ADVANTEST®
ADVANTEST CORPORATION

INSTRUCTION MANUAL

TR4132/4132N

Spectrum Analyzer

MANUAL NUMBER EI 9003

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 Power Cable options

There are six power cable options (refer to following table).
Order power cable options by Accessory Codes.

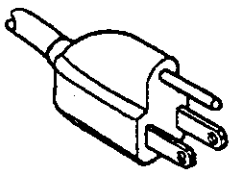
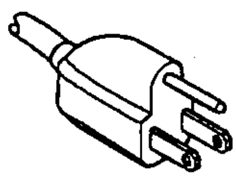
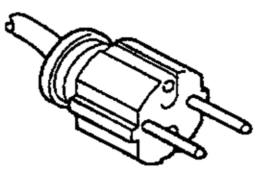
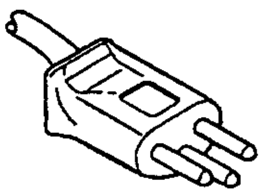
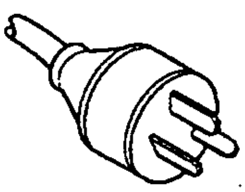
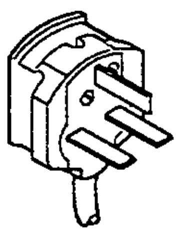
	Plug Configuration	Standards	Rationg, Color and Length	Accessory Codes (Option Number)
1		JIS: Japan Law on Electrical Appliances	125V at 7A Black 2m (6ft)	Straight: A01402 (Standard) Angled: A01412
2		UL: United States of America CSA: Canada	125V at 7A Black 2m (6ft)	Straight: A01403 (Option 95) Angled: A01413
3		CEE: Europe VDE: Germany OVE: Austria SEMKO: Sweden DEMKO: Denmark KEMA: Holland FIMKO: Finland NEMKO: Norway CEBEC: Belgium	250V at 6A Gray 2m (6ft)	Straight: A01404 (Option 96) Angled: A01414
4		SEV: Switzerland	250V at 6A Gray 2m (6ft)	Straight: A01405 (Option 97) Angled: A01415
5		SAA: Australia, New Zealand	250V at 6A Gray 2m (6ft)	Straight: A01406 (Option 98) Angled: ———
6		BS: United Kingdom	250V at 6A Black 2m (6ft)	Straight: A01407 (Option 99) Angled: A01417

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SECTION 1
GENERAL INFORMATION AND SPECIFICATIONS

1-1 Introduction

TR4132 or **TR4132N** Spectrum Analyzer is not only capable of performing spectrum analysis of various waveforms and waveform analysis such as spurious surveilance of various radio wave appliances, but also functioning as a new type field strength measuring equipment.

Especially in field strength measurement, this instrument is designed to perform panoramic sensitive reception over a wide frequency range. Since the coefficient compensation for specified antenna is automatically effected inside the instrument, the measurement can be conducted speedily at any arbitrary frequency. While, the frequency and the reference level are displayed in digital when the signal under measurement is corresponded to the center of CRT display.

A provision is further made for quasi peak value measurement of interference waves under CISPR Specifications.

On account of the low-power minded design, battery mode operation (with **TR1927** Battery Pack) has become possible so that the instrument can be taken to the places such as mountain side where no electric power is available.

1-2 Accessory

The standard accessory supplied together with the instrument is listed below. Please check the items and quantity on delivery. SECTION 7 describes optional accessory.

1-2-1 TR4132

(1) Input Cable **MI-02** 1pc
(2) Input Cable **MI-04** 1pc
(3) **TR1613** N-BNC Conversion Adapter 1pc
(4) Fuse* 2pcs
(5) Allen Wrench 3mm 1pc
(6) Front Cover. 1pc
(7) Instruction Manual .... 1 copy

1-2-2 TR4132N

(1) Input Cable **MO-15**....... 1pc
(2) Fuse* 2pcs
(3) Allen Wrench 3mm 1pc
(4) Front Cover.................. 1pc
(5) Instruction Manual .... 1 copy

(Note) See page 7-8 as to specification of the input cables.

1-3 Specifications

The electrical performance and general specifications of **TR4132/4132N** are shown in [Table 1-1]. The electrical performance is subject to AC 100V ± within 10%, 50/60Hz, environment temperature during operation at 0°C to +40°C, relative humidity less than 85%, and warm up for about 30 minutes.

*100V AC ±10%, 120V AC ±10% ....
0.5A slow blow fuse
200V AC ±10%, 240VAC $^{+4\%}_{-10\%}$ ....
0.25A slow blow fuse

Frequency Specifications

Frequency Range : 100kHz to 1000MHz

Center Frequency Display
: Unit of 1MHz, digital display by LED

Center Frequency Display Accuracy: Within ±10MHz

Scan width : By DISPERSION/DIV. switch 100MHz/DIV. to 100kHz/DIV. in 1-2-5 step and zero scan.

Scan Linearity : Within ±5%

Tuning Mode : By Center Frequency Tuning and *Presetting with semi-fixed variable resistor (***TR4132N** type is preset at VHF TV band, 20MHz/DIV., 1.5MHz B.W.)

Stability:
- **Frequency stability**; Within 200kHz/5 minutes or less
- **Residual FM** ; Within 10kHzp-p
- **Noise Sidebands**; –70dBc, 200kHz away from carrier with IF B.W. 10kHz.

IF Bandwidth : 300kHz, 100kHz, 30kHz, 10kHz (3dB) automatically set by DISPERSION/DIV. switching or 1.5-MHz, 120kHz, 9kHz (6dB) manually set .

IF Bandwidth Accuracy: Within ±20%

IF Bandwidth Selectivity
: 60dB/3dB IF Bandwidth ratio < 15 :1

IF Bandwidth Switching Accuracy: Within ± 1 dB

Ampritude Specifications

Display on CRT : 10dB/div., 5dB/div., LINEAR switchable

LOG. Display Accuracy
: Within ±1dB for 10dB variation
Within ±1.5dB for 40dB variation
Within ±2dB for 80dB variation

Reference Level Display
: Decimal 3 digits, 7-segment LED, 1dB resolution.

Reference Level Selection:
- **Input Level** ; Input terminal voltage display (dBμ)
- **Field Strength** ; Field Strength display (dBμ/m) Half-wave length dipole antenna and log. periodic antenna switchable. (with built-in antenna coefficient compensation).

Reference Level Accuracy: Less than ±1.5dB

Dynamic Range:
- **Dynamic Range on CRT**; 80dB
- **Averaged Noise Level**
; Below 5dBμ (at IF Bandwidth 10 kHz, Video Filter 100Hz)
- **Spurious Response**
; Ratio of spurious for input signal –70dB or below (at RF. ATT. 0dB, and Input 80dB)
- **Residual Response**
; less than –20dBμ (at RF. ATT. 0dB, Zeró input)

Video Filter : 100Hz, 10kHz, OFF switchable in MEAN Detection Mode.

Frequency Response
: Less than ±1dB (for 100kHz to 1000MHz)

Input Sensitivity : 5dBμ

IF Gain : 0 to 30dB/10dB step, –60dB to +6dB/1dB step

Gain Compression: Below –1dB (at RF. ATT. 0dB, 100dBμ Input)

Detection Method: MEAN (Average Value) Dynamic Range 80dB and Q.P. (Quasi Peak Value of C.I.S.P.R. specifications) Dynamic Range 40dB

Input Specifications

(1) **TR4132**
- **Input Connector** : N type
- **Input Impedance** : 50 ohms
- **Input V.S.W.R.** : Less than 1.5 (at RF. ATT. 10dB)
- **Input Attenuator** : 0 to 40dB, on 10dB step
- **Maximum Input Level**: 130dBμ ±50Vdc

(2) **TR4132N**
- **Input Connector** : BNC type
- **Input Impedance** : 75 ohms
- **Input V.S.W.R.** : Less than 1.5 (at RF. ATT. 10dB)
- **Input Attenuator** : 0 to 40dB, on 10dB step
- **Maximum Input Level**: 130dBμ ±50Vdc

Scan Specifications
- **Scan Time** : 20ms to 10s continuously variable
- **Scan Mode** : SINGLE, MANUAL, AUTO

Output Specifications

Calibration Output:
- **Level** ; 80dBμ ±0.5dB
- **Frequency** ; 100MHz ±200kHz
- **Output Impedance**; 50Ω (**TR4132**)
75Ω (**TR4132N**)

X-axis Output:
- **Level** ; about +5V to –5V
- **Output Impedance**; about 10kΩ

Y-axis Output:
- **Level** ; about 0V to 3.5 V
- **Output Impedance**; about 10kΩ

Monitor Output : available for 8Ω earphone (**TR1619**)

General Specifications

CRT : 10 div. x 8 div., effective display 94 x 75mm Internal Graticule Square type, P31 phosphor

Warm Up : about 30 minutes

Temperature in Operation: 0°C to +40°C, humidity less than 85%

Temperature in Storage: –20°C to +70°C

Power Requirements: AC 100V ± 10%, 50/60Hz, about 50VA (can be arranged to AC 120V, 200V±10%, 240V $^{+4}_{-10}$% on order). With **TR1927** Battery Pack (optional) DC drive is possible for about 3.0 hours.

External Dimensions: about 300 (wide) x 170 (high) x 430 (deep) mm

Weight : about 12kg

Table 1-1 Specifications

SECTION 2
OPERATING INSTRUCTIONS

2-1 Description

This section provides cares to use the instrument, panel controls and connectors referring to the figures, operating instructions, CRT display and **CAL. OSC.** adjustments and basic measurement examples.

2-2 Preparations and Precautions for Use

(1) The allowable power voltage is 100, 120, 200VAC ±10% or 240VAC$^{+4\%}_{-10\%}$ with the frequency of 50 or 60Hz.

(2) Verify that **AC POWER** switch is **OFF** everytime connecting the instrument to AC power line.

(3) Power Cable
3-pin plug is fitted to power cable, of which the round center pin is for grounding. When a 2-pin conversion adapter is used, either the wire from the adapter (Fig. 2-1) or the ground terminal **(GND)** on the rear panel must be earthed.

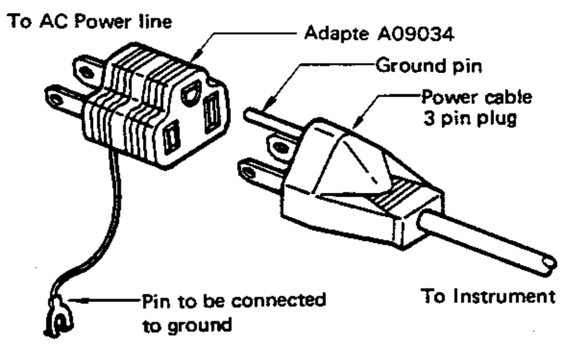


Fig. 2-1 Power Cable Plug and Adapter

(4) The instrument does not use a fan, so care is required for environmental ventilation. It is advisable not to place anything behind close to the instrument and not to use the instrument side to the bottom.

(5) Keep the environment temperature some where at 0°C to +40°C when the instrument is in operation.

(6) The environment temperature when the instrument is stored must be at −20°C to +70°C.

(7) If AC power line has superimposed noise, use of a noise filter is recommended.

2-3 Controls and Connectors

FRONT PANEL (Fig. 2-2)

① **AC POWER** switch
Supplies AC power to the instrument.When it is set to **ON**, AC power is supplied to all the circuits, and immediately pressed again to **OFF**, the AC power is removed.

② **INTENSITY** control
Adjusts intensity of the trace on CRT display.

③ **FOCUS** control
Focusses the trace on CRT display.

④ **TRACE ALIGN** adjust
This semifixed resistor is to align the trace on CRT display.

⑤ **SCAN MODE** selector
Selects the scan mode. When set to **AUTO**, sweep is repeated automatically with the repetition time controlled by **SCAN TIME (MANU. SCAN)**. At **MANU.**, sweep is manually controlled by **MANU. SCAN (SCAN TIME)**.
If set to **SINGLE**, only one sweep is performed by pressing **START/RESET** button switch. At the end of the sweep, the bright spot stays at the right end of CRT display. Immediately **START/RESET** button is pressed again under this state, the bright spot returns to the left end of CRT display. This operation repeates each time **START/RESET** button is pressed. The sweep time is controlled

with **SCAN TIME (MANU. SCAN)**.

⑥ **SCAN TIME (MANU. SCAN)** control
Controls sweep time at **MANUAL SCAN** mode. When **SCAN MODE** switch is set to **MANU.**, sweep is manually effected. At **AUTO** or **SINGLE** position, the sweep time can be continuously adjusted for 20 milliseconds to 10 seconds with **SCAN TIME** control.

⑦ **START/RESET** switch
At **SCAN MODE** switch set to **SINGLE**, sweep can be started and restarted with this button switch.

⑧ **CAL. OUT.** connector
This is the internal standard oscillator output which is utilized for calibrating vertical axis and horizontal axis of CRT. The output signal is 100MHz with the amplitude of 80dBμ. The output impedance is as follows:

TR4132	50Ω
TR4132N	75Ω

⑨ **INPUT** connector
The unknown signal is applied to this connector. The maximum input level is 130dBμ and ±50V for DC input. The input impedance and input connector are as follows:

TR4132	50Ω N type connector
TR4132N	75Ω BNC type connector

⑩ **RF. ATT.** switch
This is the input attenuator that is used in the case the input signal level is too high. The figures imprinted outer are the value corresponding to individual input to meet non-distortion performance of −70dB for second harmonic.

⑪ **IF GAIN** switch
Selects IF stage gain. 0dB to 30dB on 10dB step can be set with the outer switch, and −6dB to +6dB on 1dB step with the inner switch.

⑫ **CAL.** adjust
Semifixed resistor to calibrate the CRT display level at the condition the inner switch of **IF GAIN** set to **CAL.**

⑬ **10dB/DIV., 5dB/DIV., LINEAR** selector
Selects 10dB/DIV, 5dB/DIV or LINEAR scale in reference to the horizontal top line of CRT display. When set to **LINEAR**, CRT displays the scale in linear. At this time, the level is automatically raised 40dB and the value at the **REFERENCE LEVEL** display is the absolute level on the top of the scale. The level of bottom scale is always 0V.
If switched to 10dB/DIV., one scale of horizontal graticule is 10dB, and it becomes 5dB per scale at 5dB/DIV. position

⑭ **REFERENCE LEVEL** display
Indicates the reference level on the top line of CRT in 1dB resolution.

⑮ **REFERENCE LEVEL** selector
Switches reference level display either to input terminal level (dBμ) or to field strength (dBμ/m). If set to **ANTENNA-A (DIPOLE)**, **REFERENCE LEVEL** indicates the field strength in dBμ/m when a standard dipole antenna is connected.
When it is set to **ANTENNA-B**, the field strength of the CRT display reference level, when a log periodic antenna (**TR1711**) is connected, is displayed at **REFERENCE LEVEL.**

⑯ **DETECTION MODE** selector
Selects signal detection mode.
At **MEAN**, mean detection is performed by a fast response detection circuit. **VIDEO FILTER** can be selected to **OFF**, **10kHz** or **100Hz** in this mean value detection. When this selector is set to **Q.P.**, quasi peak value under C.I.S.P.R., Specifications as specified by International Special Committee on Radio Interference is displayed. Since the response of **Q.P.** mode is slow, measurement may be proceeded by making the sweep time extremely long or by means of manual scan. In this mode the level becomes automatically 40dB higher than the case of **MEAN** mode.

⑰ **TUNING** control
Sets the center frequency of CRT display. When this control is handled, reading on the LED display changes and the center frequency is shifted.

⑱ **TUNING FINE** control
Used for fine adjustment of center frequency. Adjustment range is ±5MHz or more.

⑲ **TUNING/PRESET (TUNING/TV)** selector
When this switch is set upward to **TUNING**, the frequency at the CRT display center is moved by **TUNING** control and is indicated on **CENTER FREQUENCY** display.

When set to **PRESET**(**TR4132**), the center frequency of CRT display can be preset by the semifixed resistor and is indicated on **CENTER FREQUENCY** display. In the setting to **TV**(**TR4132N**), the scan width (**DISPERSION/DIV.**) is automatically fixed at 20MHz/DIV. with IF bandwidth (6dB) automatically fixed at 1.5MHz for practical convenience.

⑳ **PRESET** (or **TV**) adjust
Sets the frequency at the CRT center when **TUNING/PRESET** (**TR4132**) or **TUNING/TV**(**TR4132N**)switch is set to **PRESET** or **TV**.

㉑ **ZERO ADJ.**
This semifixed resistor is used to calibrate indication of **CENTER FREQUENCY**.

㉒ **CENTER FREQUENCY** display
The frequency corresponded at the center of CRT display by **TUNING** control is indicated in 1MHz resolution.

㉓ **DISPERSION/DIV.** switch
Selects the horizontal-axis scale of CRT display in the range from 100MHz/DIV. to 0.1MHz/DIV. in 1-2-5 sequence. When IF bandwidth is set to **AUTO**. 3dB bandwidth is automatically set in conjunction with **DISPERSION/DIV.** switch settings as follows

Table 2-1 Automatic Bandwidth Determination

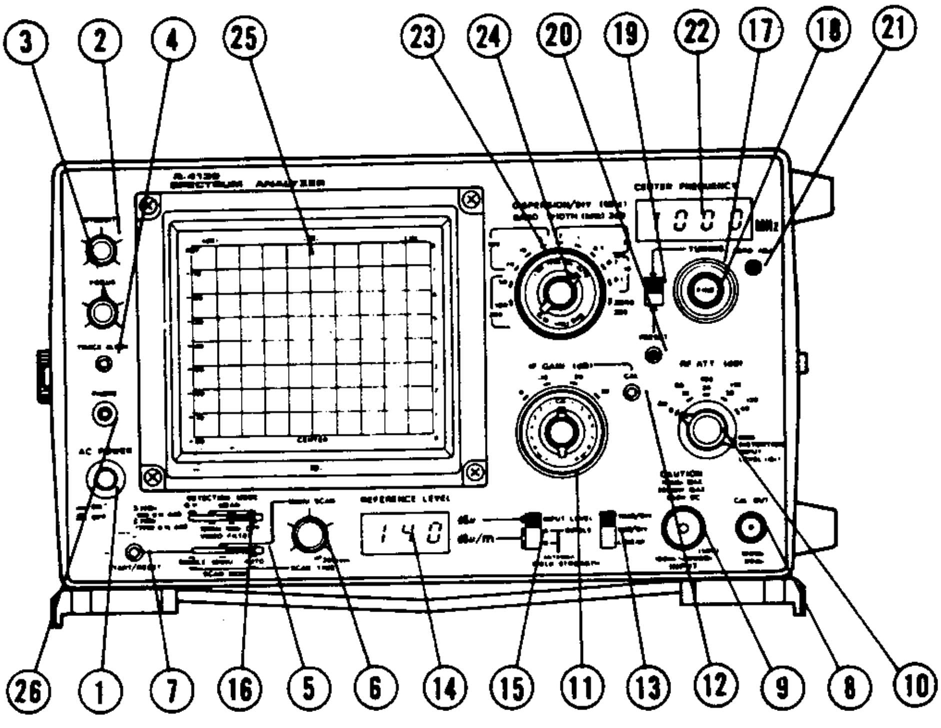
DISPERSION/DIV.	3dB bandwidth
100MHz, 50MHz	300kHz
200MHz to 5MHz	100kHz
2MHz to 0.5MHz	30kHz
0.2MHz, 0.1MHz	10kHz
ZERO	300kHz

When **DISPERSION/DIV.** switch is set to **ZERO**, the instrument operates as a tuned receiver at the frequency indicated on **CENTER FREQUENCY**. So, it can be used to demondulate and to observe modulated signals and also to monitor single signal.

㉔ **BAND WIDTH** switch
Forms coaxial switch together with **DISPERSION/DIV.** and selects the IF bandwidth that determines the resolution of a spectrum analysis.
When set to **AUTO**. the optimum bandwidth (3dB) for the scan width accompanied by **DISPERSION/DIV.** switch is set automatically.
The IF bandwidth (6dB) can also be independently set to 9kHz, 120kHz or 1.5MHz. The 9kHz and 120kHz bandwidths are used mainly for quasi peak value measurement.

㉕ **CRT** display
A square type cathode ray tube with P31 phosphor is used. The graticule on display is vertical 8 divisions and horizontal 10 divisions.

㉖ **PHONE** connector
Receptacle for 8-ohm monitor earphone (**TR1619**).



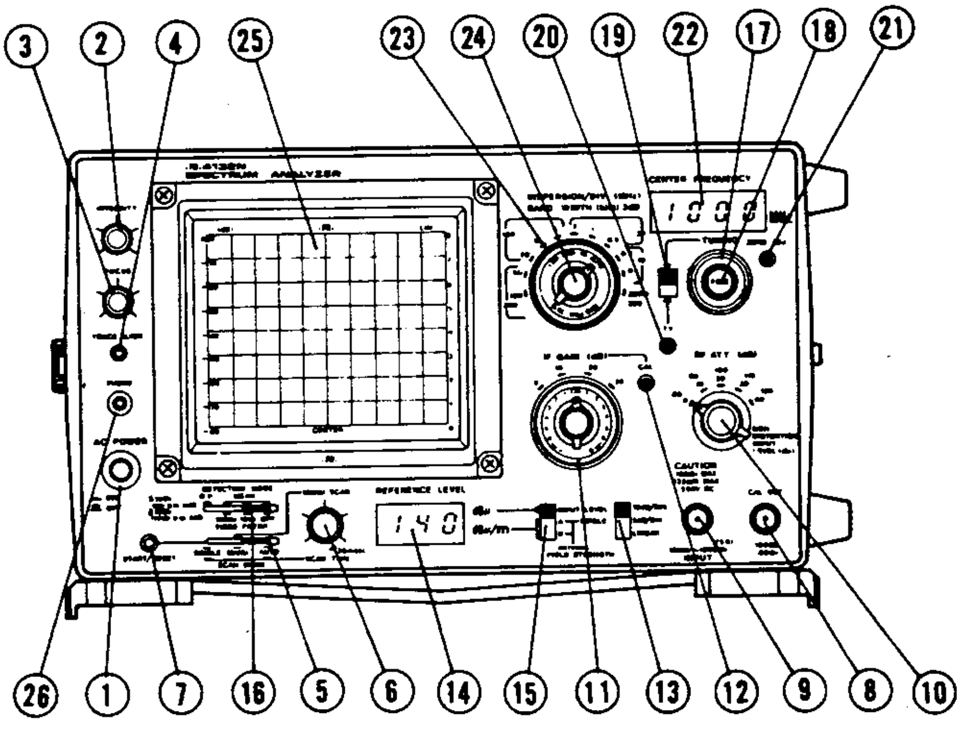


Fig. 2-2 Panel Description (Front Panel)

REAR PANEL (Fig. 2-3)

㉗ AC power cable
The AC power cable to be connected to AC line.

㉘ **FUSE**
Kept inside the holder is a 0.5A slow blow fuse for AC 100V line. To replace the fuse, move the cap turning to the direction as indicated by an arrow.

CAUTION
Pull off the power cable from the AC line receptacle when replacing the fuse.

㉙ **GND** terminal
When two-pin adapter is used, either the lead wire from the adapter or this ground terminal must be earthed.

㉚ **POWER MODE** switch
Selects the drive power source. Set it to **AC** when the instrument is driven by and AC power while to **DC** if driven by a DC power with **TR1927** Battery Pack.

㉛ **EXT. DC INPUT** connector
TR1927 Battery Pack is connected here for driving the instrument by DC power.

㉜ X-axis **OUTPUT** connector
This is the horizontal axis output connector. The output is −5V to +5V approximately with the output impedance of about 10kΩ.

㉝ Y-axis **OUTPUT** connector
Vertical axis output connector. The output is about 0V at the bottom and about +3.5V at the top of CRT display scale with the output impedance of about 10kΩ.

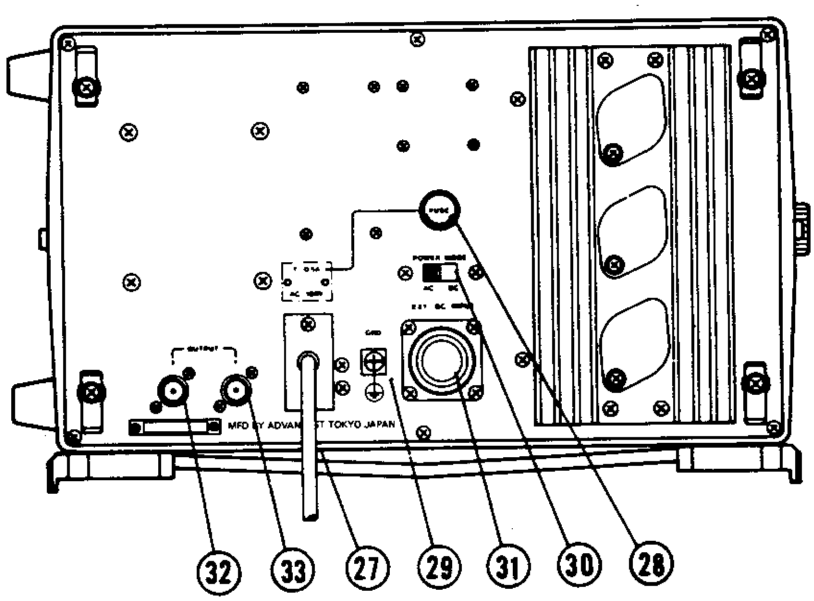


Fig. 2-3 Rear Panel Controls and Connectors

2-4 Basic Operations

This section describes the handling which is basically required to operate the instrument. It covers the way of zero frequency adjustment and proceeds to level calibration utilizing the **CAL. OUT.** signal. This procedure is also applicable to check whether the instrument is under proper operation.

Refer to [Fig. 2-4] and proceed as follows:

(1) Make sure that AC power line voltage is identical to that indicated on the rear panel.

(2) Verify that **POWER MODE** switch on the rear panel is set to **AC** and **AC POWER** switch on the front is **OFF.** Then connect power cable to AC power line.

(3) Preliminary set the front panel switches and controls as follows:

INTENSITY .... center position
FOCUS .... center position
SCAN MODE .... AUTO
DETECTION MODE .... MEAN (VIDEO FILTER-OFF)
SCAN TIME (MANU. SCAN) 20ms
REFERENCE LEVEL ... INPUT LEVEL
10dB/DIV., 5DB/DIV., LINEAR .... 10dB/DIV.
IF GAIN (dB) .... 20dB, CAL.
RF. ATT. (dB) 10dB
DISPERSION/DIV. .... 100MHz/DIV.
B.W. (Hz) 6dB .... AUTO
TUNING/PRESET or TUNING/TV .... TUNING
CENTER FREQUENCY 000MHz

(4) Set **AC POWER** switch to **ON.** About 20 seconds later, a zero frequency trace will appear on CRT display.

(5) If the trace fails to appear, increase the brightness by turning **INTENSITY** control clockwise. If the trace is too bright, adjust **INTENSITY** control for optimum brightness.

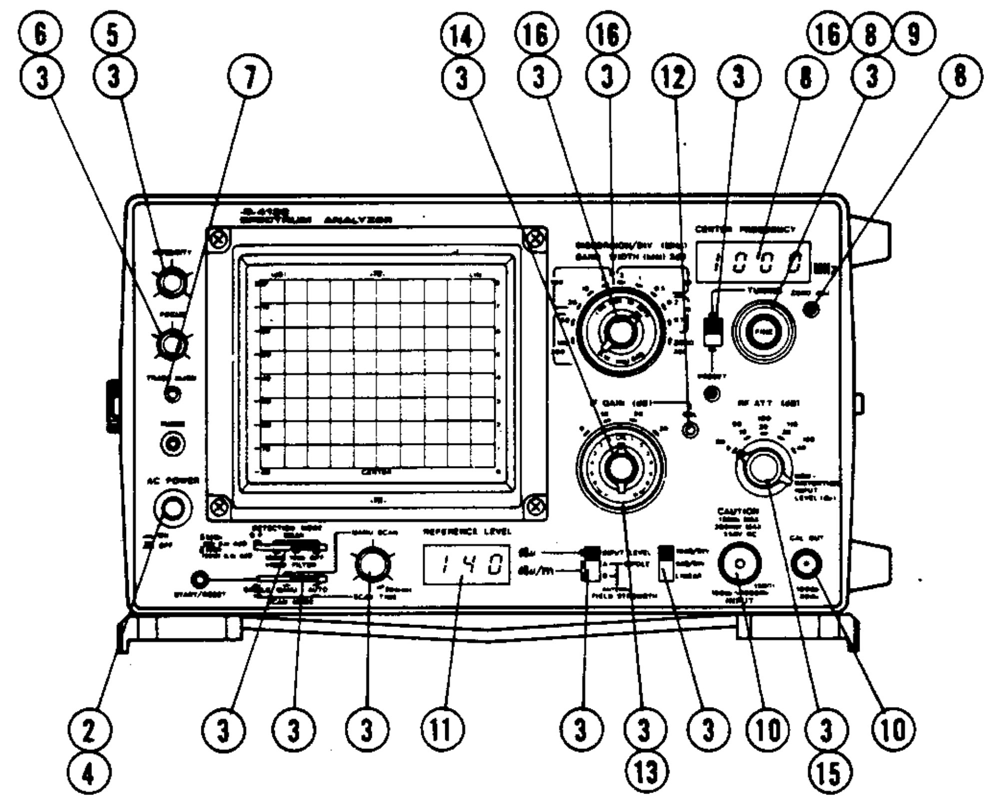


Fig. 2-4 Controls for Basic Operation

CAUTION

Do not leave the trace on CRT display in excessive brightness for long duration as otherwise CRT may be damaged.

(6) In case the trace is indistinct, adjust **FOCUS** control. Unless brightness of the trace is appropriate, it is difficult to obtain a clear focus.

(7) When the trace is tilted relative to the horizontal scale of the CRT display, adjust **TRACE ALIGN** with a screw driver to bring it correctly on the graticule line. [Fig. 2-5]

(8) Adjust **TUNING** control to correspond zero frequency trace at the center of CRT display. Adjust **ZERO ADJ.** to obtain a reading of 000 on **CENTER FREQUENCY** display.

(9) **TUNING** is effected by 2-stage controls of rough and fine. Inner **FINE** control is a 3-turn fine adjustment with an adjusting range of 10MHz or wider. Therefore, it is convenient to use it when **DISPERSION/DIV.** switch is below 500kHz/DIV.

(10) Connect **CAL. OUT.** to **INPUT** using the N-BNC adapter with BNC-BNC cable **MI-02** for **TR4132.** Use **MO-15** cable in the case of **TR4132N.** [Fig. 2-6]

(11) Verify that **REFERENCE LEVEL** displays 100dBμ at this state.

(12) The level of 100MHz fundamental spectrum of **CAL.** signal is 80dBμ. Therefore, it is displayed at a point 20dB below the top line **(REF.)** of CRT scale. [Fig. 2-7] If not displayed at this position, adjust **IF GAIN (dB)-CAL.** Spectra also appear at left of the zero frequency spectrum, but levels and frequencies of the spectra are not accurately displayed.

(13) Rotate **IF GAIN** clockwise and verify that the signal on CRT display goes upward on 10dB step. At this time, the noise level also increases. Verify that **REFERENCE LEVEL** indicates increases on 10dB step.

(14) Rotate the inner (1dB) switch of **IF GAIN** clockwise, and see that the signal on CRT display goes upward in 1dB increments. If the inner 1dB switch of **IF GAIN** is turned counter-clockwise, the signal will goes downward in 1dB increments and **REFERENCE LEVEL** display will increase in 1dB increments.

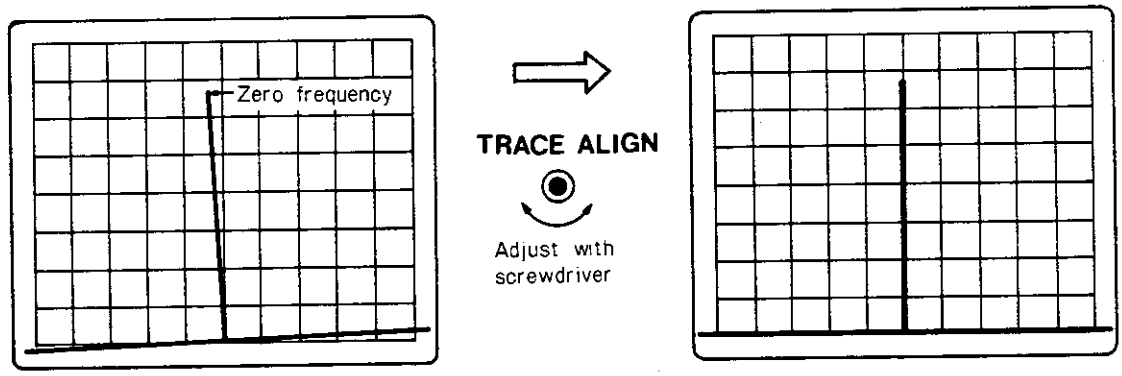


Fig. 2-5 Trace Align Adjustment

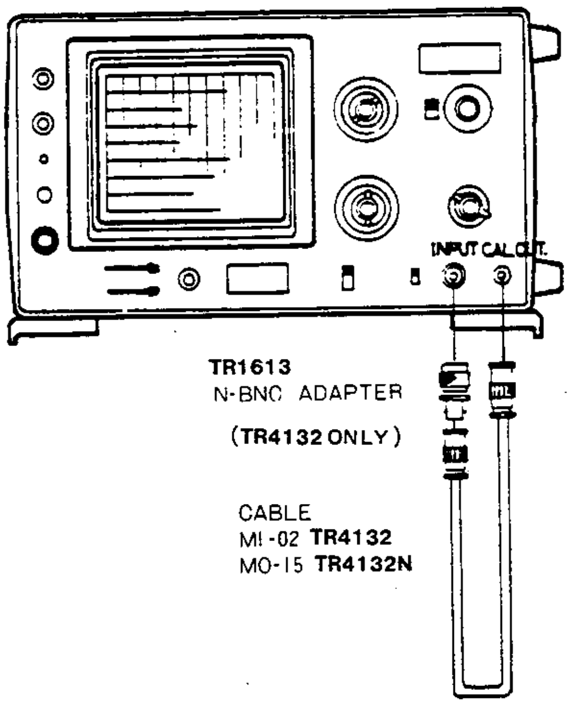


Fig. 2-6 CAL. OUT. Signal connection

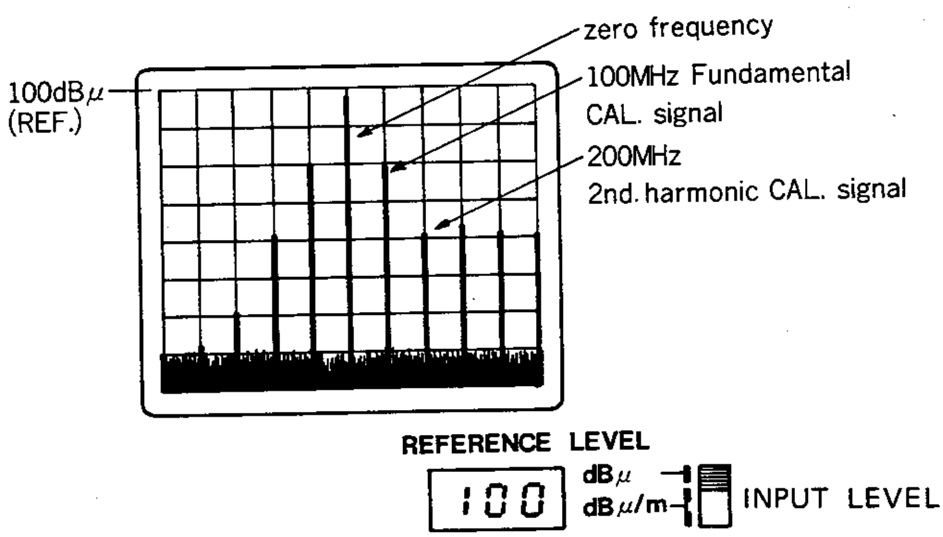


Fig. 2-7 CAL. Signal Spectrum display

(15) Turn **RF. ATT.** clockwise, and see that the signal on CRT display goes downward in 10dB increments with **REFERENCE LEVEL** display increased in 10dB increments. If **RF. ATT.** is set to 0dB, the zero frequency level on CRT may vary. However, the magnitude of the zero frequency is not related to operation of the instrument.

(16) Use **DISPERSION/DIV.** switch if intending to expand and observe an arbitrary signal spectrum. With **BAND WIDTH** switch set to **AUTO** and positioning the spectrum to be observed at the center of CRT display by **TUNING**, turn **DISPERSION/DIV.** switch clockwise. The spectrum will be expanded. If the spectrum cannot be observed appropriately on the CRT when expanded, re-adjust **TUNING** for correct position. [Fig. 2-9]

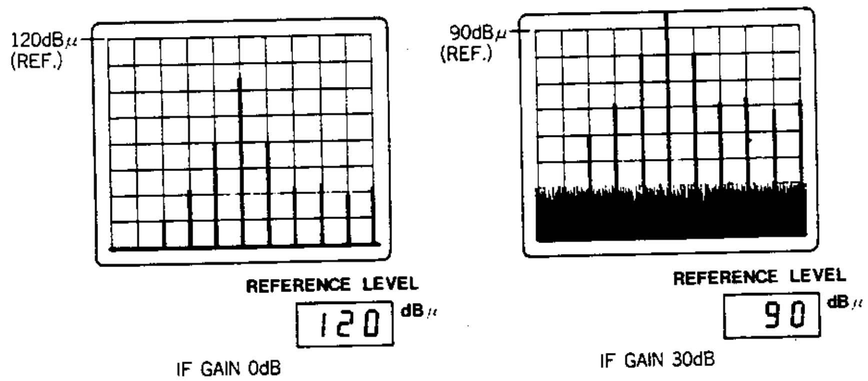


Fig. 2-8 Spectrum display by changing IF GAIN

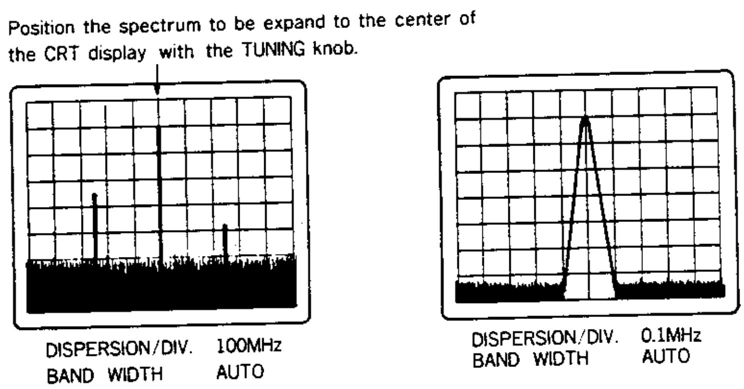


Fig. 2-9 Expansion of an Arbitrary Spectrum

2-5 Daily Calibration

It is recommended to carry out calibrations on level and CRT display of the instrument before entering into measurements.

2-5-1 Level Calibration

(1) Verify and reset the front panel controls as follows:

RF. ATT. 10dB
IF GAIN .... 20dB, CAL.
TUNING/PRESET (TV) ...... TUNING
DISPERSION/DIV. ...... 50MHz/DIV.
B.W. (Hz) 6dB .... AUTO
10dB/DIV., 5dB/DIV., LINEAR .... 10dB/DIV.
REFERENCE LEVEL .. INPUT LEVEL
SCAN MODE .... AUTO
SCAN TIME 20ms
DETECTION MODE .... MEAN (VIDEO FILTER-OFF)
CENTER FREQUENCY 100MHz

(2) Connect **CAL. OUT.** signal to **INPUT.**

(3) Adjust **CAL.** control of **IF GAIN** to obtain a **CAL. OUT.** 100MHz fundamental signal level at 2 divisions (−20dB) below the top line **(REF.)** of CRT scale. [Fig. 2-10]

(4) The instrument display is now calibrated in dBμ.

2-5-2 CRT Display Calibration

It is necessary to conduct calibration by adjusting respective semifixed resistors in case waveforms are distorted or incorrect values are displayed. The semifixed resistors have an access from the holes on the left side of upper case by a screw driver. Use 3mm minus type driver for the adjustments.

Calibration may be achieved at the condition the temperature inside the instrument has become stable, so warm up for more than 30 minutes is required.

(1) Calibrating Trace Align
In the case the trace has tilted due to terrestrial magnetism or system of magnetism, adjust **TRACE ALIGN** on the front panel. [Fig. 2-5]

(2) Calibrating Focus
If focus of the trace cannot be adjusted by the front panel **FOCUS** control, adjust **ASTIG.** on the left side.

(3) Calibrating Vertical-Axis Scale
If the signal waveform on CRT display does not vary on proper step when **RF. ATT., IF GAIN** or input signal is shifted by 10dB, adjust **V. GAIN** on the left side.

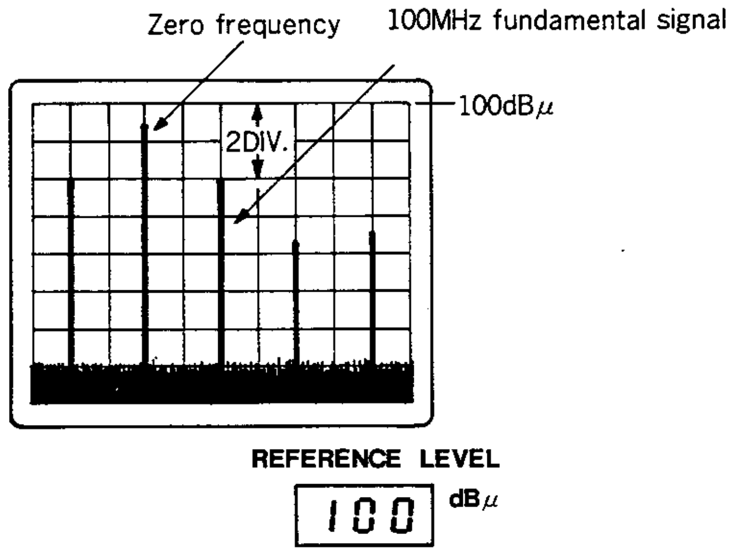


Fig. 2-10 dBμ Calibration display

(4) Calibrating Baseline
Set **IF GAIN** to 0dB and **10dB/DIV., 5dB/DIV., LINEAR** selector to 10dB/DIV. If the trace is deviated from the baseline, adjust the left side **V. POSI.**

(5) Calibrating Vertical-Axis REFERENCE level
Reset **10dB/DIV., 5dB/DIV., LINEAR** selector from 10dB/DIV. to 5dB/DIV. Adjust the left side **V. REF.** so that the spectrum level at the top line (REF.) of CRT display does not move.

(6) Calibrating Horizontal-Axis Position
Reset **DISPERSION/DIV.** from 100MHz/DIV. to 0.1MHz/DIV. in sequence. If the spectrum at the center of CRT display moves, the left side **H. POSI.** must be adjusted in the following manner.
Firstly, set **DISPERSION/DIV.** to 0.1MHz/DIV. and correspond the spectrum to the center of CRT display by **TUNING.** Next, reset **DISPERSION/DIV.** to 100MHz/DIV. and adjust **H. POSI.** on the left side to center the spectrum.

(7) Calibrating Horizontal-Axis Scale
When **DISPERSION/DIV.** is set to 100MHz/DIV., the horizontal axis scale on CRT display must be 100MHz per division. Adjust **H. GAIN** on the left side as necessary. Use of the 100MHz **CAL. OUT.** signal is convenient in this adjustment.

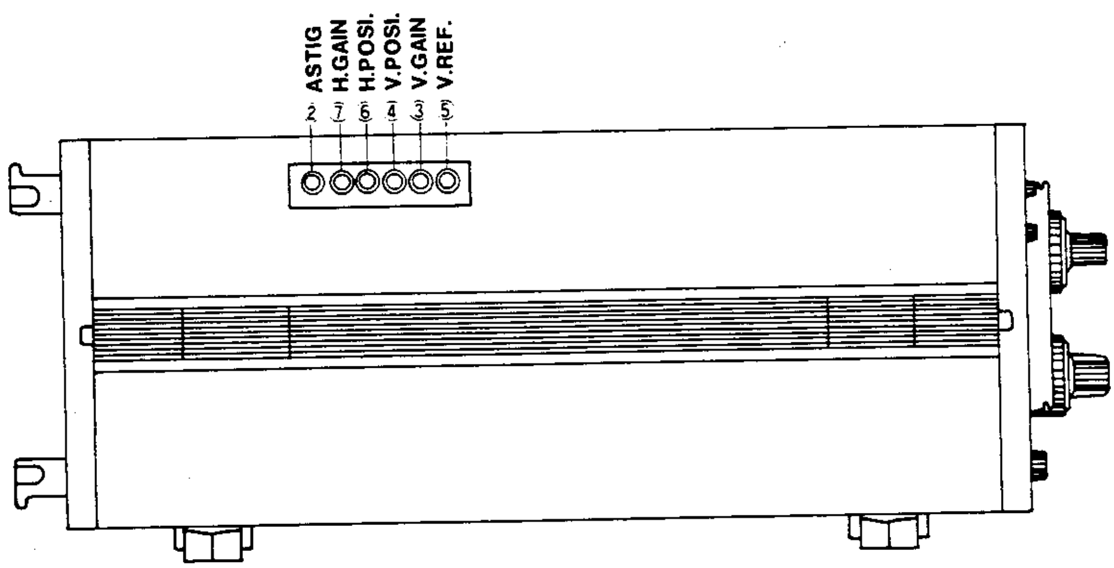


Fig. 2-11 CRT Display Calibration

2-6 Basic Applications

2-6-1 Level Measurement

(1) Connect unknown signal to **INPUT** connector. It is anticipated that 1st. Mixer may be damaged or saturated if the input level is in excess.
RF. ATT. is provided to prevent obstruction to proper measurement due to lowered display level or harmonic distortion caused by damage or saturation of the mixer for over-input. Therefore, suggest to switch **RF. ATT.** sequentially from higher value to a lower value when the level of input signal is unknown. A drop of the level due to saturation is specified as gain compression which is −1dB or less for a 100dBμ input at **RF. ATT.** being 0dB with the instrument. When **RF. ATT.** is set to 0dB, mismatching tends to cause too much an error. Careful attention must be given to the above if accurate level measurement is desired.

