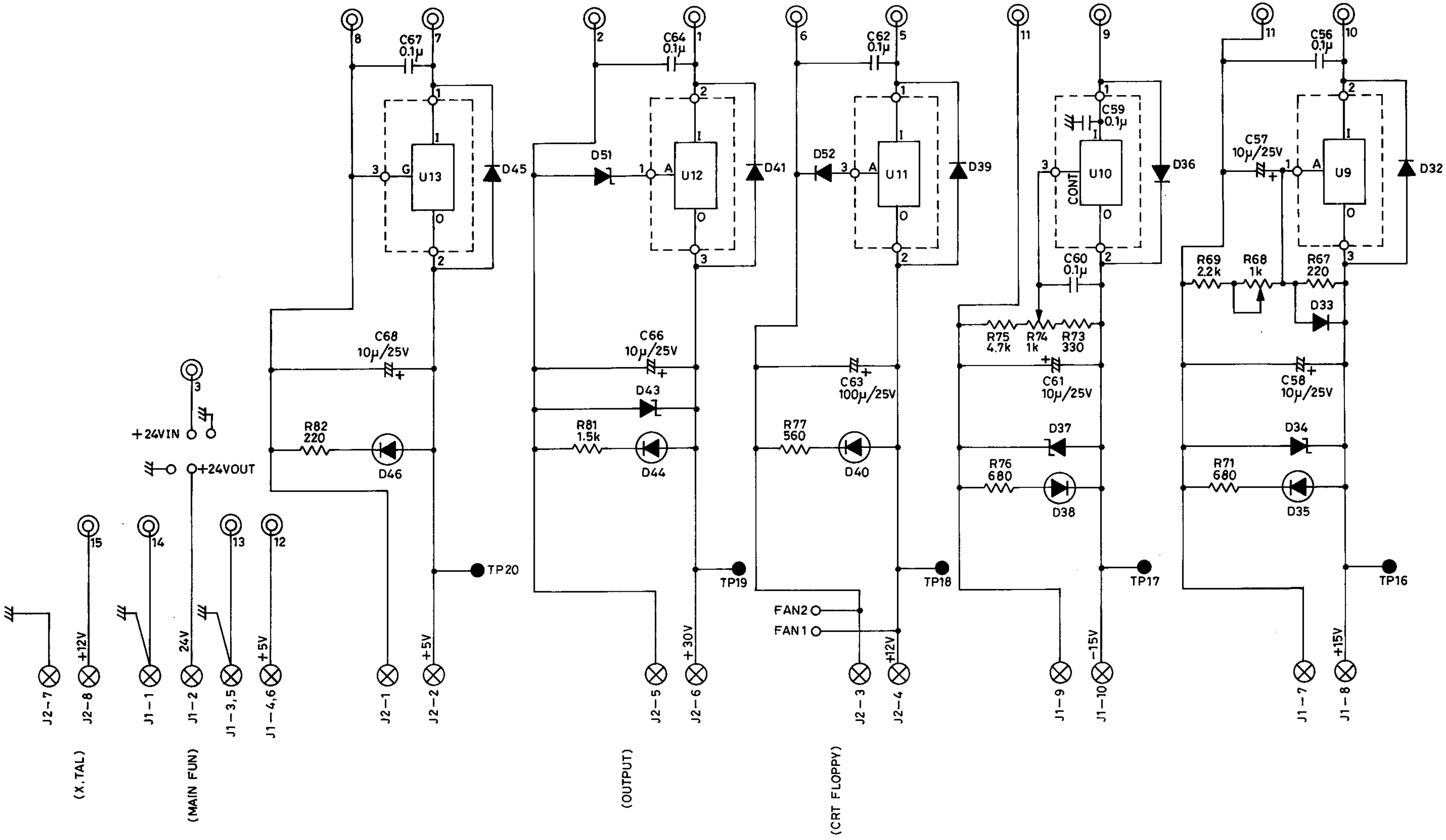
◎ TO OUT PUT SECTION

R4611
POWER SUPPLY
(MAIN SWITCHING)
BLG-013451 2/5

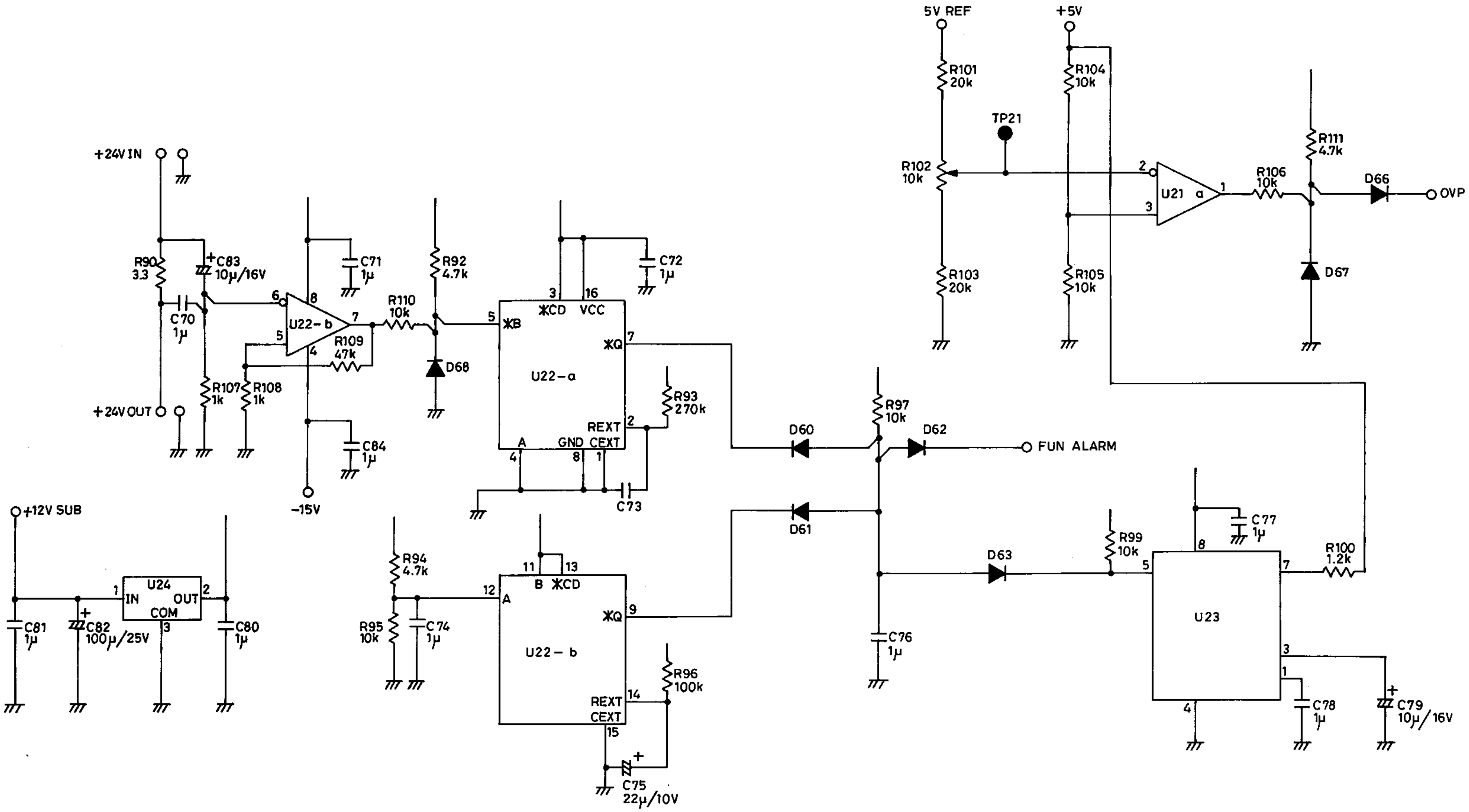
41



R4611
POWER SUPPLY
(CONTROL SECTION)
BLQ－013451 3/5



R4611
POWER SUPPLY
(OUTPUT SECTION)
BLQ – 013451 4/5