(2) Adjust **RF. ATT.** and **IF GAIN** to match the level of the signal spectrum to any graticule line on CRT display (vertical axis scale 0 to −80dB lines). The absolute level of the top line **(REF.)** on CRT display is indicated on **REFERENCE LEVEL** display so the absolute level (dBμ) is the arithmetic sum of this value and the value of the signal spectrum reading from the CRT scale. For example, assume that the spectrum level is set by **RF. ATT.** and **IF GAIN** to −20dB line which is 2 divisions below the top line **(REF.)**. If the value displayed on **REFERENCE LEVEL** is 108dBμ, the absolute level will be 108dBμ + (−20dB) = 88dBμ. [Fig. 2-12]

(3) If **10dB/DIV., 5dB/DIV., LINEAR** vertical axis switch is set to 5dB/DIV. with the hope to make measurements by expanding CRT scale, 1 division of the scale becomes 5dB and CRT reading resolution is two times enlarged when compared with the case of 10dB/DIV. In this instance, it is advised to carry out reference level calibration in paragraph 2-5-1 of this Manual prior to the measurements.
When the selector is set to **LINEAR,** the CRT scale becomes linear display mode with the absolute level of the top scale line **(REF.)** being indicated on **REFERENCE LEVEL,** and the level of the bottom line is always 0V.
At the switch set to **LINEAR,** the **REFERENCE LEVEL** is dropped by 40dB and the display on CRT may sometimes happen to disappear. It is because of the internal provision to automatically raise the gain by 40dB when

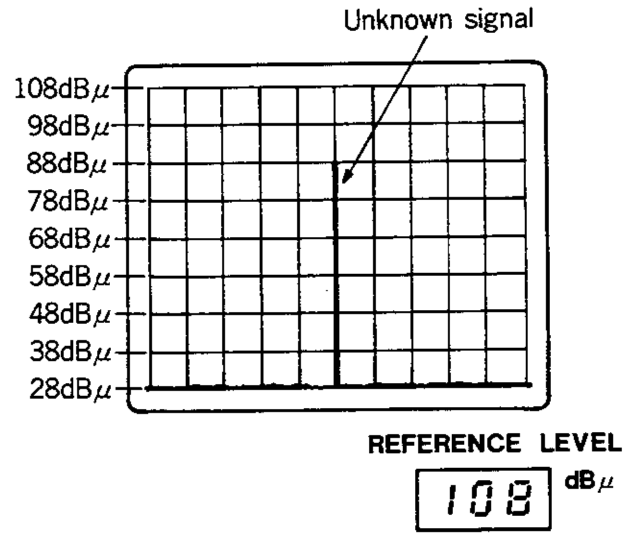


Fig. 2-12 Absolute Level Measurement Display

the switch is set to **LINEAR.** Therefore, it is necessary to adjust **IF GAIN** and **RF. ATT.** when the display disappears from the screen. The relation between **REFERENCE LEVEL** display and **LINEAR** scale is followed in [Table 2-2]. An example is this. If **REFERENCE LEVEL** display is assumed 98dBμ, since the bottom graticule level is 0V, 1 division will become 10mV so that reading is easy.

Reference Level Display	Linear Scale
104 dBμ	20mV/DIV.
98 dBμ	10mV/DIV.
84 dBμ	2mV/DIV.
78 dBμ	1mV/DIV.
64 dBμ	200 μV/DIV.
58 dBμ	100 μV/DIV.
44 dBμ	20 μV/DIV.
38 dBμ	10 μV/DIV.

Table 2-2 Relation of REFERENCE LEVEL and LINEAR Scale

(4) [Fig. A-24] may be conveniently used when converting the dBμ to other units.

2-6-2 **Frequency Measurement**

There are three methods to measure frequency with Spectrum Analyzer as described here. Refer to Paragraph 2-4 for basic operation before proceeding to the following operation.

- Set **DISPERSION/DIV.** to 100MHz/DIV.
- Connect unknown signal to **INPUT** with the accessory cable. In the case the level of the signal is unknown, set **RF. ATT.** to 40dB first and then turn it counter-clockwise (ATT. value decreases), while observing the spectrum on CRT display, and set the level at which observation of the waveform is easiest.

(1) Absolute Value Measurement

a) Set **DISPERSION/DIV.** to 1MHz and rotate **TUNING** to center the zero frequency spectrum on the CRT display.

b) Adjust **ZERO ADJ.** to obtain a value of **000** on the **CENTER FREQUENCY** display.

c) Rotate **TUNING** to position the spectrum to be measured to the **CENTER** of CRT display. The frequency of unknown signal is now indicated on **CENTER FREQUENCY** display. The error is ± 10MHz. [Fig. 2-13]

(2) Measurement relative to Zero Frequency

Connect unknown signal to **INPUT** and set **DISPERSION/DIV.** to the maximum value at which the zero frequency spectrum and the unknown signal can be ob-

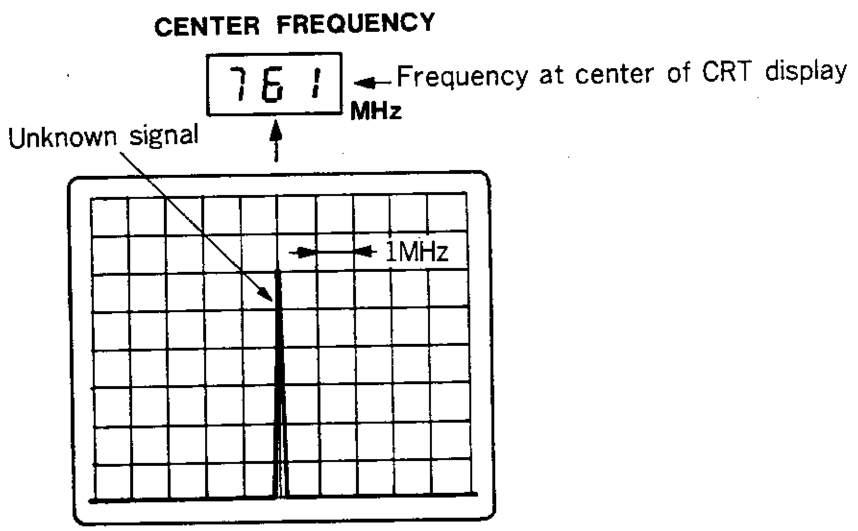


Fig. 2-13 Absolute Frequency Measurement Procedure

served simultaneously. Read the deviation between these two spectra from the CRT scale, and find the frequency of the unknown signal by multiplying this value by the setting of **DISPERSION/DIV.** Measuring error is ± 5% of measured value. [Fig. 2-14]

(3) Measurement relative to Reference Signal
Apply a stable reference signal and unknown signal to **INPUT** connector simultaneously, while set **DISPERSION/DIV.** to the minimum value at which the two spectra can be observed on CRT display. Read the distance between two spectra from CRT graticule, and calculate the frequency in the following equation. [Fig. 2-15]
Measured frequency = Reference signal frequency (Hz) + Spectrum interval (DIV.) x DISPERSION/DIV. setting
At the time the unknown signal is to the right of the reference signal, let's make it plus in the above equation, and when it is to the left make it minus. The accuracy of **DISPERSION/DIV.** is ± 5%, so the measurement error is less as the reference signal and unknown signal frequencies are closer.
The 100MHz **CAL. OUT.** signal contains harmonics which can be conveniently used as the reference signals.

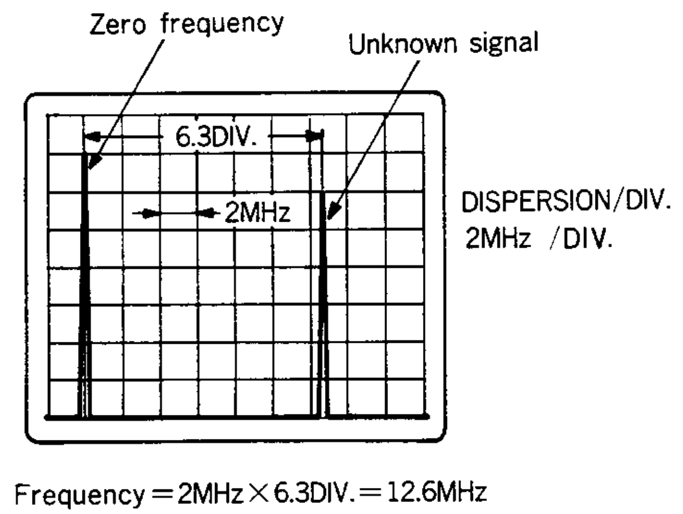


Fig. 2-14 Measurement Relative to Zero Frequency

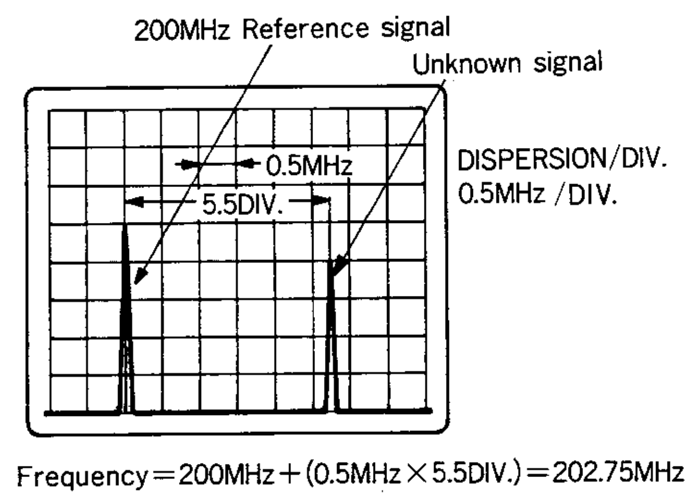


Fig. 2-15 Measurement Relative to Reference Signal

2-6-3 Spectrum Analysis

Perform level calibration in accordance with Paragraph 2-5 before proceeding spectrum analysis.

(1) The spectrum appearing at the center of CRT display is the zero frequency when **CENTER FREQUENCY** is set to **000** by **TUNING**. If **DISPERSION/DIV.** is set to 100MHz/DIV. for instance, the signal of 100MHz will appear one division away to the right of zero frequency spectrum. Spectra will also appear to the left of zero frequency, but level and frequency of these spectra are not accurately displayed.

(2) Connect unknown signal to **INPUT**. If the level of the signal is unknown, set **RF. ATT.** to 40dB. Then turn it counter-clockwise (ATT. value decreases) while observing the spectrum on CRT display. When **RF. ATT.** is set to 0dB, reflection of the input signal caused by mismatching may sometimes produce much error of displayed level.

(3) It is better to set **DISPERSION/DIV.** while rotating **TUNING** so that the spectrum remains at the center of CRT display.

(4) When **BAND WIDTH** is set to **AUTO**, the IF bandwidth is automatically selected to the optimum bandwidth corresponding to the setting of **DISPERSION/DIV.** as shown below.

DISPERSION/DIV.	IF Bandwidth (3dB)	Average Noise Level
100MHz 50MHz	300kHz	20dBμ
20MHz 10MHz 5MHz	100kHz	15dBμ
2MHz 1MHz 0.5MHz	30kHz	30dBμ
0.2MHz 0.1MHz	10kHz	5dBμ
ZERO	300kHz	20dBμ

Table 2-4 Automatic IF Bandwidth Selection

The noise level depends on the IF bandwidth. The above is the value when **VIDEO FILTER** is set to 100Hz. When measuring a low level signal, make the **DISPERSION/DIV.** narrower selecting smaller value.

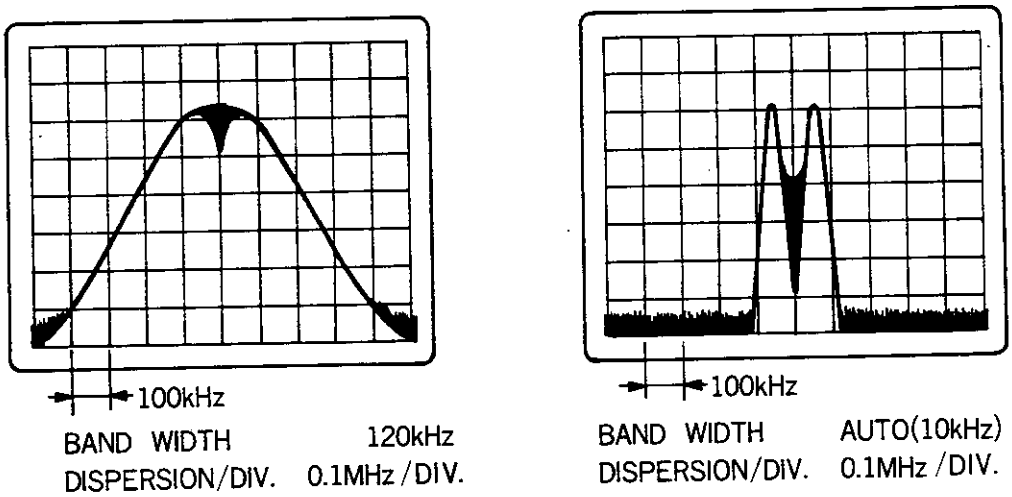


Fig. 2-16 Separation of Signals of same Amplitude

(5) **BAND WIDTH** (IF bandwidth) determines the frequency resolution. If the bandwidth is 10kHz for instance, measurement is not possible unless the difference between two signals is more than 10kHz as shown in [Fig. 2-16]. Furthermore, time constant of the bandwidth becomes longer as IF bandwidth is narrower, so either make scan rate slower or **DISPERSION/DIV.** smaller.
A provision is made to the instrument so that optimum 3dB bandwidth is automatically selected by **DISPERSION/DIV.** when **BAND WIDTH** is set to **AUTO**, and measurement is always possible at the scan rate of 20 milliseconds. When 6dB bandwidth is used, the bandwidth is not selected automatically. So, the level of the spectrum may drop as **BAND WIDTH** is made narrower and **DISPERSION/DIV.** wider. In this case, scan time must be selected.
Frequency resolution is also determined by selectivity of the filter. The selectivity is specified by the ratio of 60dB and 3dB (6dB) bandwidths. Therefore, good selectivity means excellent ability to discriminate signals of different amplitudes.
The bandwidth selectivity of **TR4132/4132N** is 15 to 1. In this case, a frequency difference of 7.5 times or more of IF bandwidth is necessary to completely separate two signals in the amplitude difference of 60dB.

(6) Besides IF bandwidth selectivity, there is sideband noise which is also related to the ability to separate signals of different amplitude and adjacent frequencies. Sideband noise is the noise appearing at the skirt of IF filter as shown in [Fig. 2-17] and affects the resolution when observing signals of different amplitudes.
The sideband noise of **TR4132/4132N** is 70dB or greater below the peak of a carrier signal at 200kHz away from the center of the carrier for 3dB IF bandwidth setting of 10kHz.

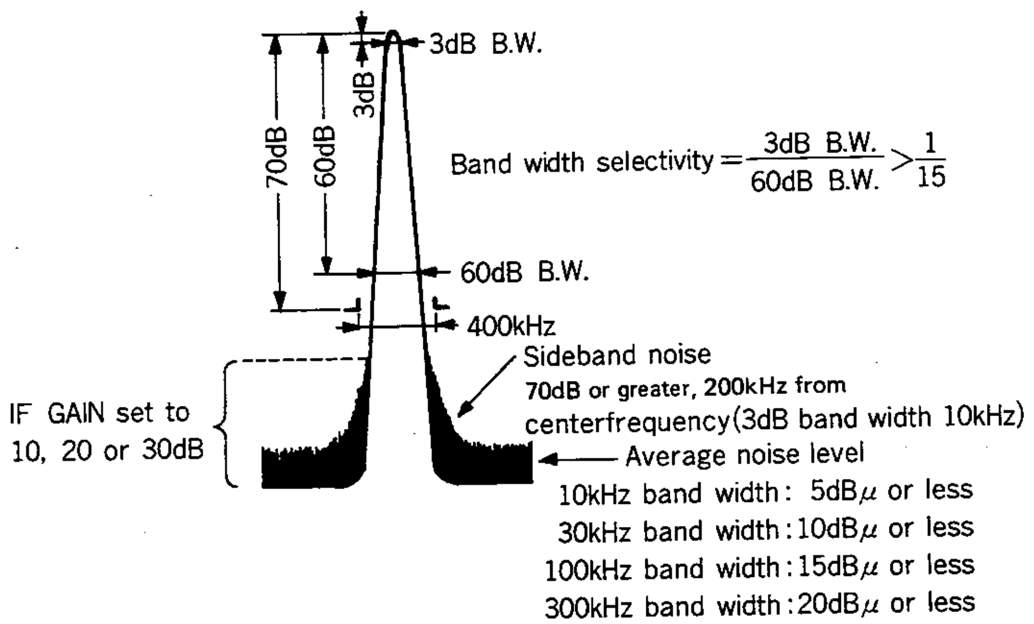


Fig. 2-17 Separation of Signals of Different Amplitude

(7) **VIDEO FILTER** of **DETECTION MODE**

May be utilized when observation of a signal waveform at the skirt or improvement of resolution at the bottom of the waveform is desired. This is to insert a low pass filter into the section driving the CRT, which averages the noise.

The bandwidth of such low pass filters can be switched to 100kHz or 100Hz, but the bandwidth of 1/30 or less of the IF bandwidth is suitable for effective averaging. At this time, the level may happen to drop because of the time constant of the low pass filter. In such an occasion, set **SCAN MODE** to **MANU.** or make the scan rate slower with **SCAN TIME** control. This will improve the S/N by about 10dB as shown in [Fig. 2-18].

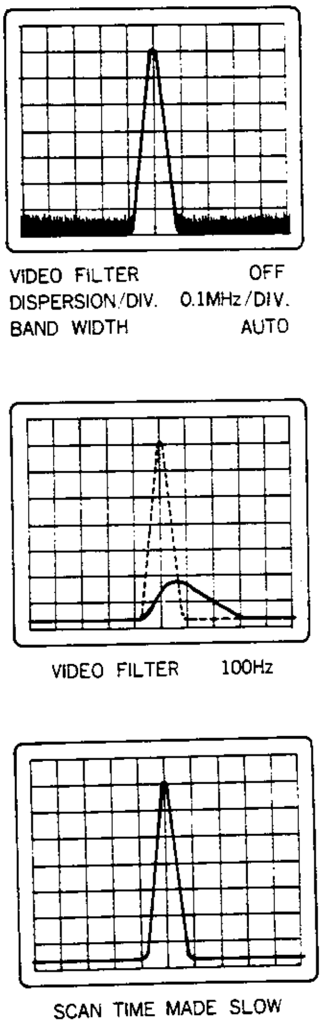


Fig. 2-18 Effect of VIDEO FILTER

2-6-4 Harmonic Distortion Measurement

Harmonic distortion is measured in the same manner as level measurement described in Paragraph 2-6-1 and frequency measurement in Paragraph 2-6-2. In harmonic distortion measurement special care must be given to the harmonic distortion generated at the Mixer inside of the instrument [Fig. 2-19].

As shown in [Fig. 2-20], the second harmonic distortion, when 80dBμ signal is applied to the mixer, is −70dB, that is, 10dBμ. It changes 20dB as the level of the mixer input is changed 10dB.

Therefore, in the case of measuring second harmonic of 60dB below the signal, **RF. ATT.** must be adjusted to obtain a mixer input level in the range of 70dBμ to 90dBμ. The input level at which this instrument measures second harmonic distortion below 70dB is indicated just for guidance as **NON-DISTORTION INPUT LEVEL** (dBμ) at outer indication roll of **RF. ATT.** on the front panel. When measuring low distortion signals, use of a rejection filter (high pass filter or band rejection filter) for the fundamental wave is effective. The dynamic range in the measurement can be widened equivalently resulting distortion measurement range enlarged by inserting such a filter between the unknown signal and **INPUT** connector of the instrument. In measuring a fundamental signal in 120dBμ with second harmonic in −100dB (that is 20dBμ), for example, a notch filter giving 40dB to the fundamental frequency is conveniently inserted. This gets the level of the fundamental signal down by 80dBμ, and permits measurement of second harmonic up to 10dBμ or more relative to the input of 80dBμ as seen in [Fig. 2-21]. Therefore, second harmonic of 20dBμ can be measured.

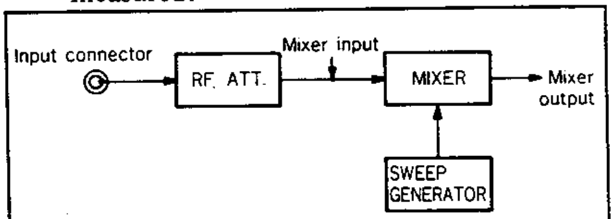
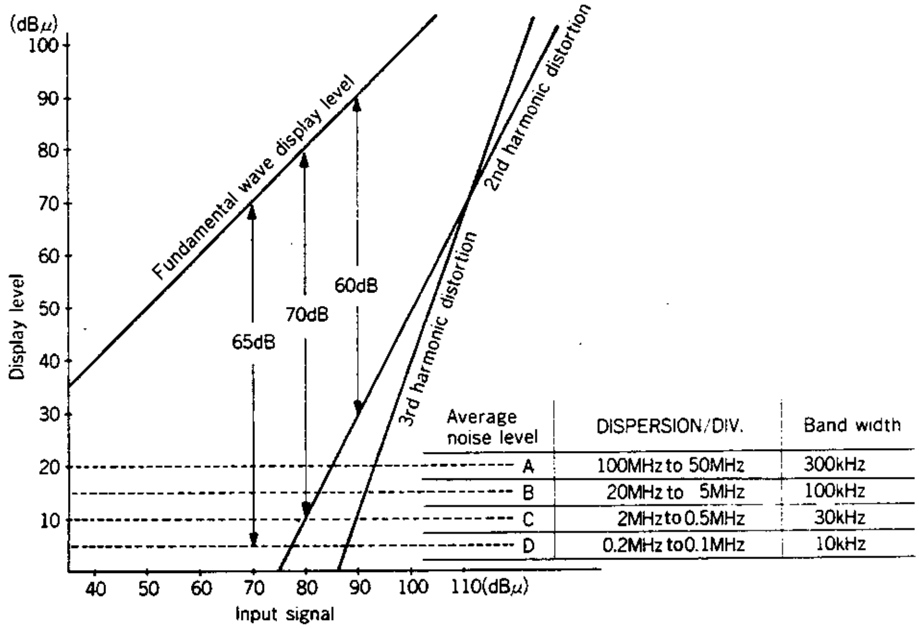


Fig. 2-19 Mixer Input



Average noise level	DISPERSION/DIV.	Band width
A	100MHz to 50MHz	300kHz
B	20MHz to 5MHz	100kHz
C	2MHz to 0.5MHz	30kHz
D	0.2MHz to 0.1MHz	10kHz

Fig. 2-20 Mixer Harmonic Distortion Noise

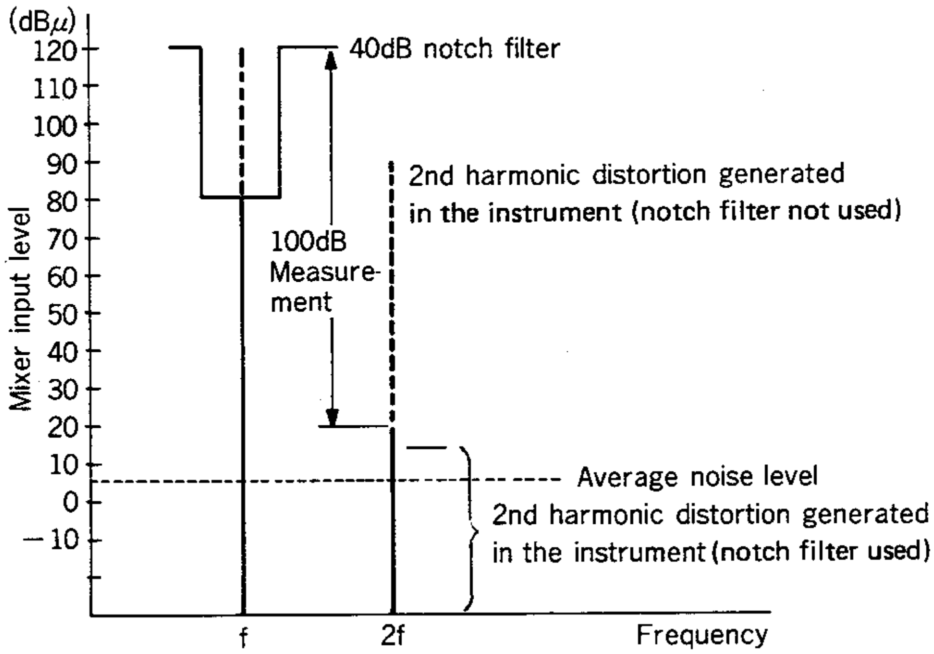


Fig. 2-21 Expansion of Dynamic range using a notch filter

2-6-5 Field Strength Measurement

When measuring the field strength Ex (dBμ/m) with an antenna connected to the analyzer, the relation between the Ex and the input terminal voltage ex displayed in the analyzer is given by the following equation.

$$Ex = (ex + 6) + La - He + Ba = ex + K$$

$$K = 6 + La - He + Ba$$

Where, He (dB): Effective length of antenna
La (dB): Cable loss
Ba (dB): Balun loss
K (dB): Compensation coefficient

When the **REFERENCE LEVEL** selector is switched to the **ANTENNA-A** position, the field strength Ex (dBμ/m) on the CRT reference level (top graticule line), whose frequency being displayed on **CENTER FREQUENCY**, is automatically compensated with the coefficient K for the half-wave dipole antenna to be indicated on the **REFERENCE LEVEL** display.

Likewise, when switched to the **ANTENNA-B** position, a value which has been compensated automatically with the wide-band logarithm periodic antenna compensation coefficient will be displayed, thereby enabling direct reading of the field strength.

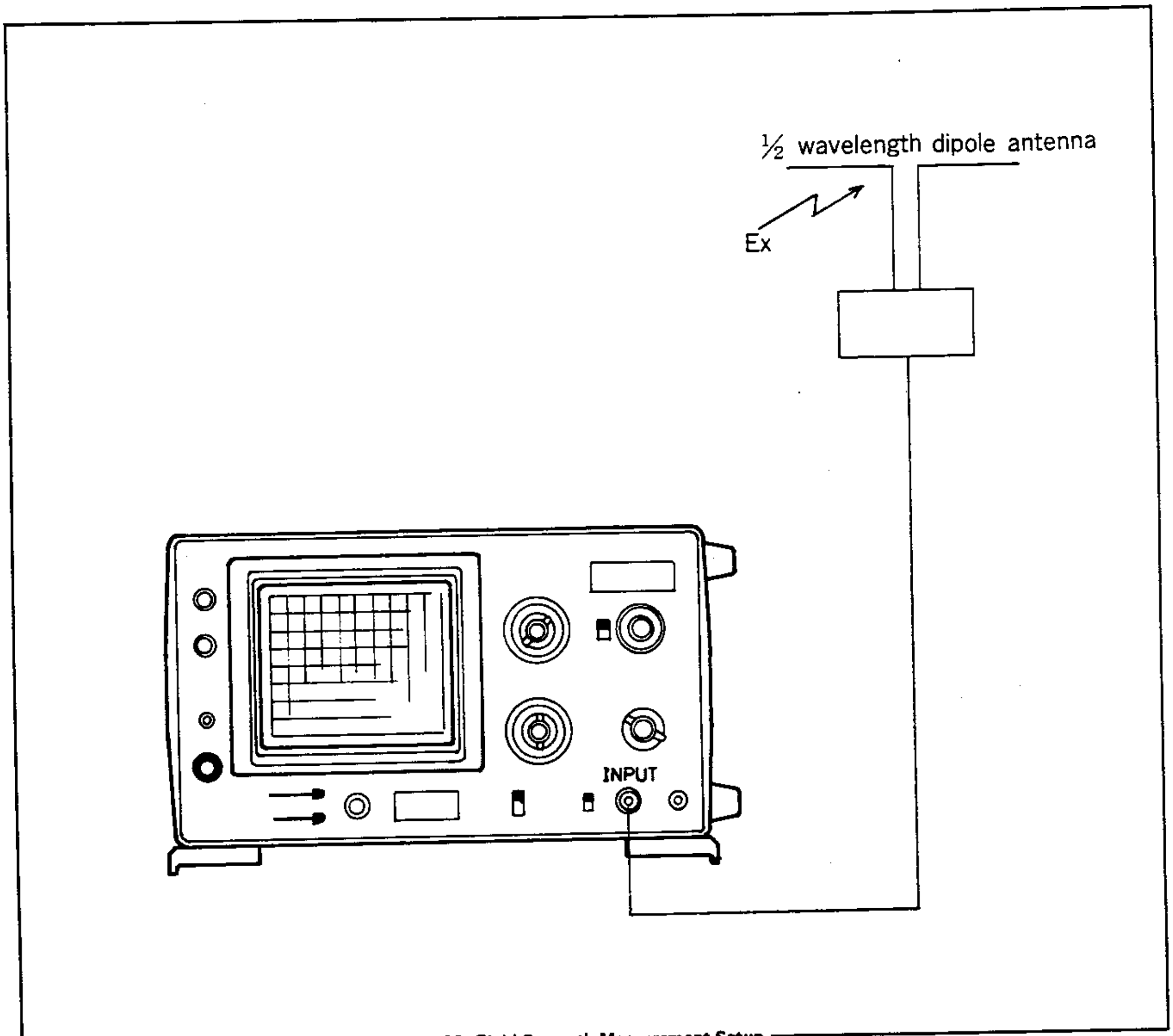


Fig. 2-22 Field Strength Measurement Setup

In addition, also note that in this **ANTENNA-B** position, when special specifications apply for antenna gain, the analyzer will adjust to these specifications. In all cases, cable loss La from the antenna to the analyzer includes 5D 2W, 10 m loss, so if any other cable is used, error will be introduced. This factor must be remembered especially when long cables are used resulting in considerable cable loss. Proceed the actual measurement as follows.

(1) Calibrate the level [See Para 2-6-1] and frequency [See Para 2-6-2].
(2) Connect the antenna to **INPUT** and set **REFERENCE LEVEL** to **ANTENNA-A** or **B** depending on the antenna used. [Fig. 2-22]
(3) Select **DISPERSION/DIV.** to see the spectrum easiest.
(4) Center the signal to be measured on the CRT display by **TUNING.**
(5) The field strength (dBμ/m) with the antenna coefficient compensated for the frequency at the center of CRT display can now be observed below the reference line and is indicated on **REFERENCE LEVEL** display. [Fig. 2-23]
The compensation coefficients for a half-wave dipole antenna (**TR1722**) and a wideband logarithm periodic antenna (**TR1711**) are shown in Fig. 2-24.

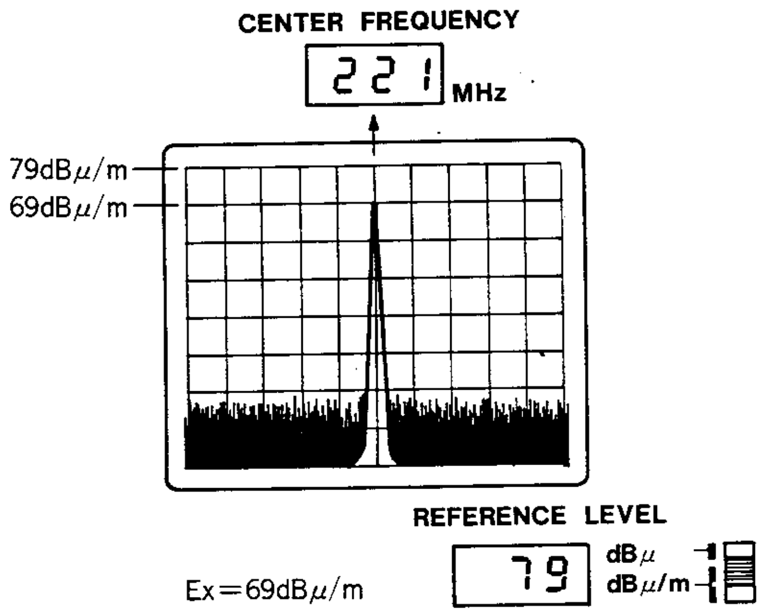


Fig. 2-23 Field Strength display

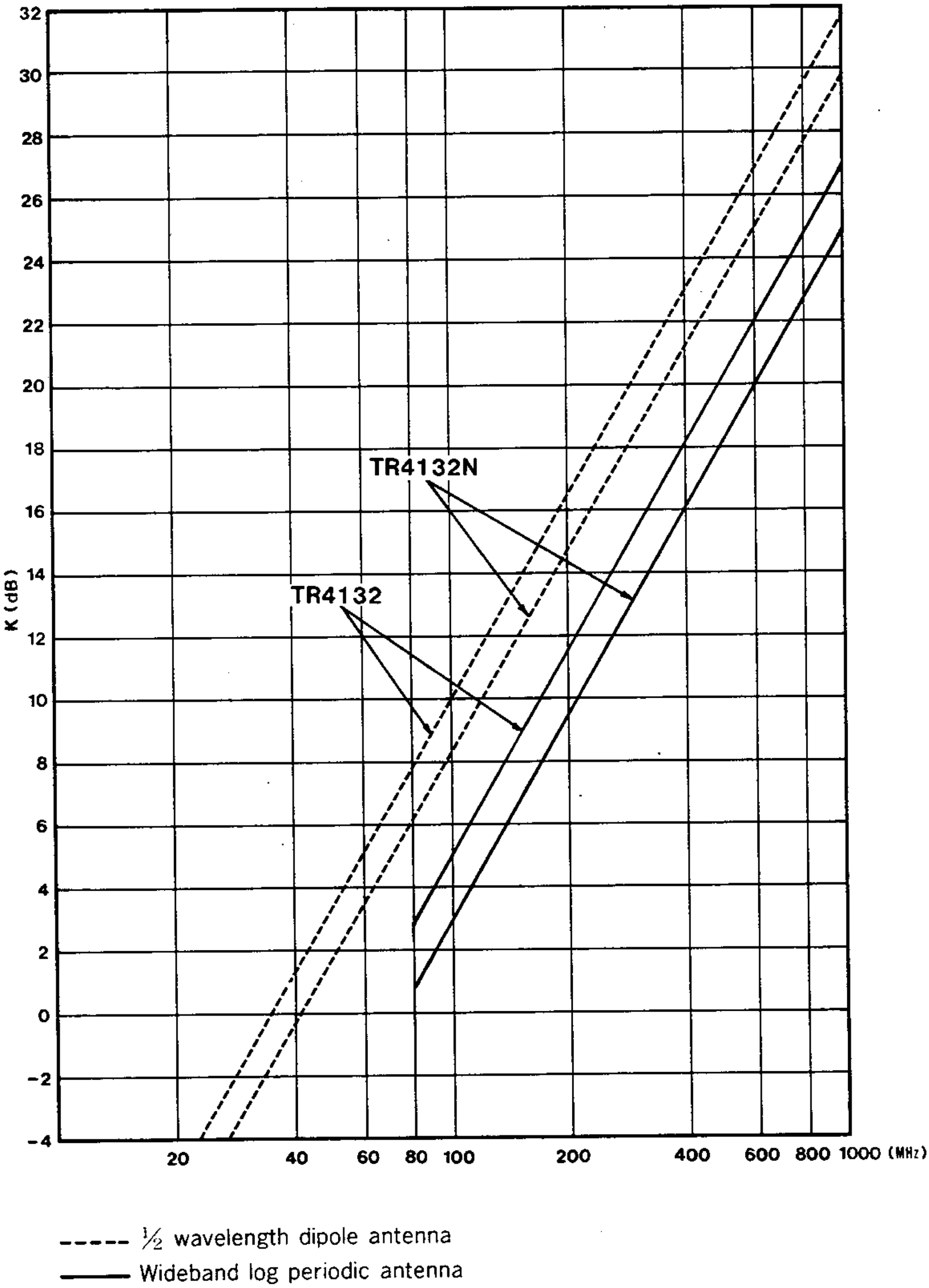


Fig. 2-24 Antenna Coefficient Compensation

2-6-6 Noise Field Strength (quasi peak value) Measurement with Dipole Antenna

As **DETECTION MODE** is set to **Q.P.**, the quasi peak value is displayed on CRT display. Measurement of quasi peak value is based on C.I.S.P.R. Comité International Spécial des Perturbations Radioelectriques) standards. The detection constant is automatically set when 6dB IF bandwidth is set to either 9kHz or 120kHz according to the frequency measurement range as mentioned in [Table 2-4] below.

Frequency Measurement Range		150kHz to 30MHz	25MHz to 1000MHz
IF Bandwidth (6dB)		9kHz	120kHz
Detection time Constant	Charge	1ms ±20%	1ms ±20%
	Discharge	160ms ±20%	550ms ±20%

Table 2-4 Automatic Setting of Detection Constant with TR4132/4132N

Since the response to fluctuation of level is arranged slow in quasi peak value measurement, it is suggested to make the scan time very slow or effect the measurement by manual operation or setting **DISPERSION/DIV.** to **ZERO.**

The quasi peak detection circuit has a dynamic range of 40dB, and **10dB/DIV., 5dB/DIV., LINEAR** selector is set to 5dB/DIV.

In noise field strength (quasi peak value) measurement, first carry out calibration of level and frequency and then proceed the following operation.

(1) Set the front panel controls as follows:

RF. ATT. 40dB
IF GAIN 0dB
DISPERSION/DIV. .... 100MHz/DIV.
B.W. (Hz) 6dB 1.5MHz (6dB)
TUNING/PRESET(or TV) .... TUNING
DETECTION MODE .... MEAN (VIDEO FILTER-OFF)
SCAN MODE .... AUTO
REFERENCE LEVEL ... ANTENNA-A
10 dB/DIV. 5dB/DIV., LINEAR .... 10dB/DIV.

(2) Connect the dipole antenna to **INPUT**. A spectrum appears on CRT display. Adjust **RF. ATT.** so that the peak value of this spectrum becomes highest but does not exceed 1 division (−10dB) below the top line (**REF.**) of CRT graticule (to prevent mixer gain compression).

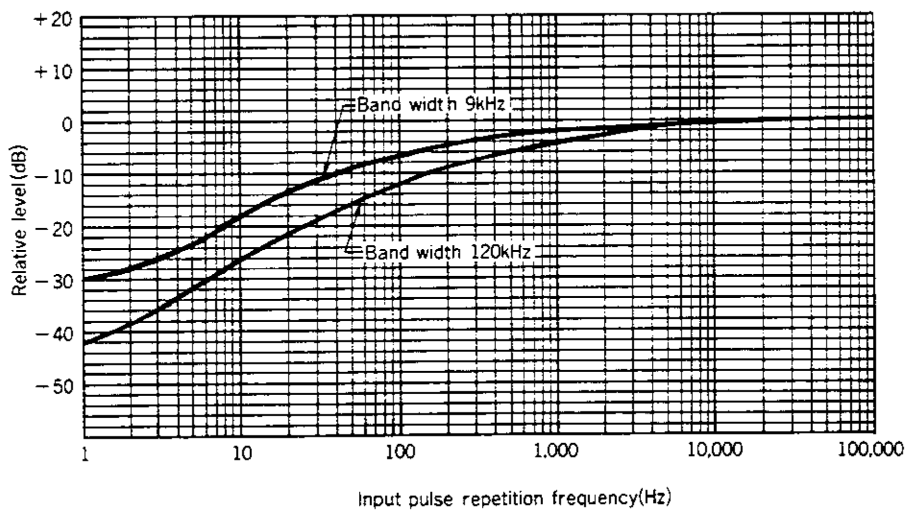


Fig. 2-25 Detection Characteristics for Repetitive Frequency

(3) Then adjust **IF GAIN** to make the level of the spectrum highest but still not exceeding the top graticule line of CRT (to prevent overload of IF section).

(4) Rotate **TUNING** to center the signal so that **CENTER FREQUENCY** indicates the frequency to be measured.

(5) Set **DISPERSION/DIV.** to **ZERO** or **SCAN MODE** to **MANU.** When **SCAN MODE** is set to **MANU**, adjust **MANUAL SCAN** control to position the bright spot to the center of CRT display. As automatic Calibration of the antenna level for the frequency at the center of CRT display is performed in the same manner as for field strength measurement, the level can be directly read by this procedure.

(6) Next, reset the controls as follows:

B.W. (Hz) 6dB .... 9kHz or 120kHz (Selected according to frequency)

DETECTION MODE .... Q.P.

10dB/DIV., 5dB/DIV., LINEAR .... 5dB/DIV.

Note: As DETECTION MODE is set to Q.P., indication of REFERENCE LEVEL goes down by 40dB and for this, it sometimes happen that the display on CRT disappears. This is because the gain is automatically raised by 40dB inside of the instrument. Accordingly, IF GAIN and RF. ATT must be readjust to bring back the display in such an event.

(7) The level displayed on the CRT is the noise field strength of the signal under measurement.

(8) Read the level as follows:

Noise field strength (dBμ/m)
= **REFERENCE LEVEL** display (dBμ/m)
+ CRT display (dB)

[Fig. 2-26] shows the display when **DISPERSION/DIV.** is set to **ZERO.** Only a bright spot appears when **SCAN MODE** is set to **MANU.**

REFERENCE LEVEL display: 79dBμ/m
CRT display: 5dB x 4 DIV. = −20dB
Therefore,
Noise field strength
= 79 (dBμ/m) + (−20dB) = 59 (dBμ/m)

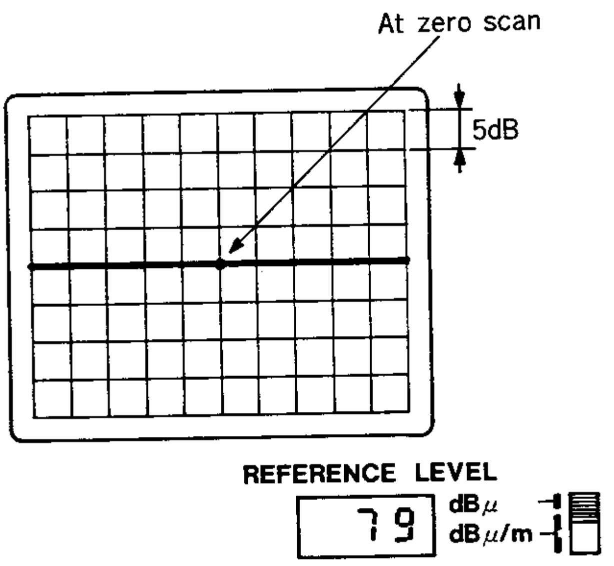


Fig. 2-26 Noise Field Strength Measurement Procedure

2-6-7 Digital Memory Measurement

The accessory **TR1604** Digital Memory has been designed for combined use with the **TR4132/4132N** spectrum analyzers, storing the CRT display spectrum data in digital form in a storage memory, thereby obtaining a picture of greater stability.

With 2 channels in the memory, display functions include [A] that displays 1 channel data and [A/B] that fixes 1 channel data and displays successively the other channel's data.

Although it is quite difficult to get an idea of the overall waveform during high resolution measurements due to the much slower sweep rate, linking up to the **TR 1604** set to [A] enables still pictures to be observed until the next input is applied, thereby making very accurate measurements much easier to perform. Furthermore, when performing comparative measurements with reference signals, and when measuring field strength with a high level of external noise, using the **TR 1604** in the [A/B] position will enable measurements to be performed much more quickly.

1. **Specifications**

Memory:	X axis 9 bits, 512 points Y axis 8 bits, 256 points
Write time:	20 ms to 10 s depending on the **TR4132/4132N** scanning time setting
Display time:	Approx. 4 ms, full-scale repetition
Sampling error:	Y axis 2.5% max.
Storage function:	Memory contents stored by setting the **TR4132/4132N** scanning mode to **MANUAL**
Display function:	A–display of memory A contents A/B–display of memory A and B contents
Operating temperature:	0°C to +40°C
Storage temperature:	−25°C to +70°C
Power supply:	Supplied by **TR4132/4132N**
Power consumption:	Approx. 25 VA
Warm-up time:	Approx. 30 min.
Dimensions:	Approx. 290(W) x 40(H) x 390 (D) mm

2. **Panel Controls**
(See Fig. 2-27)

(1) **MEMORY ON/OFF** switch
Memory function is activated in the **ON** position, while **TR4132/4132N** functions are activated in the **OFF** position.

(2) **A** and **A/B** switches
Memory A contents are displayed when set to **A**. And if the **TR4132/4132N** scanning mode is set to **MANUAL**, the memory contents will be fixed.
When set to **A/B**, memory A and memory B are displayed. In this case, the contents of memory A is fixed, and the memory B contents will be displayed depending on the input. If the **TR4132/4132N** scanning mode is set to **MANUAL**, however, the memory A and B contents will simply be fixed.

(3) **FUSE** holder
This holder contains a 0.20 A (0.10 A for AC 220 V) fuse. If the fuse needs to be replaced, turn the holder cap in the direction of the arrow to remove the cap.

3. **Preliminary Precautions**

- When **TR4132/4132N SCAN MODE** is set to **SINGLE**, only a single sweep operation will be performed. For another single sweep to be performed, it will be necessary to press the start button twice.
- Since **TR1604** and **TR4132/4132N** are connected internally, refrain from removing the **TR1604** from the **TR4132/4132N.**

4. **Basic Operation Procedure**

(1) Turn the **TR4132/4132N POWER** switch **ON***.

NOTE

When switching the **TR4132/4132N POWER ON**, the **A**, **A/B** selector must be started with **A**.

(2) Switch the **TR1604** Digital Memory control **ON**, and set the **A**, **A/B** selector to **A**. Input signals will be accepted and displayed successively on the CRT screen.