R4611
POWER SUPPLY
(FUN ALARM)
BLQ－013451 5/5

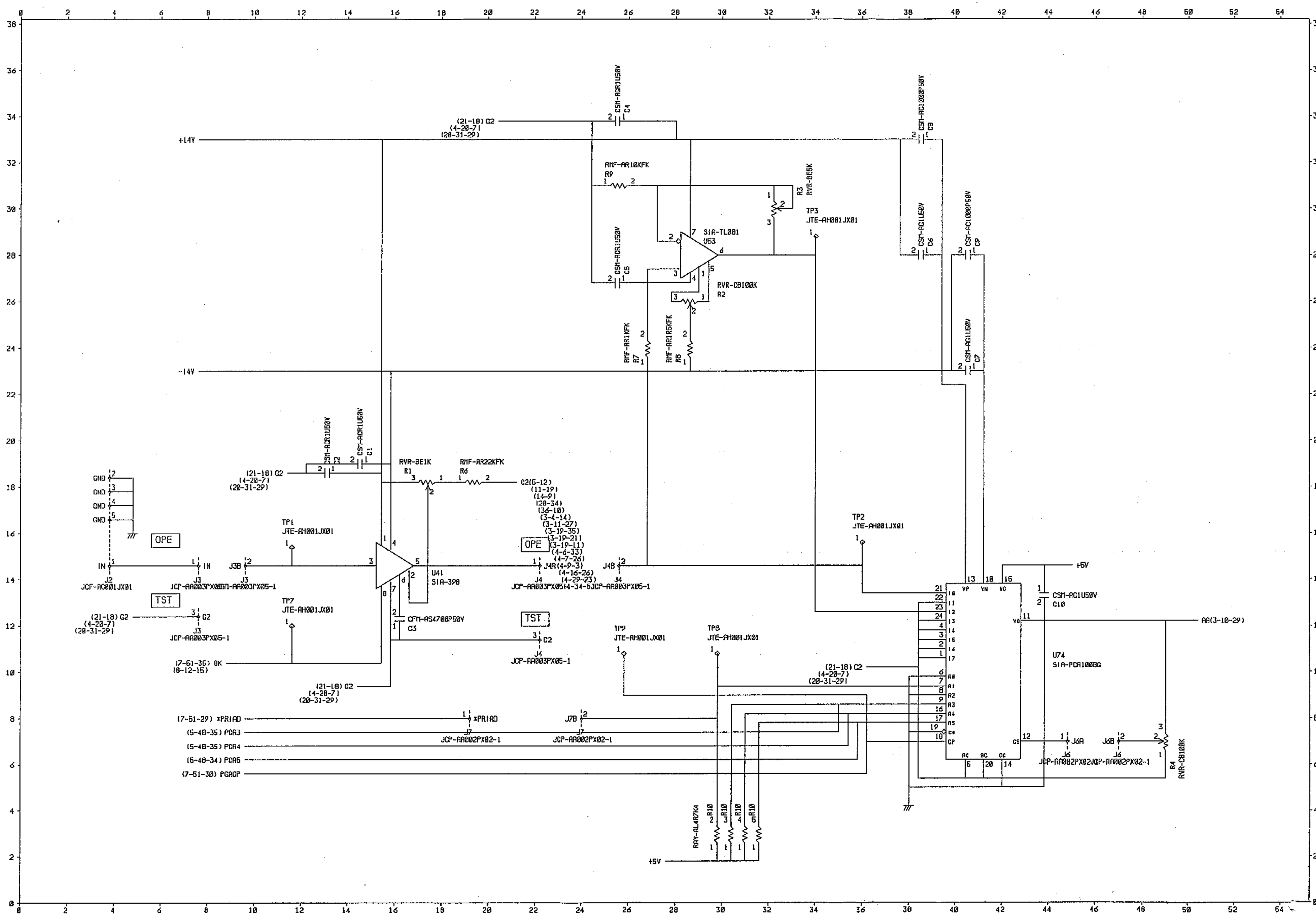
44

R4611

A/D DST

BGP–014179 1/21

45

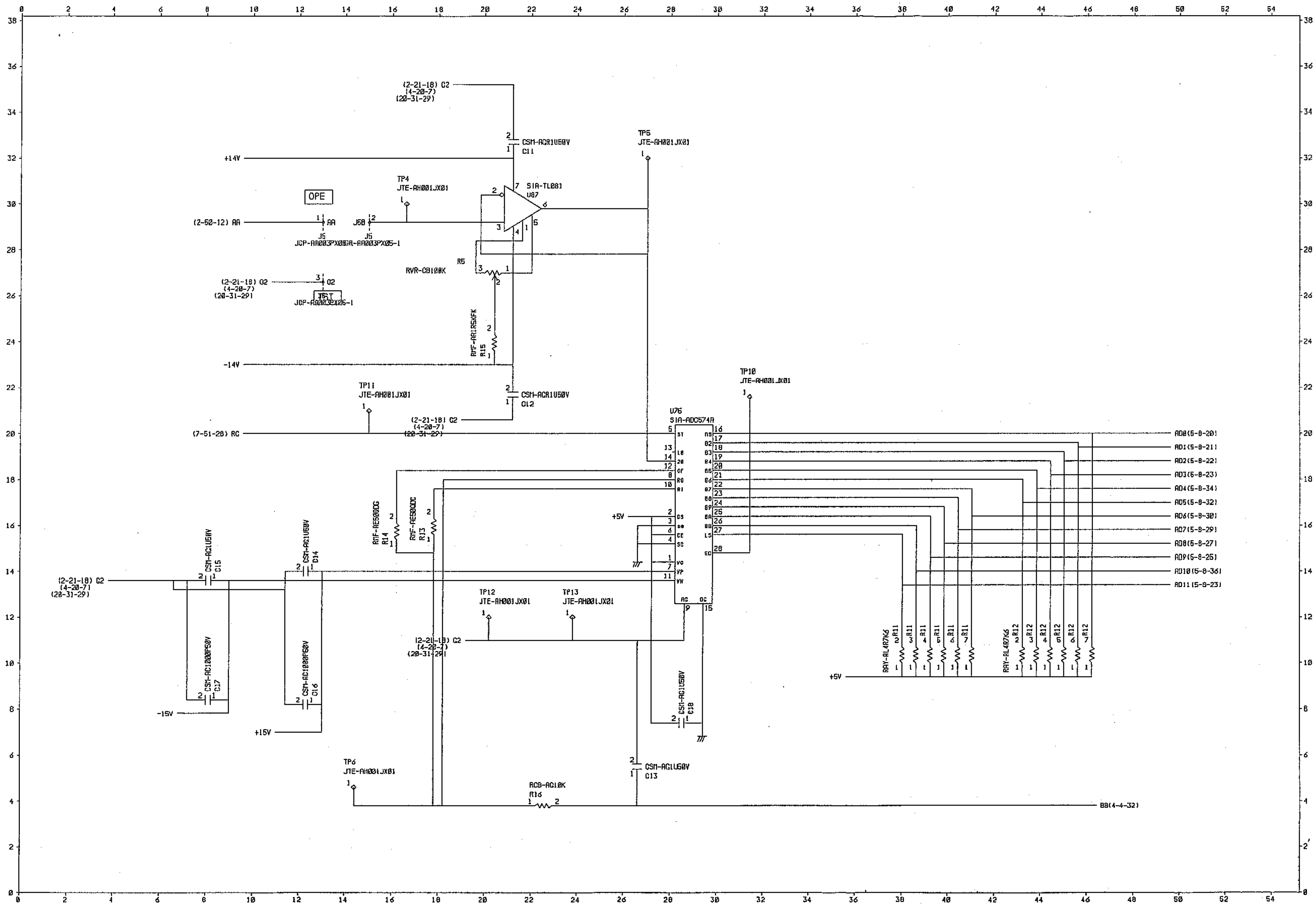


R4611

A/D DST

BGP-014179 2/21

46

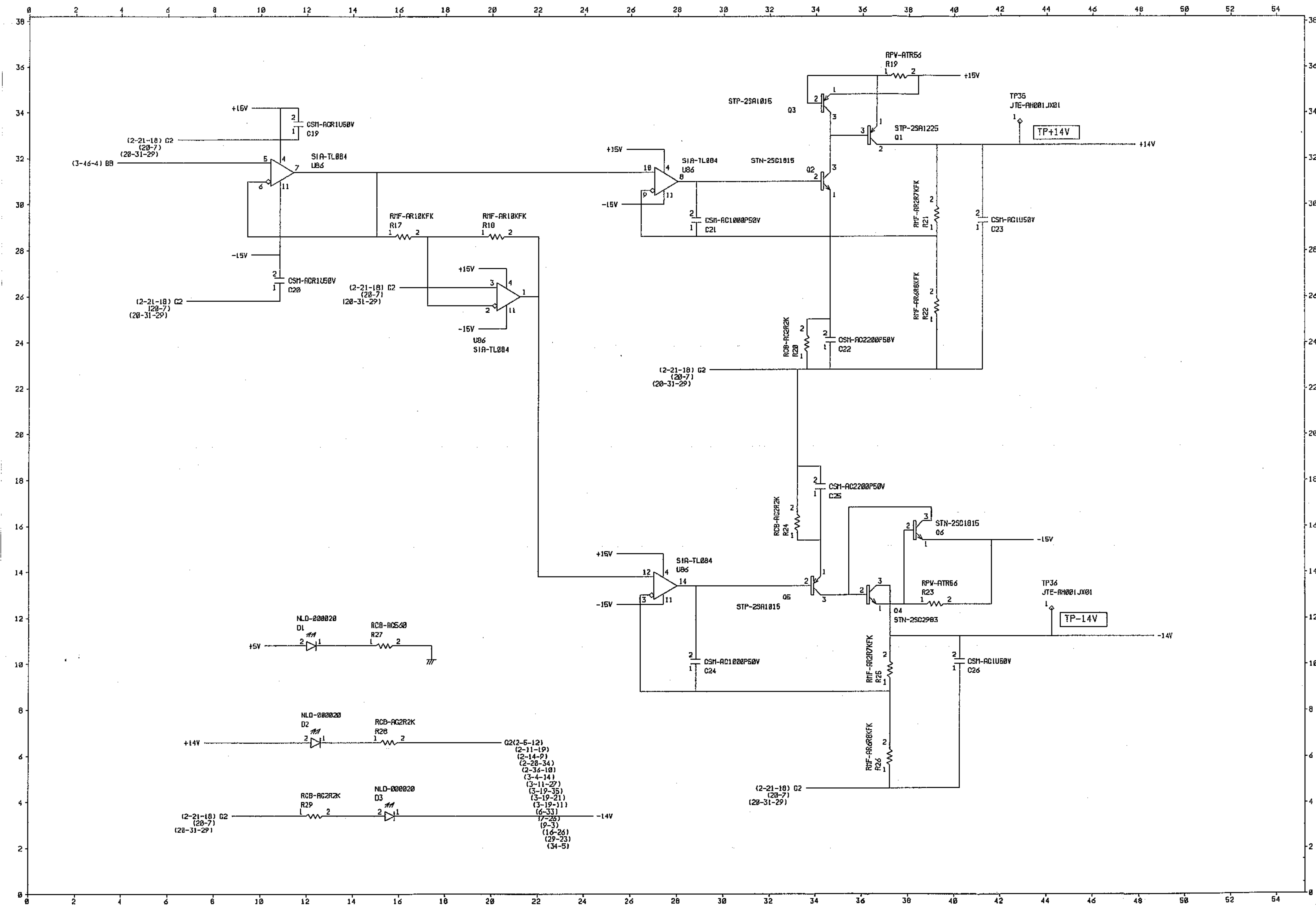


R4611

A/D DST

BGP-014179 3/21

47

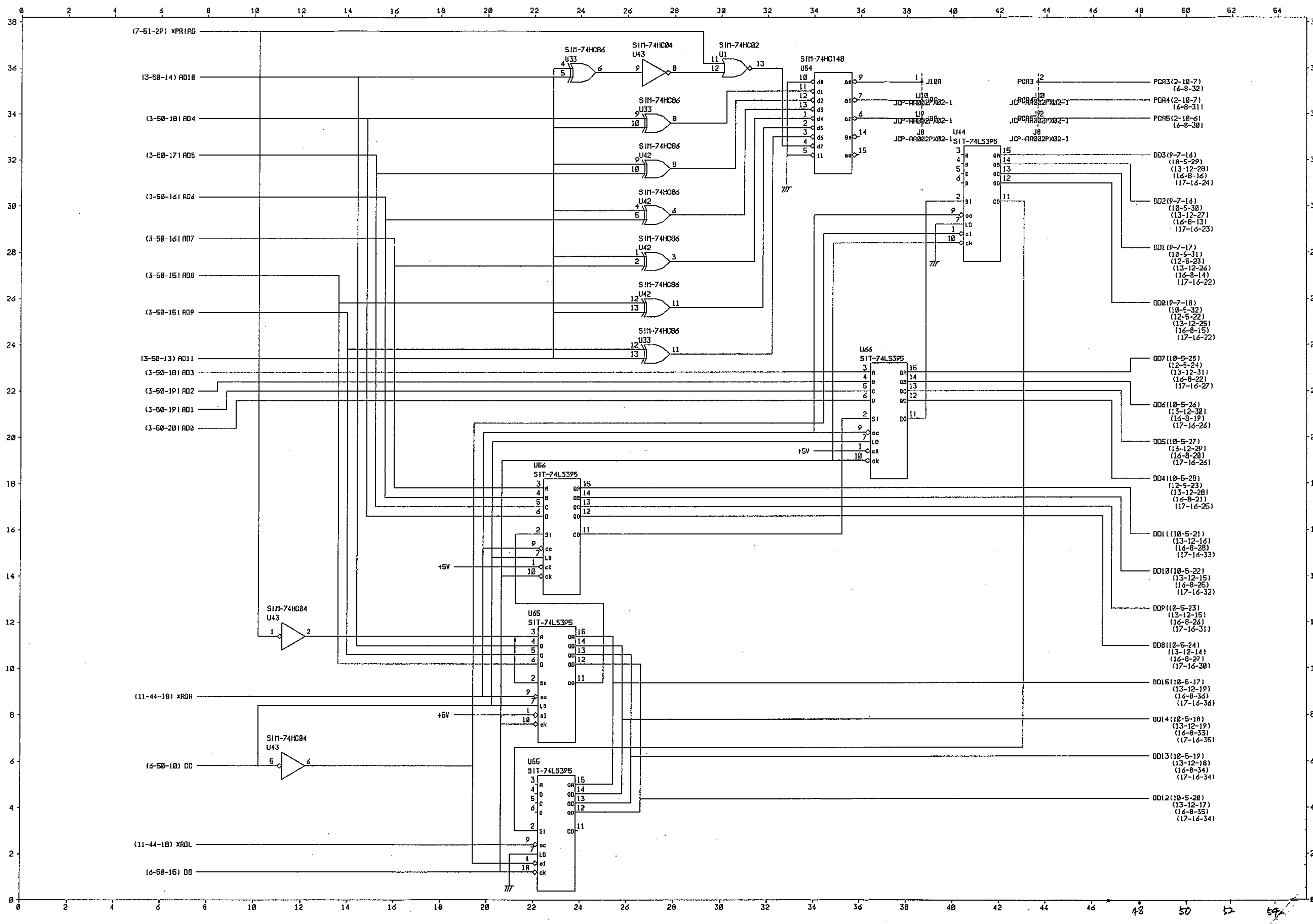


R4611

A/D DST

BGP-014179 4/21

48

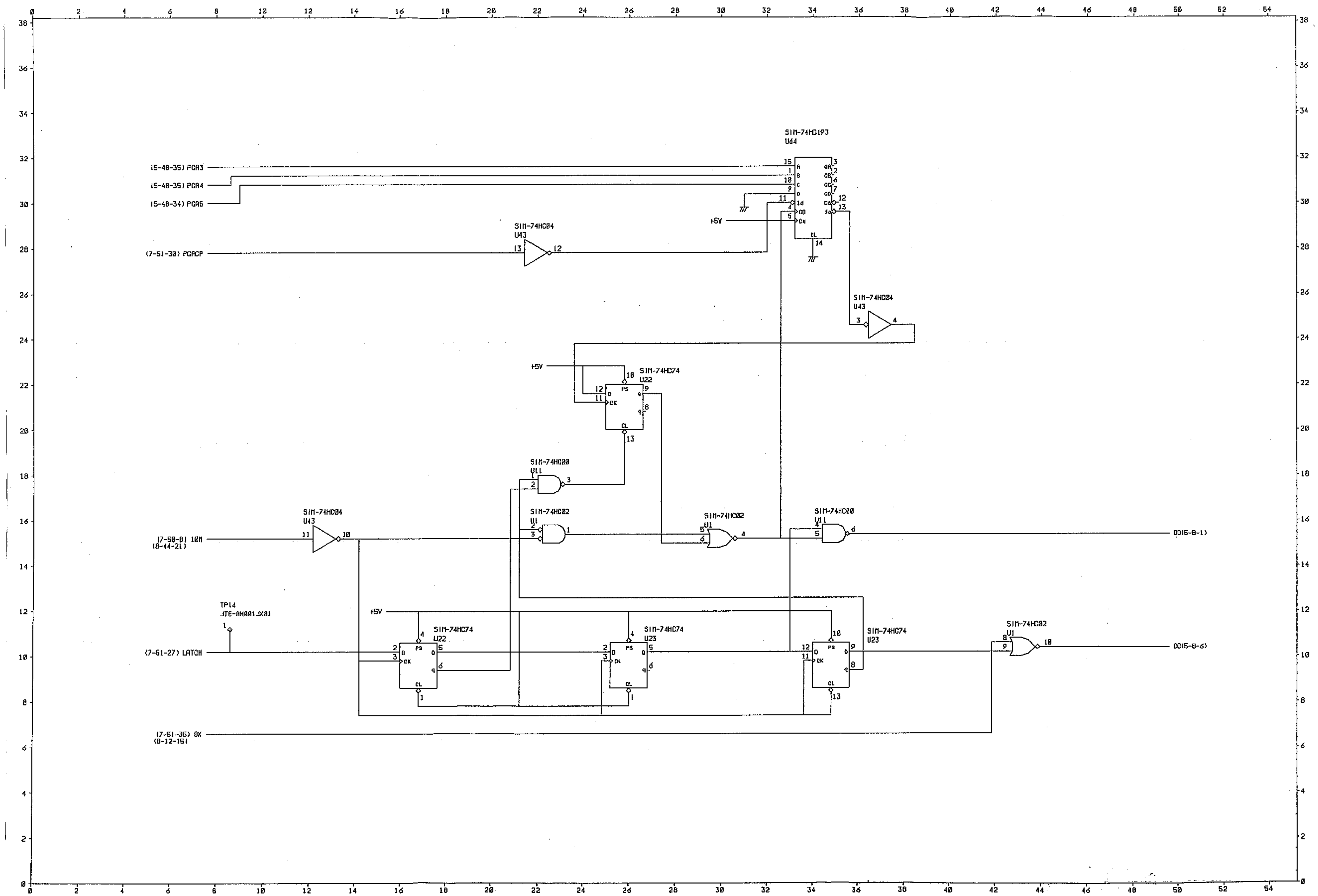


R4611

A/D DST

BGP-014179 5/21

49

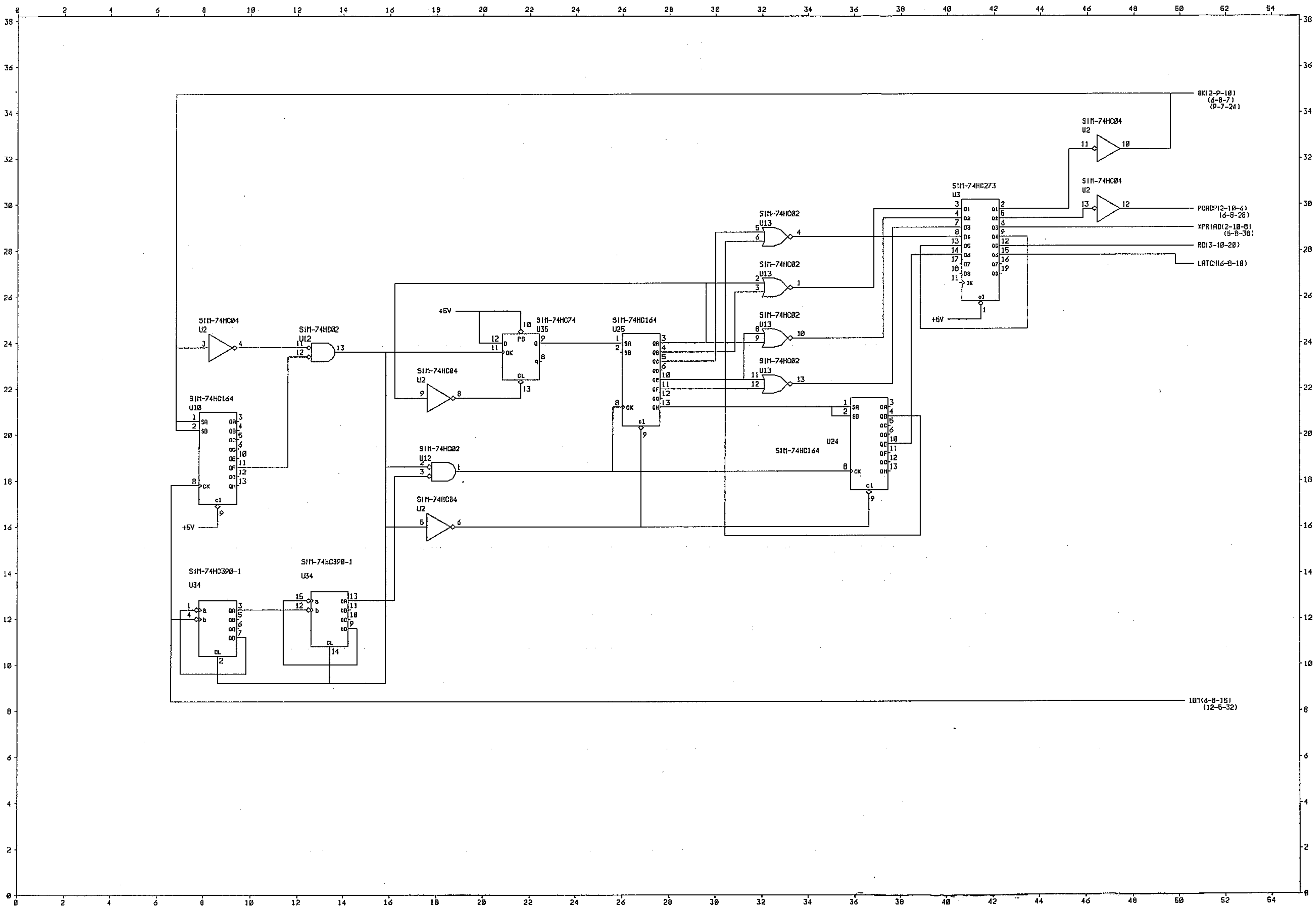


R4611

A/D DST

BGP-014179 6/21

50