(3) The sweep mode may be stopped by switching the **TR4132/4132N SCAN MODE** control to **MANUAL**, resulting in

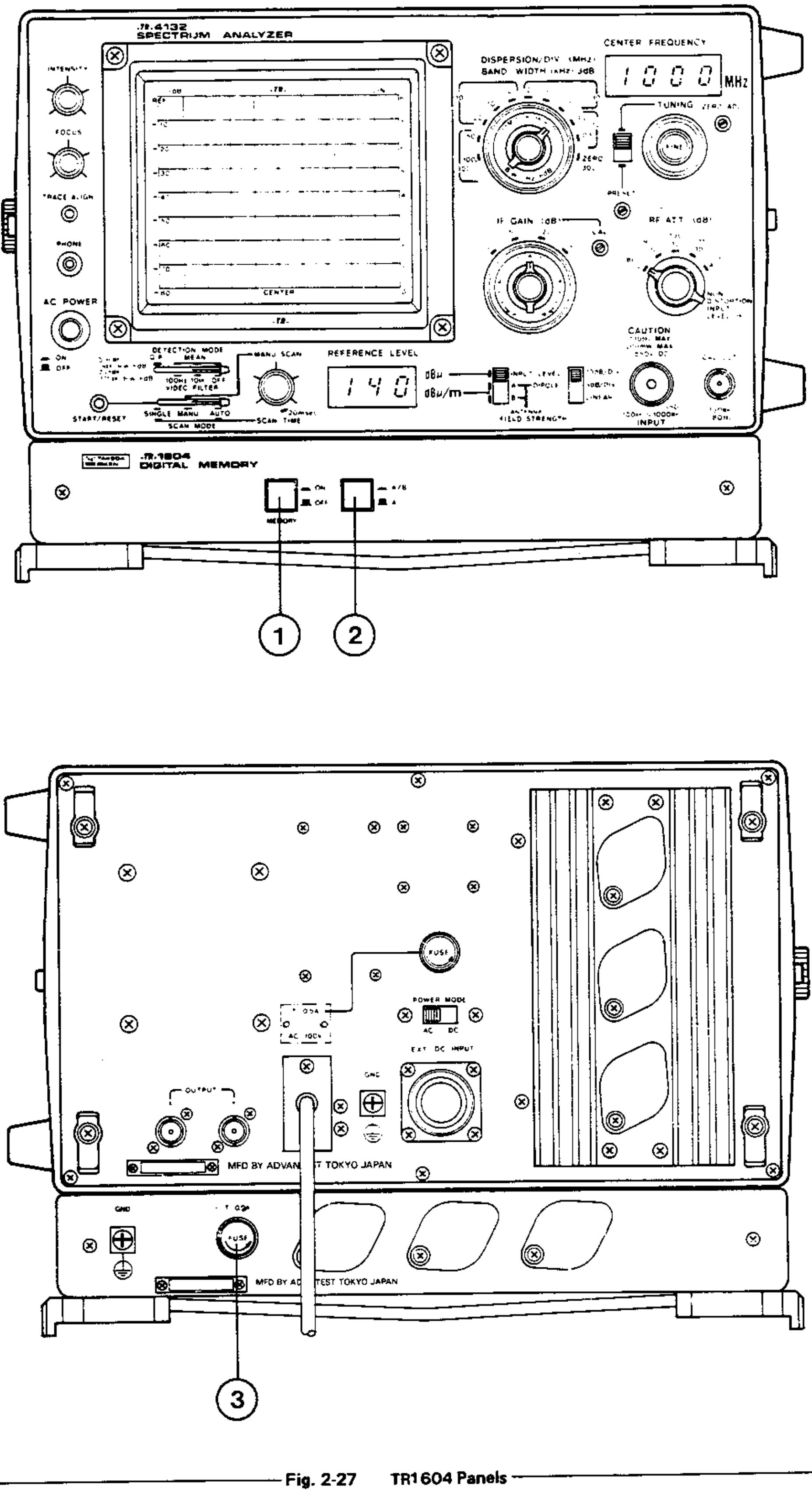


Fig. 2-27 TR1604 Panels

the memory contents being fixed. The signal waveform shown on the CRT display will be held at the status achieved when **MANUAL** was set.

(4) For comparison measurements, switch the **A, A/B** selector to **A/B**. In this case, the contents in memory A at the time of switching will be fixed and displayed on the CRT. At the same time, input data will be supplied successively to the other memory (memory B), and the contents also displayed.

(5) If the **TR4132/4132N SCAN MODE** control is then set to **MANUAL** without changing any of the other settings, the sweep action will be stopped, and the **A/B** memory contents fixed. The signal waveforms shown on the CRT display will be the waveforms at the time that **MANUAL** was set.

* When the **TR1927** battery pack is used, unplug the **TR4132/4132N** power cable from the receptacle. Power will subsequently be turned on and off at the **TR1927**

5. **CRT Display Calibration**

For calibration procedures with **MEMORY** switched **OFF**, refer to section 2-5-2. With **MEMORY** switched **ON**, however, first refer to section 2-5-2 again, and then proceed with the additional calibrations described below.

(1) Vertical scale calibration

If the CRT display signal waveform fails to vary by the normal amount when the **TR4132/4132N RF ATT., IF GAIN** or input signal is changed by 10 dB, calibrate the scale by adjusting with control ② (**Y GAIN**) shown in Fig. 2-28.

(2) Base line calibration

Set the **TR4132/4132N IF GAIN** to 0 dB, and set the **10 dB/DIV., 5 dB/DIV.** and **LINEAR** vertical axis selectors to **10 dB/DIV.**

If the base line is not on the horizontal graticule line, correct it by using the control ① (**Y POSI.**) also shown in Fig. 2-28.

(3) Horizontal axis position calibration

Set the **TR4132/4132N DISPERSION/**

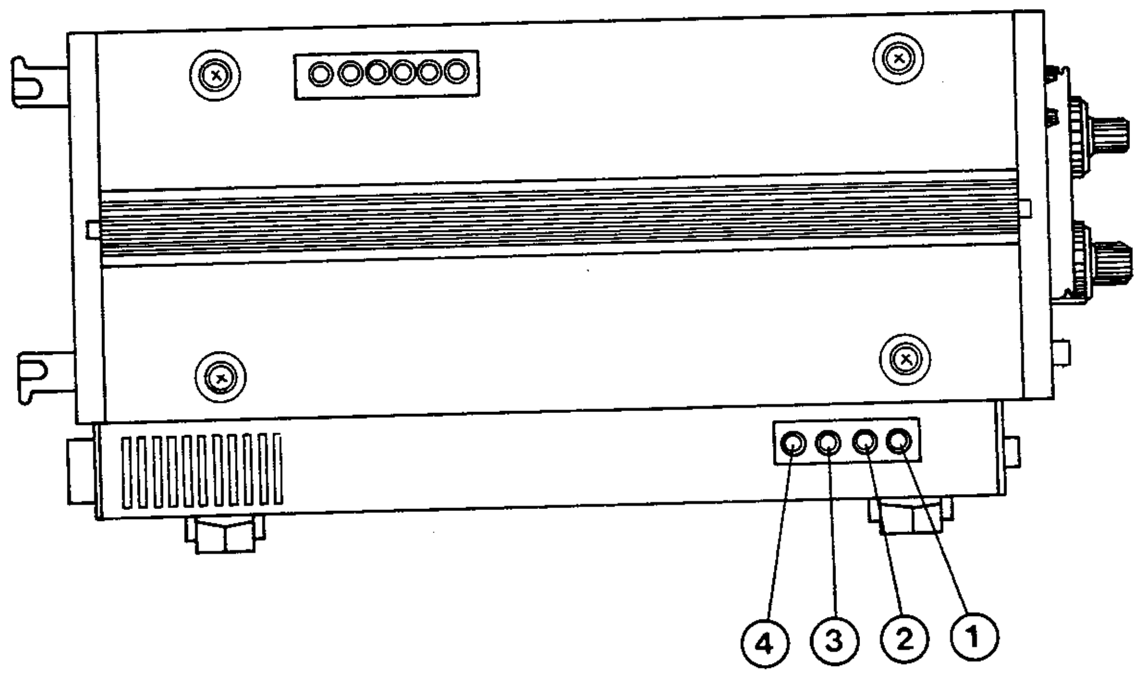


Fig. 2-28 CRT Display Calibrations

DIV. control to 100 MHz/DIV., and position the signal waveform in the center of the CRT screen with **MEMORY OFF**. Next switch **MEMORY ON**, and check that the CRT display signal waveform does not move. If it does move, adjust control ③ (**X POSI.**) shown in Fig. 2-28 until no further movement is detected.

(4) Horizontal scale calibration
Calibrate the horizontal scale on the CRT screen to 100 MHz per scale division with the **DISPERSION/DIV.** control in the 100 MHz/DIV. position, using control (4) (**X GAIN**) shown in Fig. 2-28.
For this calibration, it is convenient to use the harmonics of the **TR4132/4132N** 100 MHz **CAL. OUT.** signal.

6. TR1604 Operation

Refer to the **TR1604** Digital Memory Block Diagram shown in Fig. 2-29.

① Timing generator
Generation of the timing signals for control of the various stages.

② A and B memory
Includes 2 pages composed of 256 points on the vertical axis and 512 points on the horizontal axis per page.

③ A/B converter (Y stage)
Sampling of vertical axis analog signals, and conversion to digital signals.

④ D/A converter
Conversion of vertical axis memory contents to analog signals, and output to the vertical axis of the CRT screen.

⑤ A/D converter (X stage)
Conversion of horizontal analog signals to digital signals.

⑥ Ramp generator
Generation of approx. 4 ms ramp waveforms for output to the horizontal axis of the CRT screen.

⑦ Counter
In addition to counting from point 1 to point 512 of the memory ②, the counter also supplies the CRT display blanking signal.

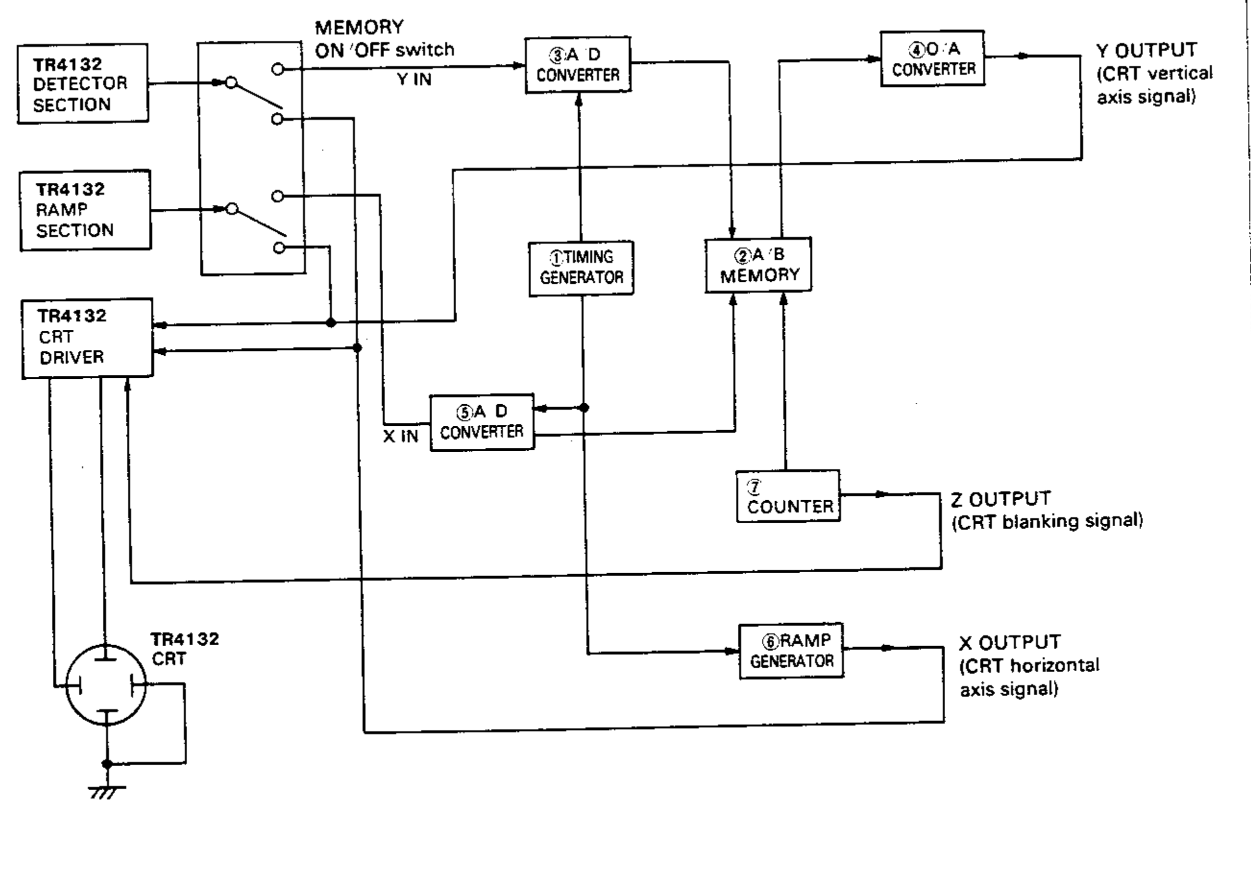


Fig. 2-29 TR1604 Block Diagram

SECTION 3
PERFORMANCE CHECK

3-1 Description

This section outlines performance check procedures for **TR4132** or **TR4132N** Spectrum Analyzer.

3-2 Preparations and Precautions for use

3-2-1 Equipment and Tools

The equipment selected must have equivalent or better performance ratings than those listed in [Table 3-1].

Table 3-2 Tools for Performance Check

Item	Stock No.	Remarks
BNC-BNC Cable	**MI-02**	(for **TR4132**)
BNC-BNC Cable	**MO-15**	(for **TR4132N**)
BNC-SMA Cable	**MC-37**	
BNC-UM Cable	**MC-36**	
N(J)-BNC(P) Adapter		US-349/U
N(P)-BNC(J) Adapter	**TR1613**	JUG-201A/U (for **TR4132**)
UM(J)-UM(J) Adapter		UM-QA-JJ
Adjusting Plain Board	CZ570	22-pin double

Note: See Section 7 for detaile

3-2-2 General Precautions

(1) The instrument must be operated on AC 100V (or as specified among 100V, 120V, 200V and 240V) ± 10%, 50/60Hz.

(2) Ensure the **AC POWER** switch is set to **OFF** before connecting the power cable.

(3) Power cable
The power cable has 3-pin type plug of which the round pin in the center is for grounding. In the case of using an adapter for 2-pin connection, either the wire from the adapter or the ground terminal **GND** on the rear panel of the instrument must be earthed to the ground.

(4) Because the instrument is not fan-cooled, ensure proper environmental ventilation is procided, no other equipment is placed directly adjacent to it, and do not turn the instrument on its side.

(5) The operating temperature specification for the instrument is 0°C to +40°C with a humidity of less than 80%.

Table 3-1 Equipment for Performance Check

Equipment	Performance ratings	Recommendation
(1) Signal Generator	Frequency: 1MHz to 500MHz Output level: 117dBμ (50Ω) Output impedance: 50Ω Output level flatness: Within ±0.5dB Frequency accuracy: Within ±1% Noise sideband: −140dB away from 200kHz carrier	
(2) Frequency Counter	Frequency: 10Hz to 100MHz Sensitivity: 10mVrms Stability: 5 x 10^{-8}/day	ADVANTEST **TR5122G**
(3) High Frequency Power Meter	Frequency: 100kHz to 1500MHz Sensitivity: −30dBm to +20dBm Accuracy: ±0.5dB	Boonton 41A
(4) Attenuator	Frequency: DC to 500MHz Attenuation: 0 to 80dB on 10dB step Accuracy: ±1.5dB	
(5) Low Distortion Oscillator	Frequency: 10, 20, 30, 50, 70, 100, 150, 200 & 250MHz Output: 100dBμ (50Ω) Harmonic distortion: below −80dB	

(6) A warm up for about 30 minutes is required before the performance check.

3-3 Performance Check using the CAL. OUT. Signal

This section outlines performance check procedures of instrument using calibration output provided on the front panel of the instrument.

3-3-1 Preliminary Settings

(1) Set the **POWER MODE** switch on the rear panel to **AC** with the **POWER** switch on the front panel set to **OFF**.

(2) Connect the power cable to the AC power source with the specified voltage.

(3) Set the control knobs and switches on the front panel as follows:

INTENSITY .... center
FOCUS .... center
SCAN MODE .... AUTO
DETECTION MODE ... MEAN (VIDEO FILTER-OFF)
SCAN TIME (MANUAL SCAN) 20ms
REFERENCE LEVEL .. INPUT LEVEL
10dB/DIV., 5dB/DIV., LINEAR .... 10dB/DIV.
IF GAIN (dB) .... 0dB, CAL.
RF. ATT. (dB) 0dB
DISPERSION/DIV. 100MHz
B.W. (Hz) 6dB .... AUTO
TUNING/PRESET .... TUNING
(TUNING/TV for **TR4132N)**

(4) Set **AC POWER** to **ON** and **REFERENCE LEVEL** and **CENTER FREQUENCY** LEDs will light. Turn **TUNING** to set **CENTER FREQUENCY** at 000 MHz, while **REFERENCE LEVEL** indicates 110 dBμ.

* If abnormal, refer to chart 7 of Section 6 Trouble Shooting.

(5) About 10 seconds after setting **AC POWER** to **ON**, a zero frequency trace appears on the CRT display. If the trace does not appear, turn **INTENSITY** clockwise.

CAUTION

Do not keep **INTENSITY** fully clockwise for a long period of time to avoid damaging the CRT.

*If abnormal, refer to Chart 1 of Section 6 Trouble Shooting.

(6) Turn **FOCUS** until a sharp trace is obtained. A sharp focus may be difficult if the trace is too bright. In this case, adjust the **INTENSITY** as required.

(7) If the trace is tilted relative to the vertical graticule line of the CRT, adjust **TRACE ALIGN** with a screwdriver to bring it correctly along the graticule. [Fig. 3-1]

(8) Using the N-BNC conversion adapter (JUG-201A/U or **TR1613**) with the BNC-BNC cable (**MI-02**), connect **CAL. OUT.** on the front panel to **INPUT** connector. For **TR4132N**, use **MO-15**

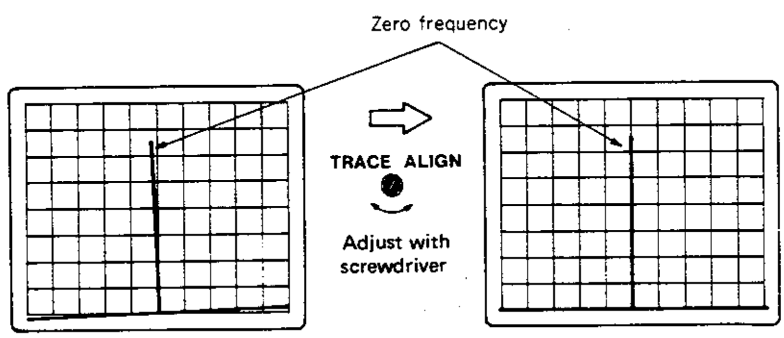


Fig. 3-1 TRACE ALIGN Adjustment

Input cable. Refer to Fig. 3-2 for the connection.

(9) At this time the CRT display is as shown in [Fig. 3-3].

(10) Run the instrument in this condition for about 30 minutes.

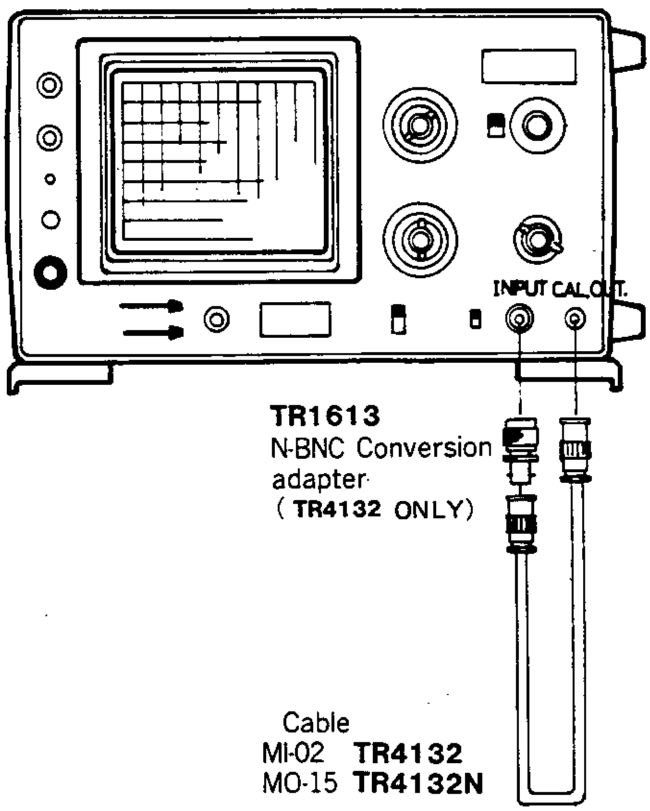


Fig. 3-2 CAL. OUT. Signal Connection

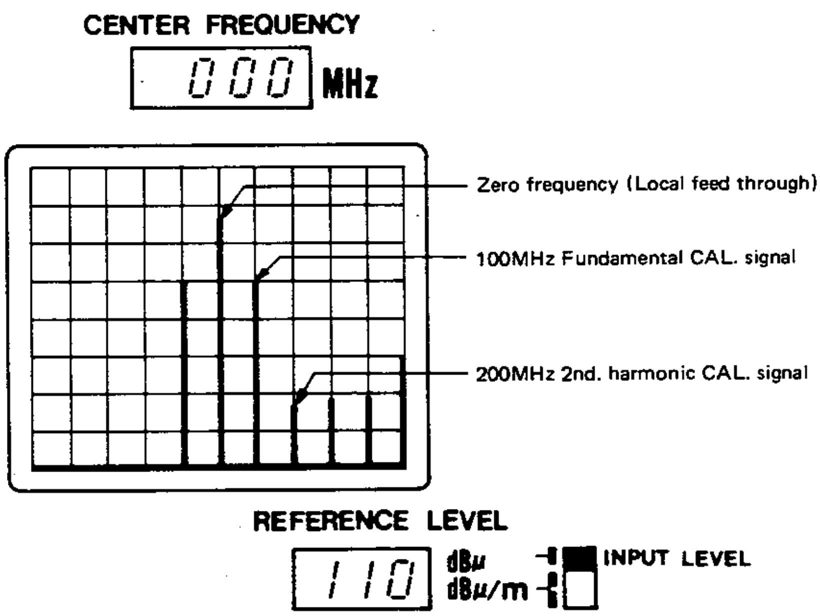


Fig. 3-3 CAL. OUT. Signal Spectrum

3-3-2 Frequency Display Accuracy Check

Specification: Within ± 10MHz

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

SCAN TIME .... White-line at 12 o'clock position

IF GAIN 20dB

DISPERSION/DIV. .... 5MHz/DIV.

(2) To eliminate hysteresis, return **DISPERSION/DIV.** switch to 100MHz/DIV. and reset it to 5MHz/DIV.

(3) Correspond the signal by **TUNING** to **CENTER** marked line of the CRT.

(4) Adjust **ZERO ADJ.** semifixed register, so that **CENTER FREQUENCY** displays 000 MHz.

(5) Turn **TUNING** clockwise and read **CENTER FREQUENCY** when the 100MHz CAL. signal and its harmonics are displayed at the CRT center. Observe that the error to 100 x N (MHz) (where N=1 to 10) of the display is whithin ± 10MHz.

(6) Then, return **TUNING** counter-clockwise, and read the error respectively in the same manner as in (5) above and observe the error within ± 10MHz here again.

* If abnormal, refer to Chart 7 of Section 6 Trouble Shooting.

3-3-3 Scan Linearity Check

Specification: Within ± 5%

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

SCAN TIME .... White-line at 12 o'clock position

IF GAIN 20dB

DISPERSION/DIV. ...... 20MHz/DIV.

(2) Adjust **TUNING** to correspond the zero frequency signal (Local feed through) on the third vertical line at the left of the CRT display. [Fig. 3-4]

(3) Observe that the deviation of 100MHz CAL. signal to the fourth vertical line from the right is within ± 0.25 divisions.

(4) Turn **TUNING** to correspond 100MHz CAL. signal to the third vertical line from the left and observe the error of 200MHz harmonic signal to the fourth vertical line from the right.

(5) Likewise, proceed to check the linearity for 900MHz to 1000MHz.

* If abnormal, refer to Chart 7 of Section 6 Trouble Shooting.

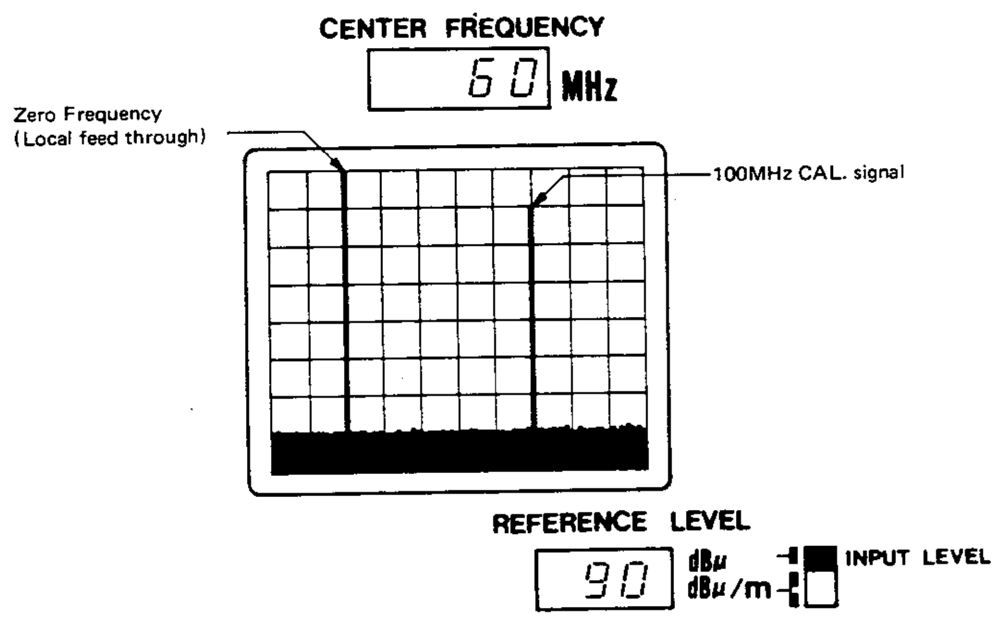


Fig. 3-4 Scan Linearity Check Procedure

3-3-4 REFERENCE LEVEL Display Check

(1) Set **RF. ATT.** to 40dB and **IF GAIN** to 0dB **CAL. REFERENCE LEVEL** will now display 150 dBμ.

(2) As **RF. ATT.** is switched counter-clockwise step by step, the display moves downward by every 10dB. When **RF. ATT.** is 0dB, **REFERENCE LEVEL** will indicate 110 dBμ.

(3) If switching **IF GAIN** clockwise from 0dB to 10dB, 20dB and 30dB in sequence, the display changes to 110, 100, 90, 80 respectively.

(4) When the 1dB-step switch of **IF GAIN** (Inner switch) is turned counter-clockwise from **CAL.** in 1dB sequence, the reading of **REFERENCE LEVEL** goes up by every 1dB, while it goes downward by every 1dB when turned clockwise.

86, 85, 84, 83, 82, 81, 80, 79, 78, 77,

c.c.w. ←—— CAL. ——→ c.w.

(5) Adjust **TUNING** so **CENTER FREQUENCY** displays 34MHz. (43MHz in the case of **TR4132N**).

(6) Reset **REFERENCE LEVEL** selector from **INPUT LEVEL** to **ANTENNA-A**, and observe that the reading of **REFERENCE LEVEL** does not change.

(7) When the center frequency is set to 1000MHz by **TUNING**, the **REFERENCE LEVEL** display for **ANTENNA-A** increases by 31 ± 1dB in comparison with the **INPUT LEVEL**. (An increase of 29 ± 1dB in the case of **TR4132N**)

(8) At **ANTENNA-B, REFERENCE LEVEL** always displays 5dB less than **ANTENNA-A**.

(9) If the vertical division selector is switched to **LINEAR** either from **10dB/DIV.** or **5dB/DIV.**, the reading of **REFERENCE LEVEL** decreases by 40dB.

(10) Return of the vertical division selector either to **10dB/DIV.** or **5dB/DIV.** from **LINEAR**, and switching **DETECTION MODE** selector from **MEAN** to **Q.P. REFERENCE LEVEL** will indicate a decrease of 40dB like (9) above.

* If abnormal, refer to Chart 7 of Section 6 Trouble Shooting.

3-3-5 Vertical Axis Check

Specification: CRT LOG. scale accuracy within ± 1dB on 10dB display, ± 1.5dB/40dB, ± 2dB/80dB

(1) Reset specific controls from the initial settings (Para 3-3-1 (3)) as follows:

CENTER FREQUENCY 100MHz
IF GAIN 30dB
DISPERSION/DIV. .... 5MHz/DIV.

(2) Adjust **IF GAIN-CAL.** to correspond to the peak of 100MHz CAL. signal to the horizontal top line. [Fig. 3-5]

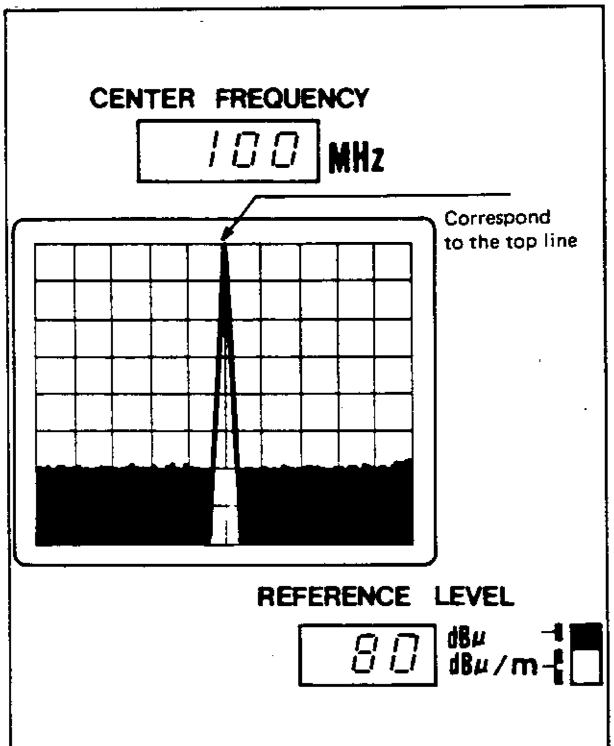


Fig. 3-5 Vertical Axis Check Procedure

(3) When **RF. ATT.** is switched clockwise, step by step or **IF GAIN** is switched counter-clockwise, the signal level is within ± 1dB on a 10dB-variation, within ± 1.5dB on a 40dB-variation and within ± 2dB on a 70dB-variation.

* If abnormal, refer to Chart 4, 5 and 6 of Section 6 Trouble Shooting.

3-3-6 Bandwidth Accuracy Check

Specification: Within ± 20%

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

CENTER FREQUENCY 100MHz
10dB/DIV., 5dB/DIV., LENEAR .... 5dB/DIV.
IF GAIN 10dB, 6dB
DISPERSION/DIV. ...... 0.5MHz/DIV.
B.W. 6dB 1.5MHz

(2) Adjust **IF GAIN-CAL.** so that the signal peak is at 6dB (1.2 divisions) above the horizontal center line of the CRT display. [Fig. 3-6]

(3) Check that the bandwidth (6dB bandwidth) across the horizontal center line is between 1.2MHz and 1.8MHz.

(4) Reset **B.W.** to 120kHz and **DISPERSION/DIV.** to 0.1MHz/DIV.

(5) Check in the same manner as (3) above that the bandwidth at 6dB below the peak is between 96kHz and 144kHz.

*If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

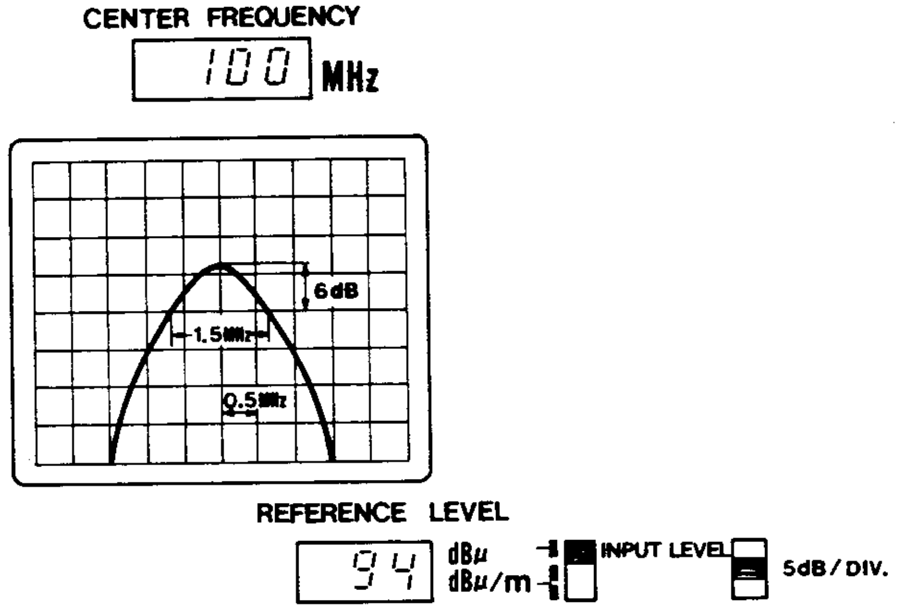


Fig. 3-6 Bandwidth Accuracy Check Procedure

3-3-7 Bandwidth Selectivity Check

Specification: 60dB/3dB (6dB) resolution bandwidth ratio < 15 : 1

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

CENTER FREQUENCY 100MHz
IF GAIN 30dB
DISPERSION/DIV. ...... 0.1MHz/DIV.

(2) Turn **TUNING** to center the signal on the CRT display.

(3) Adjust **IF GAIN-CAL.** to correspond the peak of 100MHz CAL. signal exactly to the horizontal top scale. [Fig. 3-7]

(4) Check that the bandwidth at 60dB below the signal peak is less than 0.15MHz.

*If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

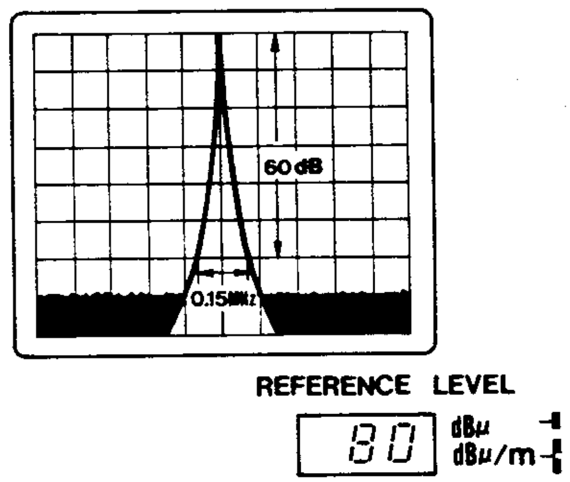


Fig. 3-7 Bandwidth Selectivity Check Procedure

3-3-8 Bandwidth Switching Level Error Check

Specification: Within ± 1dB

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

CENTER FREQUENCY 100MHz
SCAN TIME .... White-line at 12 o'clock position
10dB/DIV., 5dB/DIV., LINEAR .... 5dB/DIV.

(2) Paying attention to the level of CAL. signal on the CRT display, switch **DISPERSION/DIV.** from 100MHz/DIV. to 0.1MHz/DIV. Adjust **TUNING** if the display does not stay in the center. Switch **B.W.** from **AUTO** to 9kHz, 120kHz and 1.5MHz in sequence, and check that variation of the CAL. signal level on the CRT display is within ±1dB.

*If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

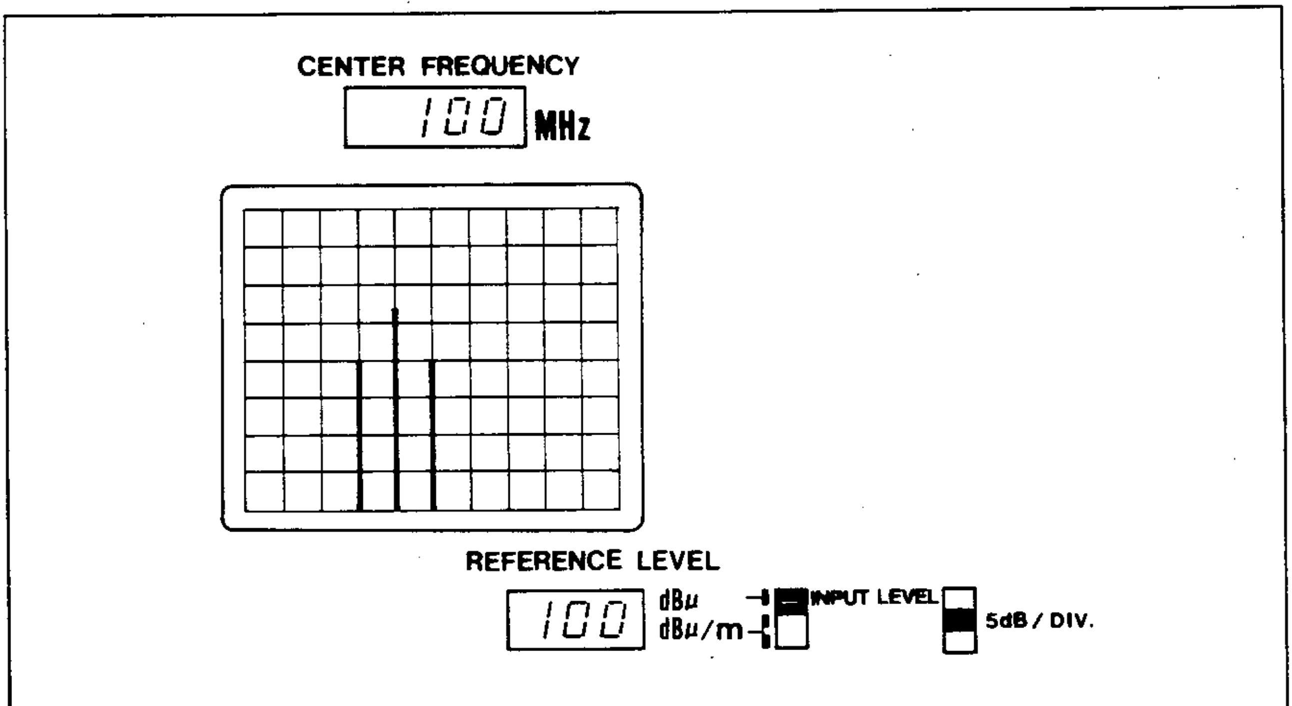


Fig. 3-8 Bandwidth Switching Error Check Procedure

3-3-9 Average Noise Level Check

Specification: Below 5dBμ (at IF Bandwidth 10kHz, Video filter 100Hz)

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

IF GAIN 30dB
DISPERSION/DIV. ..... 100MHz/DIV.

(2) Adjust **IF GAIN-CAL.** to correspond the peak of 100MHz CAL. signal to the horizontal top line. [Fig. 3-9]

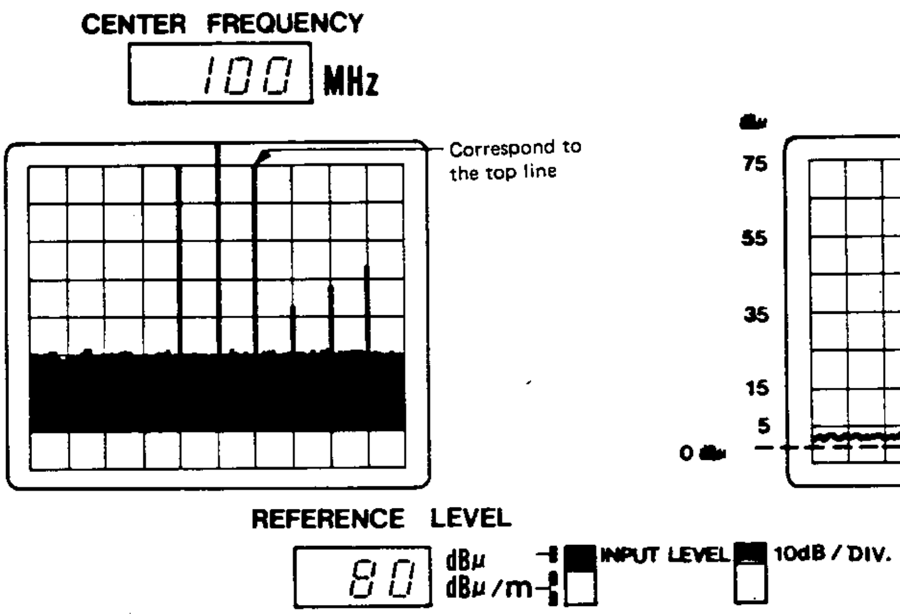
(3) Set **IF GAIN** inner switch (1dB-step) to +5dB (when **REFERENCE LEVEL** will read 75dBμ).

(4) Position the white-line of **SCAN TIME** at 11 o'clock position.

(5) Set **DISPERSION/DIV.** to 0.1MHz/DIV. and **VIDEO FILTER** to 100Hz respectively.

(6) Check that the noise level is below 5dBμ. [Fig. 3-10]

*If abnormal, refer to Chart 4 and 5 of Section 6 Trouble Shooting.



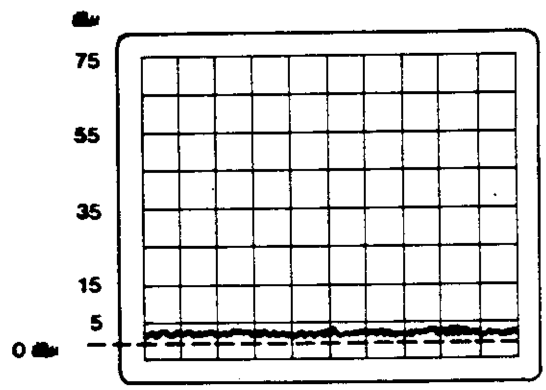


Fig. 3-9 Average Noise Level Check Procedure — Fig. 3-10 Average Noise Level Check Display

3-3-10 Residual Spurious Response Check

Specification: Less than 20dBμ (at no input and RF. ATT. 0dB)

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

SCAN TIME .... White line at 11 o'clock position
IF GAIN 30dB
VIDEO FILTER 10kHz
DISPERSION/DIV. .... 20MHz/DIV.

(2) Disconnect **INPUT** from **CAL.OUT.**

(3) Turn **TUNING** from the full counterclockwise position to 1000MHz slowly and check that the response is below 20dBμ. [Fig. 3-11]

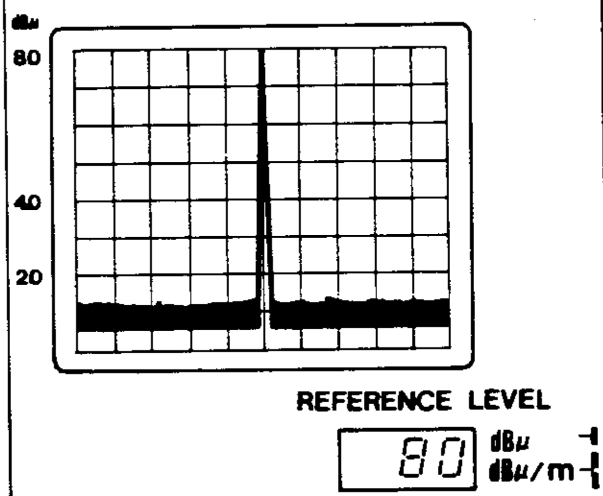


Fig. 3-11 Residual Spurious Response Check Procedure

3-4 Performance Tests with External Equipment

This section describes the procedure to check main performance of the instrument by connecting various measuring equipment. Refer to Para 3-2 as regards the equipment to be utilized and for the test precautions.

3-4-1 CAL. OUT. Frequency Accuracy

Specification: 80dBμ ±0.5dB

Equipment used: Frequency Counter

(1) Connect **CAL. OUT.** of the instrument to the input of the Frequency Counter. [Fig. 3-12]

(2) Check that the counter reading is between 99.8MHz and 100.2MHz.

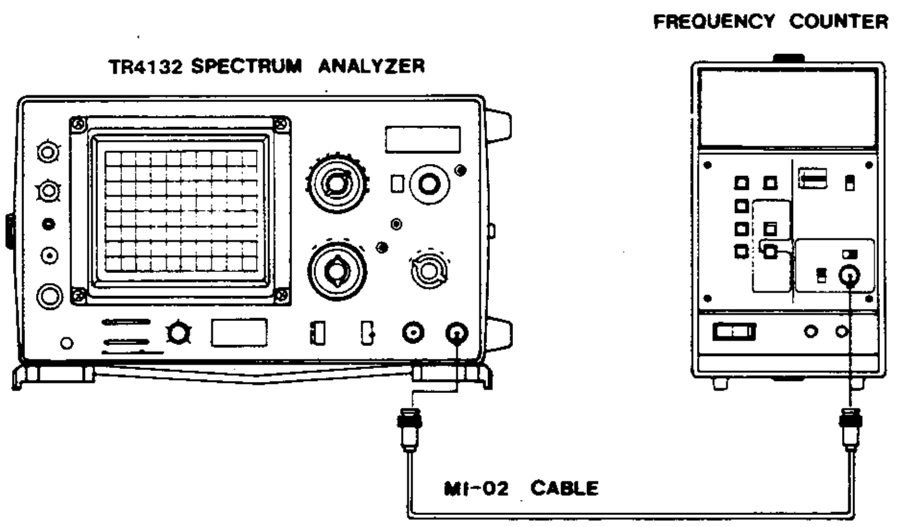


Fig. 3-12 CAL. OUT. Frequency Accuracy Test Setup

3-4-2 CAL. OUT. Level Accuracy

Specification: 80dBμ ±0.5dB

Equipment used: High Frequency Power Meter

(1) Connect the equipment to **CAL. OUT.** of the instrument as shown in [Fig. 3-13] and measure the level of the calibration output signal.

(2) Check that the measurement reads as follows:

TR4132	−26.5dBm to −27.5dBm
TR4132N	−28.5dBm to −29.5dBm

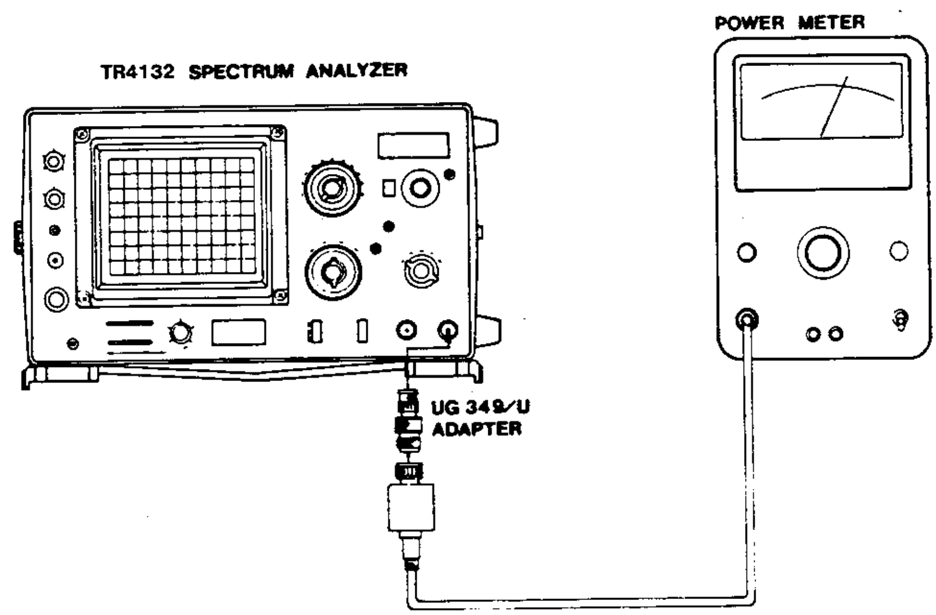


Fig. 3-13 CAL. OUT. Level Accuracy Test Setup

3-4-3 CRT LOG. Scale Accuracy

Specification: ± 1dB on 10dB display,
± 1.5dB/40dB, ± 2dB/80dB

Equipment used: Signal Generator
Attenuator

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:
CENTER FREQUENCY 100MHz
IF GAIN .... 10dB, +5dB
DISPERSION/DIV. ..... 0.2MHz/DIV.
B.W. (6dB) 120kHz

(2) Set the Signal Generator output to 100MHz/95dBμ and the Attenuator to 0dB respectively and connect to **INPUT** of the instrument as shown in [Fig. 3-14].