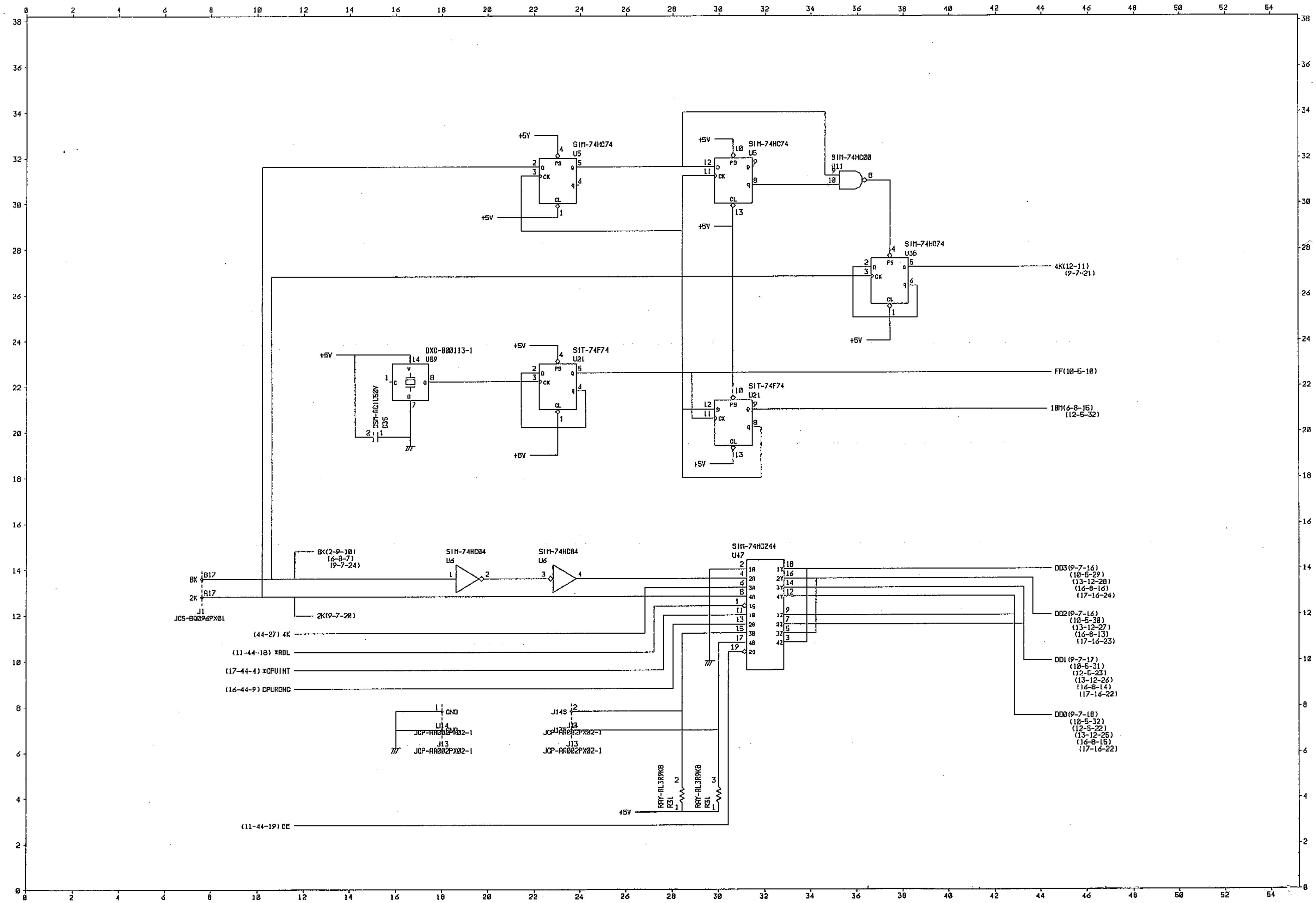


R4611

A/D DST

BGP-014179 7/21

5/

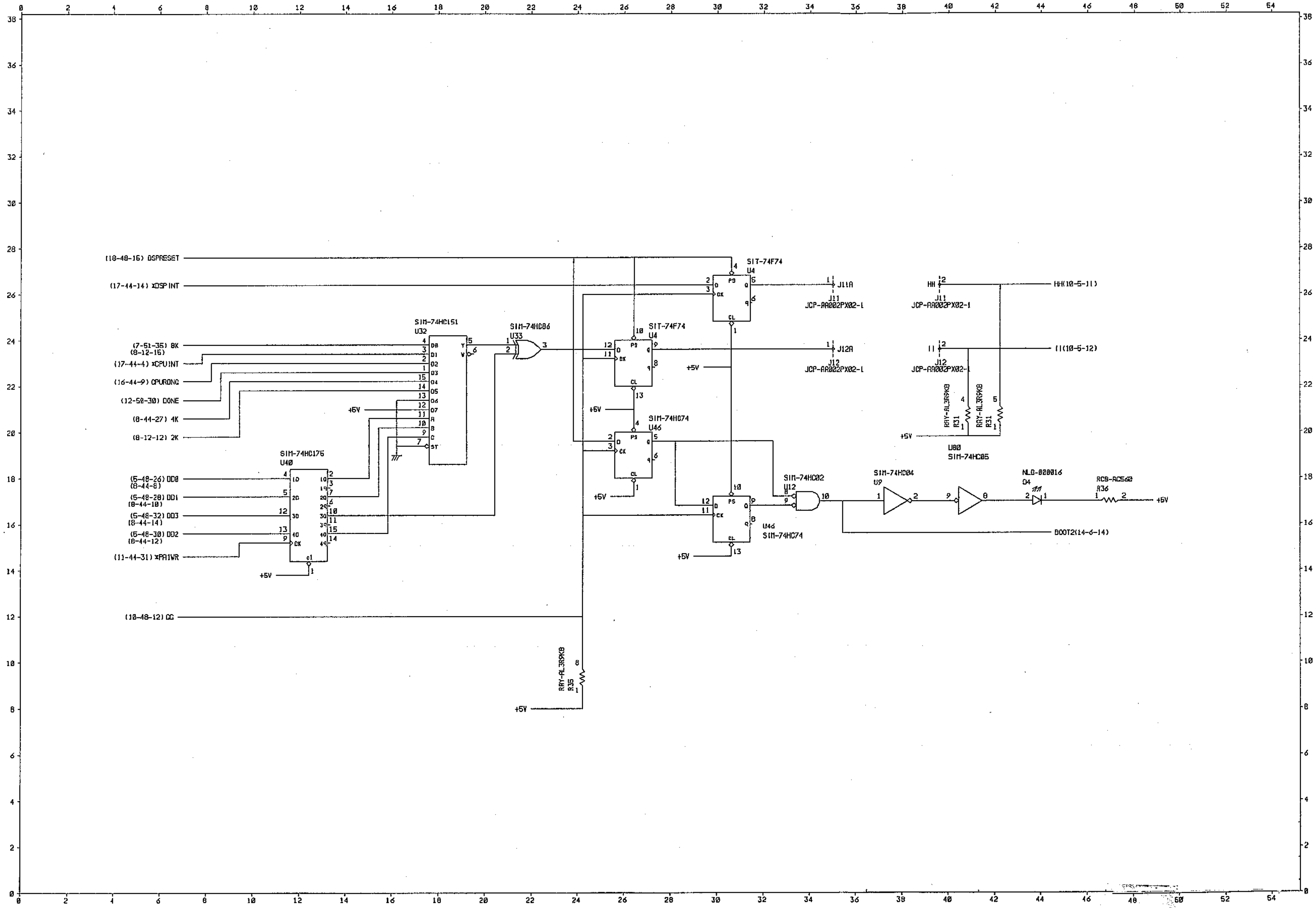


R4611

A/D DST

BGP-014179 8/21

52



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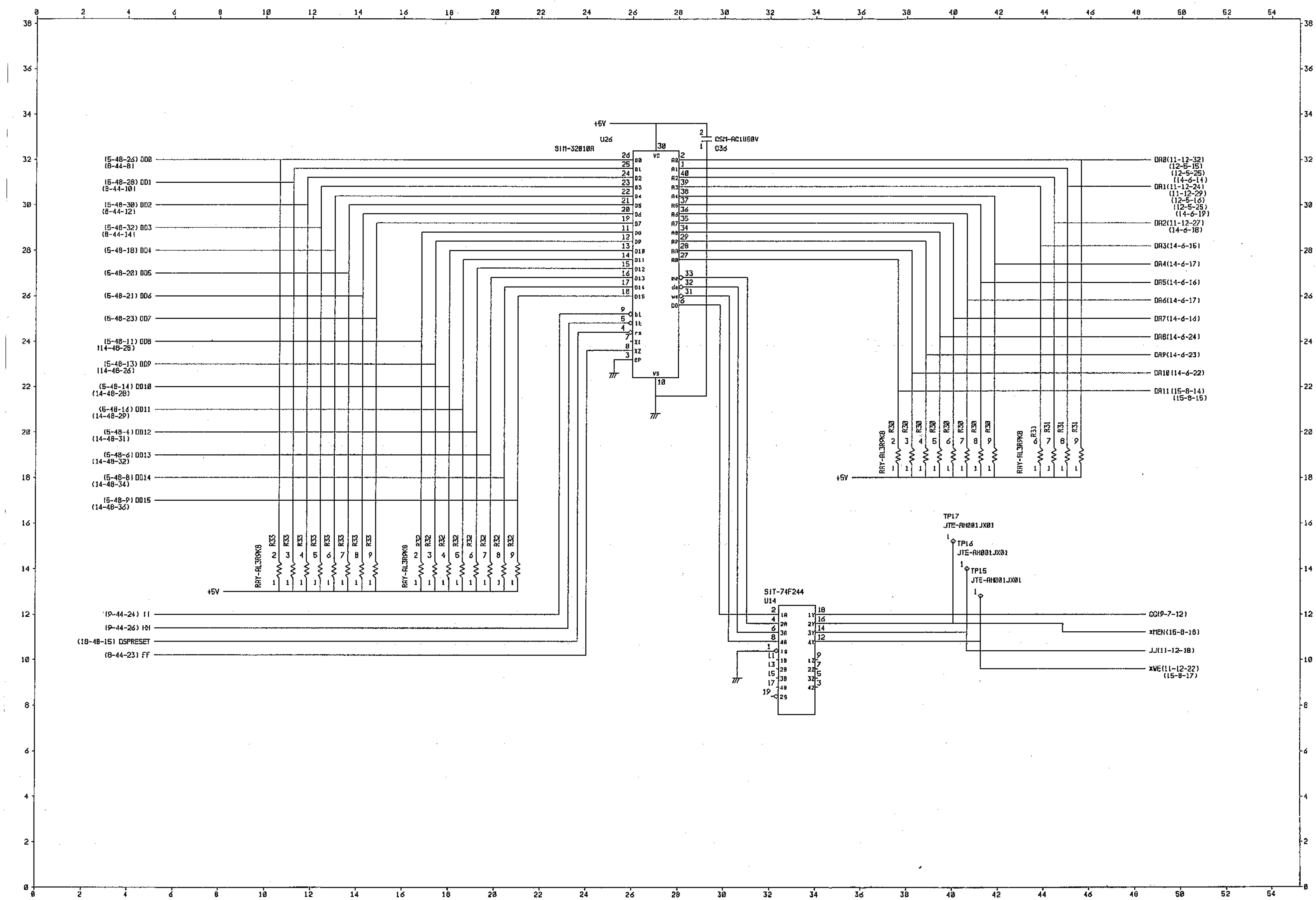
A/D DST