(3) Switch **IF GAIN-CAL.** so that the signal peak comes to the horizontal top line. [Fig. 3-15].

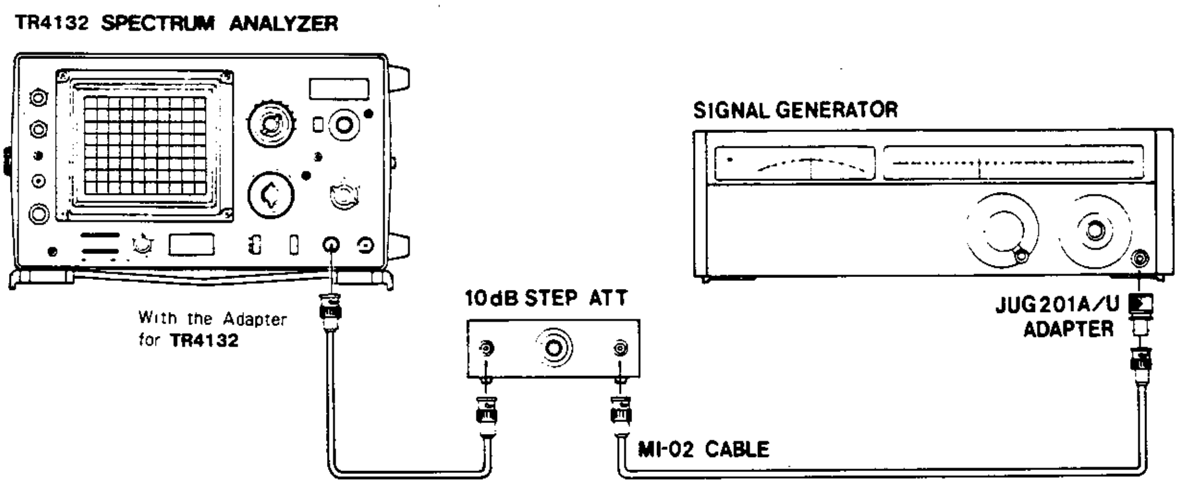


Fig. 3-14 CRT LOG. Scale Accuracy Test Setup

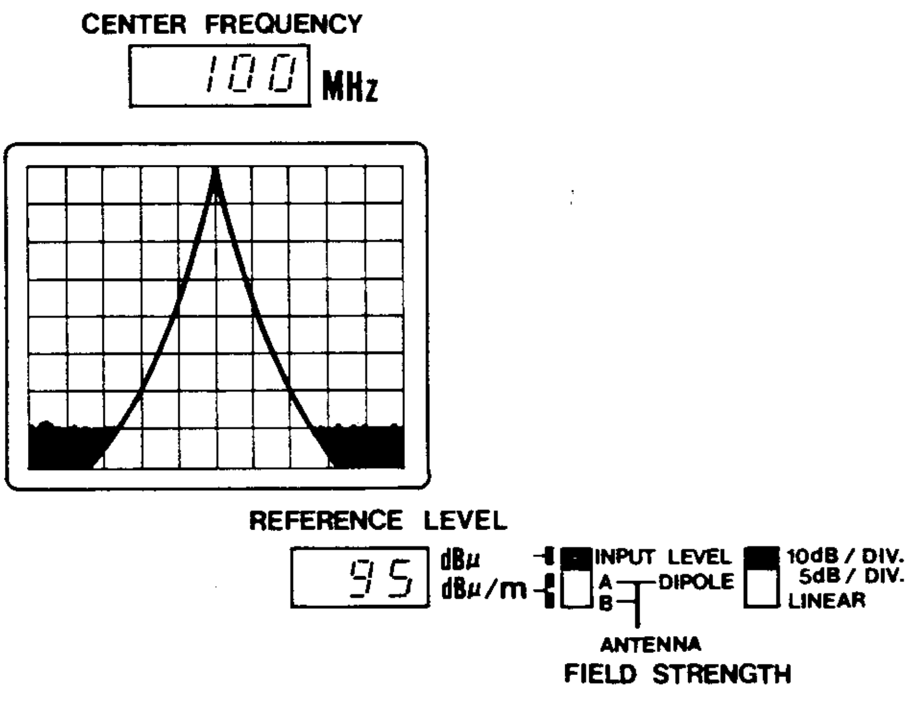


Fig. 3-15 CRT LOG. Scale Accuracy Check Procedure

(4) Switch the external Attenuator from 0dB to 70dB in sequence, while resetting **IF GAIN** from 10dB to 0dB.
When setting 60dB or 70dB, measurement is simplified if either **SCAN TIME** is made slower or **MANUAL SCAN** is selected.
(5) Check that variation of the CRT display is in 10dB± 1dB as the external Attenuator is changed by every 10dB; 40dB ± 1.5dB for the Attenuator change of 40dB; and 80dB ± 2dB for 80dB.
(6) Return the external Attenuator to 0dB and **IF GAIN** to 10dB respectively; and set **10dB/DIV., 5dB/DIV., LINEAR** to 5dB/DIV.
(7) Adjust **V. REF.** located on the left side of the instrument so that signal peak corresponds to the horizontal top line on the CRT.
(8) Check that the level error of the signal peak is within 0.2 divisions when the external Attenuator is switched from 0dB to 40dB in 10dB sequence. [Fig. 3-16].
(9) Set the inner switch of **IF GAIN** (1dB-step) to **CAL.** Switch the external Attenuator from 0dB to 30dB in sequence and check that the level error with the corresponding horizontal line is within 0.2 divisions. [Fig. 3-17].

* If abnormal, refer to Chart 5 of Section 6 Trouble Shooting.

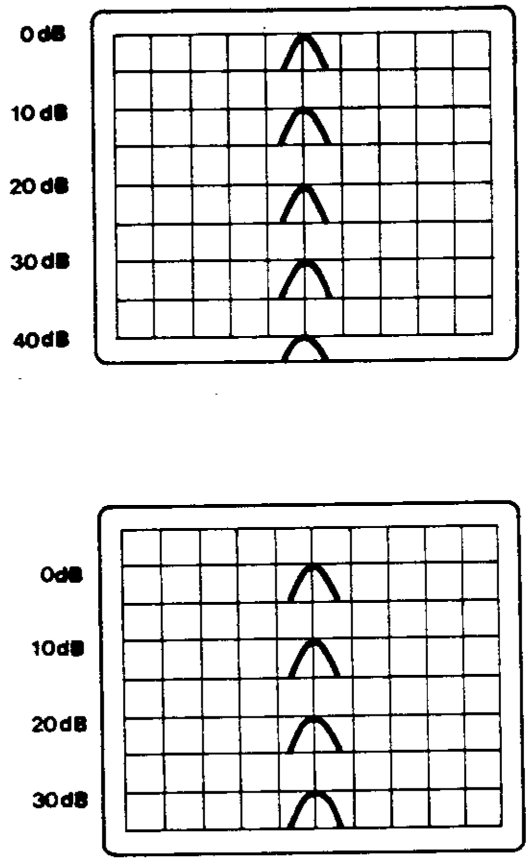


Fig. 3-16/17 CRT LOG. Scale Error Display

3-4-4 IF GAIN Accuracy

Specification: ±1dB
Equipment used: Signal Generator
Attenuator

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:
CENTER FREQUENCY 100MHz
DISPERSION/DIV. ...... 0.2MHz/DIV.
B.W. (6dB) 120kHz
10dB/DIV., 5dB/DIV. LINEAR .... 5dB/DIV.
(2) Set the Signal Generator output to 100MHz/95dBμ and the Attenuator to 0dB respectively, and connect to **INPUT** of the instrument. [Fig. 3-18]
(3) Adjust **IF GAIN-CAL.** to correspond the signal peak to the horizontal center of CRT graticule. [Fig. 3-19]
(4) Check that the level error of the signal peak from the graticule center is within 0.2 divisions (1dB) for the combination settings of **IF GAIN** outer dial (0, 10, 20, 30dB) and the Attenuator as follows:

IF GAIN setting	External Attenuator setting
10dB	10dB
20dB	20dB
30dB	30dB

Table 3-3 IF GAIN Accuracy Test/Settings of IF GAIN & Ext. ATT.

* If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

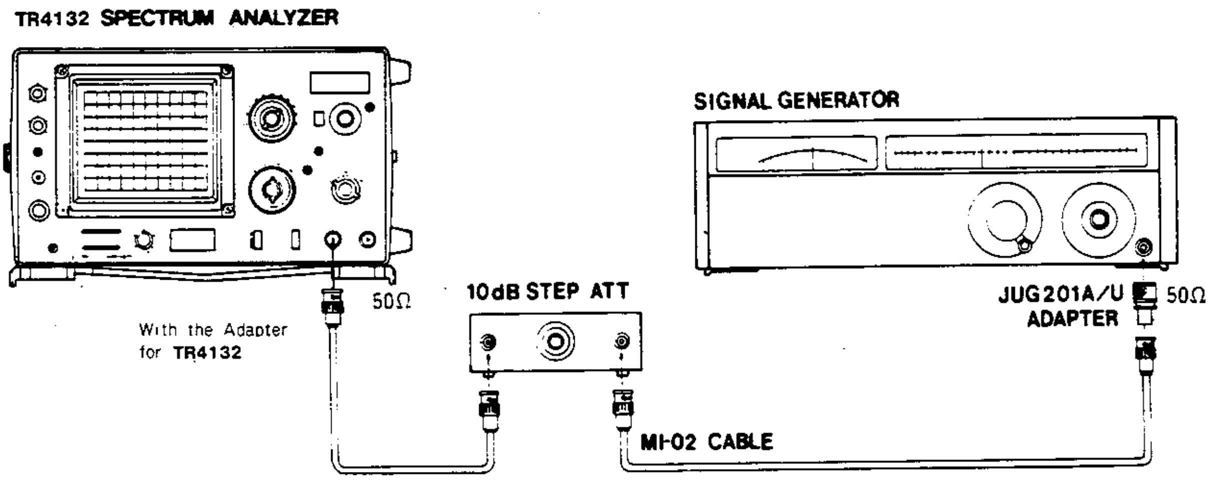


Fig. 3-18 IF GAIN Accuracy Test Setup

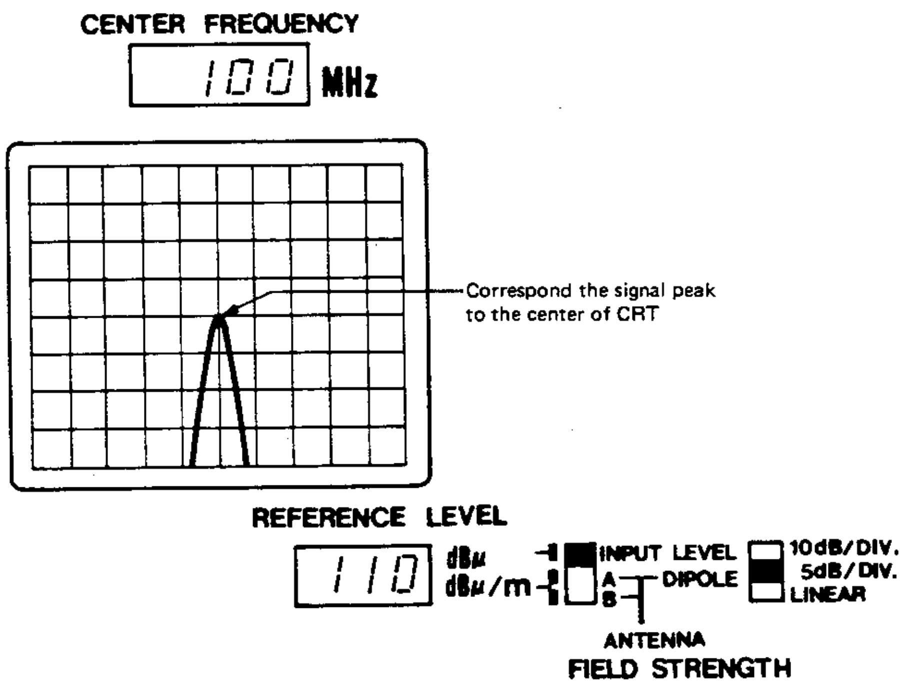


Fig. 3-19 IF GAIN Accuracy Test Procedure

3-4-5 RF. ATT. Accuracy

Specification: ±0.5dB

Equipment used: Signal Generator
Attenuator

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

CENTER FREQUENCY 100MHz
DISPERSION/DIV. ..... 0.2MHz/DIV.
B.W. (6dB) 120kHz
10dB/DIV., 5dB/DIV., LINEAR .... 5dB/DIV.
IF GAIN .... 20dB, CAL.

(2) Set the Signal Generator output to 100MHz/110dBμ and the external Attenuator to 40dB respectively, and connect it to **INPUT** of the instrument. [Fig. 3-20]

(3) Adjust **IF GAIN-CAL.** to correspond the signal peak to the center of the CRT graticule. [Fig. 3-21]

(4) Reset **RF. ATT.** and external Attenuator as listed in [Table 3-4] and check that the error from the horizontal center line is within 0.1 divisions (0.5dB) at all settings.

RF. ATT. Setting setting	External ATT. Setting setting
10dB	30dB
20dB	20dB
30dB	10dB
40dB	0dB

Table 3-4 RF. ATT. Accuracy Test/Settings of RF. ATT. & Ext. ATT.

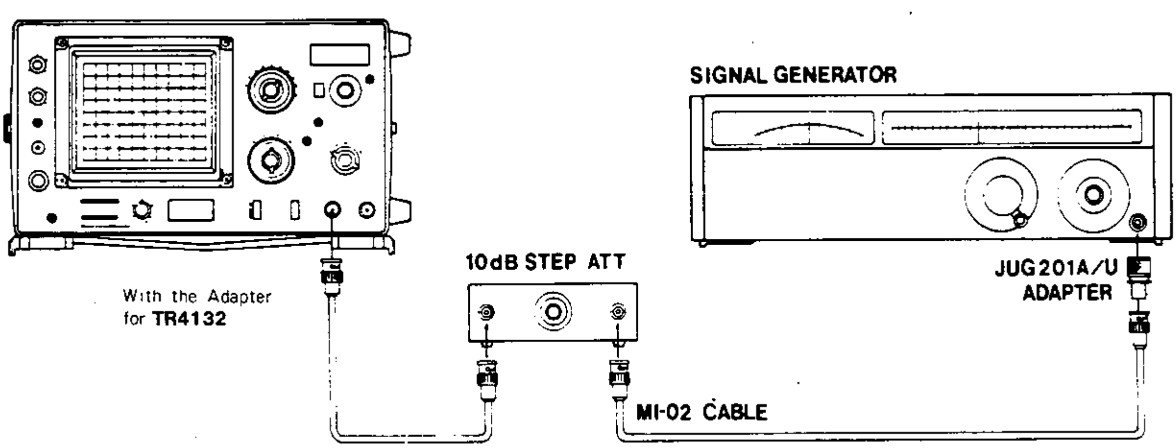


Fig. 3-20 RF. ATT. Accuracy Test Setup

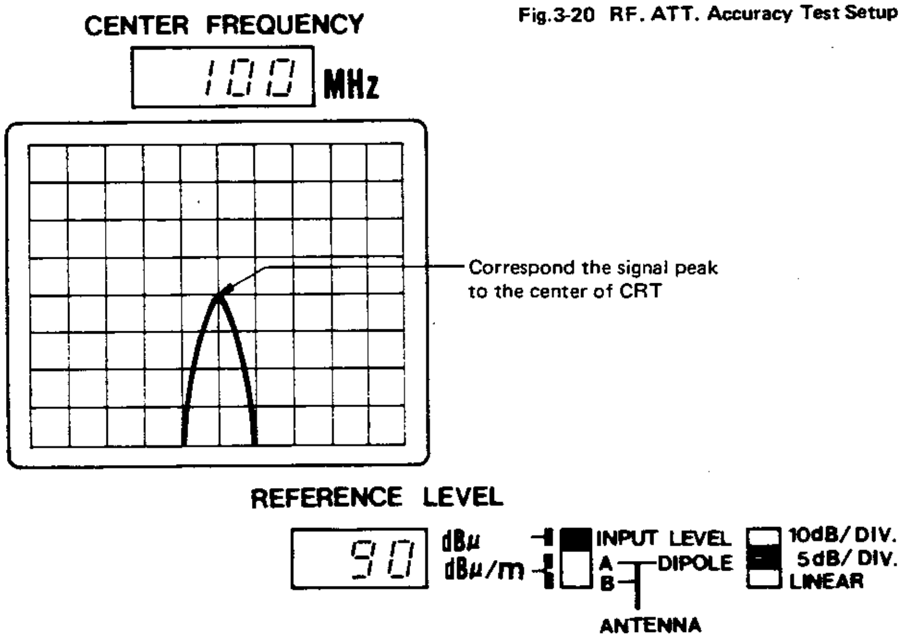


Fig. 3-21 RF. ATT. Accuracy Test Procedure

3-4-6 IF Bandwidth Accuracy

Sepecification: Within ± 20%

Equipment used: Signal Generator

(1) Connect the Signal Generator output signal (100MHz/96dBμ approx.) to **INPUT** of the instrument.

(2) Set **B.W. (6dB)** to 1.5MHz and **DISPERSION/DIV.** to **0.5MHz/DIV.** respectively, Set **10dB/DIV., 5dB/DIV., LINEAR** to 5dB/DIV.

(3) Adjust the Signal Generator output level so that the signal peak on the CRT display comes to 6dB above the horizontal center. [Fig. 3-23]

(4) Check that the frequency difference between two points where the signal crosses the horizontal center line is in the range from 1.2MHz to 1.8MHz.

(5) Reset **B.W. (6dB)** to 120kHz and **DISPERSION/DIV.** to 0.1MHz/DIV. Proceed the same test as in (3) and (4) above and check that the frequency difference is within 96kHz to 144kHz.

* If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

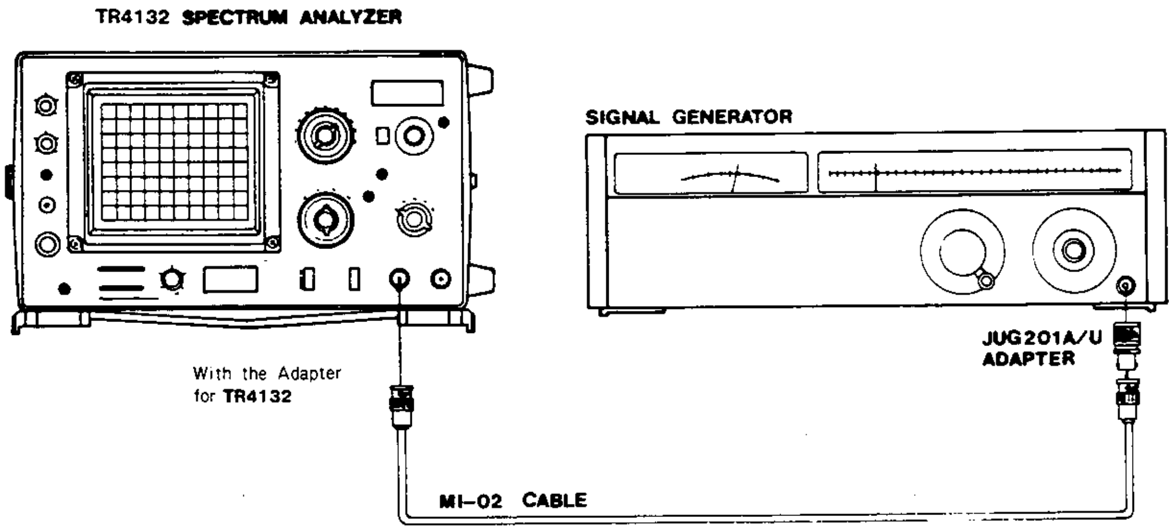


Fig. 3-22 IF Bandwidth Accuracy Test Setup

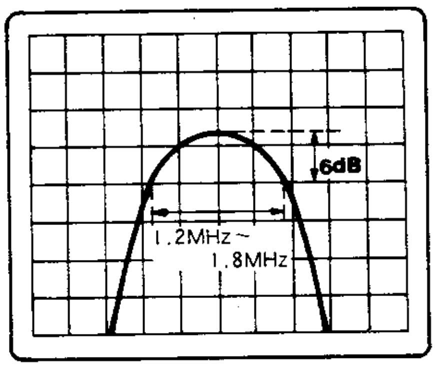


Fig. 3-23 IF Bandwidth Accuracy Test Display

3-4-7 Bandwidth Selectivity

Specification: 60dB/3dB (6dB) Resolution Bandwidth Ratio < 15 : 1

Equipment used: Signal Generator

(1) Connect the Signal Generator output (100MHz/100dBμ approx.) to **INPUT** of the instrument.

(2) Set **B.W. (6dB)** to 1.5MHz and **DISPERSION/DIV.** to 0.5MHz/DIV.

(3) Set **IF GAIN** to 10dB, and **REFERENCE LEVEL** will display 100dBμ. [Fig. 3-25]

(4) Adjust the Signal Generator output level and correspond the signal peak on the CRT display to the horizontal top line.

(5) Read the bandwidth on the display at a point 60dB below the signal peak. Verify that the bandwidth is less than 22.5MHz (=1.5MHz x 15).

(6) Reset **B.W. (6dB)** to 120kHz and **DISPERSION/DIV.** to 0.2MHz/DIV. Proceed with the same test as in (4) and (5) above, and read the bandwidth at 60dB below the signal peak. Verify that the bandwidth is less than 1.8MHz (=120kHz x 15).

(7) Set **B.W.** to **AUTO** and **DISPERSION/DIV.** to 0.1MHz/DIV. The bandwidth is automatically set to 10kHz on the 3dB-bandwidth in this case. Read the bandwidth at 60dB below the signal peak and verify that it is less than 150kHz. [See Table 3-5]

* If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

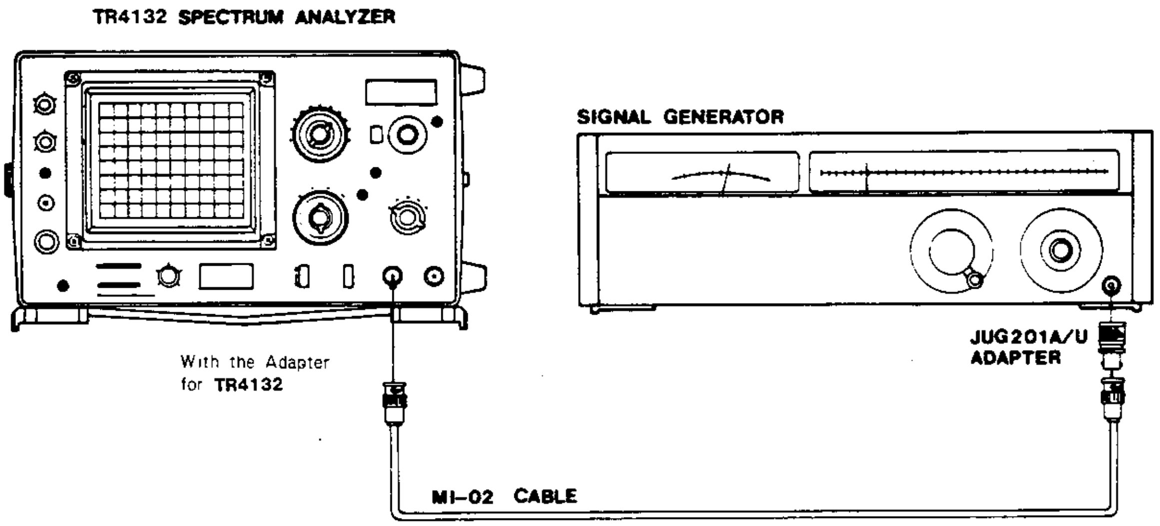


Fig. 3-24 Bandwidth Selectivity Test Setup

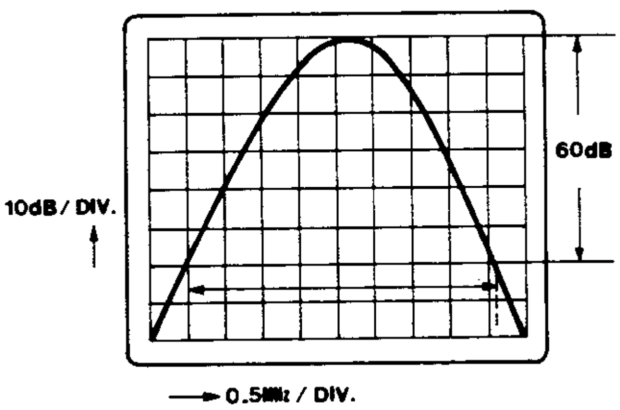


Fig. 3-25 Bandwidth Selectivity Test Display

3-4-8 Bandwidth Switching Level Error

Specification: Within ± 1dB

Equipment used: Signal Generator

(1) Connect the Signal Generator output (100kHz/90dBμ) to **INPUT** of the instrument.

(2) Turn **TUNING** from the initial setting (Para 3-3-1-(3)) and set **CENTER FREQUENCY** to 100MHz. Set **10dB/DIV., 5dB/DIV., LINEAR** to 5dB/DIV.

(3) Position the white-line of **SCAN TIME** at 12 o'clock.

(4) As **DISPERSION/DIV.** is switched clockwise, **BAND WIDTH-3dB** responds accordingly as in [Table 3-5]. Adjust **TUNING** to keep the signal at the center of the display.

(5) Switch **DISPERSION/DIV.** from **100MHz/DIV.** to 0.1MHz/DIV. in sequence and observe the signal level at each bandwidth. Then, keeping **DISPERSION/DIV.** at 0.1MHz/DIV., switch **B.W.** counter-clockwise in the sequence of AUTO-9kHz-120kHz-1.5MHz, and observe the signal level. Verify that the level difference between the highest and the lowest during this procedure is within 1dB.

* If abnormal, refer to Chart 4 of Section 6 Trouble Shooting.

DISPERSION/DIV.	IF Bandwidth (3dB)
100MHz 50MHz	300kHz
20MHz 10MHz 5MHz	100kHz
2MHz 1MHz 0.5MHz	30kHz
0.2MHz 0.1MHz	10kHz
ZERO	300Hz

Table 3-5 Relation of DISPERSION/DIV. and BANDWIDTH in AUTO mode.

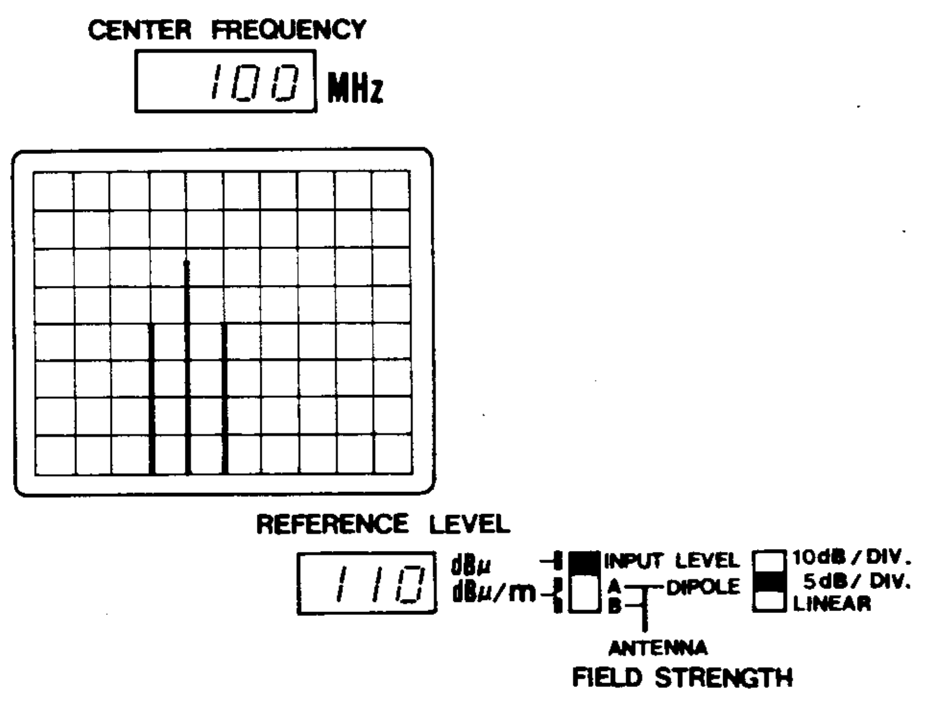


Fig. 3-26 Bandwidth Switching Level Error Test Procedure

3-4-9 Frequency Display Accuracy

Specification: Within ± 10MHz

Equipment used: Signal Generator
Frequency Counter

(1) Set the Signal Generator output level to +120dBμ and adjust the output frequency to 100MHz ± 50kHz with the Frequency counter.

(2) Connect the Signal Generator output to **INPUT** of the instrument as shown in [Fig. 3-27]

(3) Reset respective controls from the initial settings (Para 3-3-1-(3)) as follows:
SCAN TIME .... White-line at 12 o'clock
DISPERSION/DIV. .... 5MHz/DIV.

(4) Adjust **TUNING** to center the zero frequency (Local feed through)

(5) Reset **DISPERSION/DIV.** to **100MHz/DIV.** and return it to **5MHz/DIV.**

(6) Adjust **TUNING FINE** to keep the zero frequency to the center.

(7) Adjust **ZERO ADJ.** if necessary so that **CENTER FREQUENCY** indicates 000MHz.

(8) Turn **TUNING** to locate the 100MHz signal and its harmonics one after the other to the center. Repeat the same procedure to the 10th harmonic, and read respective indication on **CENTER FREQUENCY.**

(9) Verify that the indication error for 100 x N (where N is the corresponding harmonic from 1st. to 10th.) is within ± 10MHz.

(10) Next, turn **TUNING** counter-clockwise and repeat the same procedure as in (8) and (9) above. Read the error and also verify that it is within ±10MHz

* If abnormal, refer to Chart 7 of Section 6 Trouble Shooting.

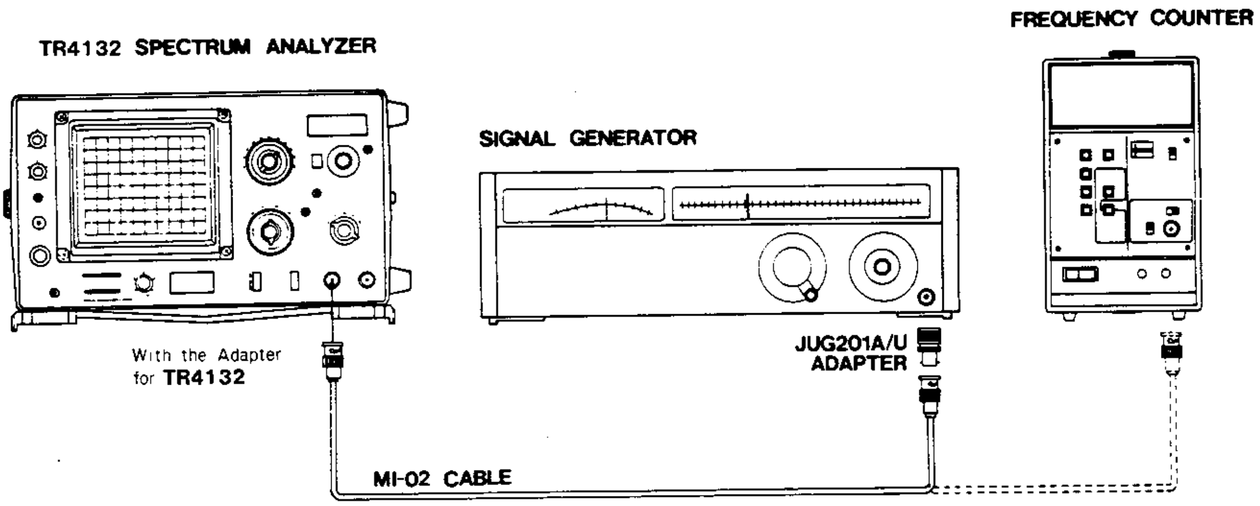


Fig. 3-27 Frequency Display Accuracy Test Setup

3-4-10 Frequency Response

Specification: Less than ± 1dB for 100kHz to 1000MHz

Equipment used: Signal Generator

(1) Connect the Signal Generator output (100MHz/80dBμ) to **INPUT** of the instrument.

(2) Reset respective controls from the initial settings (Para 3-3-1-(3)) as follows:

CENTER FREQUENCY 500MHz
10dB/DIV., 5dB/DIV., LINEAR .... 5dB/DIV.
IF GAIN 20dB
RF. ATT. 10dB

(3) Position the white-line of **SCAN TIME** at 12 o'clock.

(4) Set the Signal Generator output frequency in the range from 100kHz to 1000MHz and verify that the deflection from the horizontal center line is within ± 2dBp-p.

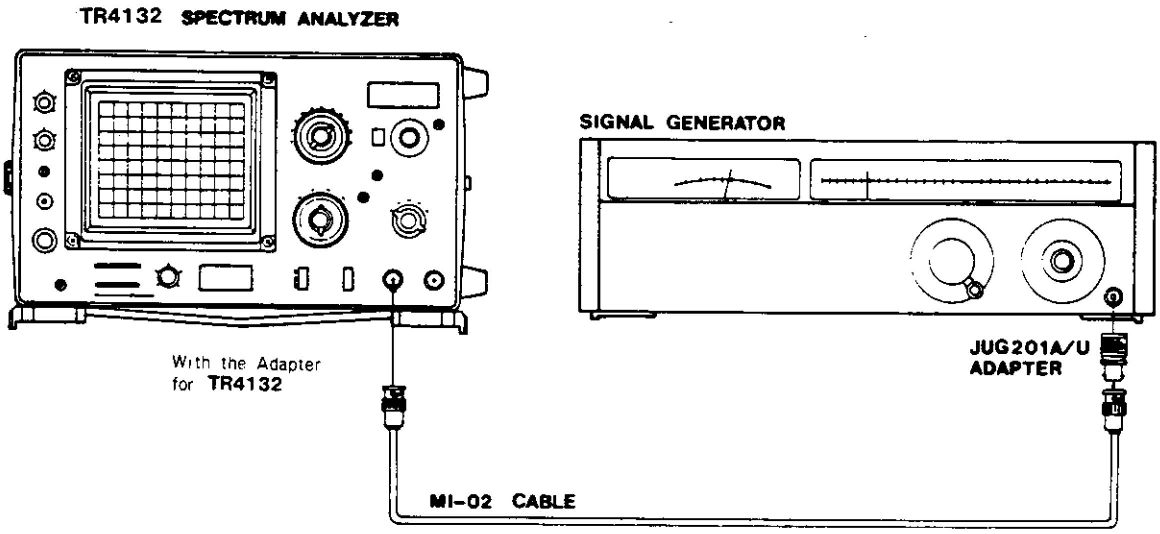


Fig. 3-28 Frequency Response Test Setup

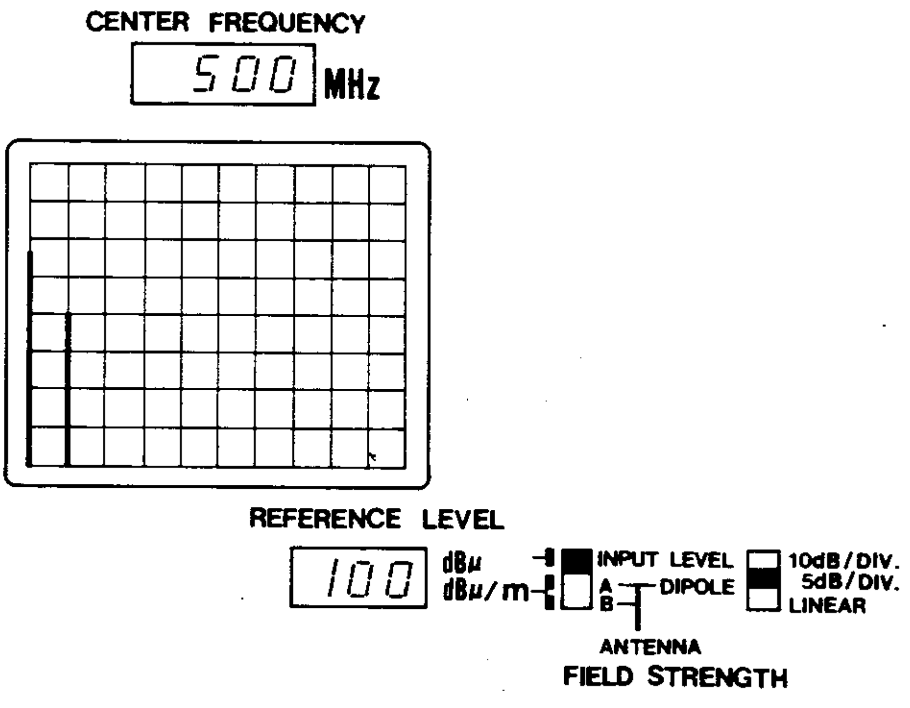


Fig. 3-29 Frequency Response Test Procedure

3-4-11 Average Noise Level

Specification: Less than 5dBμ (at IF Band width 10kHz, Video Filter 100Hz)

Equipment used: Signal Generator
Attenuator
Power Meter

(1) Reset respective controls from the initial settings (Para 3-3-1-(3)) as follows:

CENTER FREQUENCY 100MHz
SCAN TIME .... White-line at 12 o'clock
IF GAIN .... 30dB, +5dB
DISPERSION/DIV. ..... 0.1MHz/DIV.
B.W. .... AUTO

(2) Set the Signal Generator output frequency to 100MHz and connect it to the Power Meter through the external Attenuator. Set the Signal Generator output level to 85dBμ and monitor it with the Power Meter.

(3) Connect the Signal Generator output signal to **INPUT** of the instrument. Switch the external Attenuator to 50dB. [Fig. 3-31]

(4) Adjust **IF GAIN-CAL.** and center the signal on the display. [Fig. 3-32]

(5) Disconnect from **INPUT** of the instrument and set **VIDEO FILTER** to 100Hz.

(6) Set the scan time slower and check that the average noise level is below 5dBμ. [Fig. 3-33]

* If abnormal, refer to Chart 4 and 5 of Section 6 Trouble Shooting.

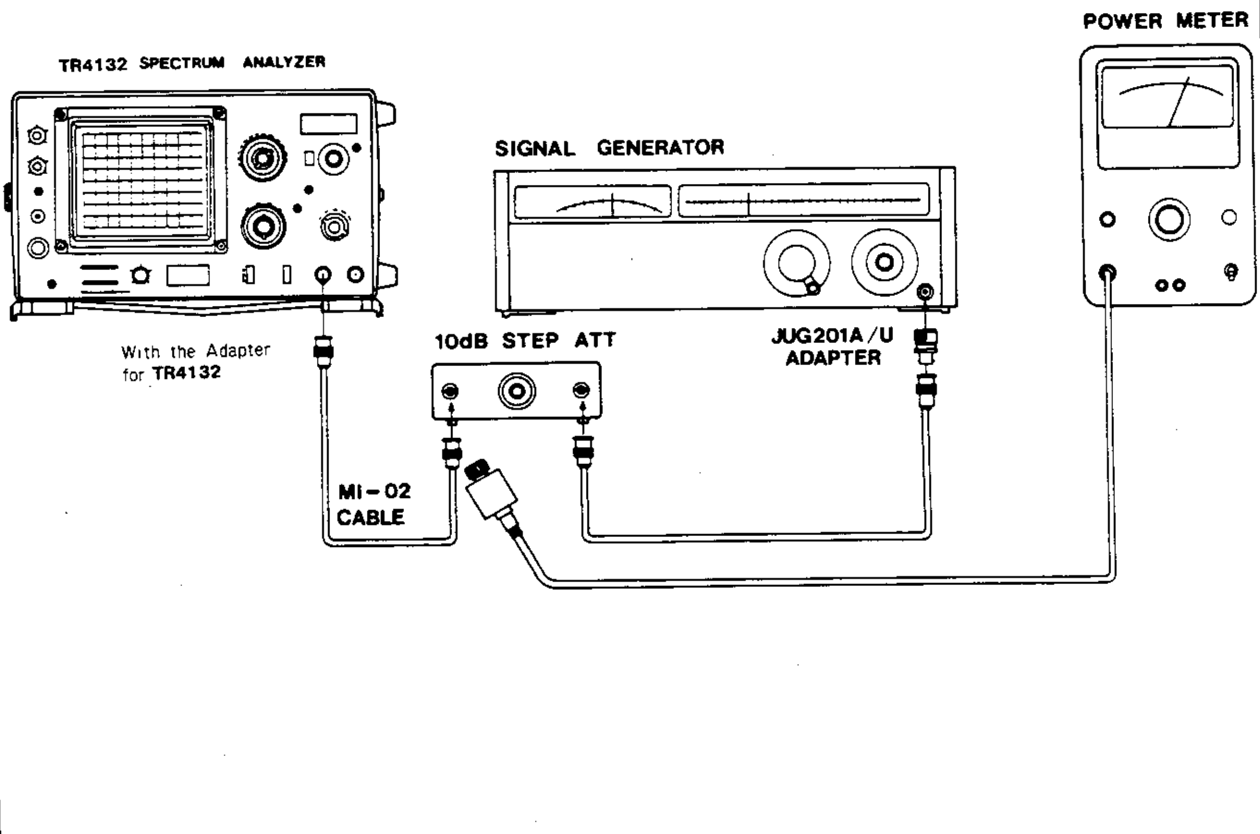


Fig. 3-30 Average Noise Level Test Setup

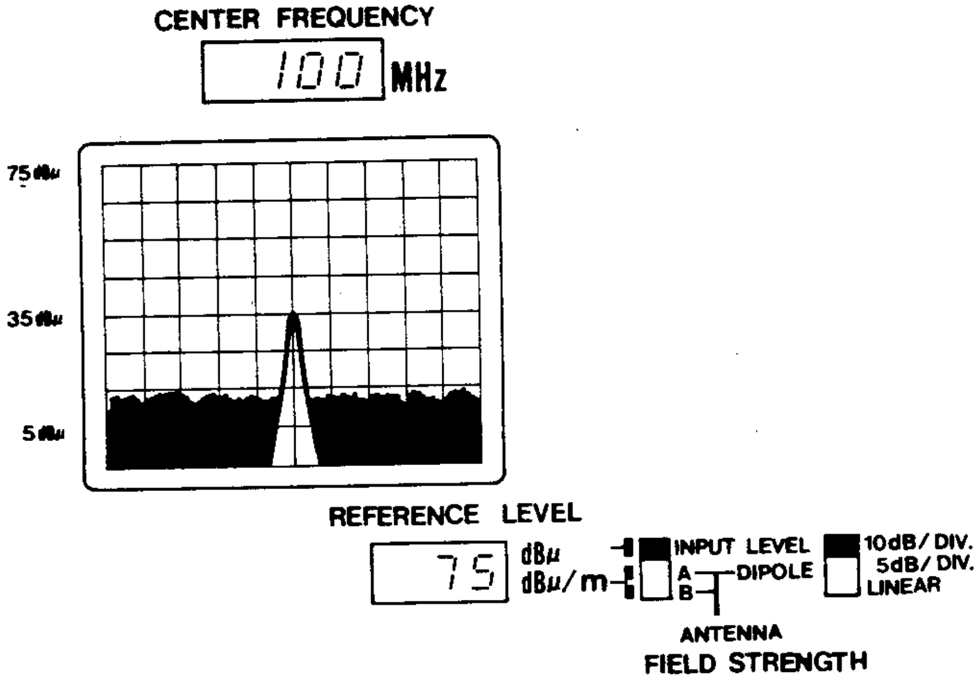


Fig. 3-31 Average Noise Level Test Procedure

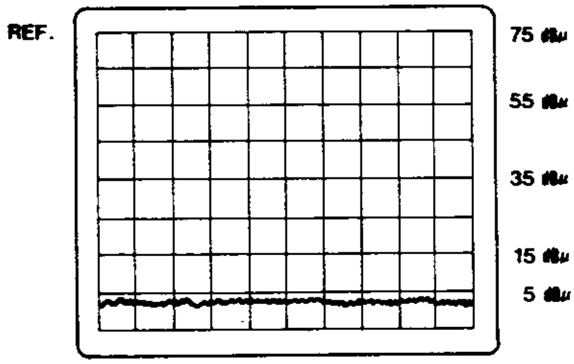


Fig. 3-32 Average Noise Level Test Display

3-4-12 Spurious Response

Specification: Below −70dB (at RF. ATT. 0dB, input 80dBμ)

Equipment used: Low Distortion Oscillator

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:
CENTER FREQUENCY 500MHz
IF GAIN 10dB

(2) Connect the Low Distortion Oscillator output of 100dBμ to the **INPUT** of the instrument.

(3) Adjust **IF GAIN-CAL.** to correspond the 100dBμ fundamental signal of the Oscillator to the horizontal top line.

(4) Observe on the display that the second harmonic is more than 50dB below the fundamental signal. Repeat the same procedure for the other outputs of the Low Distortion Oscillator and verify that the second harmonic is always 50dB or more below the fundamental signal level.

Remarks:

The spurious response test may be performed in combination with a Signal Generator and Low Pass Filter in place of the Low Distortion Oscillator. In such a case the L.P.F. must have the cut off frequencies of 10MHz, 20MHz, 30MHz, 50MHz, 70MHz, 100MHz, 150MHz, 200MHz and 250MHz with attenuation characteristic of greater than 40dB/OCT.

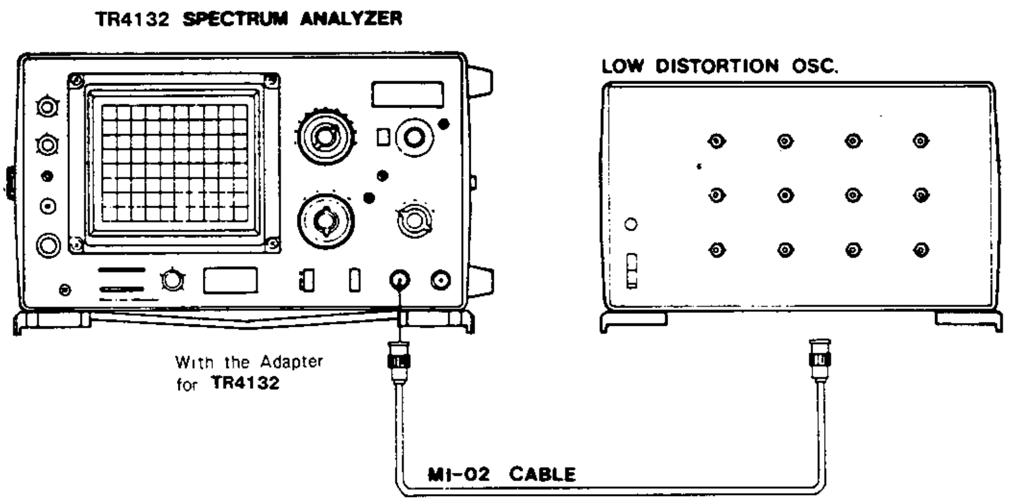


Fig. 3-33 Spurious Response Test Setup

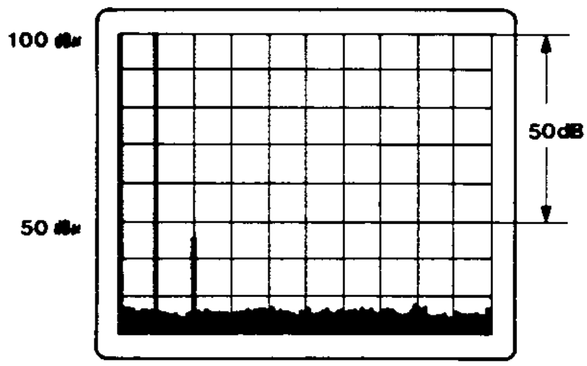


Fig. 3-34 Spurious Response Test Display (example: 100MHz signal)

3-4-13 Noise Sideband

Specification: More than 70dBc (at IF Bandwidth 10kHz, 200kHz away from the carrier)

(1) Reset **DISPERSION/DIV.** from the initial setting (Para 3-3-1-(3)) to 0.1MHz/DIV. Center the zero frequency (Local feed through) on the CRT display by **TUNING.**

(2) Correspond the zero frequency peak to the horizontal top line by **IF GAIN** (Outer and Inner) and **IF GAIN-CAL.**

(3) Observe that the peak level of the noise is −70dB or more below the signal level at 200kHz away from the center of the signal.

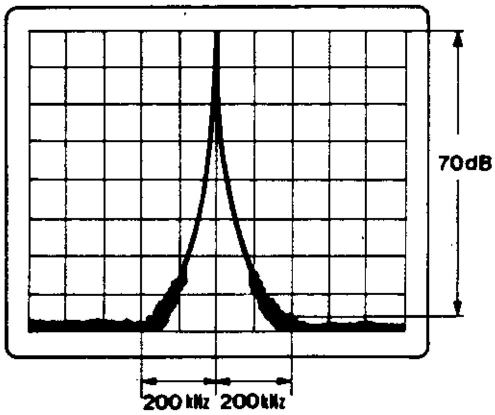


Fig. 3-36 Noise Sideband Test Display

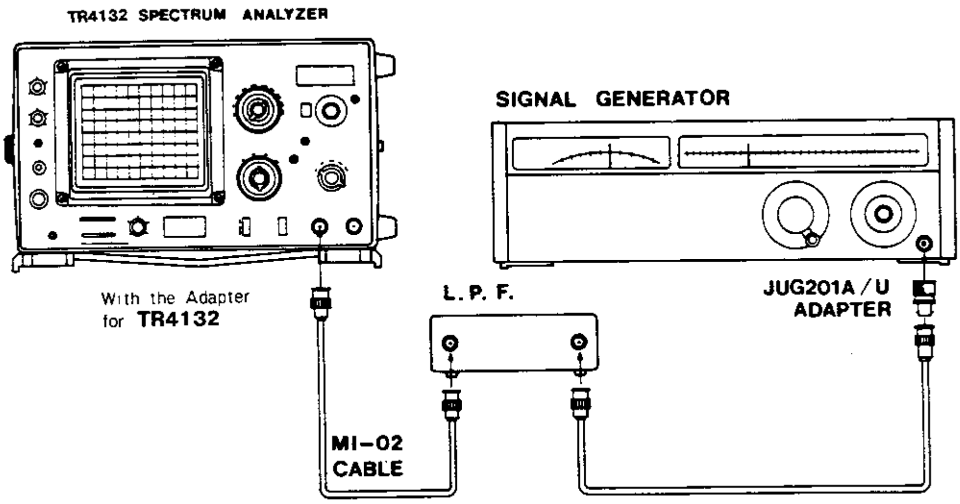


Fig. 3-35 Spurious Response Test with Signal Generator and L.P.F.

3-4-14 Frequency Stability

Specification: 200kHz for 5 minutes or less

Equipment used: Stop-Watch

(1) Reset **DISPERSION/DIV.** from the initial setting (Para 3-3-1-(3)) to 0.1MHz/DIV. Center the zero frequency (Local feed through) by **TUNING.**

(2) Observe the signal on the display 5 minutes after the setting and check that it is within ±2 divisions from the initial location.

3-4-15 Residual FM

Specification: Within 10kHzp-p

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

SCAN TIME .... White-line at 12 o'clock

DISPERSION/DIV. ...... 0.1MHz/DIV.

B.W. (6dB) 9kHz

(2) Correspond the zero frequency peak to the horizontal top line by **IF GAIN** (Outer and Inner) and **IF GAIN-CAL.** [Fig. 3-37]

(3) Set **SCAN MODE** to **MANUAL** Center the bright spot on the display by **MANUAL SCAN.**

(4) Correspond the bright dot to the second horizontal line from the top by **TUNING** and **FINE.** [Fig. 3-38]

(5) Observe that the peak-to-peak width of the bright spot is less than 2.5 divisions

3-4-16 Residual Spurious Response

Specification: Less than 20dBμ (at no input signal, RF. ATT. 0dB)

(1) Reset specific controls from the initial settings (Para 3-3-1-(3)) as follows:

SCAN TIME .... 11 o'clock

IF GAIN 30dB

DISPERSION/DIV. ...... 20MHz/DIV.

(2) Do not connect anything to **INPUT** of the instrument.

(3) Turn **TUNING** from full counter-clockwise position to 1000MHz slowly and observe that the residual response does not exceed 20dBμ.

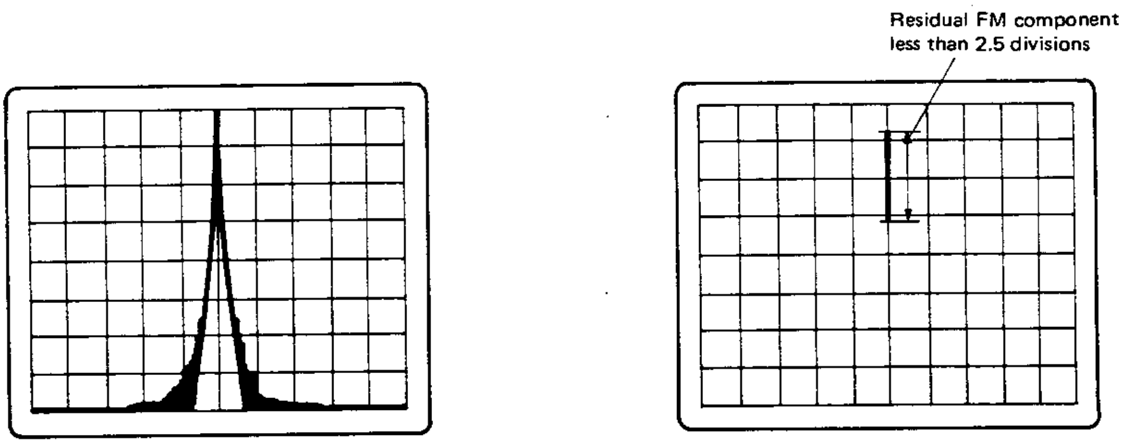


Fig. 3-37/38 Residual FM Test Display

Table 3-6 PERFORMANCE CHECK LIST

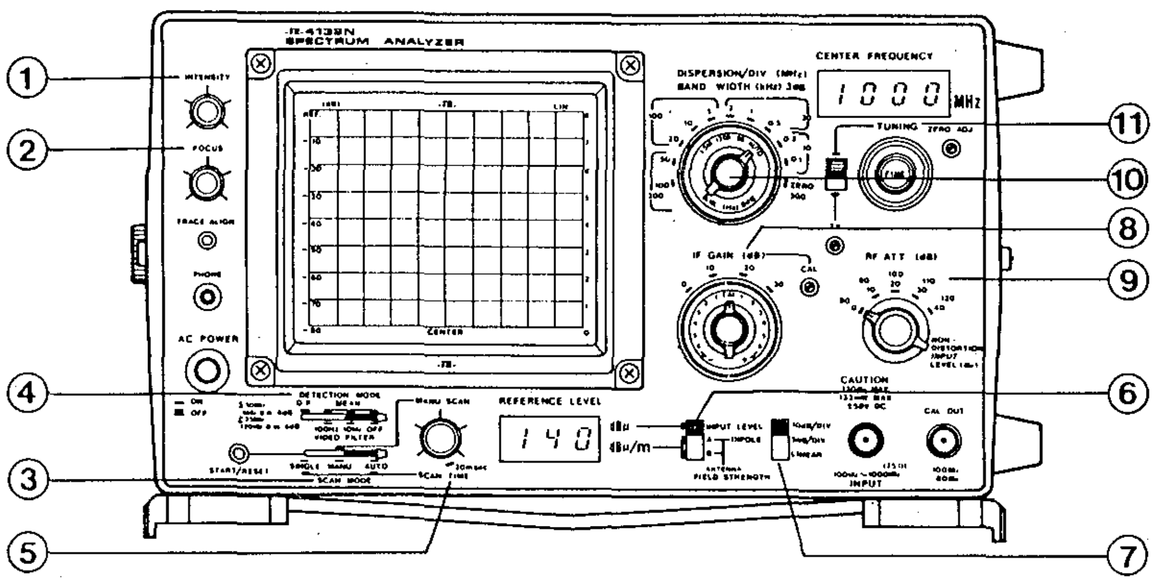
Serial No.________________

Preliminary Control Settings

1. Set POWER MODE on the rear panel to AC and set AC POWER on the front panel to OFF. Connect the power cable of the instrument to the AC power source.

2. Set the front panel controls as follows:
    1. INTENSITY .... Center
    2. FOCUS .... Center
    3. SCAN MODE .... AUTO
    4. DETECTION MODE .... MEAN (VIDEO FILTER OFF)
    5. SCAN TIME (MANUAL SCAN) 20ms
    6. REFERENCE LEVEL .... INPUT LEVEL
    7. 10dB/DIV., 5dB/DIV., LINEAR .... 10dB/DIV.
    8. IF GAIN (dB) .... 0dB, CAL.
    9. RF. ATT. 0dB
    10. DISPERSION/DIV. .... 100MHz/DIV.
        B.W. (Hz) 6dB .... AUTO
    11. TUNING/PRESET (TV) .... TUNING

3. Set AC POWER to ON, Warm up the instrument for about 30 minutes.



Test Item		Specification	⁄	⁄	⁄	⁄
Performance Check with CAL. OUT. Signal						
1	Frequency Display Accuracy	± 10MHz				
2	Scan Linearity	within ± 5%				
3	Vertical Axis	± 1dB/10dB ± 1.5dB/40dB ± 2dB/80dB				
4	Bandwidth Accuracy B.W. 1.5MHz B.W. 120kHz	with in ± 20% 1.2MHz to 1.8MHz 96kHz to 144kHz				
5	Bandwidth Selectivity (60dB/3dB Resolution Bandwidth)	< 15 : 1 B.W. below 0.15MHz				
6	Bandwidth Switching Accuracy	within ± 1dB				
7	Average Noise Level (IF Bandwidth 10kHz, Video Filter 100Hz)	below 5dBμ				
8	Residual Spurious Response (No Input signal, RF. ATT. 0dB)	less than 20dBμ				
Performance Test with External Equipment						
9	CAL. OUT. Frequency Accuracy	100MHz ± 200kHz				
10	CAL. OUT. Level Accuracy Power Meter reading TR4132 TR4132N	80dBμ ± 0.5dB –26.5dBm to –27.5dBm –28.5dBm to –29.5dBm				
11	CRT LOG. Scale Accuracy	± 1dB/10dB ± 1.5dB/40dB ± 2dB/80dB				
12	IF GAIN Accuracy	within ± 1dB (CRT Scale within 0.1 div.)				
13	RF. ATT. Accuracy	within ± 0.5dB (CRT Scale within 0.1 div.)				
14	Bandwidth Accuracy B.W. 1.5MHz B.W. 120kHz	within 20% 1.2MHz to 1.8MHz 96kHz to 144kHz				
15	Bandwidth Selectivity (60dB/3dB Resolution Bandwidth) B.W. 1.5MHz B.W. 120kHz B.W. AUTO	< 15 : 1 less than 22.5MHz less than 1.8MHz less than 150kHz				
16	Bandwidth Switching Accuracy	within ± 1dB				
17	Frequency Display Accuracy	within ± 10MHz				
18	Frequency Response (range from 100kHz to 1000MHz)	within ± 1dB				
19	Average Noise Level (IF Bandwidth 10kHz, Video Filter 100Hz)	less than 5dBμ				
20	Spurious Response (RF. ATT. 0dB, Input 80dBμ)	below –70dB				
21	Noise Sideband (IF Bandwidth 10kHz, 200kHz away from carrier)	below –70dBc				
22	Frequency Stability	greater than 200kHz for 5 minutes				
23	Residual FM	less than 10kHz p-p				
24	Residual spurious Response (No Input signal, RF. ATT. 0dB)	less than 20dBμ				

SECTION 4
CALIBRATION ADJUSTMENTS

4-1 Description

This section describes calibration procedures for **TR4132/4132N** Spectrum Analyzers after basic operation checks or performance tests have been completed.
The instrument must be operated after performance checks and calibration adjustments to ensure specifications are met even for repairs due to faulty operation. The reference numbers and symbols referred to in this section are identical to those printed on drawings and printed circuit boards.

4-2 Preparations and Precautions for Calibration

The equipment and tools required for calibration are listed below. The equipment selected must have equivalent or better performance rating than those listed in [Table 4-1].

4-2-1 Equipment and Tools

4-2-2 Preparations and General Precautions

(1) The instrument must be operated on AC 100V (or as specified among 100V, 120V, 200V and 240V) ± 10% with line frequency of 50Hz or 60Hz.

Table 4-1 Equipment for Calibration

Equipment	Performance ratings	Recommendation
1) Signal Generator	Frequency: 1MHz to 500MHz Output level: 117dBμ (50Ω) Output impedance: 50Ω Output level flatness: ±0.5dB Frequency accuracy: ±1% Noise sideband: −140dB, away from 200kHz carrier (1Hz Bandwidth)	
2) Frequency Counter	Frequency: 10Hz to 100MHz Sensitivity: 10mVrms Stability: 5×10^{-8}/day	ADVANTEST **TR5122G**
3) Digital Voltmeter	Measurement range: 0V to ±1000V Accuracy: ±0.1% Input impedance: > 10MΩ	ADVANTEST **TR6855**
4) DC High Voltage Probe	Measurement range: ±3000V	ADVANTEST **TR1116**
5) High Frequency Power Meter	Frequency: 100kHz to 1500MHz Sensitivity: −30dBm to +20dBm Accuracy: ±0.5dB	Boonton 41A
6) Spectrum Analyzer	Frequency: 100kHz to 1500MHz Sensitivity: −120dBm Resolution: 30Hz to 300kHz	ADVANTEST **TR4110/4113A**
7) Attenuator	Frequency: DC to 500MHz Attenuation: 0 to 80dB (10dB step) Accuracy: ±1.5dB	
8) Low Distortion Oscillator	Frequency: 10, 20, 30, 50, 70, 100, 150, 200 & 250MHz Output: 100dBμ (50Ω) Harmonic distortion: Below −80dB	

Table 4-2 Tools for Calibration

Commodity	Stock No.	Remarks
BNC-BNC Cable	MI-02	(for TR4132)
BNC-BNC Cable	MO-15	(for TR4132N)
BNC-SMA Cable	MC-37	
BNC-UM Cable	MC-36	
N(J)-BNC(P) Adapter		UG-349/U
N(P)-BNC(J) Adapter	TR1613	JUG-201A/U (for TR4132N)
UM(J)-UM(J) Adapter		UM-QA-JJ
Board for Adjustment	CZ570	22-pin, double

Note: See Page 7-8 for details.

(2) Ensure **POWER** of the instrument is set to **OFF** when connecting the power cable.

(3) Calibration must be performed in an environment free from dust, vibration, and noise, and at a temperature of +23°C ± 5°C with a humidity of less than 80%.

4-2-3 Preliminary Control Settings

(1) Set **POWER MODE** on the rear panel to **AC** and set **POWER** on the front panel to **OFF**.

(2) Connect the power cable to the AC power source which voltage corresponds to that imprinted on the rear panel.

(3) Check the Power Supply as follows:

a) Check each pin of the Connector J2 at the bottom of the instrument with Digital Voltmeter.

J2 – 19A, B .... +15V ± 0.6V (86Ω to 88Ω)
J2 – 18A, B .... –15V ± 0.6V (86Ω to 88Ω)*
J2 – 17A, B .... +5V ± 0.2V (86Ω to 88Ω)

b) Check the voltages of IC4 and D4 located inside of the rear panel.

Pin 2 of IC4 .... +24V ± 1.2V (86Ω to 88Ω)
Cathode Voltage of D5 . . . about 260V (131Ω to 133Ω)

CAUTION

Set the Power Switch to **OFF** whenever Impedance of Power Line is checked.

c) Checking High Voltage Power Supply
Switch the **POWER** to **OFF**.
Remove Board SG210 and CRT Socket, and then switch the **POWER** to **ON**.
Check pin voltage of the CRT Socket.
Proceed carefully using a high voltage probe with digital Voltmeter.

Pin 1, Pin 14 (H) –2.01kV
Pin 2 (G1) *1 –2.08kV to –2.01kV
Pin 3 (K) –2.01kV
Pin 4 (P1) *2 –1.38kV to –1.87kV
Pin 6 (G2) +100V

*1 : Controlled by **INTENSITY**.
*2 : Controlled by **FOCUS**.

After each voltage has been checked, switch **POWER** to **OFF** and mount the Socket to CRT and insert the Board SG210.

(4) Set the front panel controls as follows:

INTENSITY .... center
FOCUS .... center
SCAN MODE .... AUTO
DETECTION MODE .... MEAN (VIDEO FILTER-OFF)
SCAN TIME (MANUAL SCAN) . . . 20ms
REFERENCE LEVEL . . INPUT LEVEL
10dB/DIV., 5dB/DIV., LINEAR .... 10dB/DIV.
IF GAIN (dB) .... 0dB, CAL.
RF. ATT. (dB) 0dB
DISPERSION/DIV. 100MHz
B.W. (Hz) .... AUTO
TUNING/PRESET (TV) ...... TUNING

(5) Set **AC POWER** to **ON**, and the LED's on **REFERENCE LEVEL** and **CENTER FREQUENCY** will illuminate. Turn **TUNING** to read 000MHz on **CENTER FREQUENCY**. **REFERENCE LEVEL** will indicate 110dBμ.

(6) About 20 seconds after **AC POWER** is switched to **ON**, a trace of zero frequency (Local feed through) will appear on the CRT display. If the trace does not appear, turn **INTENSITY** clockwise. It may be turned counter-clockwise if the intensity is too strong.

CAUTION

Do not keep **INTENSITY** fully clockwise for a long period of time to avoid demaging the CRT

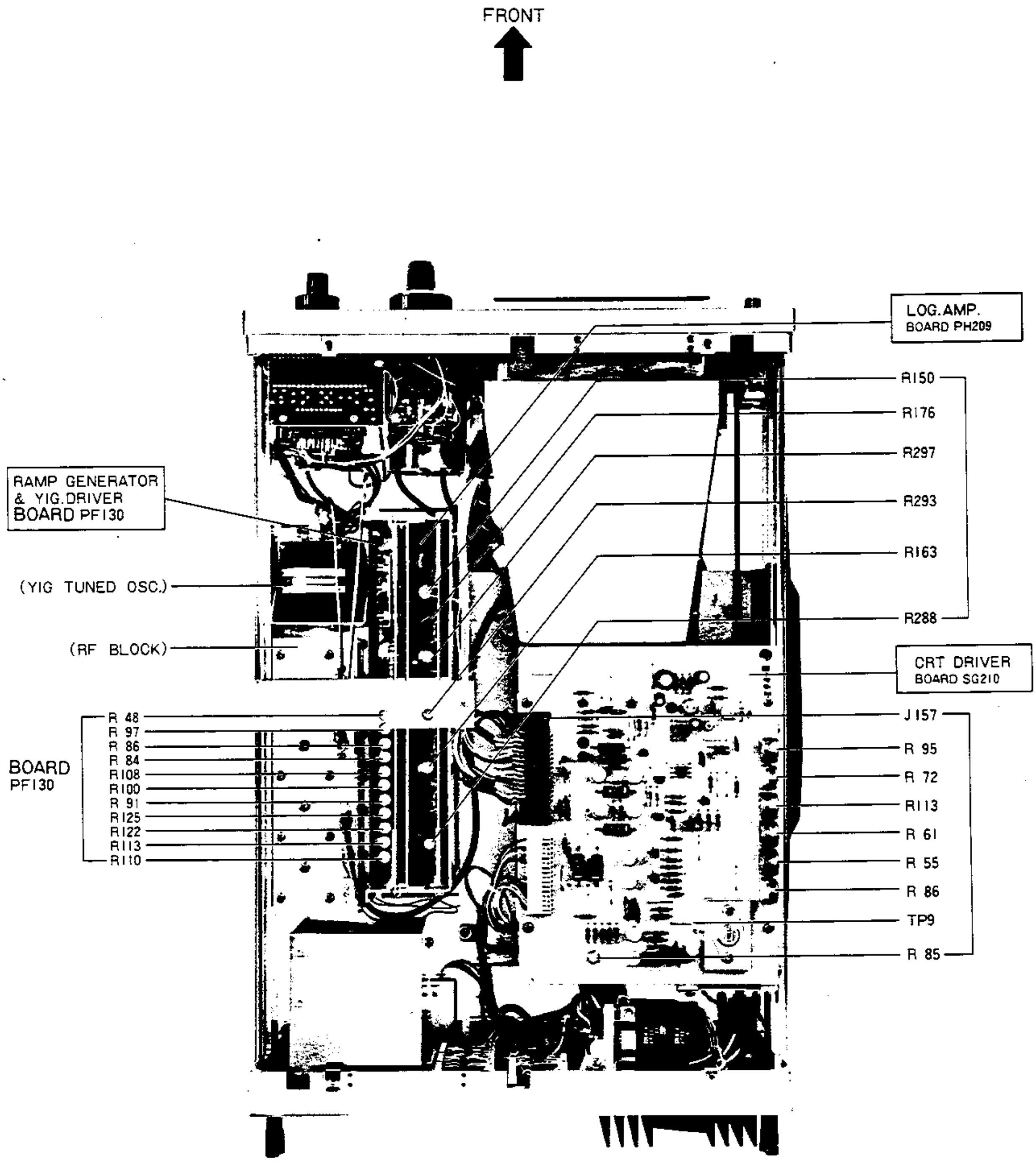


Fig. 4-1 Top View

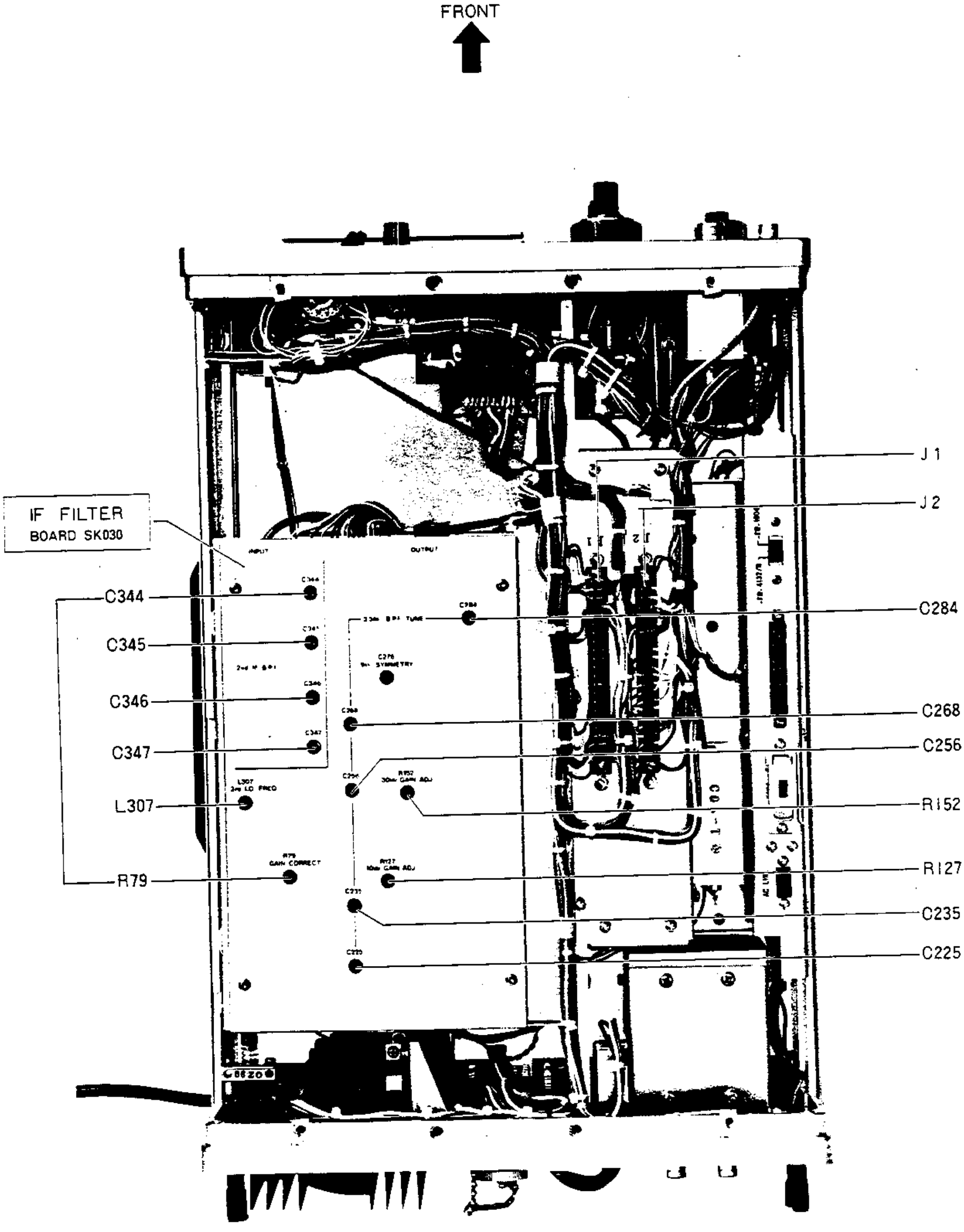


Fig. 4-2 Bottom View

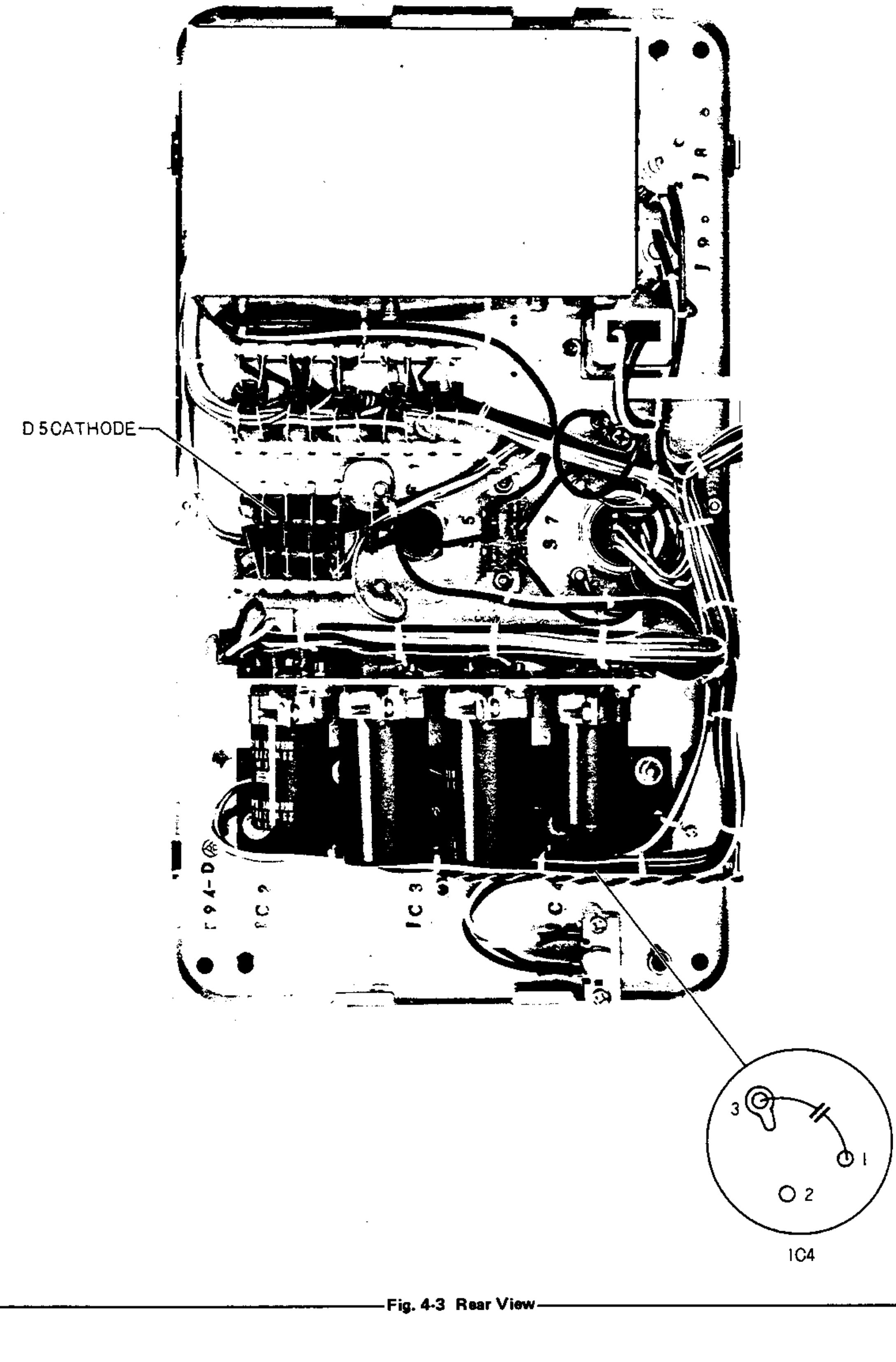


Fig. 4-3 Rear View

(7) Adjust **FOCUS** if the focus is not distinct. A sharp focus may not be available in case the intensity is too strong, so adjustment of the intensity to appropriate level is also necessary.

(8) If the trace is tilted relative to the vertical graticule line of the CRT, adjust **TRACE ALIGN** with a screwdriver as shown in [Fig. 4-8].

(9) With accessory BNC-BNC cable (Stock No. **MI-02**) fitted to the N-BNC conversion adapter (**TR1613**), connect **CAL. OUT.** to **INPUT** on the front panel. The **MO-15** cable is used for **TR4132N**.

(10) Warm up the instrument for about 30 minutes in this condition.

4-3 CRT DRIVER Adjustment (Board SG210)

Equipment used: Digital Voltmeter

(1) Remove 4pcs of the screws at the upper and bottom cover of the instrument.

(2) Remove the L-type metal fitting which supports the boards (PF130 and PH209) at the upper side of the instrument.

(3) Remove the inner board (PH209) and connect it again to an intermediate by a plain adjusting blank board which is supplied as an accessory.

4-3-1 +170V Adjustment (CRT Bias Voltage)

(1) Connect the Digital Voltmeter to TP9 of Board SG210.

(2) Adjust R85 to obtain a voltage reading of +170V±1V.

4-3-2 Focus Adjustment

(1) Reset respective controls from the initial settings (Para 4-2-3-(3)) as follows:

CENTER FREQUENCY 100MHz
SCAN MODE .... MANUAL
DISPERSION/DIV. .... ZERO
B.W. 1.5MHz

(2) Center the bright spot by **MANU. SCAN** and **TUNING FINE.** Turn **INTENSITY** to darken the bright spot. Adjust **FOCUS** and R86 (**ASTIG**) of Board SG210 for sharp focus.

(3) Return **SCAN MODE** to **AUTO.**

4-3-3 Vertical Axis Adjustment

(1) Leave the control settings as in Para 4-3-2-(1). Connect the Digital Voltmeter to Pin 2 of Connector J157. Adjust **TUNING** and **FINE** to read +2.0V±0.05V on the Digital Voltmeter.

(2) Adjust R113 (**V. POSI.**) to correspond the trace to −40dB level.

(3) Set **IF GAIN** to 30dB. With **TUNING, FINE** and also **IF GAIN** and **CAL.**, adjust the voltage at Pin 2 of Connector J2 to +4.0V±0.05V.

(4) Adjust R72 (**V. GAIN**) to correspond the trace to 0dB line of the CRT display.

(5) Repeat the procedures from (1) to (4) above once more.

4-3-4 Vertical Reference Level Adjustment

(1) Perform the same procedure as in Para 4-3-3-(3) above and adjust to +4.0V ±0.05V.

(2) Reset **10dB/DIV., 5dB/DIV., LINEAR** selector from 10dB/DIV. to 5dB/DIV. Adjust R95 (**V.REF.**) to correspond the trace to the horizontal top line.

4-3-5 Horizontal Axis Adjustment

(1) Leave the control settings as in Para 4-3-2-(1). Adjust **IF GAIN** and **RF. ATT.** to correspond the trace to −40dB on the CRT display.

(2) Connect the Digital Voltmeter to Pin 14 of Connector J157.

(3) Set **SCAN MODE** to **MANU.** Turn **MANU. SCAN** to adjust the voltage at Pin 14 to 0.0V.

(4) Adjust R61 (**H. POSI.**) to correspond the bright dot to the center line.

(5) Turn **MANU. SCAN** to read a voltage at Pin 14 to −4.5V±0.1V.

(6) Adjust R55 (**H. GAIN**) to correspond the bright spot to the vertical end line at the left.

(7) Repeat the procedure from (3) to (6) above once more.

4-3-6 Baseline Adjustment

(1) Disconnect **CAL. OUT.** from **INPUT.** Reset as follows:

10dB/DIV., 5dB/DIV.,
LINEAR .... 10dB/DIV.
IF GAIN .... 0dB, CAL.
B.W. .... AUTO

(2) Adjust R113 (**V. POSI.**) to correspond the baseline to the graticule bottom line.

*If abnormal, refer to Chart 6 of Section 6 Trouble Shooting.

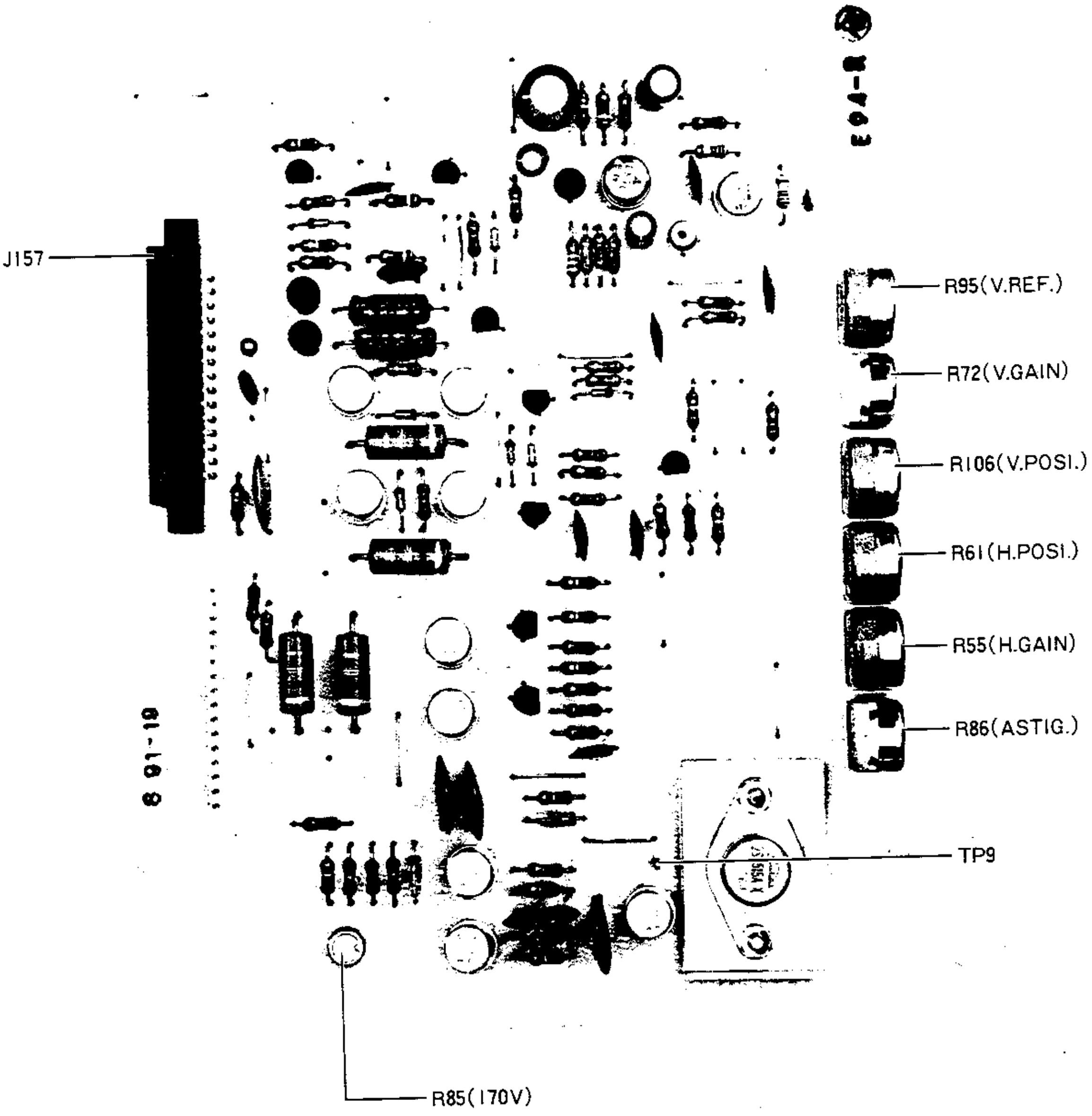


Fig. 4-4 Location of V.R. (SG210) Adjustment

4-4 CAL. OSC. Adjustment (Board SF145)

Equipment used: High Frequency Power Meter (50Ω)
Frequency Counter
Signal Generator

4-4-1 Output Level Adjustment

(1) Connect the High Frequency Power Meter to **CAL. OUT.** of the instrument and measure the output level.

(2) Adjust R16 of Board SF145 to read the level as follows:

TR4132	−27dBm
TR4132N	−29dBm

4-4-2 Output Frequency Adjustment

(1) Read the output frequency of the Signal Generator with the Frequency Counter and Adjust it to 100.000MHz.

(2) Connect the output of the Signal Generator to **INPUT** of the instrument. Set **DISPERSION/DIV.** to 0.1MHz/DIV.

(3) Center the signal by **TUNING**.

(4) Disconnect the Signal Generator output from **INPUT**. Connect **CAL. OUT.** signal to **INPUT**. Adjust L41 so that the signal is within ±1 division to the **CENTER** line.

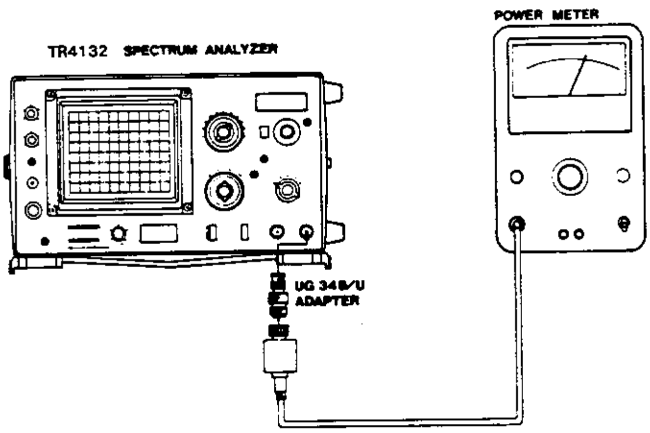


Fig. 4-5 CAL. OSC. Adjustment Setup

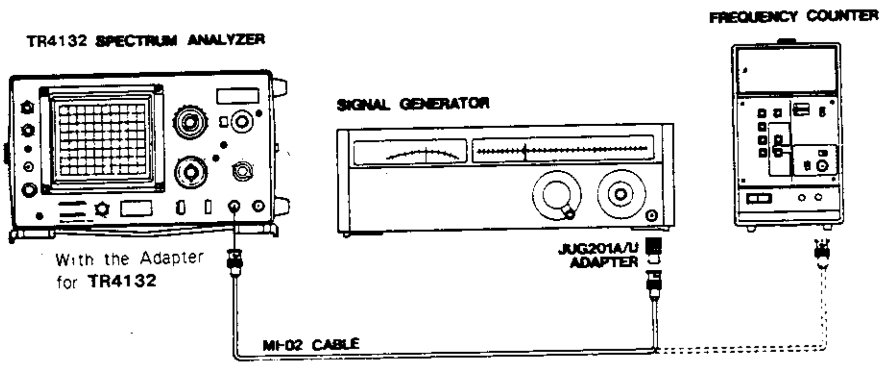
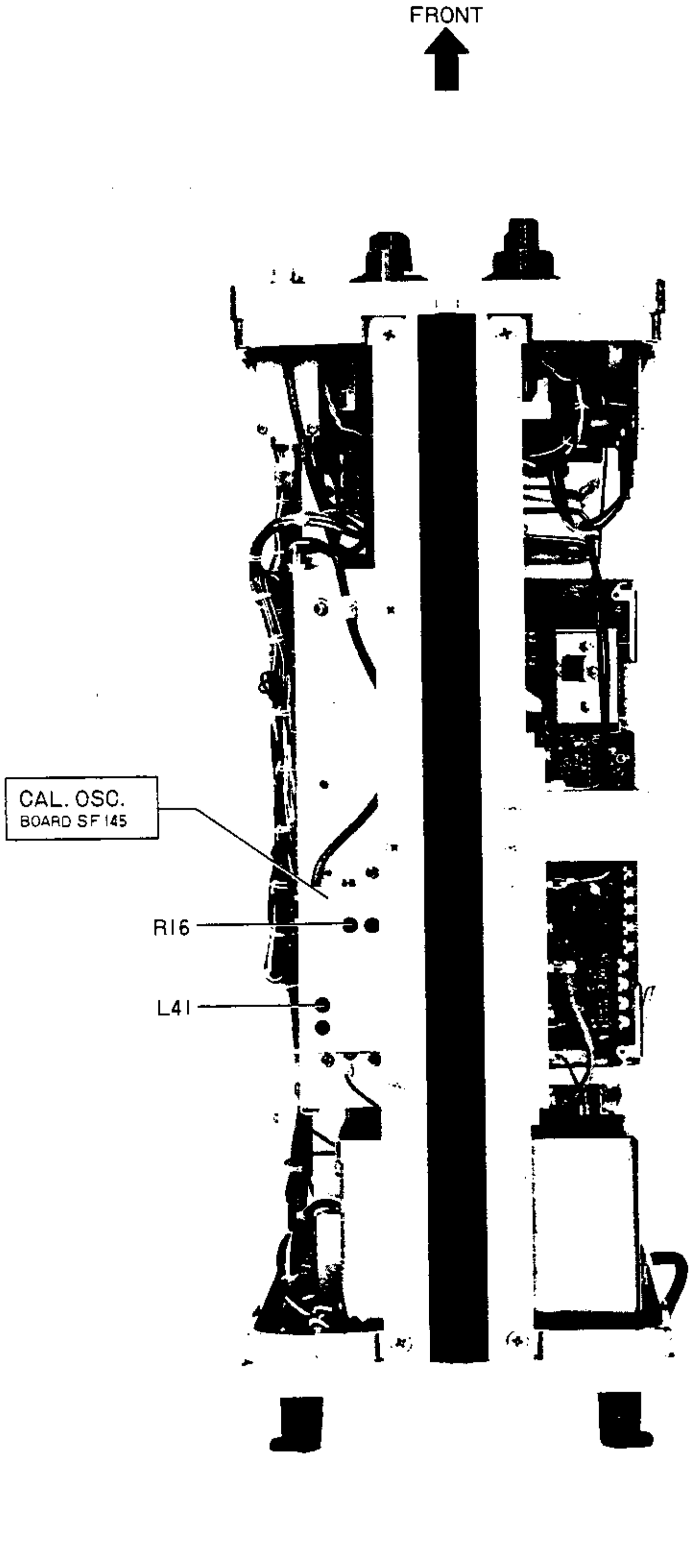


Fig. 4-6 Frequency Adjustment Setup



Note; Remove the connector plate for **TR1604** to adjust those controls.
The connector plate is installed by the two screws on its side.

Fig. 4-7 Location of CAL. OSC. Adjustment

4-5 LOG. AMP. Adjustment (Board PH209)

Equipment used: Signal Generator
Attenuator

(1) First, remove L type metal supporting the Boards PF130 and PH209, and dismount Board PH209 before entering into an adjusting procedure. Connect Board PH209 to the instrument with a plain adjusting board.

(2) Reset specific control from the initial settings (Para 4-2-3-(3)) as follows:
DETECTION MODE .... MEAN (VIDEO FILTER 10kHz)

(3) As shown in [Fig. 4-11], Disconnect Connector J53 from the output of Board SK030, that is the input of IF 1dB-step Attenuator (MEP-263). With the UM-UM Adapter (UM-QA-JJ), connect the Signal Generator output (3.33MHz, +6dBm) to J53 through the external Attenuator.

4-5-1 LOG. Adjustment

(1) With the connecting arrangement as above, set the external Attenuator to 0dB.

(2) Adjust R150 **(LOG. GAIN)** of Board PH209 which is mounted to the instrument through the adjusting blank board (Para 4-3-(1), (2), (3)), to correspond the trace to 0dB level which is the horizontal top line of the CRT.