BGP-014179 9/21

53

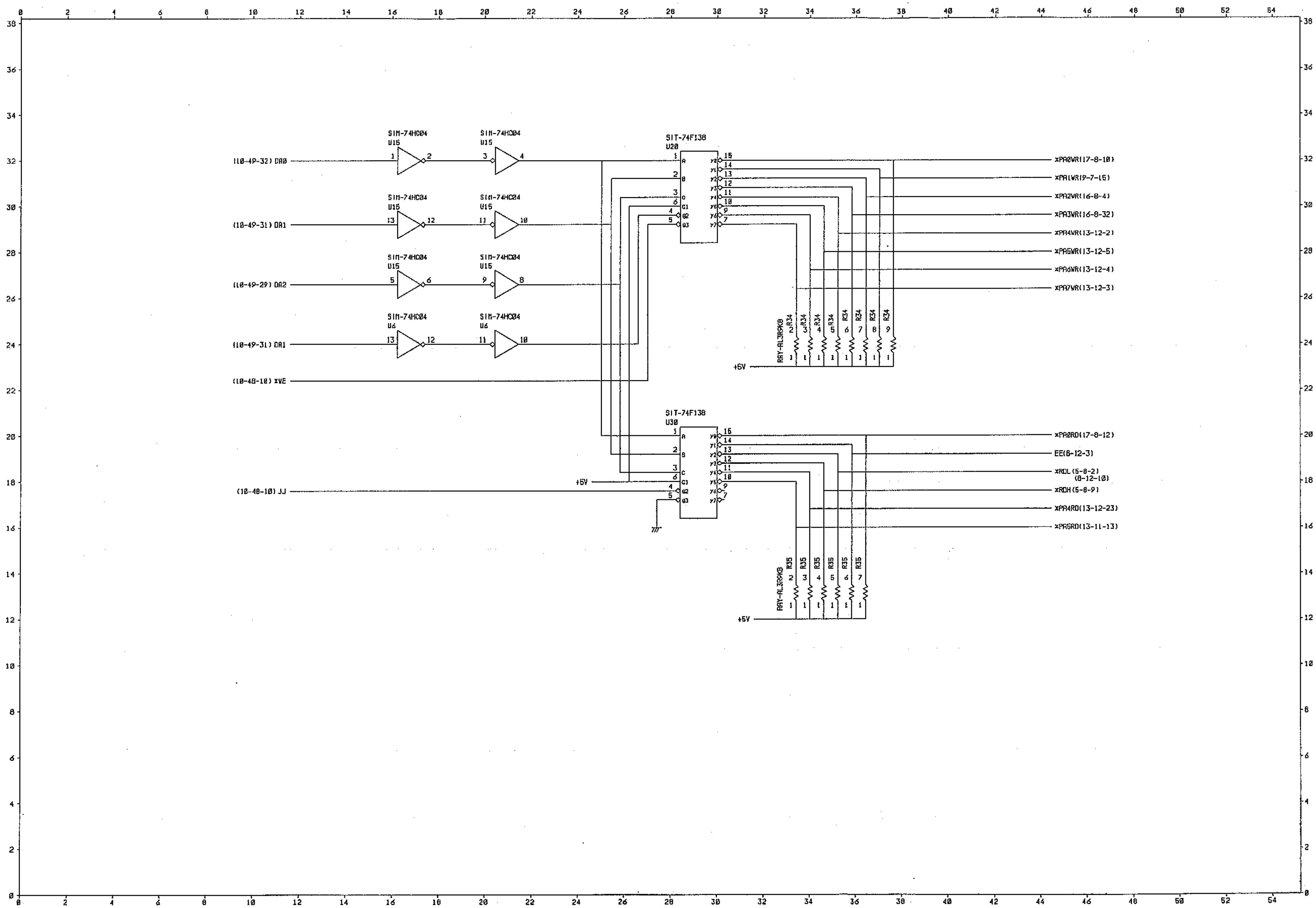


R4611

A/D DST

BGP-014179 10/21

54

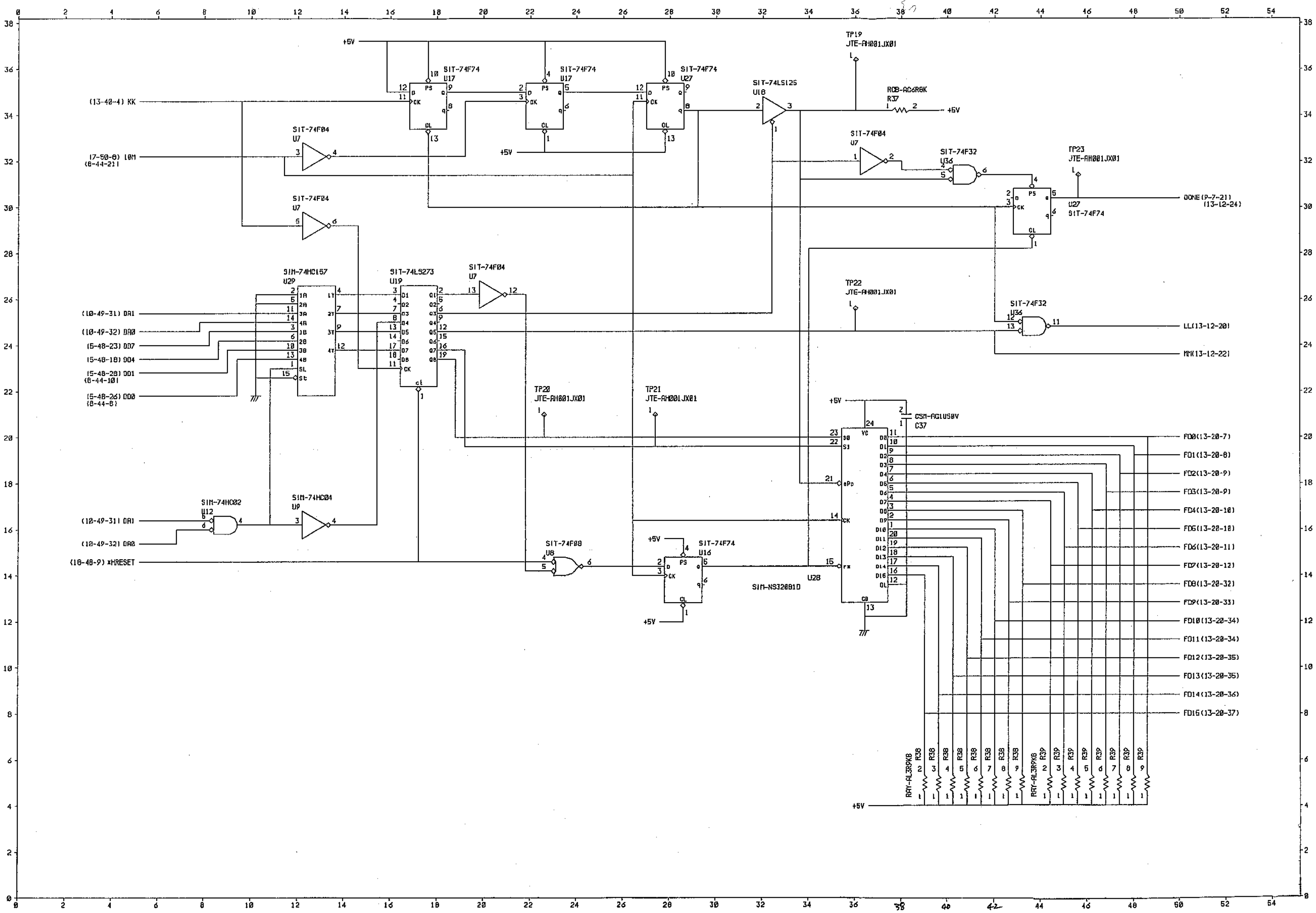


R4611

A/D DST

BGP-014179 11/21

55

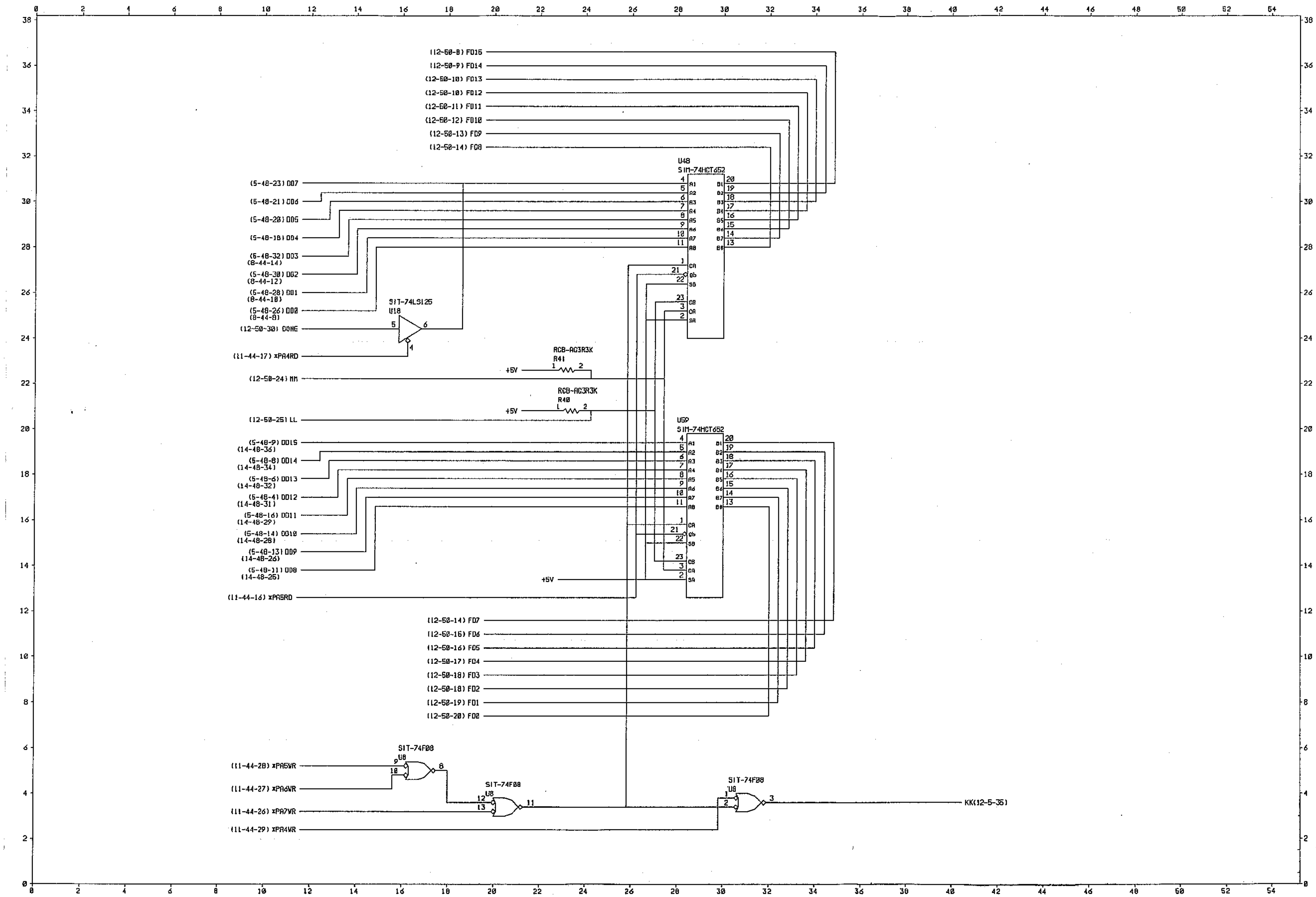


R4611

A/D DST

BGP-014179 12/21

56

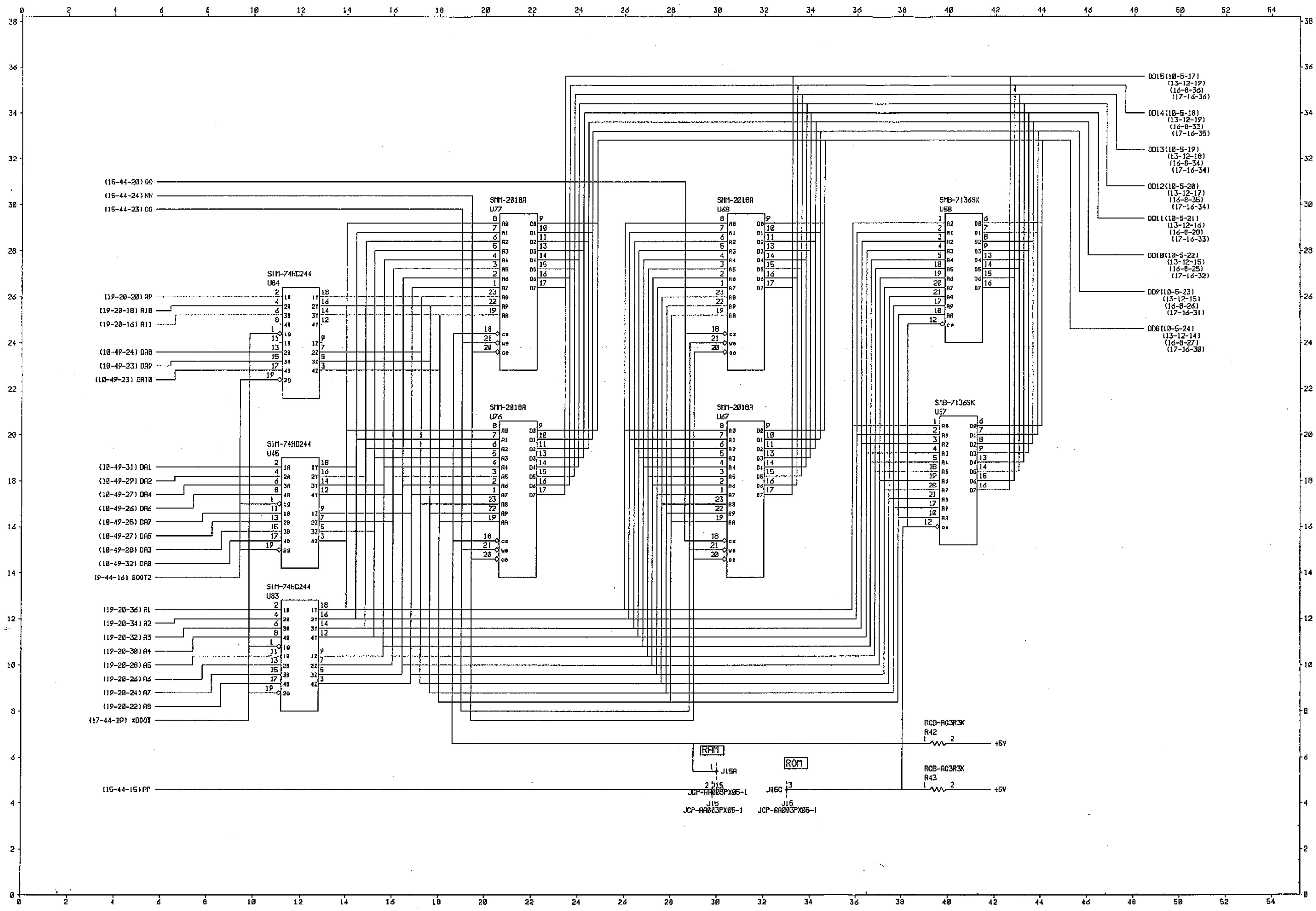


R4611

A/D DST

BGP-014179 13/21

57

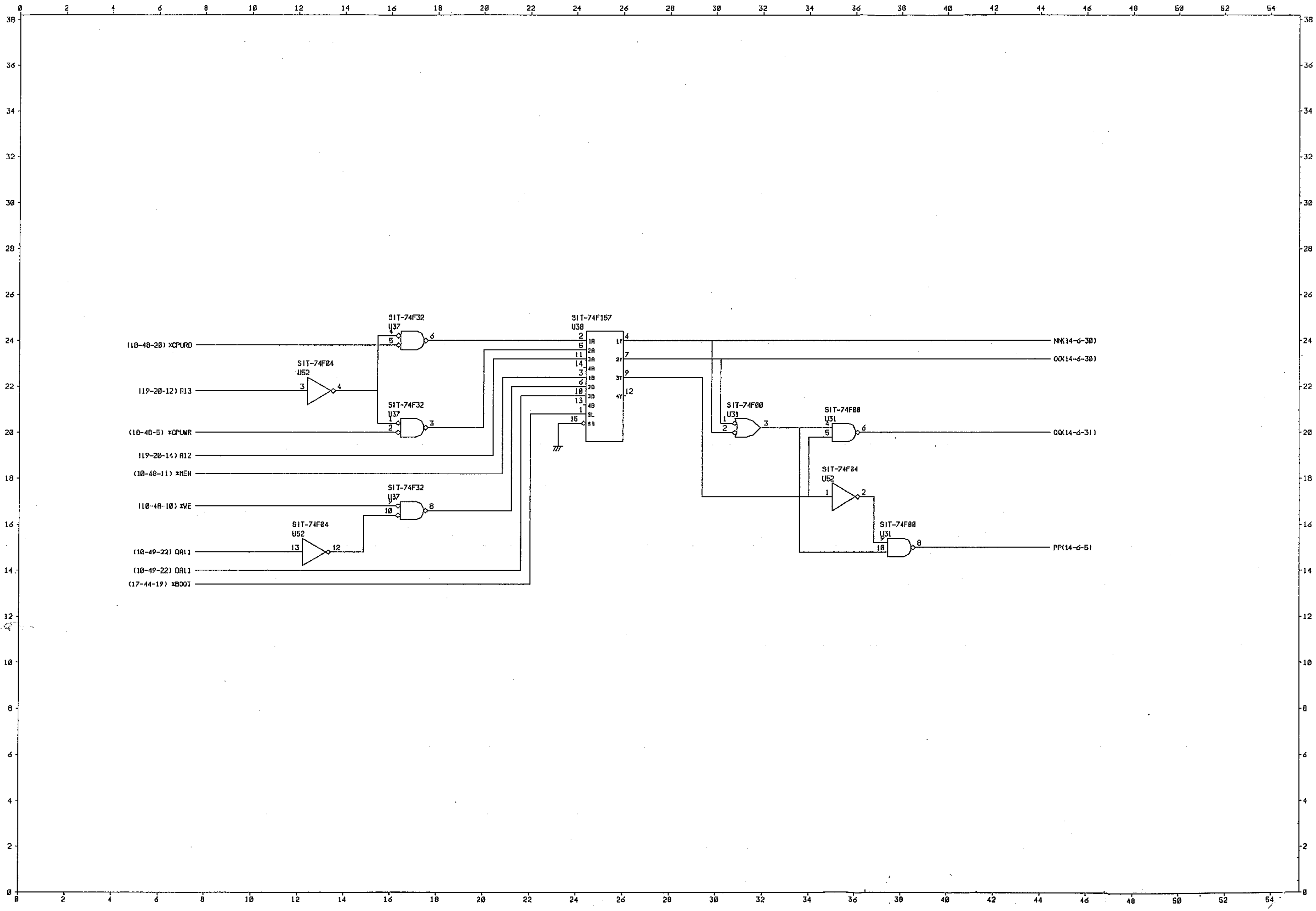


R4611

A/D DST

BGP-014179 14/21

58

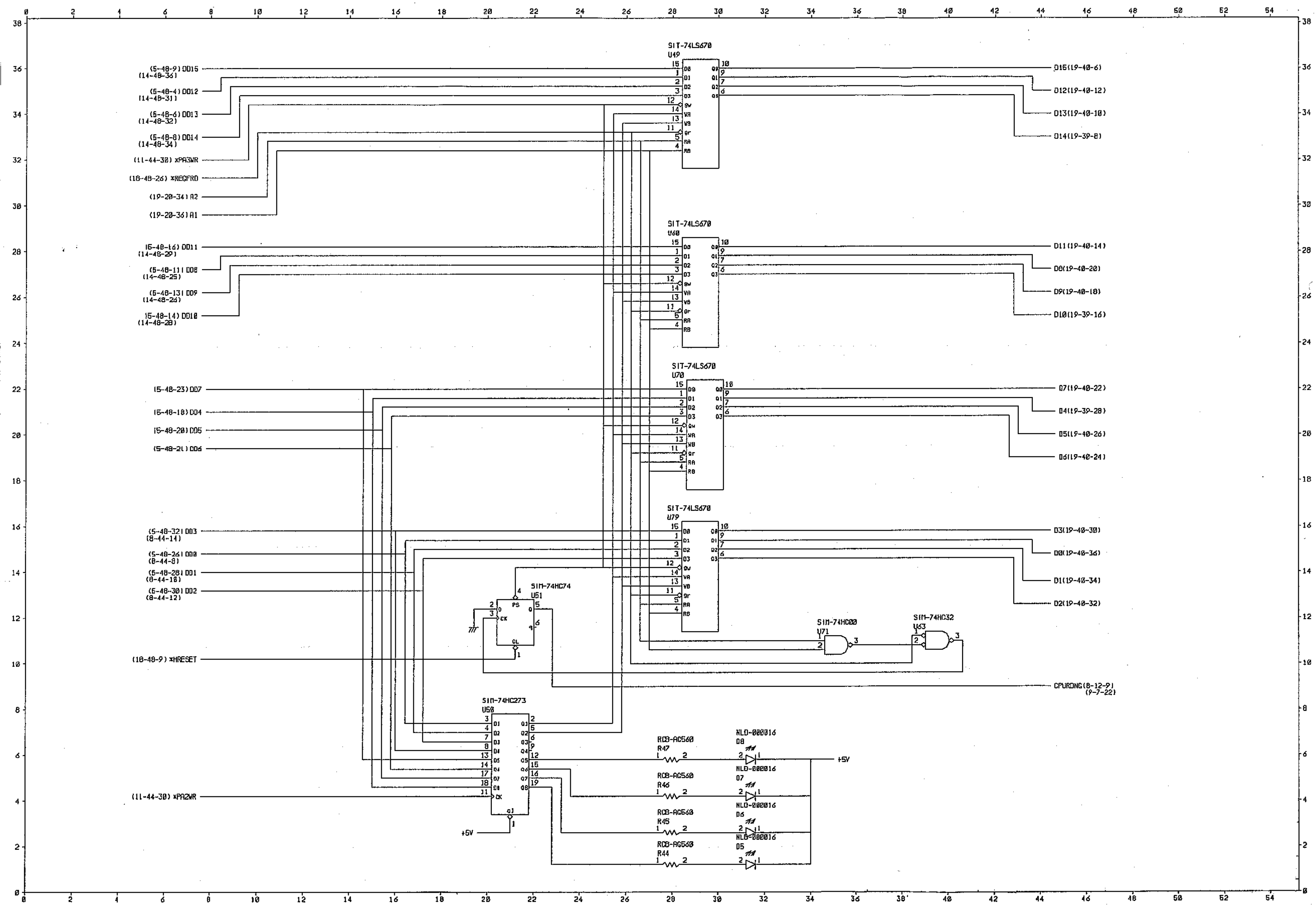


R4611

A/D DST

BGP-014179 15/21

59

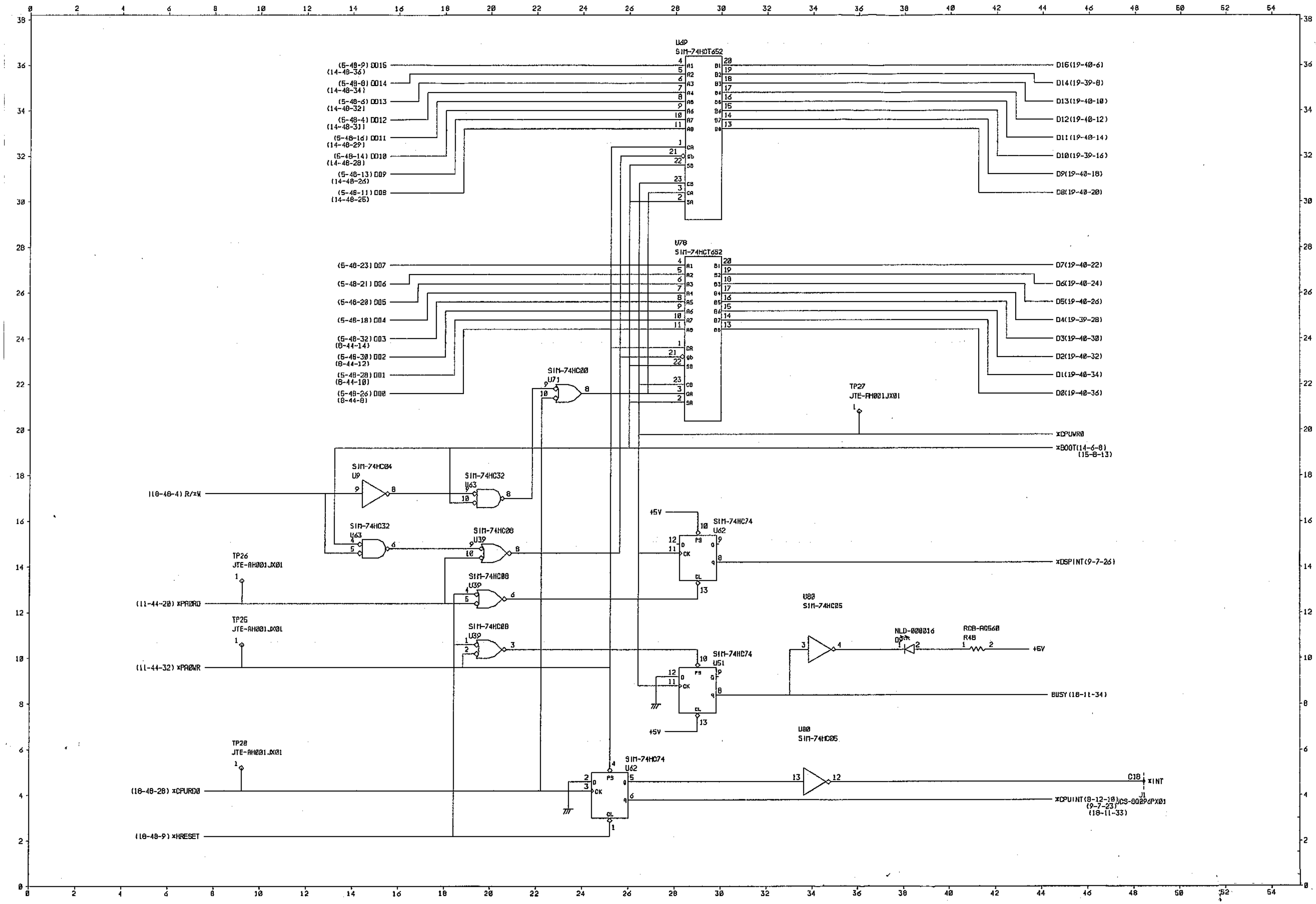


R4611

A/D DST

BGP-014179 16/21

60

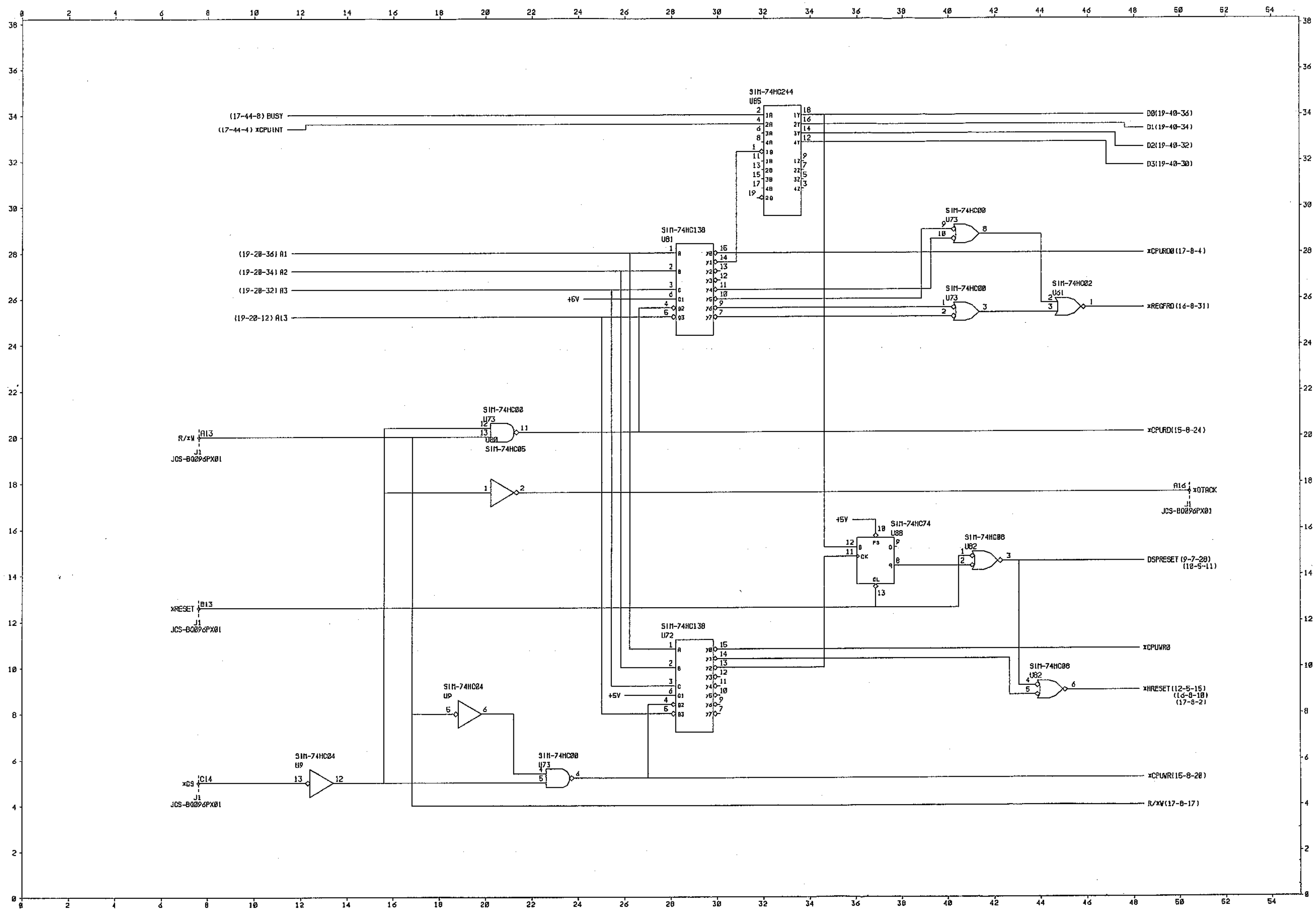


R4611

A/D DST

BGP-014179 17/21

61

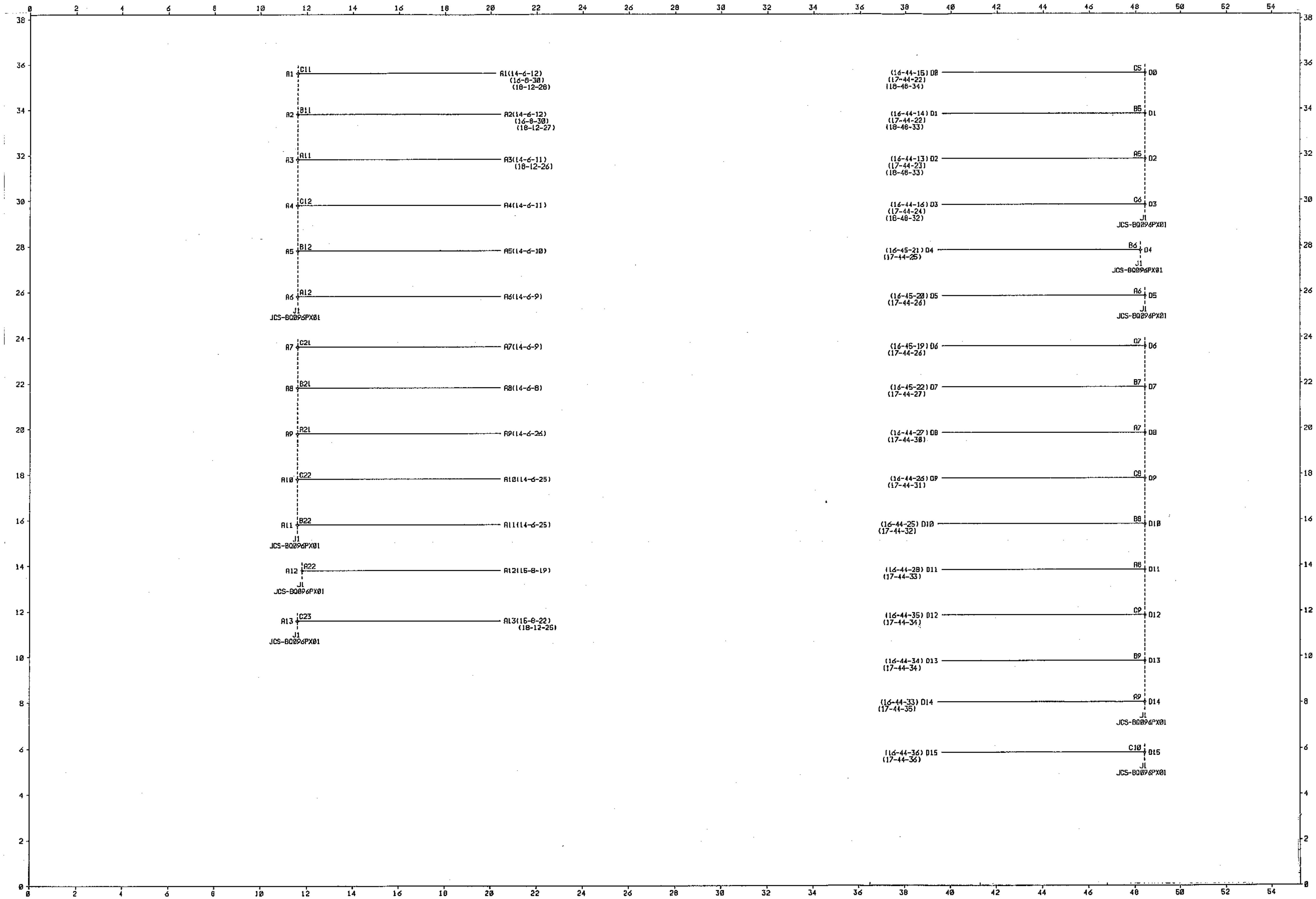


R4611

A/D DST

BGP-014179 18/21

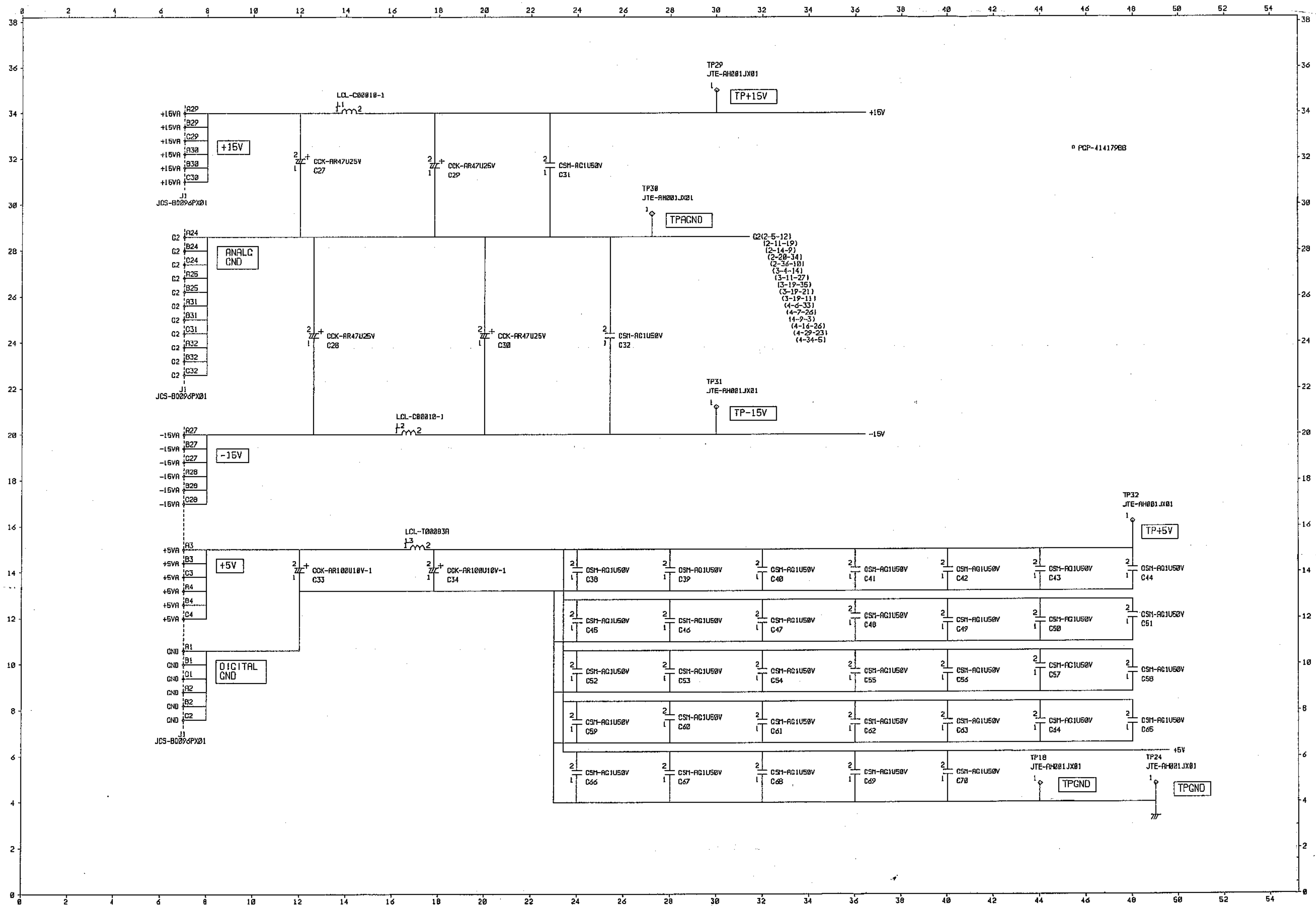
62



R4611

A/D DST

BGP-014179 19/21

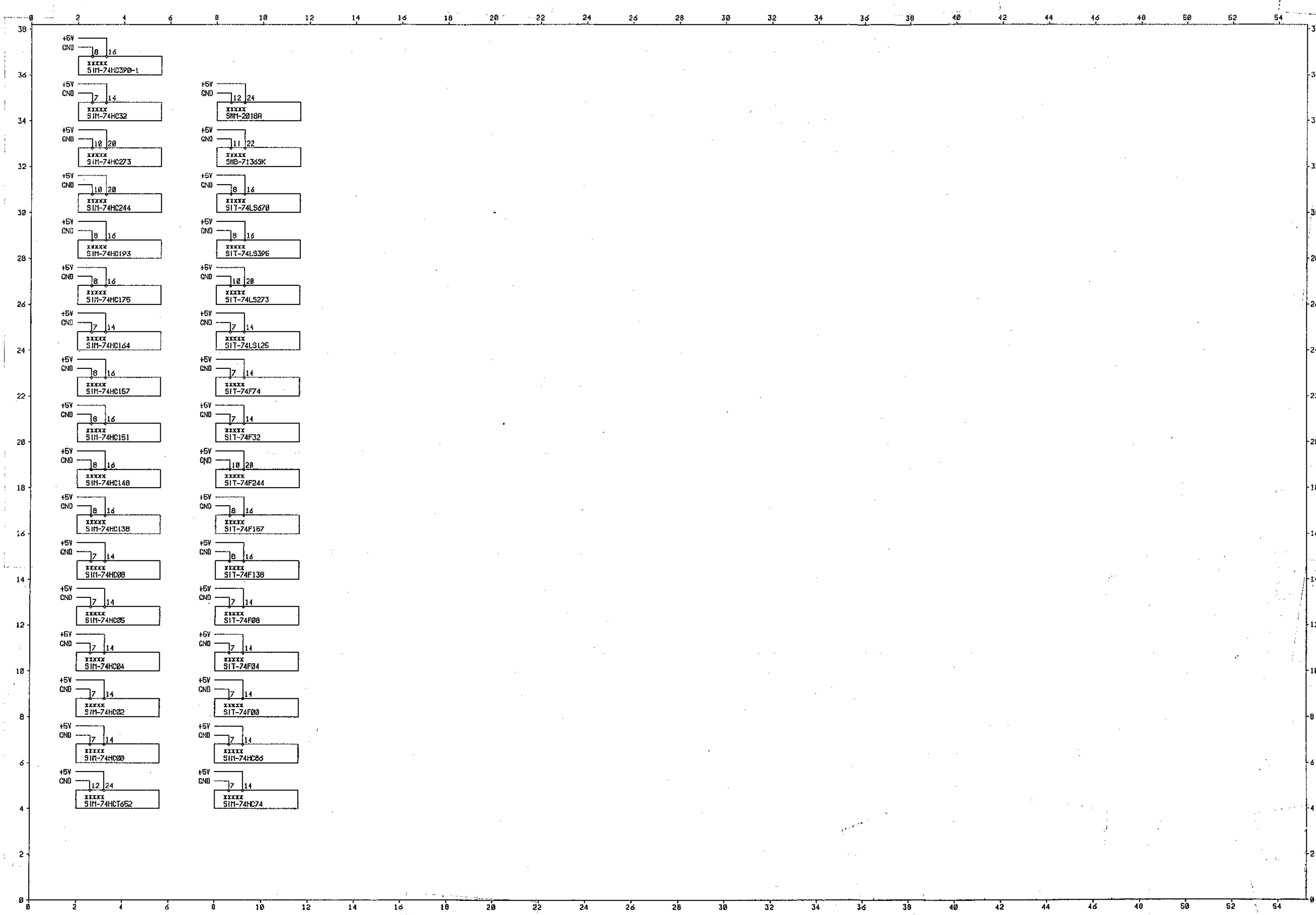


R4611

A/D DST

BGP-014179 20/21

64



R4611

A/D DST

BGP-014179 21/21

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1. Unless otherwise specifically agreed by Seller and Purchaser in writing, Advantest will warrant to the Purchaser that during the Warranty Period this Product (other than consumables included in the Product) will be free from defects in material and workmanship and shall conform to the specifications set forth in this Operation Manual.

2. The warranty period for the Product (the "Warranty Period") will be a period of one year commencing on the delivery date of the Product.