(3) Set the external Attenuator to 60dB. Adjust R163 **(LOG. OFFSET)** to correspond the trace to –60dB level which is the third horizontal line from the bottom.

(4) Repeat procedures of (1), (2), and (3) above once more to ensure the CRT scale corresponds to the settings of the external Attenuator.

4-5-2 LINEAR Adjustment

(1) Set the external Attenuator to 40dB. Set **10dB/DIV., 5dB/DIV., LINEAR** to **LINEAR.**

(2) Adjust R176 **(LIN. GAIN)** to correspond the trace to 0dB level on the CRT.

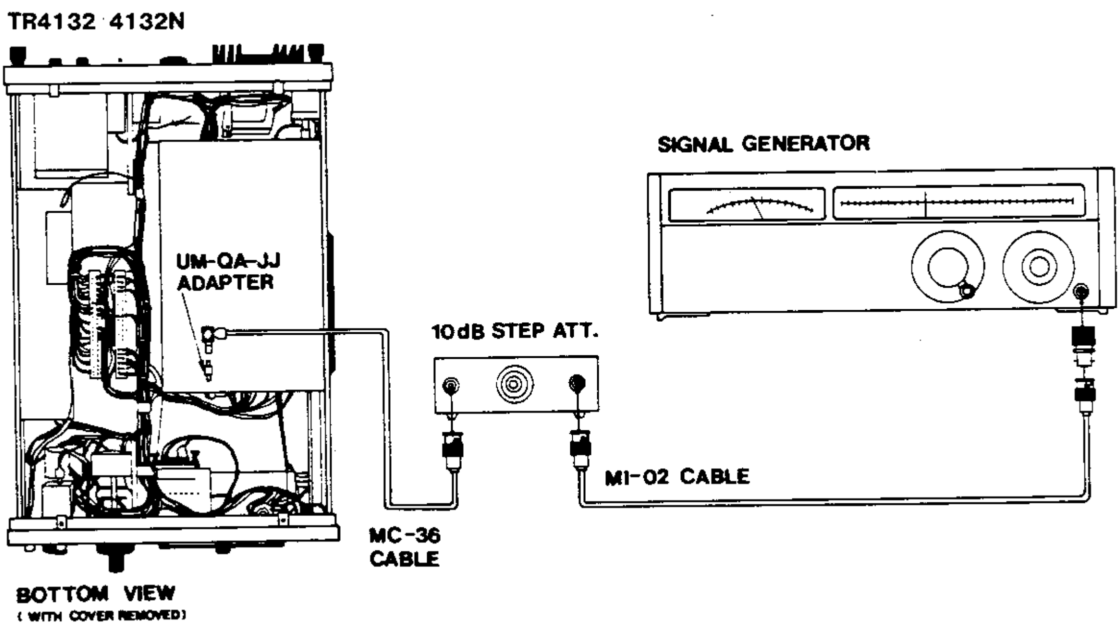


Fig. 4-8 LOG. AMP. Adjustment Setup

4-5-3 Q.P. Adjustment

(1) Set the external Attenuator to 40dB. Set **10dB/DIV., 5dB/DIV., LINEAR** to 10dB/DIV.

(2) Set **DETECTION MODE** to **Q.P.** Adjust R297 (QP3) to correspond the trace to 0dB level on the CRT.

(3) Reset the external Attenuator to 70dB. Adjust R293 (QP1) to correspond the trace to −30dB level on the **CRT.**

(4) Reset the external Attenuator to 80dB. Adjust R288 (QP2) to correspond the trace to −40dB level.

(5) Repeat procedures (3) and (4) two or three times.

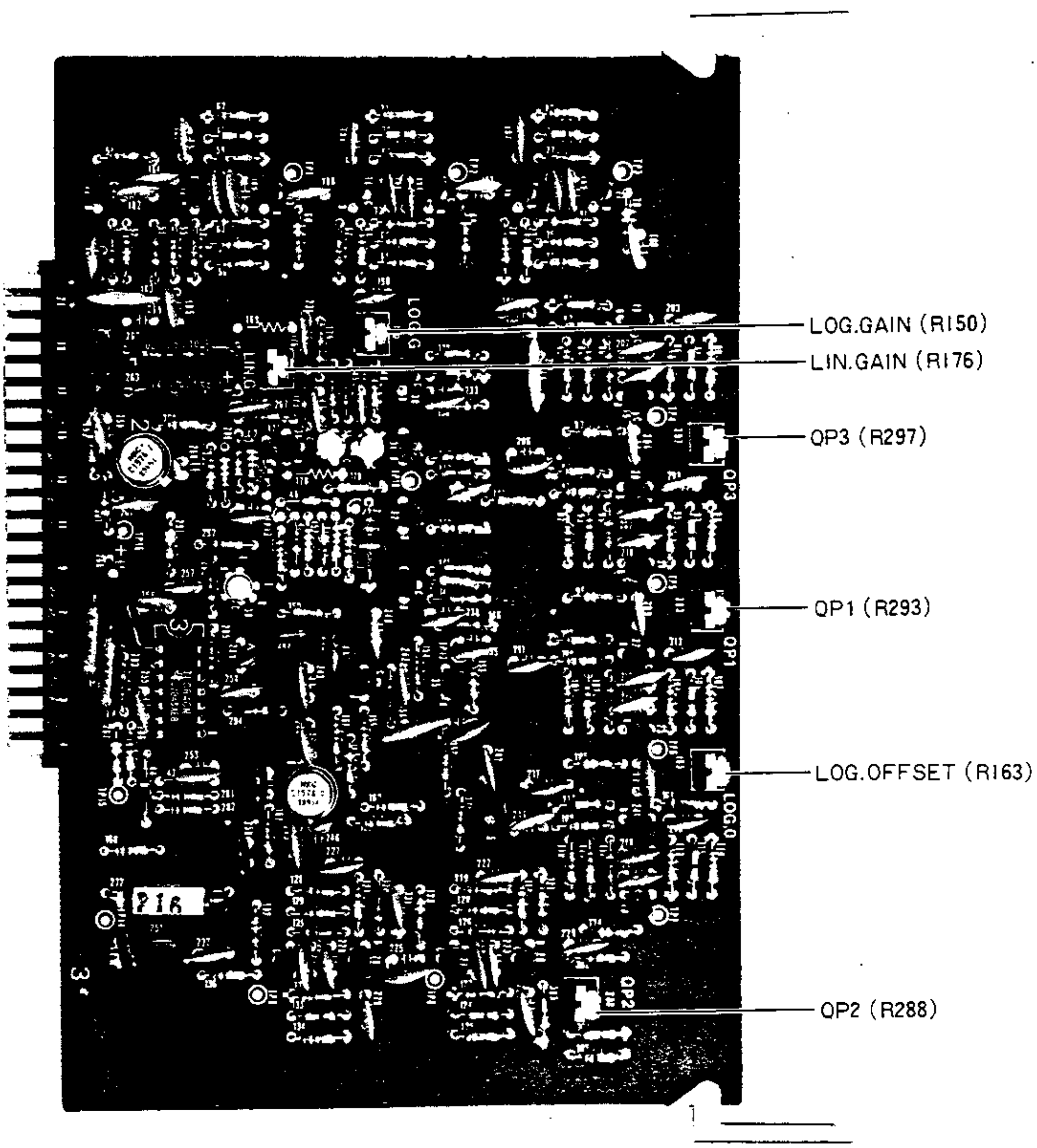


Fig. 4-9 Location of LOG. AMP. Adjustment

4-6 Ramp Generator, YIG Driver and Display Control Adjustment

Equipment used: Digital Voltmeter

4-6-1 10V Adjustment

(1) Connect the Digital Voltmeter to TP1 of Board PF130. Use the adjusting plain board as an intermediate if a direct connection is difficult. Adjust R91 (10V) to obtain a Digital Voltmeter reading of 10.00V± 0.005V.

4-6-2 Dispersion Adjustment

(1) Reset specific controls from the initial settings (Para 4-2-3-(3)) as follows:

CENTER FREQUENCY 500MHz
SCAN TIME .... White-line at 12 o'clock

(2) Turn **TUNING,** while adjusting R48 (DISP.), to correspond the zero frequency (Local feed through) to the vertical left-end line and 10th harmonic (1000MHz) signal to the vertical right-end line one the CRT.

4-6-3 Variable Width Adjustment

(1) Turn **TUNING** fully counter-clockwise. Adjust R84 **(Lo. F)** to correspond the zero frequency to the 4th vertical line from the right on the **CRT.** [Fig. 4-12(a)].

(2) Turn **TUNING** fully clockwise. Adjust R86 **(Hi. F)** to correspond 10th harmonic (1000MHz) signal to the 4th vertical line from the left. [Fig. 4-12(b)]

4-6-4 Frequency Display Adjustment

(1) Turn **TUNING** to correspond the zero frequency (Local feed through) to the **CENTER** of the CRT display. Set **DISPERSION/DIV.** to 5MHz/DIV. Turn **TUNING** to correspond the signal to the **CENTER.**

(2) Adjust R100 (0MHz) of Board PF130 to read 000MHz on **CENTER FREQUENCY** display.

(3) Turn **TUNING** to **CENTER** 1000th harmonic (1000MHz).

(4) Adjust R97 (1GHz) to read **1000**MHz on **CENTER FREQUENCY.**

4-6-5 Antenna Coefficient Compensation Adjustment

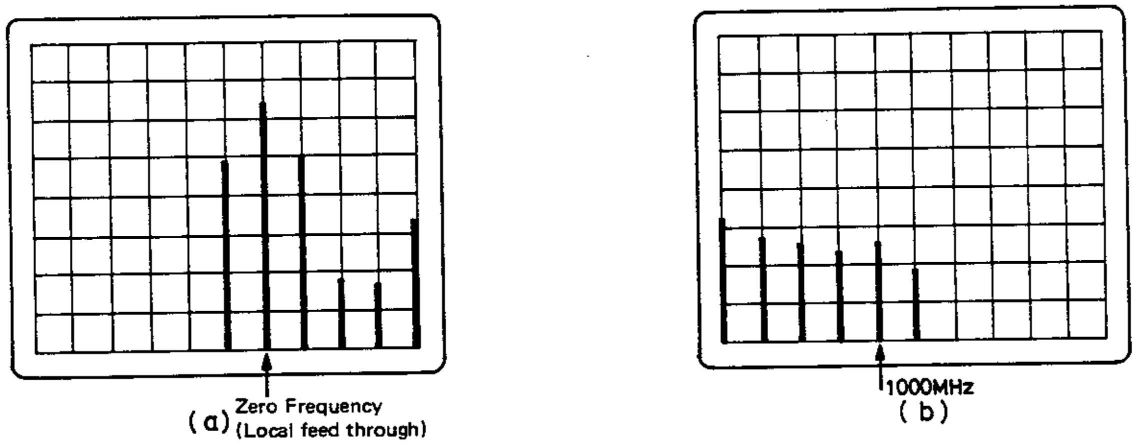
(1) Turn **TUNING** to read **LED** display of 34MHz on **CENTER FREQUENCY.** (43MHz for **TR4132N)**

(2) Reset the level switch from **INPUT LEVEL** to **FIELD STRENGTH-ANTENNA-A.** Adjust R113 **(ANT.)** to keep the reading on **REFERENCE LEVEL** unchanged.

(3) Turn **TUNING** to read 1000MHz on **CENTER FREQUENCY.**

(4) Adjust R108 (LOG. G) so that the reading on **REFERENCE LEVEL** increases by the value of 31 when switched from **INPUT LEVEL** to **ANTENNA-A.** (The reading increases by 29 for **TR4132N).**

(5) Adjust R110 (△) so that the reading on **REFERENCE LEVEL** decreases by 5dB



(a) (b)

Fig. 4-10 Variable Width Adjustment Display all the time when switched from **ANTENNA-A** to **ANTENNA-B.**

* If abnormal, refer to Chart 7 of Section 6 Trouble Shooting.

4-6-6 Level Display Adjustment

(1) Adjust R125 (LEV.G) and R122 (LEV.O) of Board PF130, so that **REFERENCE LEVEL** display is as shown in [Table 4-3] for the combination settings of **IF GAIN** and **RF. ATT.** At this time, 1dB-step of **IF GAIN** (inner switch) must be kept at **CAL.**

Table 4-3 Level Display Adjustment settings

IF GAIN	RF. ATT.	LED Display
30dB	0dB	80dBμ
20dB	0dB	90dBμ
10dB	0dB	100dBμ
0dB	0dB	110dBμ
0dB	10dB	120dBμ
0dB	20dB	130dBμ
0dB	30dB	140dBμ
0dB	40dB	150dBμ

*If abnormal, refer to Chart 7 of Section 6 Trouble Shooting.

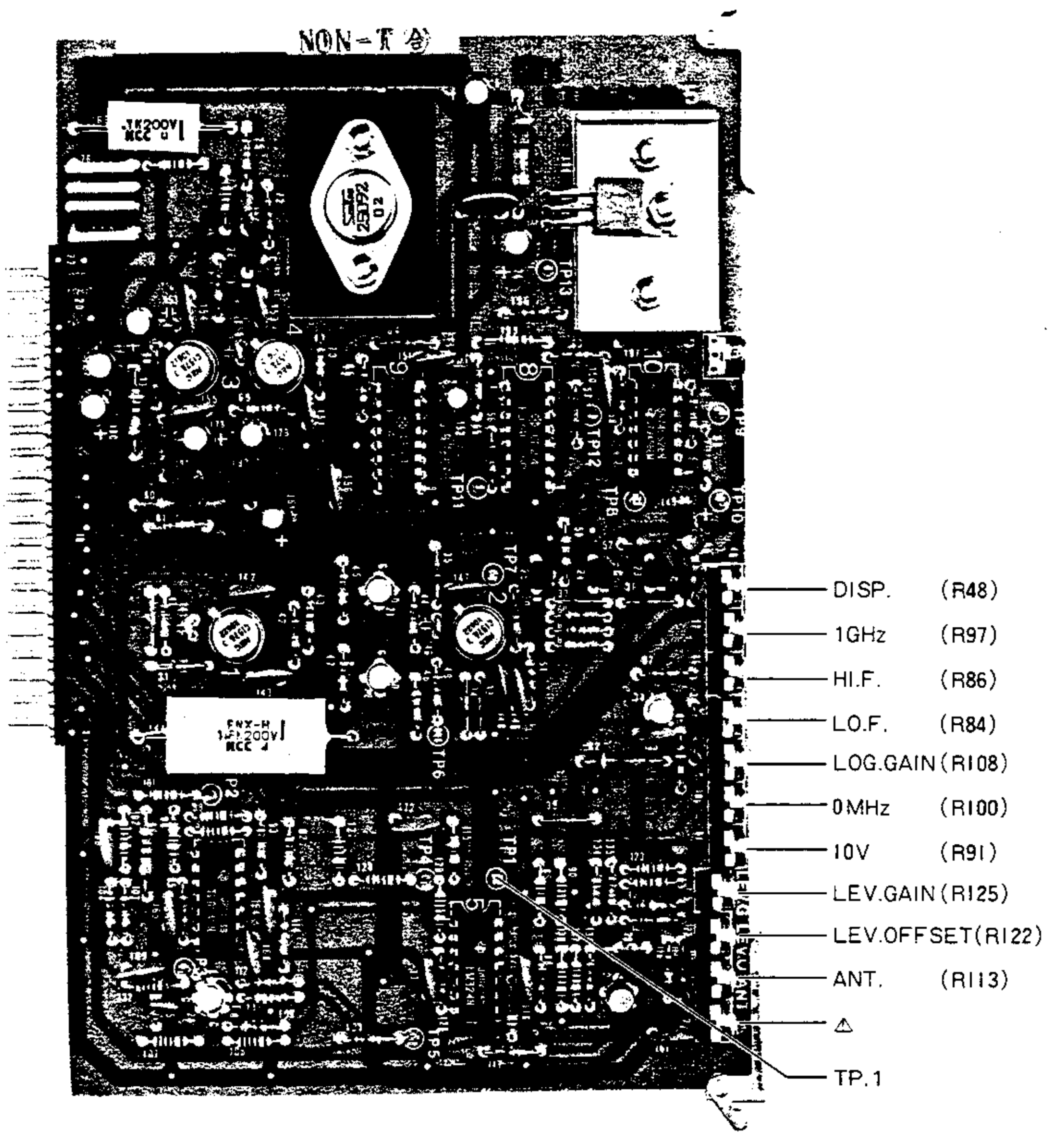


Fig. 4-11 Location of RAMP GENERATOR & YIG DRIVER Adjustment

4-7 IF FILTER Adjustment

Equipment used: Spectrum Analyzer

4-7-1 3rd Local Oscillator Adjustment

(1) Remove the cover of **IF FILTER** (Board SK030) and loosely couple on L307 to the Spectrum Analyzer. (Fig. 4-12)
Read the 3rd Local Frequency with the Spectrum Analyzer. Adjust L307 to read the frequency of 43.3MHz ± 1MHz.

4-7-2 300kHz to 9kHz Band Pass Filter Adjustment

(1) Connect **CAL. OUT.** to **INPUT** and reset specific controls from the initial settings (Para 4-2-3-(3)) as follows:

CENTER FREQUENCY 100MHz
SCAN TIME .... 11 o'clock
10dB/DIV., 5dB/DIV., LINEAR .... 5dB/DIV.
IF GAIN 10dB
DISPERSION/DIV. ..... 0.1MHz/DIV.
B.W. 9kHz

(2) Center the signal by **TUNING** and **FINE.**

(3) Adjust C284 of Board SK030 to correspond the signal level to the lowest point. [Fig. 4-13]

(4) Adjust C225, C235, C256 and C268 to obtain the signal level the highest.

(5) Repeat procedures (3) and (4) above once more.

4-7-3 Bandwidth Switching Level Error Adjustment

(1) Reset **B.W.** to **AUTO** and **DISPERSION/DIV.** to 100MHz/DIV.

(2) Adjust **IF GAIN** and **CAL.** to correspond the signal peak to the center.

(3) Adjust R152 (30kHz GAIN ADJ.) to center the signal peak when **DISPERSION/DIV.** is set to 2MHz/DIV.

(4) Also adjust R127 (10kHz GAIN ADJ.) to center the signal peak when **DISPERSION/DIV.** is set to 0.2MHz/DIV.

(5) Repeat procedures (3) and (4) above once more.

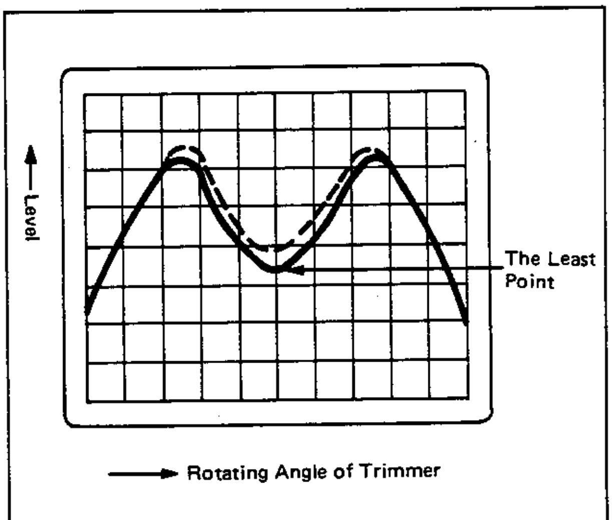


Fig. 4-13 B.P.F. Adjustment Display

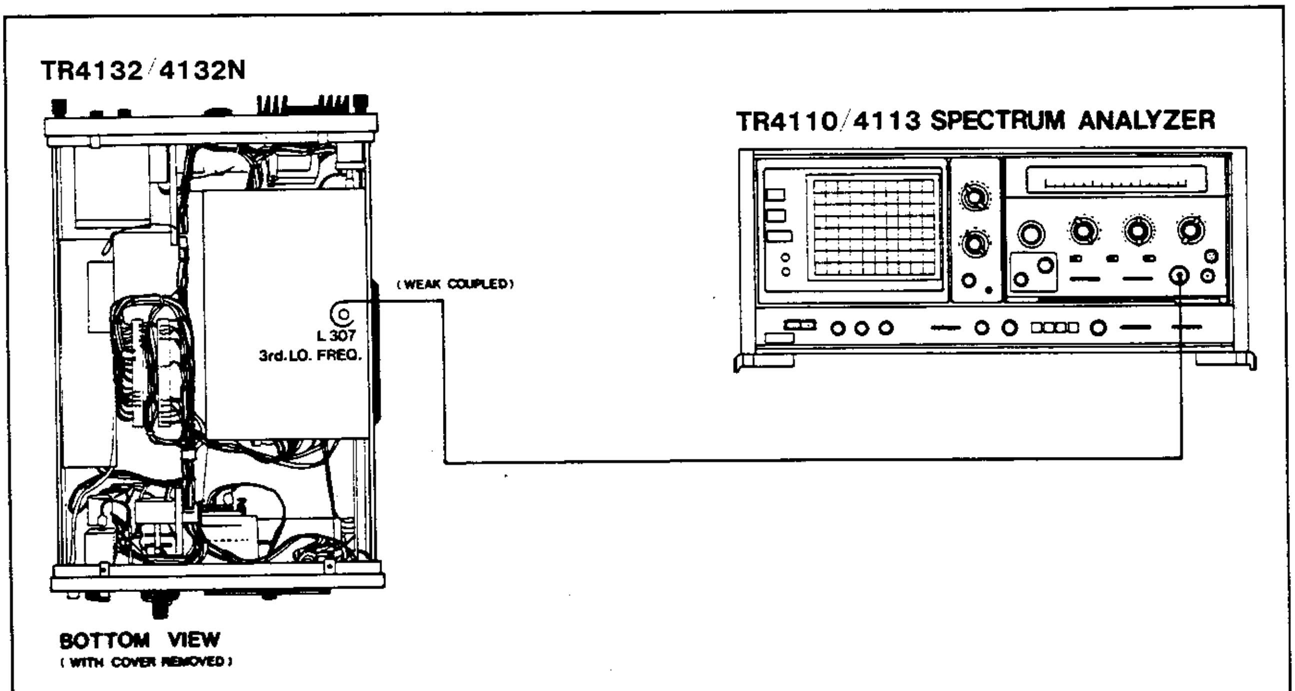


Fig. 4-12 IF FILTER Adjustment Setup

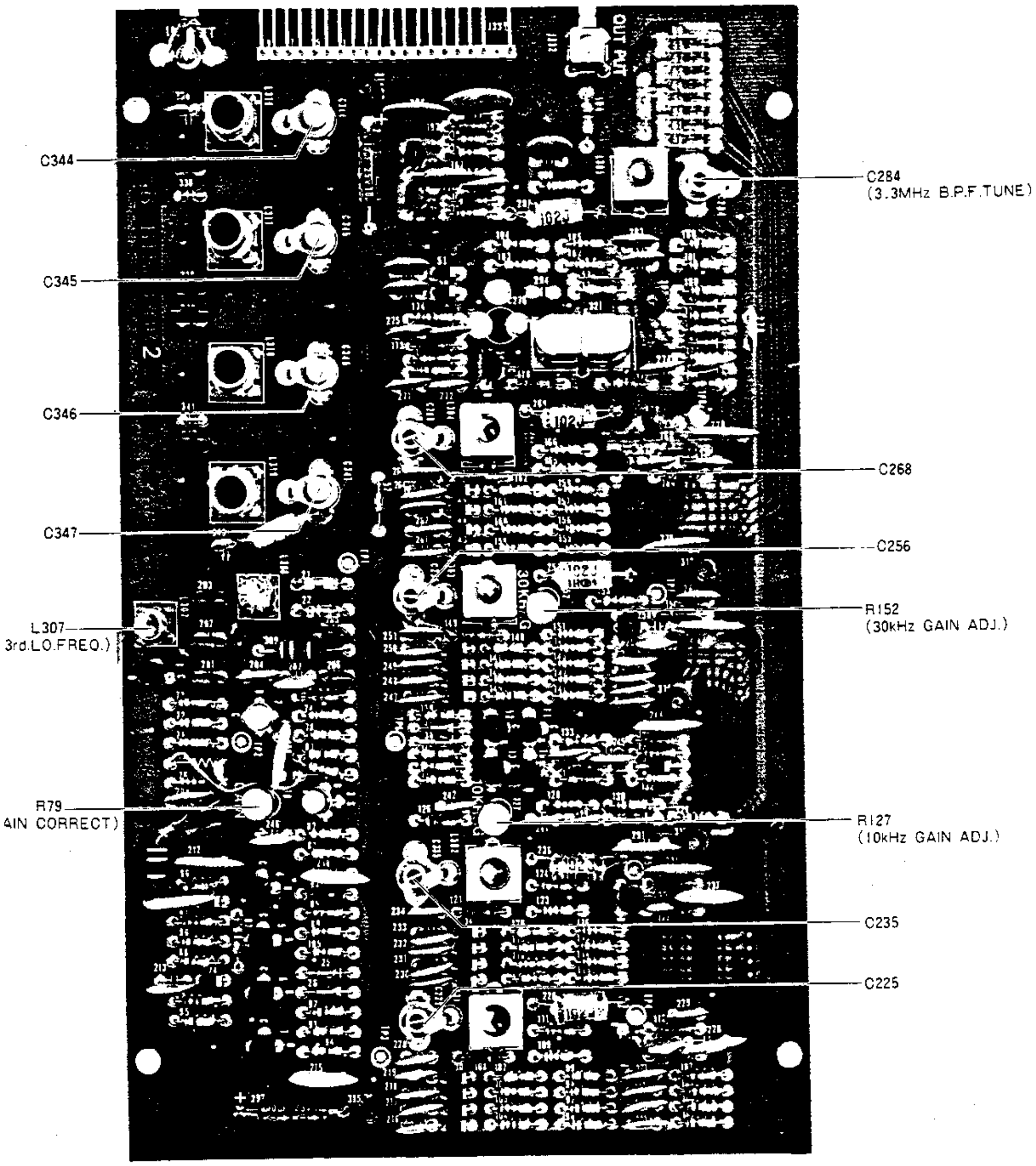


Fig. 4-14 Location of IF FILTER Adjustment

4-7-4 **1.5MHz Bandwidth Adjustment**

Equipment used: Signal Generator

(1) Reset respective controls from the initial settings (Para 4-2-3-(3)) as follows:

CENTER FREQUENCY 100MHz
DISPERSION/DIV. ..... 0.5MHz/DIV.
B.W. 1.5MHz
RF. ATT. (dB).................. 0dB

(2) Connect the Signal Generator output (100MHz, 10dBm) to **INPUT** of the instrument.

(3) Set **IF GAIN** to +30dB and carefully observe the CRT display. If the upper part of the signal has become irregular, adjust C344 to C347 to recover it. [Fig. 4-16]

(4) Reset **IF GAIN** to 0dB. Adjust C344 to C347 so that the bandwidth at 6dB below the signal peak is 1.5MHz ± 0.3MHz. [Fig. 4-17]
Set **10dB/DIV., 5dB/DIV., LINEAR** to 5dB/DIV. and adjust **IF GAIN** (10dB Outer switch, 1dB Inner switch and **CAL.**) so that the bandwidth at 6dB below the signal peak can be observed clearly.

4-7-5 **Overall Gain Adjustment**

(1) Reset specific controls from the initial settings (Para 4-2-3-(3)) as follows:

DISPERSION/DIV. ..... 100MHz/DIV.
B.W. .... AUTO
IF GAIN . . . 0dB, CAL. } REFERENCE
RF. ATT. . . . 0dB } LEVEL 110dBμ

(2) Connect **CAL. OUT.** to **INPUT.**

(3) Rotate **IF GAIN-CAL.** and position it at the center of the variable range.

(4) Adjust R79 **(GAIN CORRECT)** of Board SK030 to correspond the signal to the 3rd horizontal line from the top.

* If abnormal, refer to Chart 4 of section 6 Trouble Shooting.

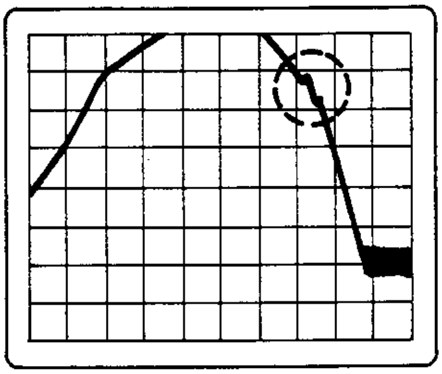


Fig. 4-16 1.5 MHz B.P.F. example

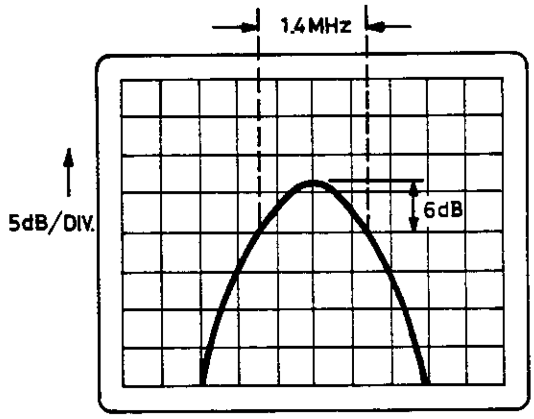


Fig. 4-17 B.W. 1.5MHz

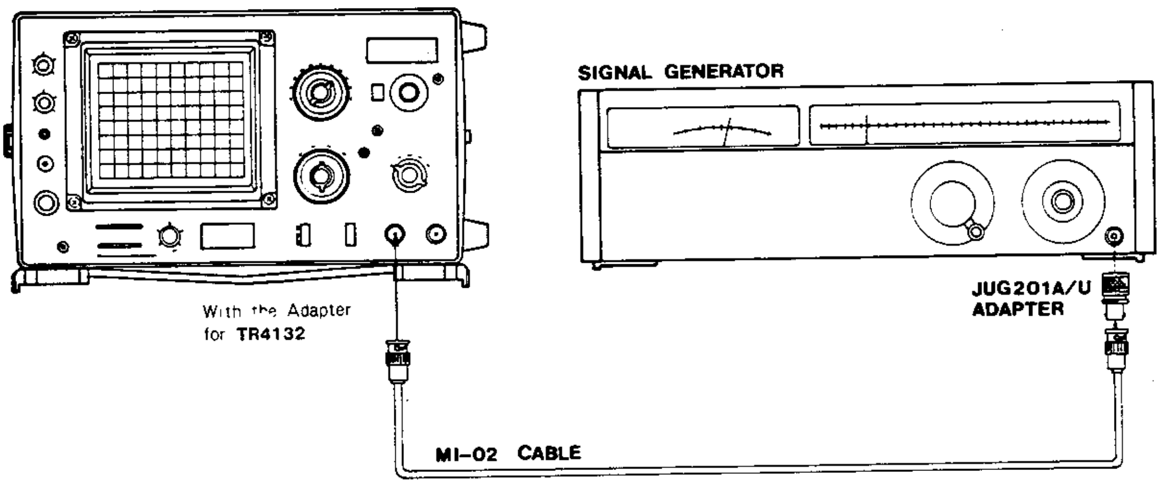


Fig. 4-15 1.5MHz Bandwidth Adjustment Setup

4-8 RF. Block Check

Equipment used: Spectrum Analyzer
Signal Generator

4-8-1 2nd Local Frequency Check

(1) Connect the Spectrum Analyzer to **IF OUTPUT** (J46) and verify the frequency (2nd Local) is 1200MHz ± 3MHz. [Fig. 4-18]

(2) Set connection of **IF OUTPUT** (J46) to original condition.

4-8-2 1153.3MHz Band Pass Filter Check

(1) Connect the Signal Generator output (46.6MHz, –30dBm) to **INPUT** of the instrument.

(2) Reset **DISPERSION/DIV.** to 0.5MHz/DIV.

(3) Center the Signal Generator output signal on the CRT display by **TUNING.**

(4) Reconnect the Spectrum Analyzer to **IF OUTPUT** (J46). The signal on the Spectrum Analyzer will shift as shown in [Fig. 4-19], which is the frequency passing characteristics of 1153.3MHz-Band Pass Filter.
Select **SCAN TIME** of the instrument for easier observation.

(5) Set **DISPERSION/DIV.** of the Spectrum Analyzer to 1MHz/DIV. and Vertical-Axias Selector to 2dB/DIV. Verify with the Spectrum Analyzer that the band-width at 6dB below the signal peak is more than ± 1.3MHz and furthermore, the signal is symmetrical to right and left. [Fig. 4-20]

(6) Reset **DISPERSION/DIV.** of the instrument to **ZERO** and center the signal by **TUNING** on the Spectrum Analyzer.

(7) Verify the output level of **IF OUT.** between –29dBm and –31dBm. (–31dBm and –33dBm for **TR4132N**)

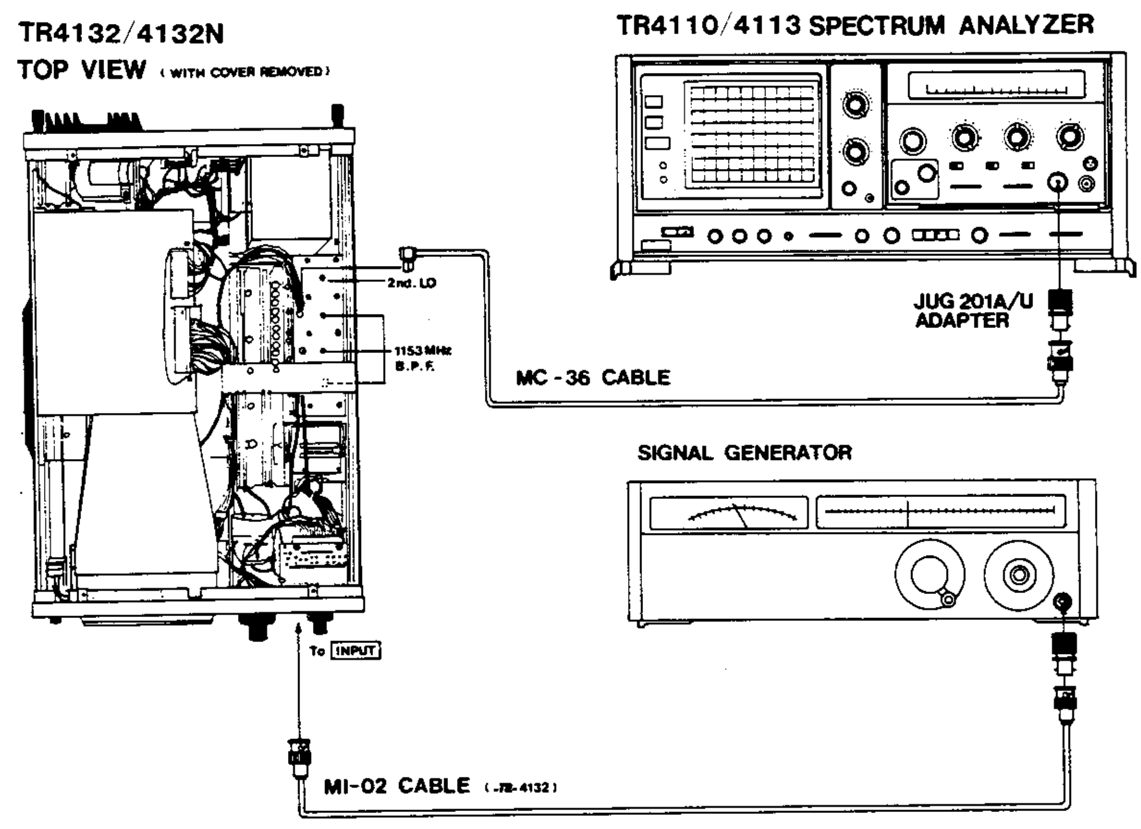


Fig. 4-18 RF. Block Check Setup

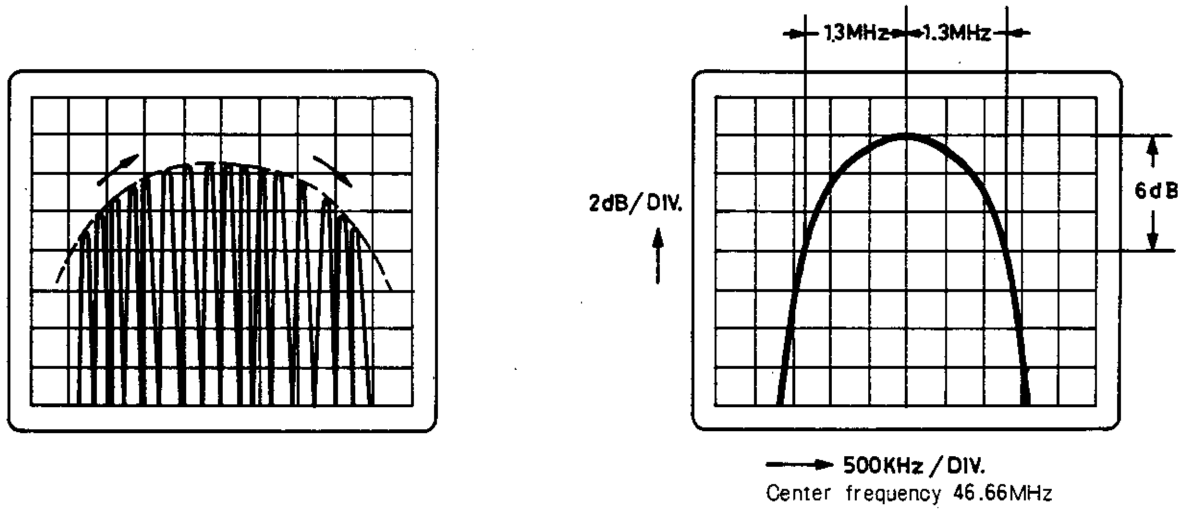


Fig. 4-19, 20 B.P.F. Check Display

Note: Loss measurement of RF Block is performed by input of a 46.66MHz signal which is identical to that of 2nd IF. The applied 46.66MHz signal is converted at RF Block as shown in the figure below and output as 46.66MHz IF. If the 46.66MHz IF and the 46.66 input are observed with the other Spectrum Analyzer, the overall loss of the RF Block can be known.

CAUTION

RF. Block is to convert the input signal which has passed RF. ATT. into IF signal of 46.66 MHz by two-stage frequency converter.
Care not to rotate the adjusting screws.
In case of a trouble, contact ADVANTEST.

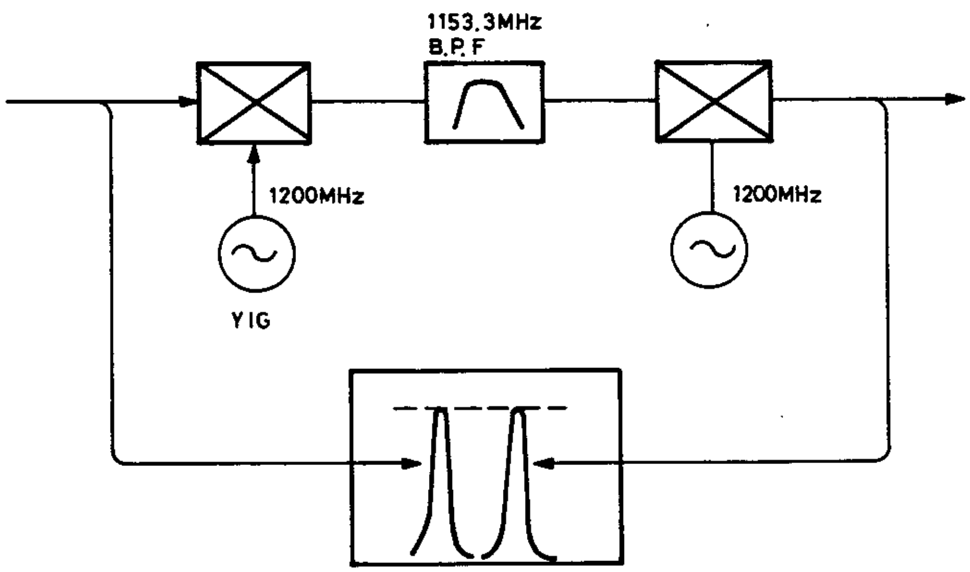


Fig. 4-21 RF. BLOCK Loss Measurement

Table 4-4 CALIBRATION ADJUSTMENT CHECK LIST

Serial No. ________

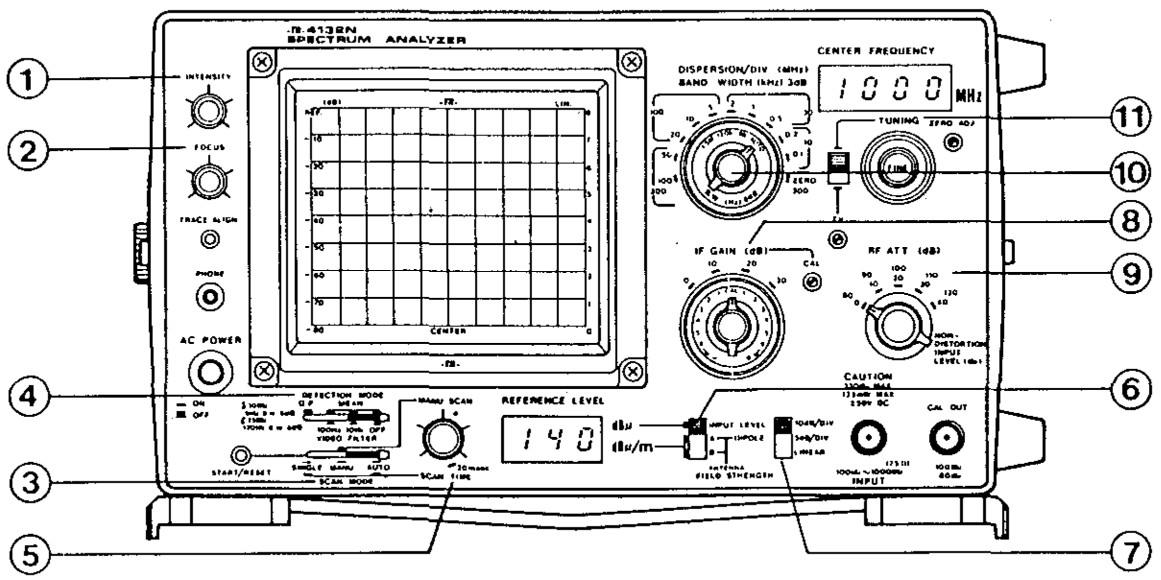
Preliminary Settings

1) Set POWER MODE on the rear panel to ON and AC POWER on the front panel to OFF. Connect the Power Cable to the AC line receptacle.

2) Set the front panel controls as follows:

1. INTENSITY .... Center
2. FOCUS .... Center
3. SCAN MODE .... AUTO
4. DETECTION MODE .... MEAN (VIDEO FILTER OFF)
5. SCAN TIME (MANUAL SCAN) .... 20 ms
6. REFERENCE LEVEL .... INPUT LEVEL
7. 10dB/DIV., 5dB/DIV., LINEAR .... 10dB/DIV.
8. IF GAIN (dB) .... 0 dB, CAL.
9. RF. ATT. .... 0 dB
10. DISPERSION/DIV. 100MHz
    B.W. (Hz) 6 dB .... AUTO
11. TUNING/PRESET (TV) .... TUNING

3) Set AC POWER to ON and warm up the instrument for about 30 minutes.



	Adjustments and check	Checking point	Specification				
1	Power Supply (Inside the bottom and rear panels)	J2-Pin 19 A & B J2-Pin 18 A & B J2-Pin 17 A & B IC4 Pin 2 D5 Cathode	+14.4V to +15.6V −15.6V to +14.4V +4.8V to +5.7V +22.8V to +25.2V about 260V				
2	High Voltage Power Supply (CRT Socket)	Pin 1, Pin 14 (H) Pin 2 (G1) Pin 3 (K) Pin 4 (P1) Pin 6 (G2)	−2.01kV −2.08kV to −2.01kV −2.01kV −1.38kV to −1.87kV +100V				
3	CRT Driver (Board SG210)	R85 R86 (ASTIG) J2-Pin 2 R113 (V. POSI.) R72 (V. GAIN) J2-Pin 14 R61 (H. POSI.) R55 (H. GAIN)	+169V to +171V (Focus adjustment) (Y-Axis adjustment) (Y-Axis adjustment) (Y-Axis adjustment) (X-Axis adjustment) (X-Axis adjustment) (X-Axis adjustment)				
4	CAL. Oscillator (Board SF145)	R16 TR4132 TR4132N L41	−27dBm −29dBm Within ± 1 division				
5	LOG. Amplifier (Board PH209)	R150 (LOG. GAIN) R163 (LOG. OFFSET) R176 (LIN. GAIN) R297 (QP 3) R293 (QP 1) R288 (QP 2)	(Log. Scale adjustment) (Log. Scale adjustment) (Linear Scale adjustment) (Q.P. Scale adjustment) (Q.P. Scale adjustment) (Q.P. Scale adjustment)				
6	Frequency Display (Board PF130)	R100 (0MHz) R97 (1GHz)					
7	Level Display (Board PF130)	R125 (LEV. GAIN) R122 (LEV. OFFSET)					
8	Antenna Coefficient (Board PF130)	R113 (ANT.) R108 (LOG. GAIN) R110 (⚠)					
9	Ramp Generator YIG Driver, Display Control (Board PF130)	R41 (10V) R48 (DISP.) R84 (LO. F) R86 (HI. F)	+9.995V to 10.005V				
10	IF Filter (Board SK 030)	L307 (3rd LO. Freq.) C284 (33MHz B.P.F. TUNE) C225, C235, C256, C268 } 300kHz to 9kHz B. P. F. R152 (30kHz GAIN ADJ.) R127 (10kHz GAIN ADJ.) C344, C345, C346, C347 } 1.5MHz B.W. R79 (GAIN CORRECT)	42.3MHz to 44.3MHz				
	RF. Block	J46 (IF OUTPUT)	1197MHz to 1203MHz				

SECTION 5
PRINCIPLES OF OPERATION

5-1 Description

This section briefly describes the general composition of **TR4132/4132N** and operation of each section, at a technical level equivalent to experienced electronics engineers. Reference to the detailed circuit diagrams included in this manual is recommended, while specific parts and terms, included in "Technical Terms" provided at the end of this manual may be of help.

5-2 General Composition

The Spectrum Analyzer is a heterodyne receiver. An input signal is converted to a fixed Intermediate Frequency (IF) which performs separation of the signal and reading of the level. This process continues to display on the Cathode Ray Tube (CRT).

TR4132/4132N is designed to upward-convert the input signal to 1153.3MHz at 1st MIXER to prevent possible response to the image signal. A YIG Tuned Oscillator of 1000MHz to 2200MHz is utilized in the 1st Local Oscillator. The signal of 1153.3MHz is then downward-converted twice to obtain the final intermediate frequency of 3.3MHz which is input to the IF FILTER Section.