3. If the Product is found to be defective during the Warranty Period, Advantest will, at its option and in its sole and absolute discretion, either (a) repair the defective Product or part or component thereof or (b) replace the defective Product or part or component thereof, in either case at Advantest's sole cost and expense.

4. This limited warranty will not apply to defects or damage to the Product or any part or component thereof resulting from any of the following:

   (a) any modifications, maintenance or repairs other than modifications, maintenance or repairs (i) performed by Advantest or (ii) specifically recommended or authorized by Advantest and performed in accordance with Advantest 's instructions;

   (b) any improper or inadequate handling, carriage or storage of the Product by the Purchaser or any third party (other than Advantest or its agents);

   (c) use of the Product under operating conditions or environments different than those specified in the Operation Manual or recommended by Advantest, including, without limitation, (i) instances where the Product has been subjected to physical stress or electrical voltage exceeding the permissible range and (ii) instances where the corrosion of electrical circuits or other deterioration was accelerated by exposure to corrosive gases or dusty environments;

   (d) use of the Product in connection with software, interfaces, products or parts other than software, interfaces, products or parts supplied or recommended by Advantest;

   (e) incorporation in the Product of any parts or components (i) provided by Purchaser or (ii) provided by a third party at the request or direction of Purchaser or due to specifications or designs supplied by Purchaser (including, without limitation, any degradation in performance of such parts or components);

   (f) Advantest's incorporation or use of any specifications or designs supplied by Purchaser;

   (g) the occurrence of an event of force majeure, including, without limitation, fire, explosion, geological change, storm, flood, earthquake, tidal wave, lightning or act of war; or

   (h) any negligent act or omission of the Purchaser or any third party other than Advantest.

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6. **THE REMEDY SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER FOR BREACH OF WARRANTY WITH RESPECT TO THE PRODUCT.**

7. **ADVANTEST WILL NOT HAVE ANY LIABILITY TO THE PURCHASER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR REVENUES, IN ANY AND ALL CIRCUMSTANCES, EVEN IF ADVANTEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE. TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

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In order to maintain safe and trouble-free operation of the Product and to prevent the incurrence of unnecessary costs and expenses, Advantest recommends a regular preventive maintenance program under its maintenance agreement.

Advantest's maintenance agreement provides the Purchaser on-site and off-site maintenance, parts, maintenance machinery, regular inspections, and telephone support and will last a maximum of ten years from the date the delivery of the Product. For specific details of the services provided under the maintenance agreement, please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest 's sales representatives.

Some of the components and parts of this Product have a limited operating life (such as, electrical and mechanical parts, fan motors, unit power supply, etc.). Accordingly, these components and parts will have to be replaced on a periodic basis. If the operating life of a component or part has expired and such component or part has not been replaced, there is a possibility that the Product will not perform properly. Additionally, if the operating life of a component or part has expired and continued use of such component or part damages the Product, the Product may not be repairable. Please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest's sales representatives to determine the operating life of a specific component or part, as the operating life may vary depending on various factors such as operating condition and usage environment.

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