IF FILTER Section provides two series of Band Pass Filter (B.P.F.), namely 300kHz, 100kHz, 30kHz and 10kHz (when set to **AUTO**) on 3dB bandwidth and 1.5MHz, 120kHz and 9kHz on 6dB bandwidth, any of which can be appropriately selected according to the sweep width of the frequency. The gain can be adjusted by the variable gain amplifier of **IF FILTER** Section.

RAMP GENERATOR is a saw-tooth generator to sweep X-Axis of CRT and YIG Tuned Oscillator. In sweeping YIG Tuned Oscillator, the saw-tooth signal is controlled at YIG DRIVER Section so that frequency sweep width of YIG Tuned Oscillator can be set in the range from 100MHz/DIV. to 0.1MHz/DIV. The frequency is controlled with further addition of the voltage that is adjusted by **TUNING.**

CENTER FREQUENCY LEDdisplays the voltage determined by **TUNING** after converting it to a digital signal at CALCULATE Section. Similarly **REFERENCE LEVEL** LEDdisplays the level in accordance with the setting of either **INPUT LEVEL** or **FIELD STRENGTH.** If **INPUT LEVEL** is selected, the values set by **RF. ATT.** and **IF GAIN** are converted to voltages respectively, summed at the operation section, A/D converted and displayed. when switched to **FIELD STRENGTH,** an antenna coefficient is calculated at the operating section based on the voltage led by **TUNING,** which is added to the value determined in the setting of **INPUT LEVEL** and displayed.

5-3 Circuit Description

5-3-1 DC CUT-OFF Section

The capacitor between the input connector and RF. ATT. is to cut off DC component of a signal. **TR4132N** has an impedance converter in addition to convert the input impedance into 75Ω.

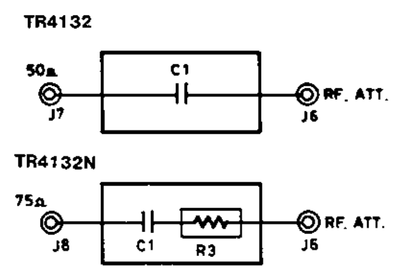


Fig. 5-1 Cut-off arrangement

5-3-2 RF. ATTENUATOR Section

The RF. Attenuator is an assembly of thin film resistors to compose fixed type attenuator in range from 10dB to 40dB on 10dB step.

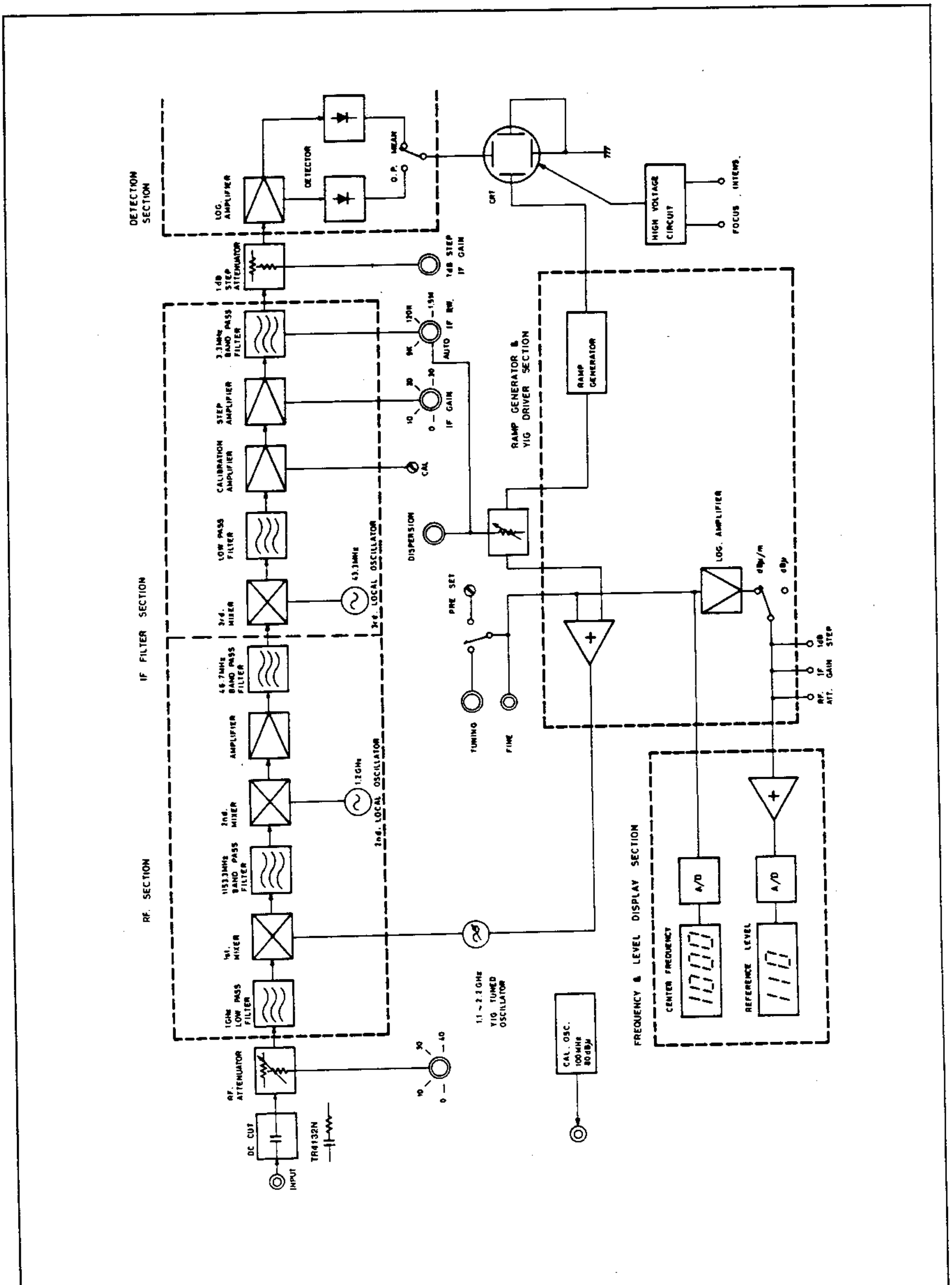


Fig. 5-2 TR4132 4132N Block Diagram

5-3-3 RADIO FREQUENCY Section (RF. block)

Radio Frequency (R. F.) Section converts the input signal (100kHz to 1000MHz) which has passed through RF. ATT. into IF signal of 46.7MHz by a two-stage frequency converter. The section is composed of 1st MIXER (Board SX052), 2nd MIXER (Board SX053) and four cavities. Board SX052 has a Low Pass Filter (L.P.F.) to intercept signals higher than 1GHz and 1st MIXER. L.P.F. is composed of a micro strip line. 1st MIXER is a balanced type mixer and is to attenuate the feed-through signal from 1st Local Oscillator (LO) to minimize high frequency distortion.

The input signal passed through the RF. ATT. is mixed with 1st LO at 1st MIXER and led to 2nd MIXER through a three-stage coupled Cavity Band Pass Filter tuned to 1153.3MHz.

Composed in 2nd MIXER is a Cavity Tuned Oscillator as 2nd LO oscillating 1200MHz. 1st IF signal is loop-coupled to the cavity of 2nd LO and is supplied to 2nd MIXER which is a balanced type.

The signal of 46.7MHz which is created at 2nd MIXER as the difference of 1200 MHz and 1153.3MHz passes L.P.F. of C27 and L41, is amplified by Q2 and becomes the output of High Frequency Section. The conversion gain from input to output of the RF. Section is from −1dB to +1dB at a 50Ω-load.

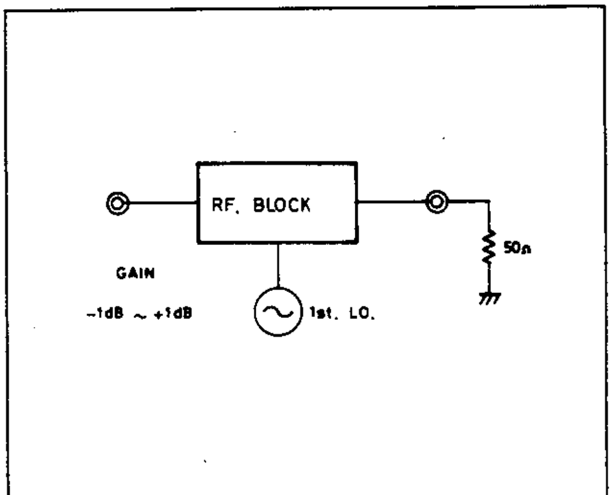


Fig. 5-4 RF. Section Conversion Gain

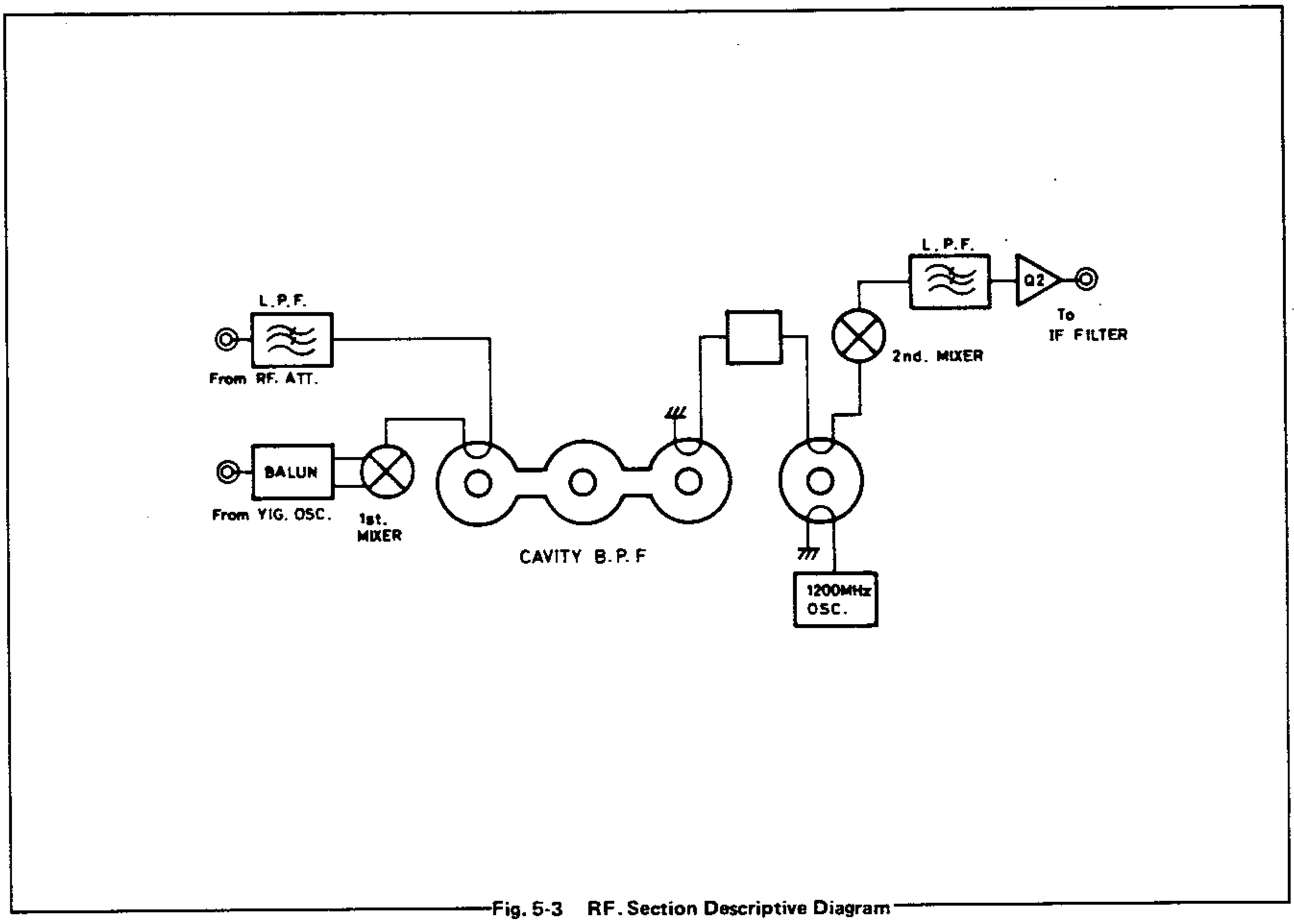


Fig. 5-3 RF. Section Descriptive Diagram

5-3-4 IF FILTER Section

IF FILTER Section converts the 46.7 MHz-signal received from the RF. Section to 3.3 MHz and make it in a form of spectrum by proceeding through B.P.F. This section also provides level adjustments and gain switching on the CRT.

The 46.7MHz-signal (2nd IF) passed from the RF. Section is supplied to 3rd MIXER through four-stage B.P.F. The signal is mixed with 3rd LO of 43.4MHz at 3rd MIXER, then passes through the L.P.F. which is composed of C205, L309 and C206, and a component of 3.3MHz is created as 3rd IF. 3rd LO is composed of L and C.

The amplifier composed of Q2 and Q3, shown in Fig. 5-5 is a variable gain amplifier to compensate for the IF conversion loss en route to 3rd IF. The gain of this amplifier can be adjusted by R79 (GAIN CORRECT). **CAL.** adjuster on the front panel is used to calibrate the level on the CRT, and controls the bias voltage of Q3 in the gain range of more than 4dB.

The amplifier circuits of Q4 to Q7 and Q10 to Q13 form 10dB step a variable gain amplifier and buffer amplifier respectively. When setting **IF GAIN** on the front panel to 10dB or 20dB, a gain of 10dB or 20dB is given corresponding to the setting, by the amplifier circuit of Q4 to Q7. When setting the gain to 30dB, a gain of 30dB is provided by addition of 10dB by the amplifier circuit of Q10 to Q13.

The filter is formed with a four-stage active B.P.F. and a crystal filter, that is composed of Q8, Q9, Q14, Q15 and Q16. The center frequency of the LC resonator at each stage is tuned to 3.3MHz identical to the crystal filter frequency. As the front panel **B.W.** is switched, the diode switch of each stage is switched accordingly and changes the Q (Quality factor) of respective LC resonator, which selects a passing bandwidth of 1.5MHz, 120 kHz or 9kHz, 1.5MHz-B.W. is determined by 46.7MHz-B.P.F. in front of 3rd MIXER. In the case of 9kHz-B.W., a crystal filter is made in series with the LC filter. When the front panel **B.W.** is set to **AUTO, B.W.** is switched in combination with **DISPERSION/DIV.** to 300kHz-100kHz-30kHz-10kHz. The deviation of passing loss due to **B.W.** switching can be recovered by adjusting R152 (30kHz-GAIN ADJ.) and R127 (10kHz-GAIN ADJ.). Q17 and Q18 form an output amplifier circuit.

The conversion loss from an input of 46.7 MHz at the IF FILTER Section en route to an output of 3.3MHz is about 9dB for **TR4132** and about 11dB for **TR4132N**, when **IF GAIN** is set to 0dB and **CAL.** is in adjustable center position.

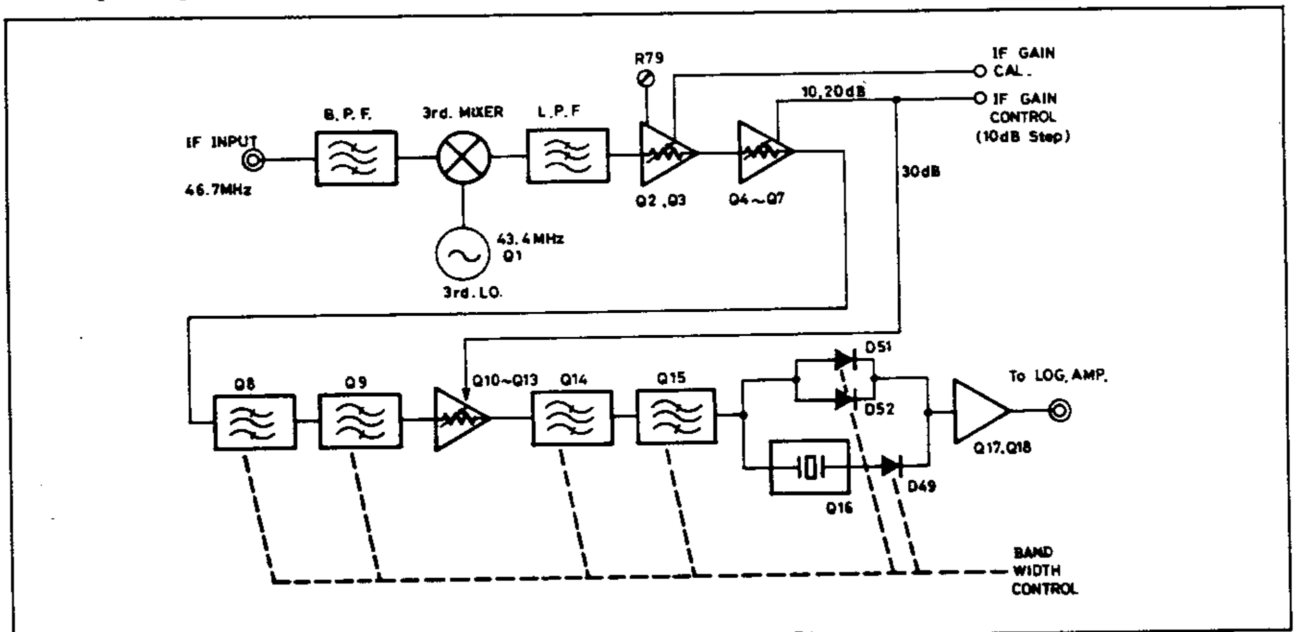


Fig. 5-5 IF FILTER Section Descriptive Diagram

5-3-5 STEP ATTENUATOR

Located between the IF FILTER Section and LOG. AMPLIFIER Section is an attenuator which is variable from 0dB to 12dB in 1dB steps. When the front panel **IF GAIN** (1dB step-Inner switch) is set to **CAL.**, the attenuation is 6dB.

5-3-6 LOG. AMPLIFIER Section

The LOG. AMPLIFIER used in the instrument is a coincidence-phase saturation amplifier of 10dB-gain connecting nine stages in cascade. The outputs of 4 front stages and 5 rear stages are summed respectively and then totalled, thus forming an approximate value amplifier.

By setting either **10dB/DIV., 5dB/DIV., LINEAR** to **LINEAR** or **DETECTION MODE** to **Q.P.** (Quasi Peak Value) on the front panel, the input signal passing through the four-front-stage-amplifiers is amplified in the circuit of Q37 and Q38, and supplied to DETECTOR. If the vertical level switch is set to 10dB/DIV. or 5dB/DIV. and also **DETECTION MODE** is set to **MEAN,** the input signal is logarithmically compressed through the all stages of the saturation amplifiers and ADDER, and then reaches Q34, which is an amplifier for LOG. R150 is LOG. GAIN, and is adjusted to provide DC voltage of LOG. OUT. to 500mV when the input signal changes the level by 10dB.

The output of DETECTOR is first supplied to the DC amplifier through a smoothing circuit, and then led to LOG./LINEAR OUT. passing through a smoothing circuit again. If **DETECTION MODE** is set to **Q.P.,** the above-mentioned output voltage from the smoothing circuit enters the Q.P. circuit, formed with two IC3 operational amplifiers, where time constant for C.I.S.P.R. specifications is provided. This output is logarithmically converted at the DC LOG. AMP. which comprises two operational amplifiers of Q39 and IC3, and then lives at Q.P. OUT. through IC2 amplifier.

Table 5-1 C.I.S.P.R. specifications/ TR4132/4132N specifications

	C.I.S.P.R. specifications		
Frequency Range	0.15MHz to 30MHz	25MHz to 300MHz	300MHz to 1000MHz
6dB Bandwidth	9kHz	120kHz	120kHz
Detection Time Constant Charge Discharge	 1ms±20% 160ms±20%	 1ms±20% 550ms±20%	 1ms±20% 550ms±20%
	TR4132/4132N specifications		
Frequency Range	100kHz to 30MHz	25MHz to 1000MHz	
6dB Bandwidth	9kHz	120kHz	
Detection Time Constant Charge Discharge	 1ms±20% 160ms±20%	 1ms±20% 550ms±20%	

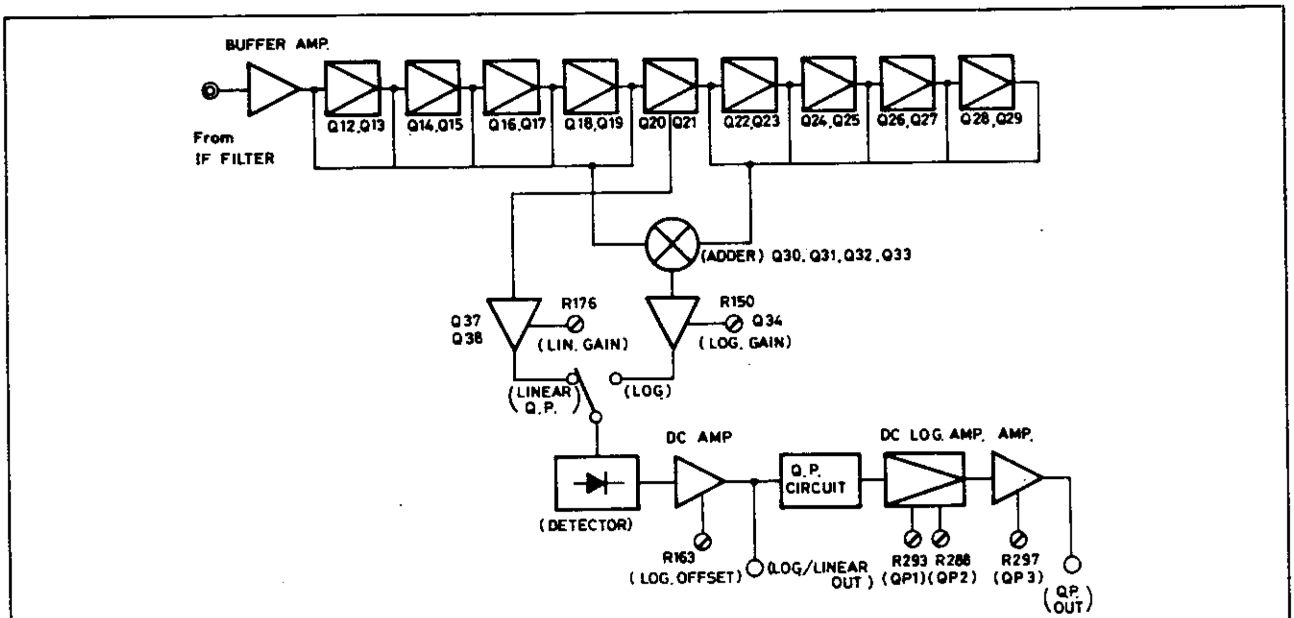


Fig. 5-6 LOG. AMPLIFIER Section Descriptive Diagram

5-3-7 RAMP GENERATOR and YIG DRIVER Section

1st LO applies the YIG-tuned oscillator which is capable of sweeping from 1000 MHz to 100kHz in one sweep for 20 milliseconds with extremely linear and stable performance. The tuned frequency (Center Frequency) is LED-displayed in digital conversion of the control current by A/D converter IC utilizing the current-to-frequency linearity of the YIG-tuned oscillator. Reference level display on the CRT can be selected to input the terminal voltage display or field strength display at the time of connecting an antenna. The voltage converted to the input terminal is determined by the settings of RF. ATT. and IF GAIN (10dB step and 1dB step). The settings are converted to voltages, which are summed at an adder, and the voltage corresponding to the reference level is digitalized by an A/D converter IC and LED-displayed on the CRT. In the case of displaying the reference level in field strength, the antenna coefficient of the antenna being used is compensated to the input terminal voltage. The voltage corresponding to the reception frequency can be obtained through the control current of the YIG-tuned oscillator. It is logarithmically converted and added to the voltage corresponding to the input terminal voltage and then LED-displayed. Composed on board PF130 are Ramp Generator, YIG Driver, Frequency Display Control, Level Display Control and Antenna Coefficient Compensation Circuit for level display.

IC1 and C144 form an integrating circuit which generates ramp waveform. When voltage reaches the upper limit (about 5V), the comparator of IC2 is inverted and triggers a series of sequencial operation to follow.

Ramp signal goes the CRT driver to drive horizontal axis of the CRT. Delivered also to CRT driver is the blanking signal which eliminates fly-back line of the CRT. The ramp signal to the attenuator of the front panel **DISPERSION/DIV.** is attenuated by the divider corresponding to the setting of **DISPERSION/DIV.** and is led again to the ramp board. This signal is then supplied through the buffer amplifier of IC3 to the adder of IC4 together with sweep signal to control-sweep the center frequency of the YIG tuned oscillator. The output of IC4 is amplified by the current amplifier of Q26 and Q27 and drives the coil of the YIG-tuned oscillator. Supplied to the oscillation section of YIG-tuned oscillator are −5V from −15V line through three-terminal regulator and also +12V from +15V line through R131. The

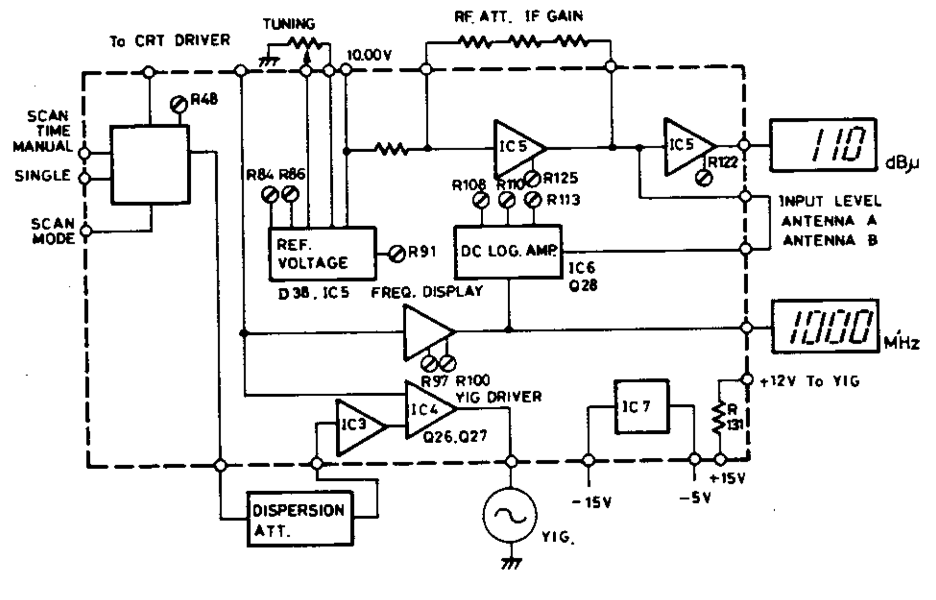


Fig. 5-7 RAMP GENERATOR & YIG DRIVER Section Descriptive Diagram

control voltage for sweep center frequency as obtained by **TUNING** potentiometer goes through the buffer amplifier of IC6 and the display drive circuit to the frequency display circuit.

The resistors (1kΩ and 100Ω) composed to RF. ATT. (10dB steps) and IF GAIN (10dB step and 1dB steps) are connected in series and inserted to IC5-feed back circuit. The output voltage generated in accordance with the resistance is sent to the level display circuit after getting an offset at the IC5-buffer.

If the front panel **REFERENCE LEVEL** is set to **FIELD STRENGTH**, the same voltage as applied to the frequency display is sent to DC LOG. AMP. composed of Q28 and IC6. The log-converted Output voltage for the frequency in LOG. AMP. is the antenna compensation coefficient which is added to the aforementioned level display circuit. The displays of frequency and level are **1000** MHz and **100**dBμ respectively in the case the input is 1000V based on the reference voltage (TP1) of 10.00V. (Refer to Para 5-3-9).

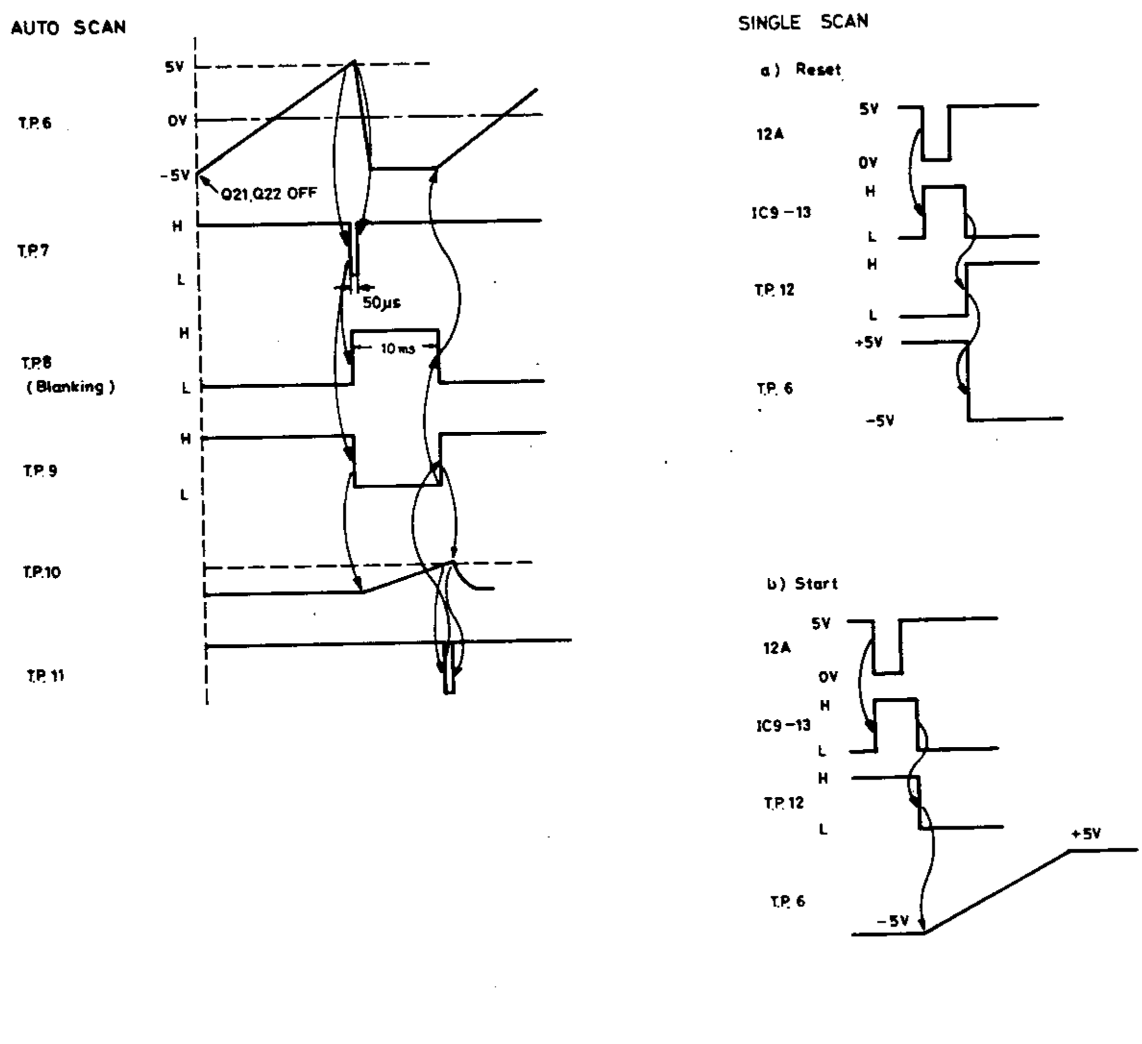


Fig. 5-8 Timing Chart in AUTO and SINGLE SCAN Modes

5-3-8 CRT DRIVER Section

The CRT DRIVER consists mainly of differential amplifiers for deflecting bright dots in the X-axis and Y-axis directions respectively, a circuit for setting grid bias voltage of CRT, a 170V regulator and a video filter.

The ramp voltage supplied from RAMP GENERATOR is amplified by the differential amplifier of Q11 to Q14 and then sent to X^+ and X^- terminals of CRT respectively.

The signal from LOG. AMP. is supplied to the amplifier of IC1 where its vertical level is switched by the vertical switching circuit of Q27 and Q28 in accordance with the setting of the front panel **10dB/DIV., 5dB/DIV., LINEAR** switch. This switching circuit is designed so that amplification of IC1 becomes twice for **5dB/DIV.,** as compared with the setting of **10dB/DIV.** and **LINEAR** to effect vertical display giving an offset by Q28.

The signal goes further through VIDEO FILTER to another differential amplifier of Q15 to Q21, where it is amplified and is sent to both Y^+ and Y^- terminals of CRT. The same signal, in the meantime passes through Q29 and is, being Y-out, the front panel **PHONE** output via the amplifier of Q30 and Q31.

Q23 to Q26 compose a voltage regulator which adjust to 170 volts through R85. R86 is to adjust **ASTIGMATISM** and is semifixed for the best effect.

5-3-9 DISPLAY Section

Both frequency and level display sections are composed of Board SG231 with LED and Board SZ441 with A/D converter IC respectively. When an analog signal of 1.000V is input in addition to the fixed reference voltage of 10.00V supplied to Board SZ441 from Ramp Generator and YIG Driver Section, the frequency section displays a digital output of **1000**, while the level section indicates **100** blanking the least significant digit.

Both display sections are arranged for easy-to-read display owing to sampling time constant adjustable by R21 and R25 respectively.

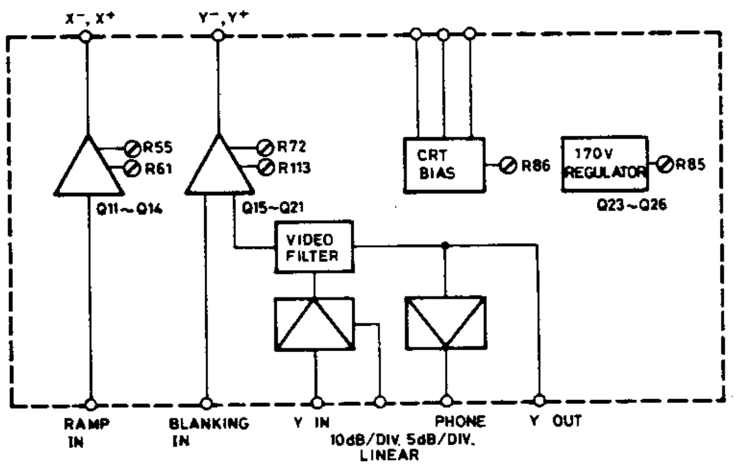


Fig. 5-9 CRT DRIVER Section Descriptive Diagram

5-3-10 CALIBRATION OSCILLATOR Section

The Calibration Oscillator is a LC Colpitts type and is output at the front panel CAL. OUT. connector. The frequency and the level are adjustable by variable inductance L25 and resistor R16 respectively.
The output is with frequency of 100MHz ± 200kHz and level of 80dBμ ± 0.5dB.

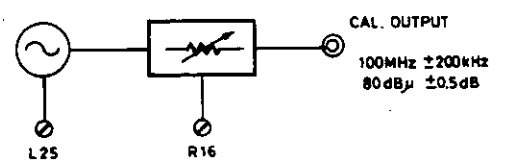


Fig. 5-10 CAL. OSC. Section Descriptive Diagram

5-3-11 High Voltage Section

This circuit supplies high voltage necessary for driving CRT. Secondary voltage which is induced by the primary circuit oscillating at about 35kHz is rectified in voltage multifying and a −2.0kV cathode voltage is supplied. Also produced in this circuit are the voltages for **FOCUS**, grid and heater.

MEMO

SECTION 6
TROUBLESHOOTING

6-1 Description

This section intends to trace trouble shooting for **TR4132** or **TR4132N** Spectrum Analyzer in conjunction with respective flow-chart.

It is requested to use the instrument after Performance Check and Calibration Adjustments have been performed whenever a repair is made resulting from defective operation.

The reference numbers and simbols of the parts etc., specified in this section are identical to those as imprinted or marked on the circuit boards and diagrams.

Table 6-2 Tools for Trouble Shooting

	Item	Stock No.	Note
1	BNC-BNC Cable	MI-02	(for TR4132)
2	BNC-BNC Cable	MO-15	(for TR4132N)
3	BNC-SMA Cable	MC-37	
4	BNC-UM Cable	MC-36	
5	N(J)-BNC(P) Adapter		UG-349/U
6	N(P)-BNC(J) Adapter	TR1613	JUG-201A/U (for TR4132)
7	UM(J)-UM(J) Adapter		UM-QA-JJ
8	Adjusting Plain Board	CZ570	22-pin, double

Note: See Page 7-7 for details.

6-2 Preparations and Precautions for Trouble Shooting

6-2-1 The equipment and tools necessary for trouble shooting are listed in [Table 6-1] and [Table 6-2]. The equipment must have equivalent or better performance ratings than those in the table.

Table 6-1 Equipment for Trouble Shooting

	Equipment	Performance ratings	Recommendation
1	Signal Generator	Frequency: 1MHz to 500MHz Frequency accuracy: Within ± 1% Output level: 117 dBμ Output impedance: 50 Ω Output level flatness: Within ± 0.5dB Noise sideband: −140dB away from 200kHz carrier	
2	Frequency Counter	Frequency: 10Hz to 100MHz Sensitivity: 10mV rms. Stability: 5 x 10^{-8}/day	ADVANTEST **TR5122G**
3	Digital Voltmeter	Range: 0V to ± 1000V Accuracy: ± 0.1% Input impedance: ≧ 10MΩ	ADVANTEST **TR6855**
4	DC High Voltage Probe	Range: ±3000V	ADVANTEST **TR1116**
5	Spectrum Analyzer	Frequency range: 100kHz to 1500MHz Sensitivity: −120dBm Resolution: 30Hz to 300kHz	ADVANTEST **TR4110/4113**
6	Oscilloscope	Frequency: DC to 10MHz Sensitivity: 10mV/DIV.	
7	Voltage Probe	Attenuation: 10 : 1 Input impedance: 10MΩ Max. DC voltage: 500V	

6-3 General Precautions

(1) The description on trouble shooting is intended for an experienced measuring equipment service engineer and an electronics engineer, so that the personnel must be qualified to understand the contents.

(2) The instrument must be operated on AC 100V (120V, 200V or 240V as specified) ± 10% and 50Hz/60Hz.

(3) The power cable has 3-pin type plug of which the round pin in the center is for grounding. In the case of using an adapter for 2-pin connection, either the wire from the adapter or the ground terminal **GND** on the rear panel of the instrument must be connected to the earth ground.

(4) Perform the trouble shooting procedure at a place where dust, mechanical vibration and noise have been eliminated.

(5) Set **POWER** to **OFF** whenever checking inside of the instrument and removing or inserting any circuit board.

(6) Pay attention, in using Oscilloscope or Digital Voltmeter, to prevent shorting with neighbouring terminal or lead wire of the parts.

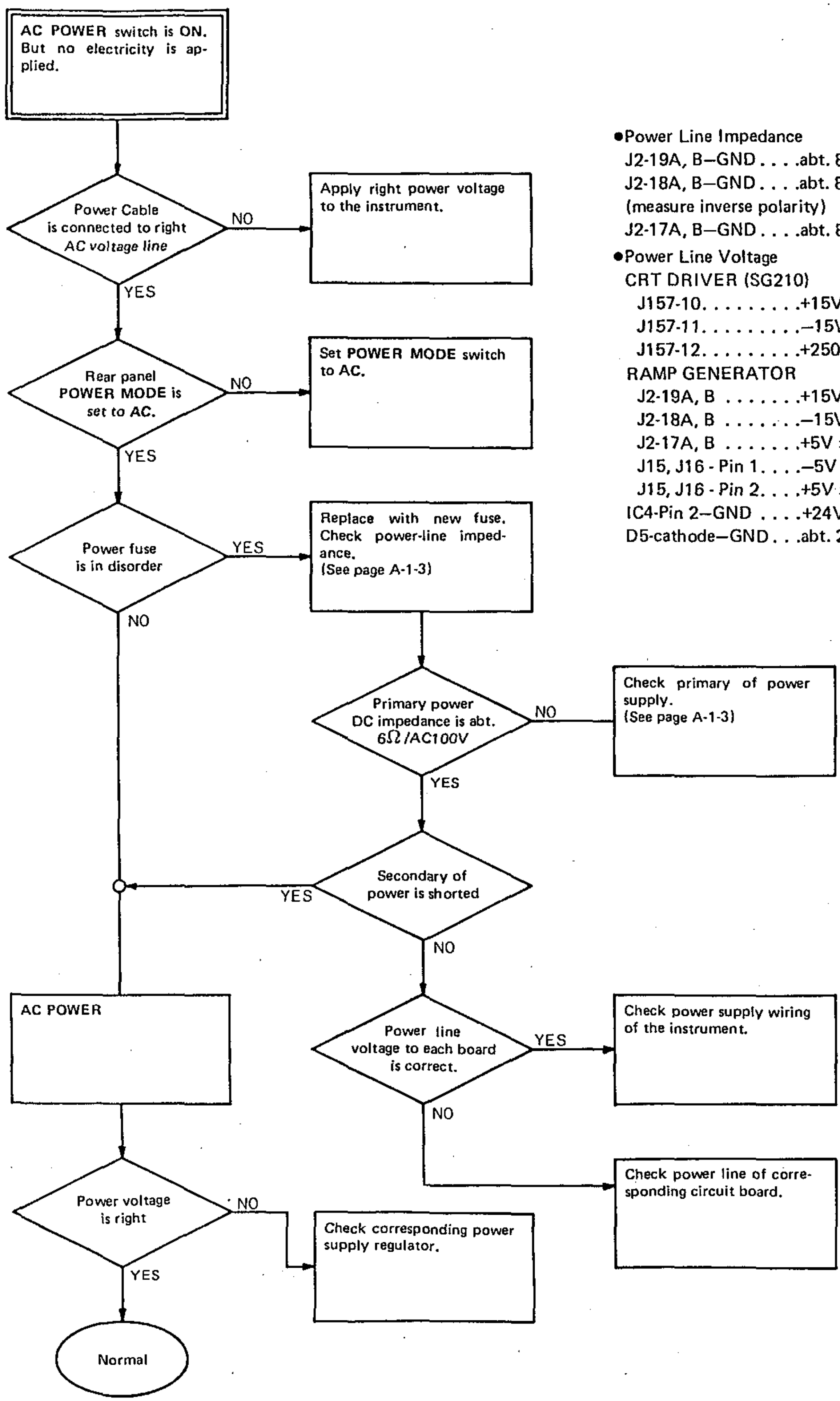
(7) A soldering-iron of 20W to 30W is recommended to replace defective parts on a circuit board. Soldering must be completed in a short time. The parts, especially semiconductors or the printed pattern, may be damaged if the soldering-iron is kept contacting for long.

(8) The replacement parts must be equivalent to the originals with reference to the Parts List herein.

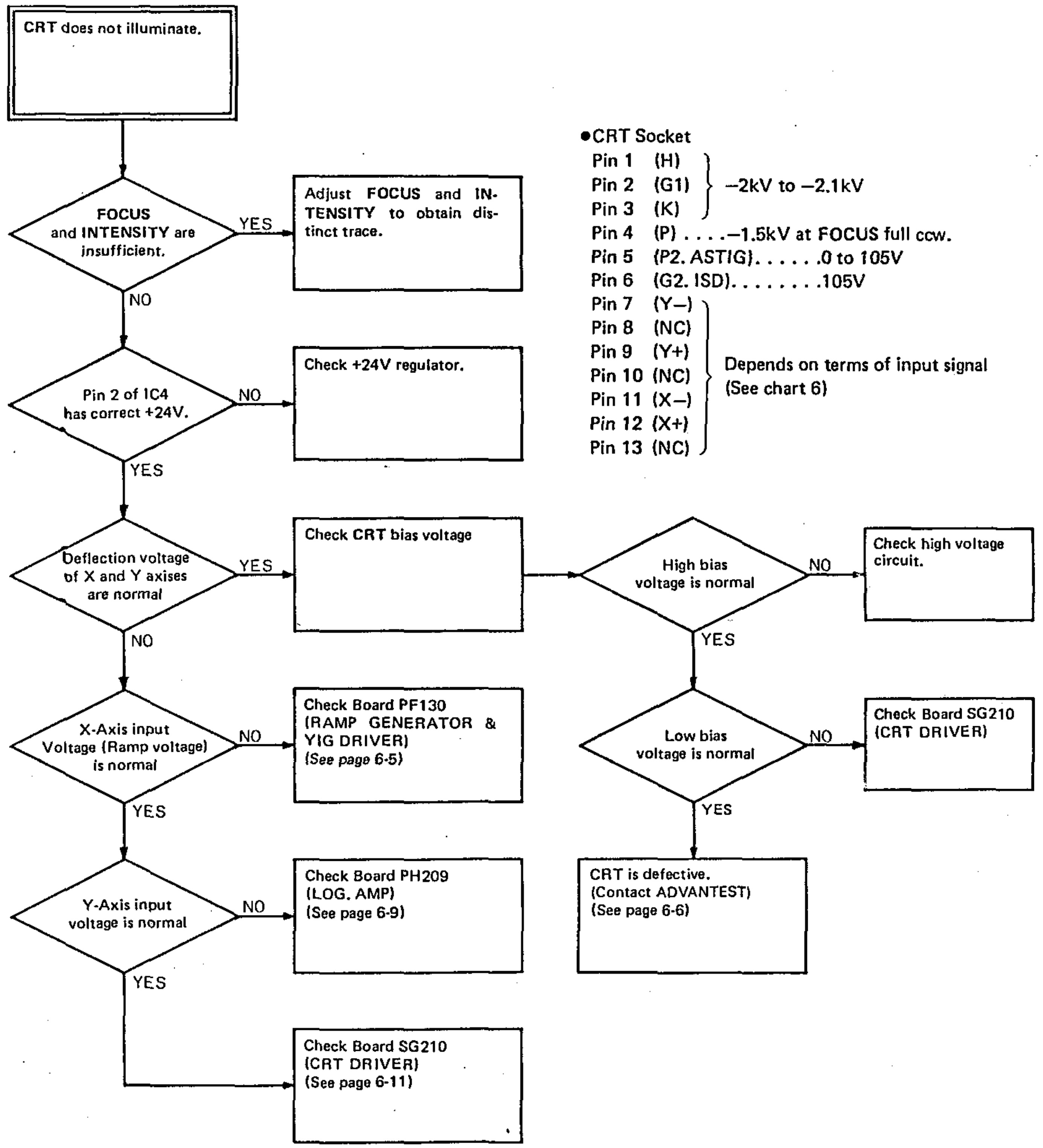
(9) The instrument uses high voltage. Special attention must be paid in trouble shooting of the high voltage block to avoid an electric shock. Leave for more than 5 minutes after **POWER** is set to **OFF** in replacing parts.

(10) In case the RF. block (MEP-262) is defective, the block itself must be replaced. Contact ADVANTEST or its distributor for assistance. The protuberant screw on the RF. block is for adjusting 1153MHz-Band Pass Filter (Cavity) and 2nd Local Oscillator. Do not turn it uselessly.

CHART−1



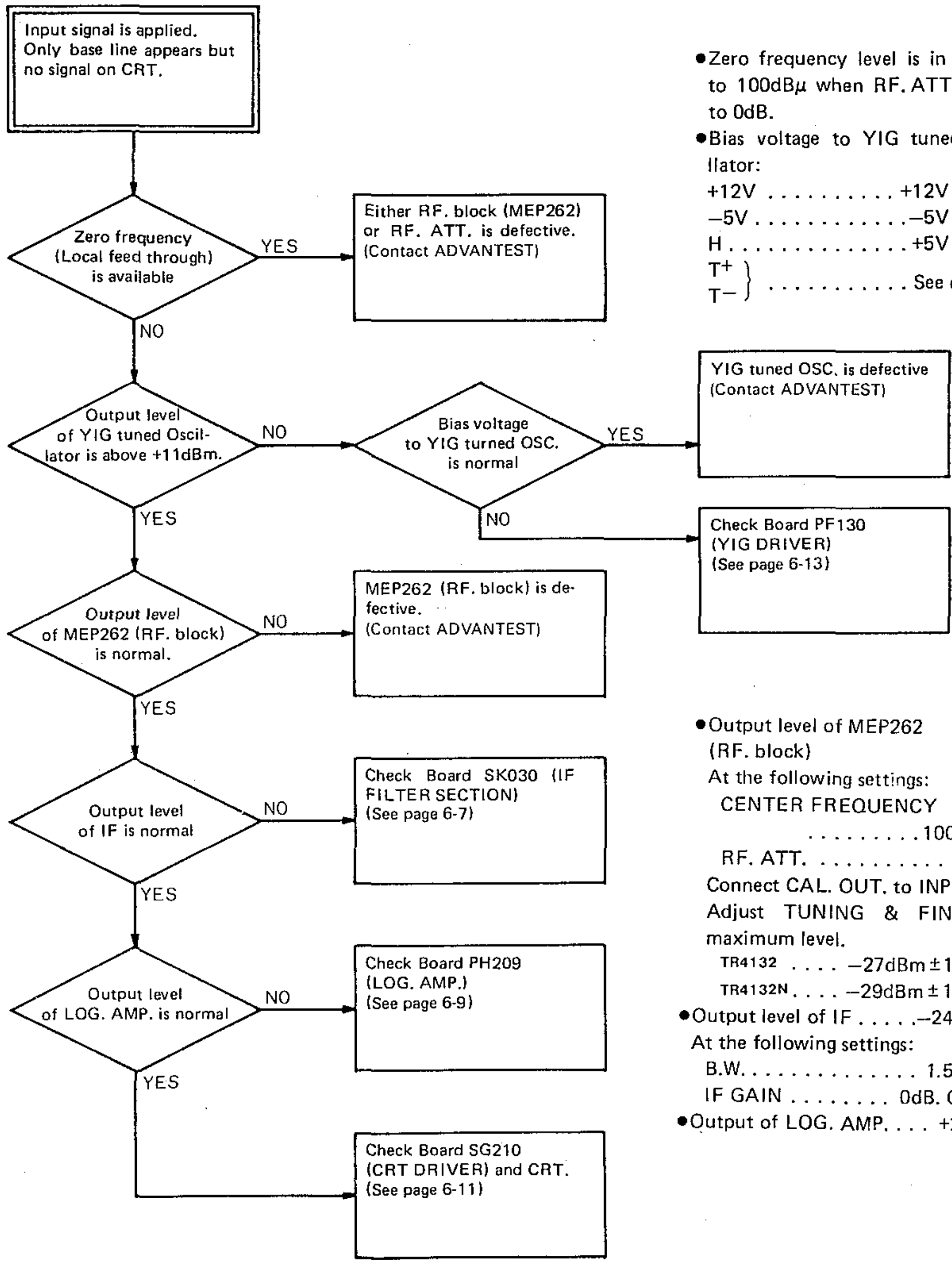
- Power Line Impedance
  - J2-19A, B–GND . . . .abt. 86Ω to 88Ω
  - J2-18A, B–GND . . . .abt. 86Ω to 88Ω
  - (measure inverse polarity)
  - J2-17A, B–GND . . . .abt. 86Ω to 88Ω
- Power Line Voltage
  - CRT DRIVER (SG210)
    - J157-10. . . . .+15V ±0.6V
    - J157-11. . . . .–15V ±0.6V
    - J157-12. . . . .+250V
  - RAMP GENERATOR
    - J2-19A, B . . . .+15V ±0.6V
    - J2-18A, B . . . .–15V ±0.6V
    - J2-17A, B . . . .+5V ±0.2V
    - J15, J16 - Pin 1. . . .–5V ±0.2V
    - J15, J16 - Pin 2. . . .+5V ±0.2V
  - IC4-Pin 2–GND . . . .+24V ±1.2V
  - D5-cathode–GND . . .abt. 250V



- CRT Socket

Pin 1	(H)	–2kV to –2.1kV
Pin 2	(G1)	
Pin 3	(K)	
Pin 4	(P) . . . .–1.5kV at FOCUS full ccw.	
Pin 5	(P2. ASTIG). . . . . .0 to 105V	
Pin 6	(G2. ISD). 105V	
Pin 7	(Y–)	Depends on terms of input signal (See chart 6)
Pin 8	(NC)	
Pin 9	(Y+)	
Pin 10	(NC)	
Pin 11	(X–)	
Pin 12	(X+)	
Pin 13	(NC)	

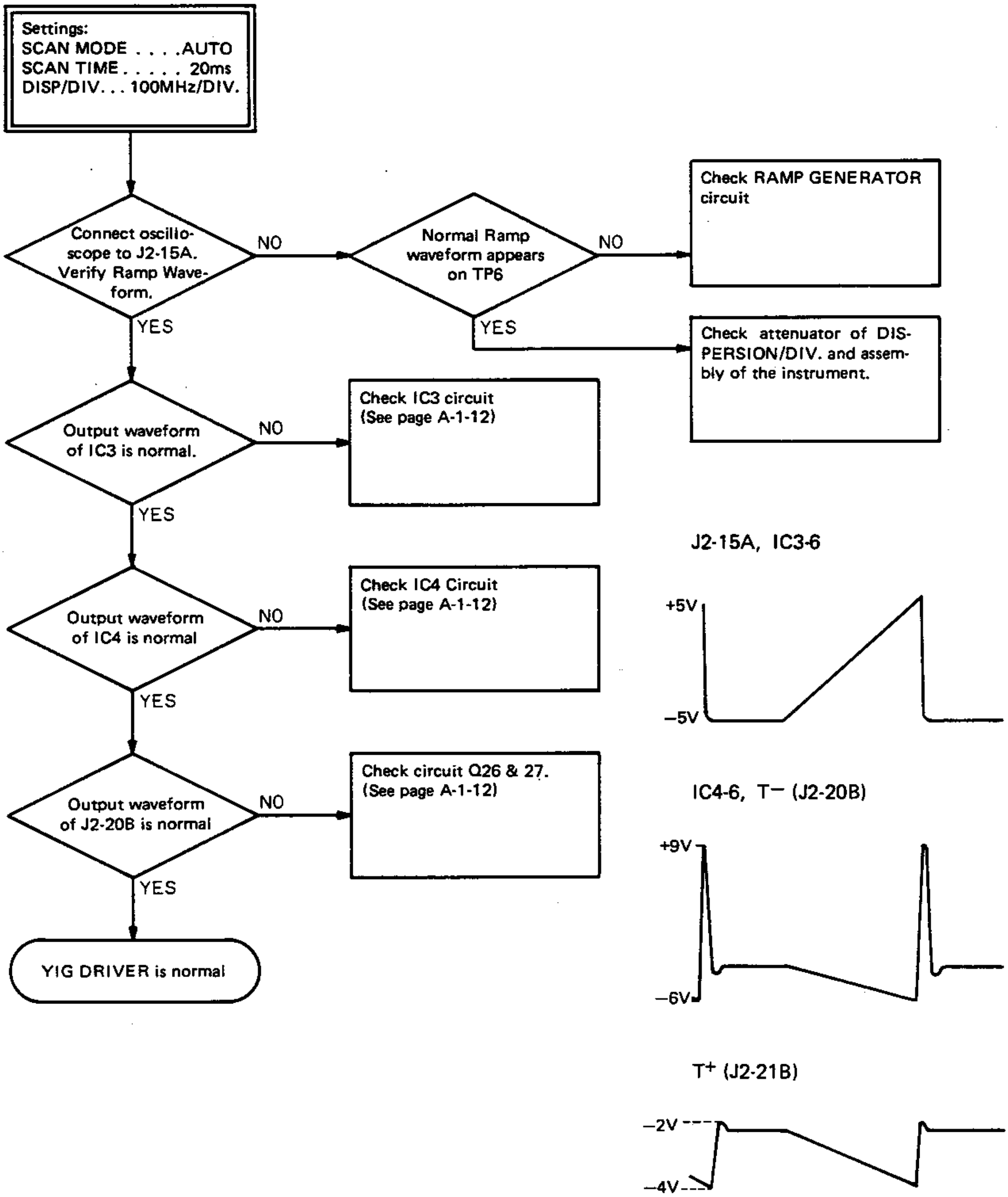
CHART−2



- Zero frequency level is in 90dBμ to 100dBμ when RF. ATT. is set to 0dB.
- Bias voltage to YIG tuned oscillator:
  - +12V . . . . +12V ±0.6V
  - −5V . . . . −5V ± 0.2V
  - H . . . . +5V ±0.6V
  - T+, T− . . . . See chart 3

- Output level of MEP262 (RF. block)
  At the following settings:
  CENTER FREQUENCY 100MHz
  RF. ATT. 0dB
  Connect CAL. OUT. to INPUT.
  Adjust TUNING & FINE for maximum level.
  TR4132 . . . . −27dBm ± 1dBm
  TR4132N . . . . −29dBm ± 1dBm
- Output level of IF . . . . . −24dBm
  At the following settings:
  B.W. 1.5MHz
  IF GAIN . . . . 0dB. CAL.
- Output of LOG. AMP. . . . +2.5V

CHART – 3 (BOARD PF130–RAMP GENERATOR & YIG DRIVER)



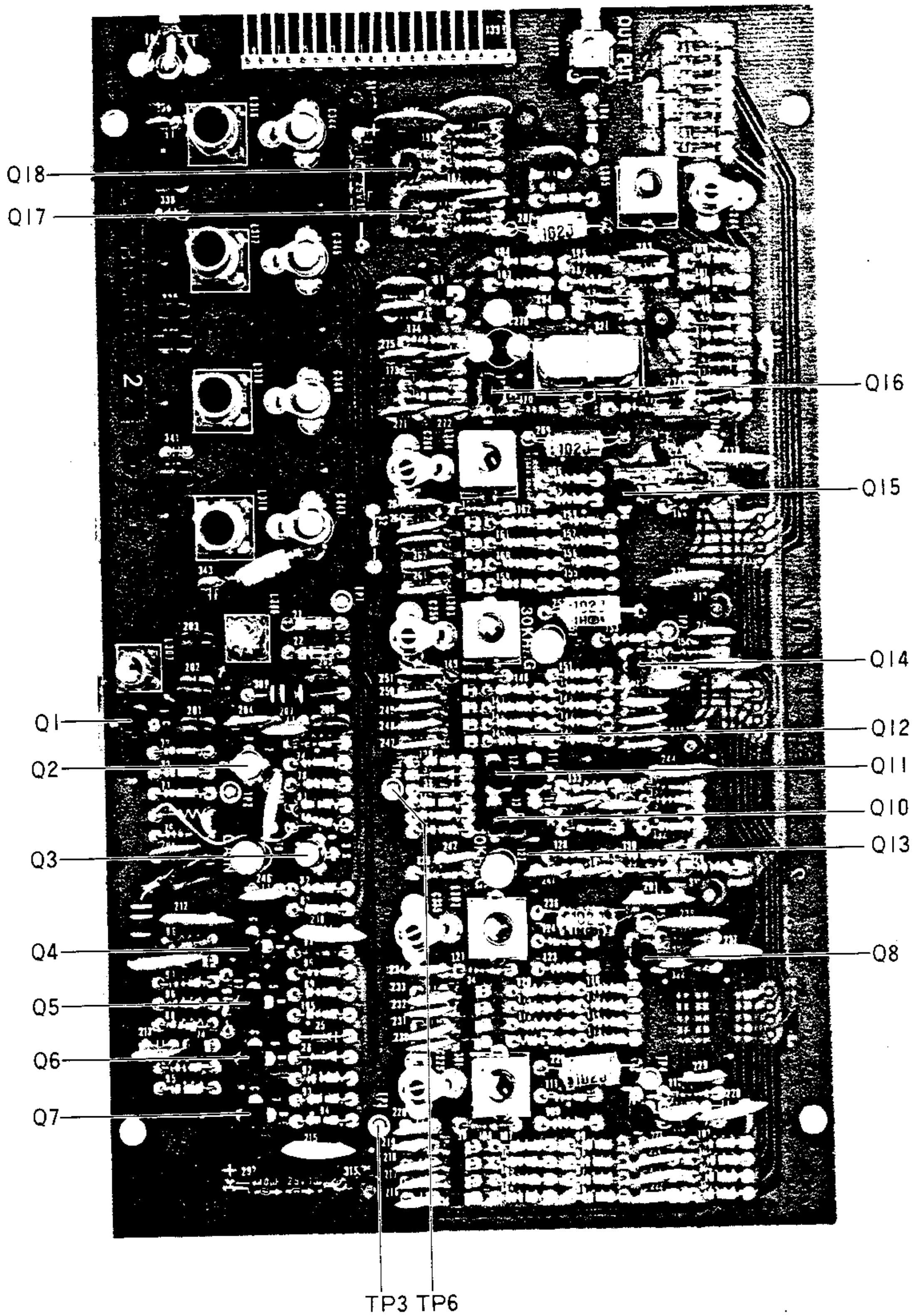
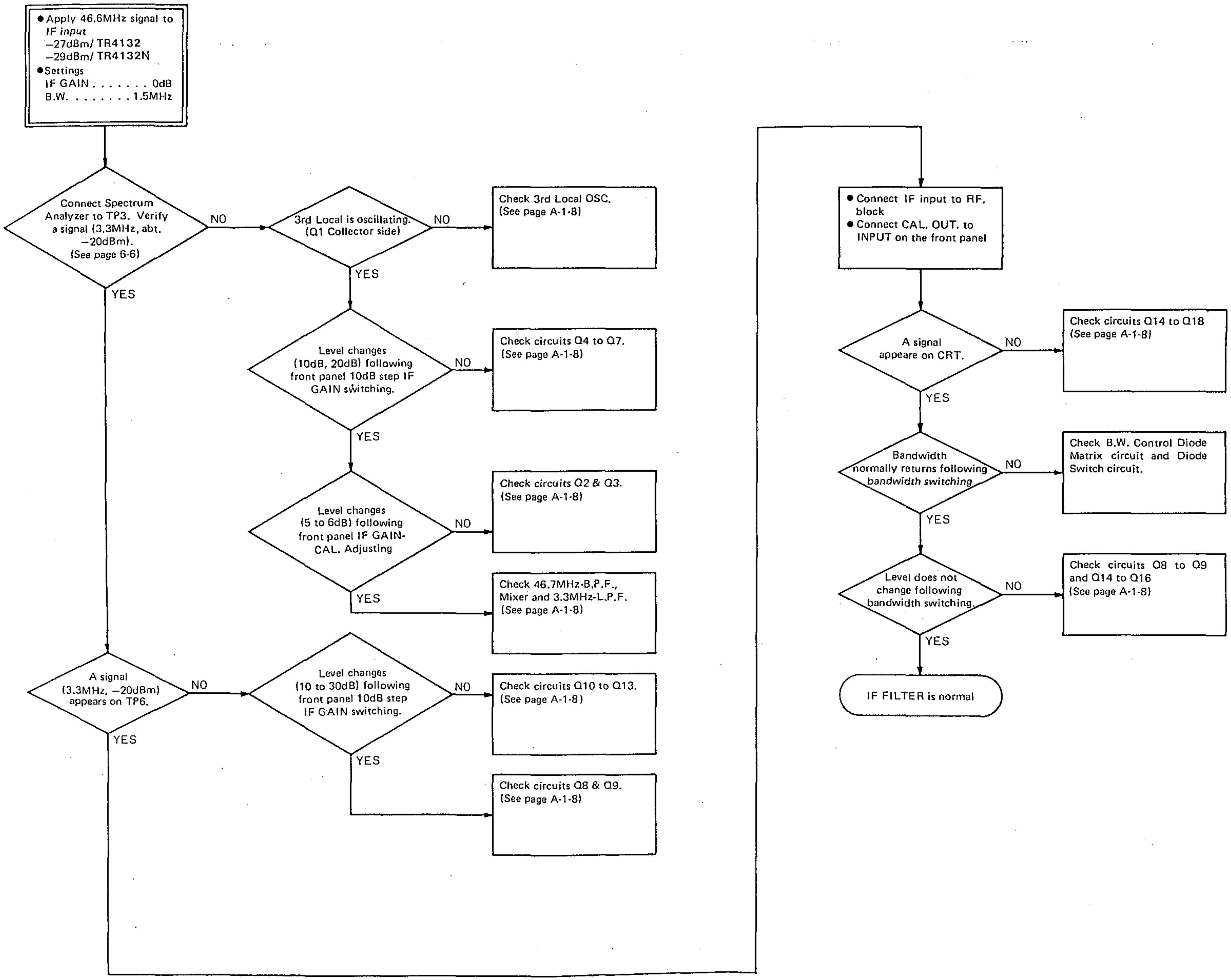


Fig. 6-1 SK030 (IF FILTER) Check Point

CHART—4 (BOARD SK030 IF FILTER)



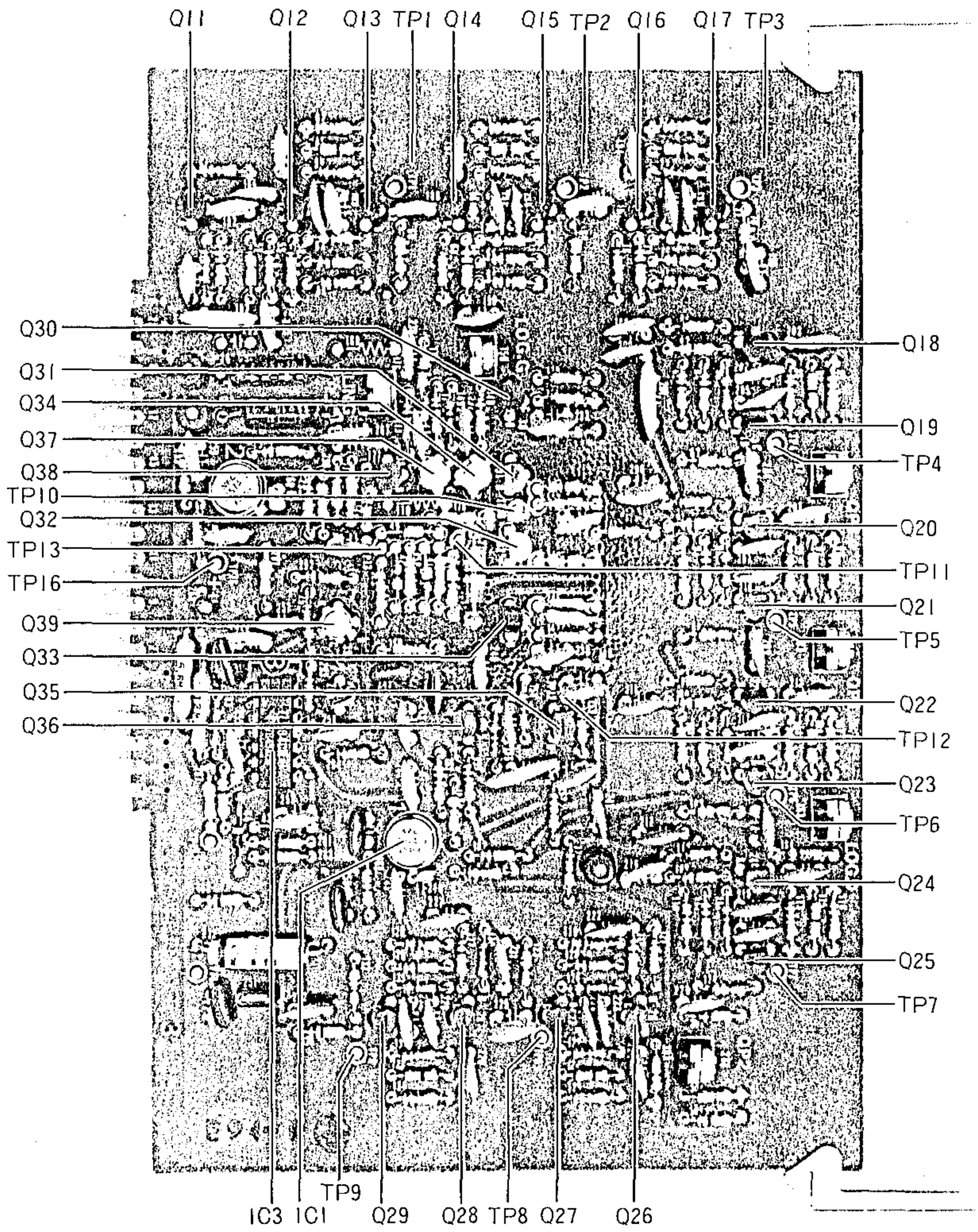


Fig. 6-2 PH209 (LOG. AMP.) Check Point

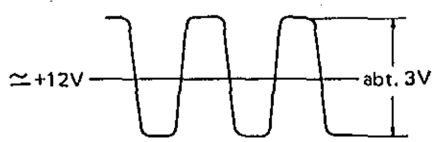
CHART – 5 (BOARD PH209 LOG. AMP.)

Apply a signal (3.3MHz, –30dBm) to LOG. AMP. input.

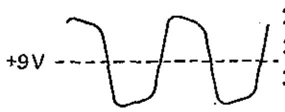
1. Connect Oscilloscope to TP1. Verify that waveform is nomarl.
   - NO → Check circuits Q11, Q12, and Q13. (See page A-1-10/11)
   - YES ↓
2. Connect Oscilloscope to TP2. Verify that waveform is normal
   - NO → Check circuits Q14 & Q15. (See page A-1-10/11)
   - YES ↓
3. Proceed same for TP3 to TP8 and verify normal waveform
   - NO → Proceed to check circuits Q16 to Q27. (See page A-1-10/11)
   - YES ↓
4. Connect Oscilloscope to TP9. Verify normal waveform.
   - NO → Check circuits Q28 & Q29. (See page A-1-10/11)
   - YES ↓
5. Connect Oscilloscope to TP10. Verify normal waveform.
   - NO → Check circuits Q30 to Q33 (See page A-1-10/11)
   - YES ↓
6. Connect Oscilloscope to TP11. Verify normal waveform.
   - NO → Check circuit Q34. (See page A-1-10/11)
   - YES ↓
7. Connect Oscilloscope to TP12. Verify normal waveform
   - NO → Check circuits Q35 & Q36. (See page A-1-10/11)
   - YES ↓
8. Connect Oscilloscope to TP13. Verify normal waveform.
   - NO → Check detection circuits D41 & D42. (See page A-1-10/11)
   - YES ↓
9. Connect Digital Voltmeter to TP14. Verify normal voltage
   - NO → Check IC1 and smoothing circuit. (See page A-1-10/11)
   - YES ↓
10. Set front panel DETECTION MODE to Q.P. Apply a signal of –40 dBm.
11. Connect Oscilloscope to TP11. Verify normal waveform.
    - NO → Check circuits Q37 & Q38. (See page A-1-10/11)
    - YES ↓
12. Connect Digital Voltmeter to TP15. Verify normal voltage
    - NO → Check circuit IC3. (See page A-1-10/11)
    - YES ↓
13. Connect Digital Voltmeter to TP16. Verify normal voltage
    - NO → Check circuits IC3 & Q39. (See page A-1-10/11)
    - YES ↓

LOG. AMP. is normal

- TP1 Normal waveform
  60mVp-p Sine wave
  Offset +12V
- TP2 Normal waveform
  190mVp-p Sine wave
  Offset +12V
- TP3 Normal waveform
  60mVp-p Sine wave
  Offset +12V
- TP4 Normal waveform
  Abt. 2Vp-p Sine wave
  Offset +12V
- TP5 to TP9 Normal waveform

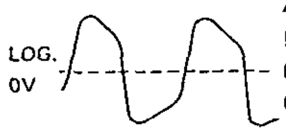


- TP10 Normal waveform



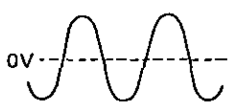
230mVp-p/Input –30dBm
270mVp-p/Input –20dBm
310mVp-p/Input –10dBm
350mVp-p/Input 0dBm

- TP11 Normal waveform



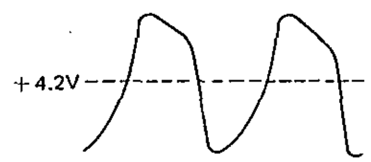
440mVp-p/Input –30dBm
520mVp-p/Input –20dBm
600mVp-p/Input –10dBm
680mVp-p/Input 0dBm

If front panel is set to LIN. or Q.P.: –



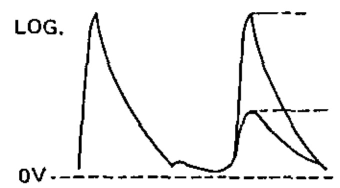
560mVp-p/Input –40dBm
180mVp-p/Input –50dBm
56mVp-p/Input –60dBm

- TP12 Waveform



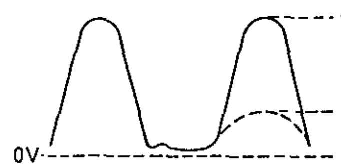
5.8Vp-p/Input –30dBm
6.6Vp-p/Input –20dBm
7.4Vp-p/Input –10dBm
8.0Vp-p/Input 0dBm

- TP13 Waveform



+270mVp-p/Input –30dBm
+120mVp-p/Input –60dBm
+310mVp-p/Input –20dBm
+340mVp-p/Input –10dBm

If front panel is set to LIN. or Q.P.:



+270mVp-p/Input –40dBm
+90mVp-p/Input –50dBm

- TP14 Voltage

Input Signal Level	TP14 Voltage
0dBm	4.0V
–10dBm	3.5V
–20dBm	3.0V
–30dBm	2.5V
–40dBm	2.0V
–50dBm	1.5V
–60dBm	1.0V
–70dBm	0.5V
–80dBm	0V

- TP15 Voltage (when set to Q.P.)

Input Signal Level	TP15 Voltage
–40dBm	4.0V
–50dBm	1.3V
–60dBm	0.4V
–70dBm	0.13V
–80dBm	0.04V

- TP16 Voltage (when set to Q.P.)

Input Signal Level	TP16 Voltage
–40dBm	4.0V
–50dBm	3.5V
–60dBm	3.0V
–70dBm	2.5V
–80dBm	2.0V

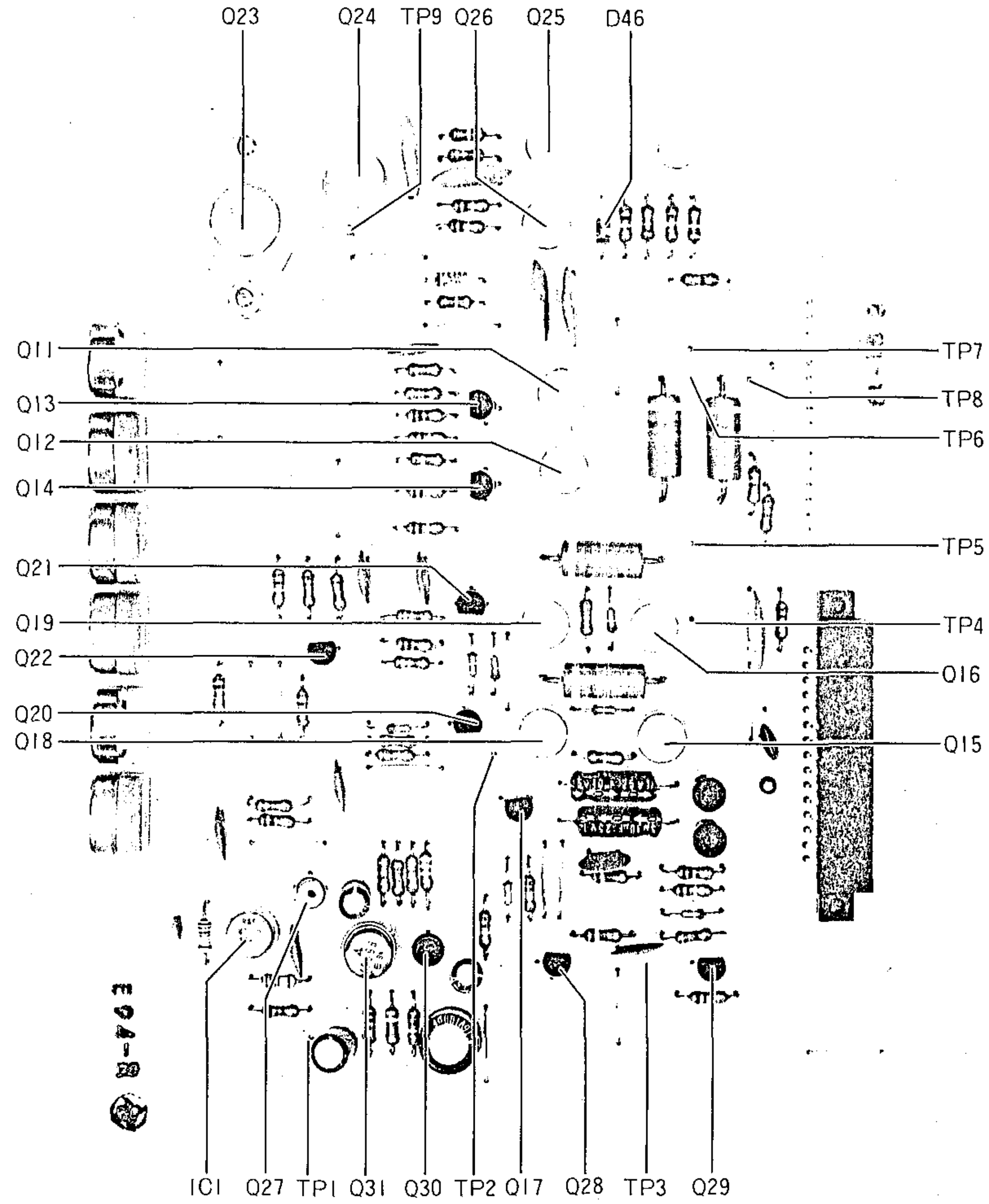
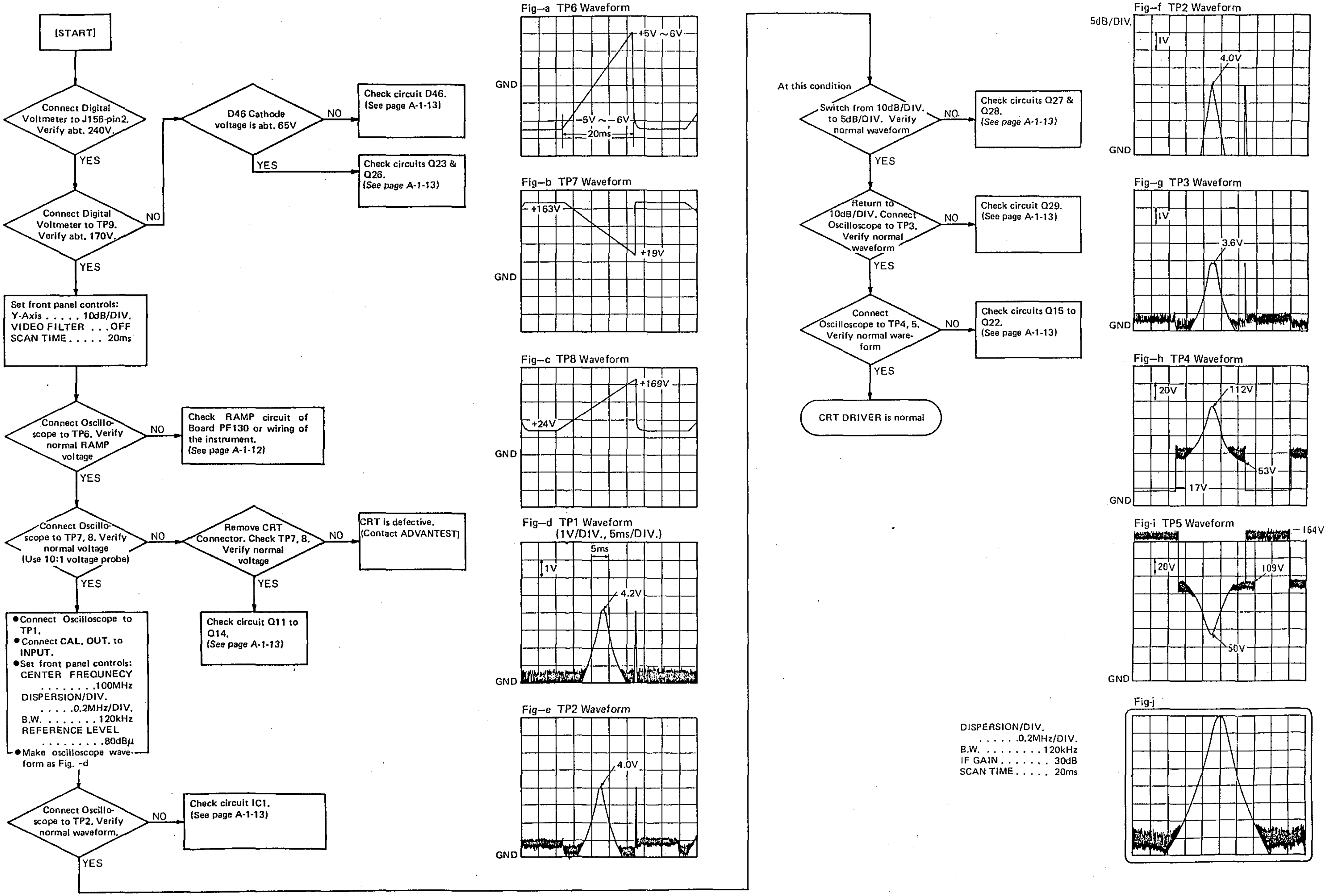


Fig. 6-3 SG210 (CRT DRIVER) Check Point

CHART – 6 (BOARD SG210 CRT DRIVER)



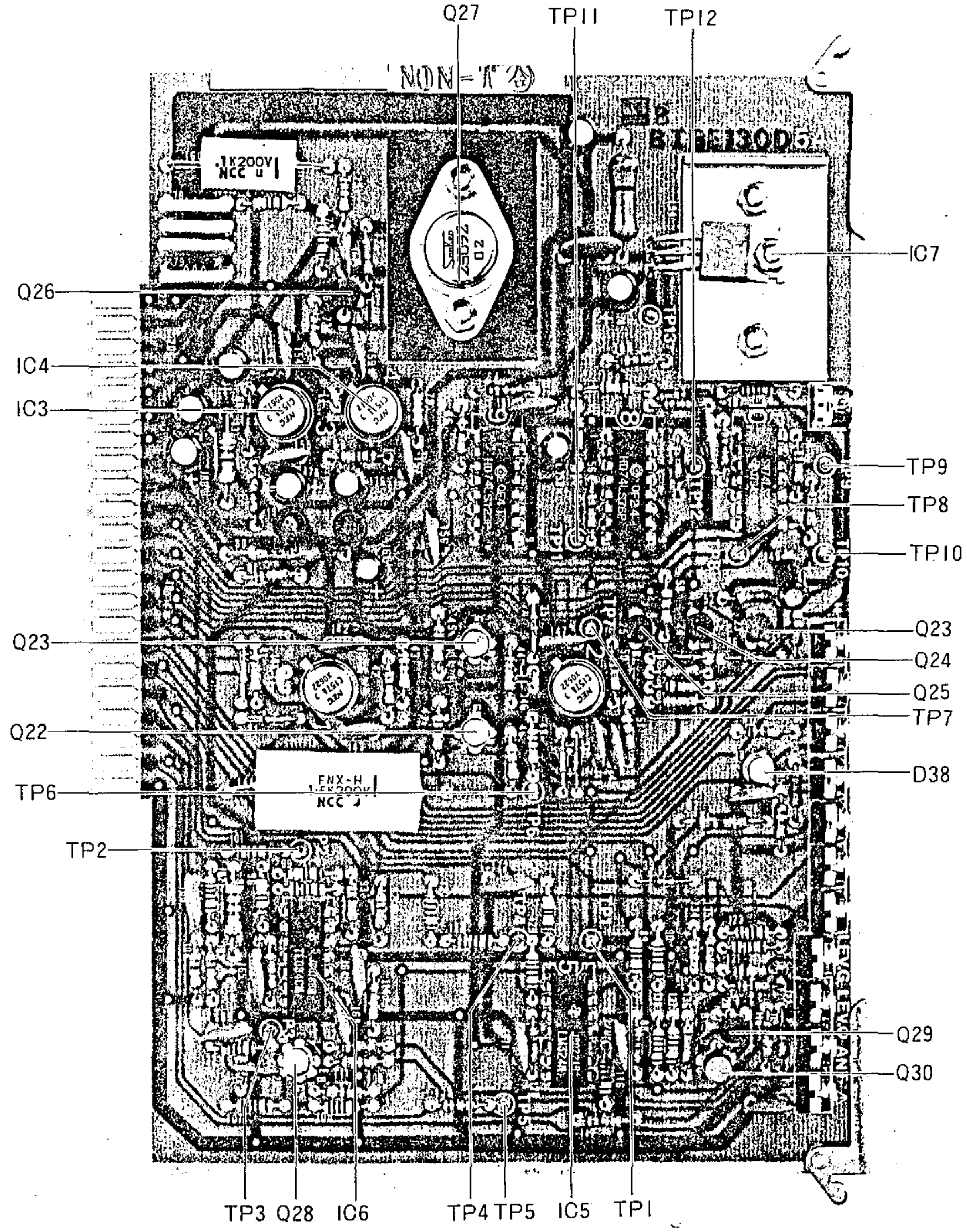
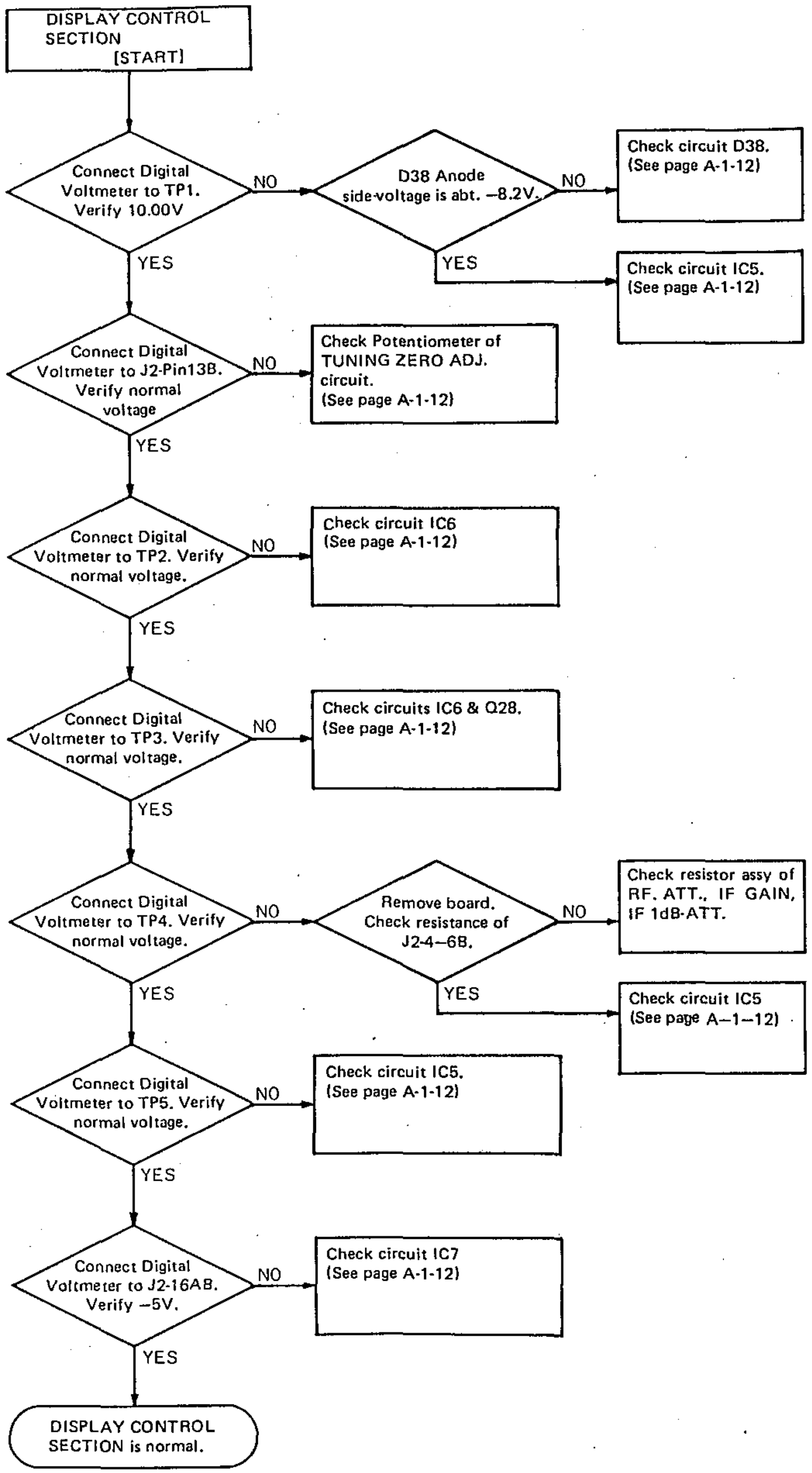


Fig. 6-4 PF130 (RAMP GENERATOR & YIG DRIVER) Check Point

CHART–7 (BOARD PF130 RAMP GENERATOR, YIG DRIVER & DISPLAY CONTROL)



●TP1	+10.00V DC			
●J2-13B	TUNING full ccw*1	abt. –2.7V	*1 ccw: counter clockwise	
	TUNING full cw*2	abt. –5.8V	*2 cw: clockwise	
●TP2	TUNING full ccw	abt. –1V		
	TUNING full cw	abt. +11V		

●TP3 At the neighbour of CENTER FREQUENCY 0MHz, rapidly changes in abt. +8V to abt. +1V. Thereafter becomes 0.0V at 34MHz (TR4132) or 43MHz (TR4132N). And Indicates –1.55V (TR4132)or –1.45V(TR4132N)at 1000MHz. *When switching front panel control from* ANT. A to ANT. B, it shows 0.25V (both TR4132 & TR4132N).

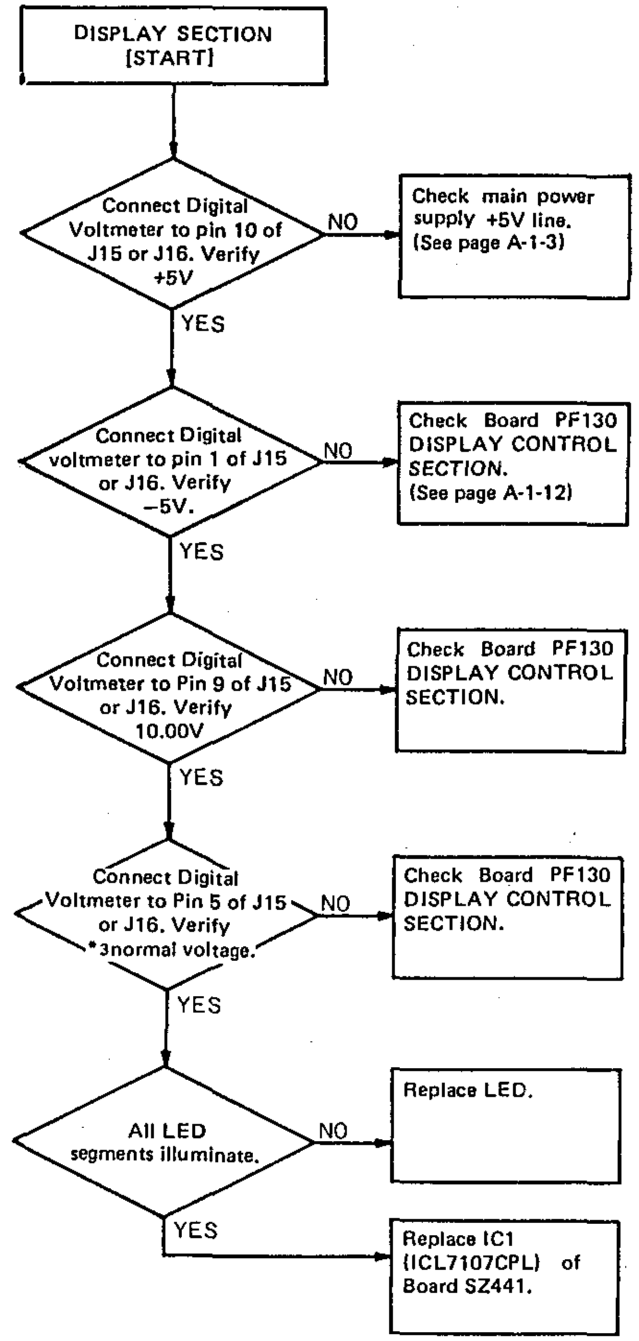
●TP4

REF. LEVEL	TP4 Voltage
80dBμ	–4.0V
90dBμ	–4.5V
100dBμ	–5.0V
110dBμ	–5.5V
120dBμ	–6.0V
130dBμ	–6.5V
140dBμ	–7.0V
150dBμ	–7.5V

*Front panel settings:
RF. ATT 0dB
IF GAIN . . . . . 0dB, CAL.
REFERENCE LEVEL . . . . . INPUT LEVEL

●TP5 *Corresponde* to REFERENCE LEVEL display at 1 : 1.
Displaying 100 . . . . 1.00V
Displaying 110 . . . . 1.10V

Where fluctuation of about o.01V is unavoidable due to tolerance of resistor on Board SZ441.



*3. *Outputs the voltage corresponding to REFERENCE LEVEL* display at 1 : 1 same as TP5.

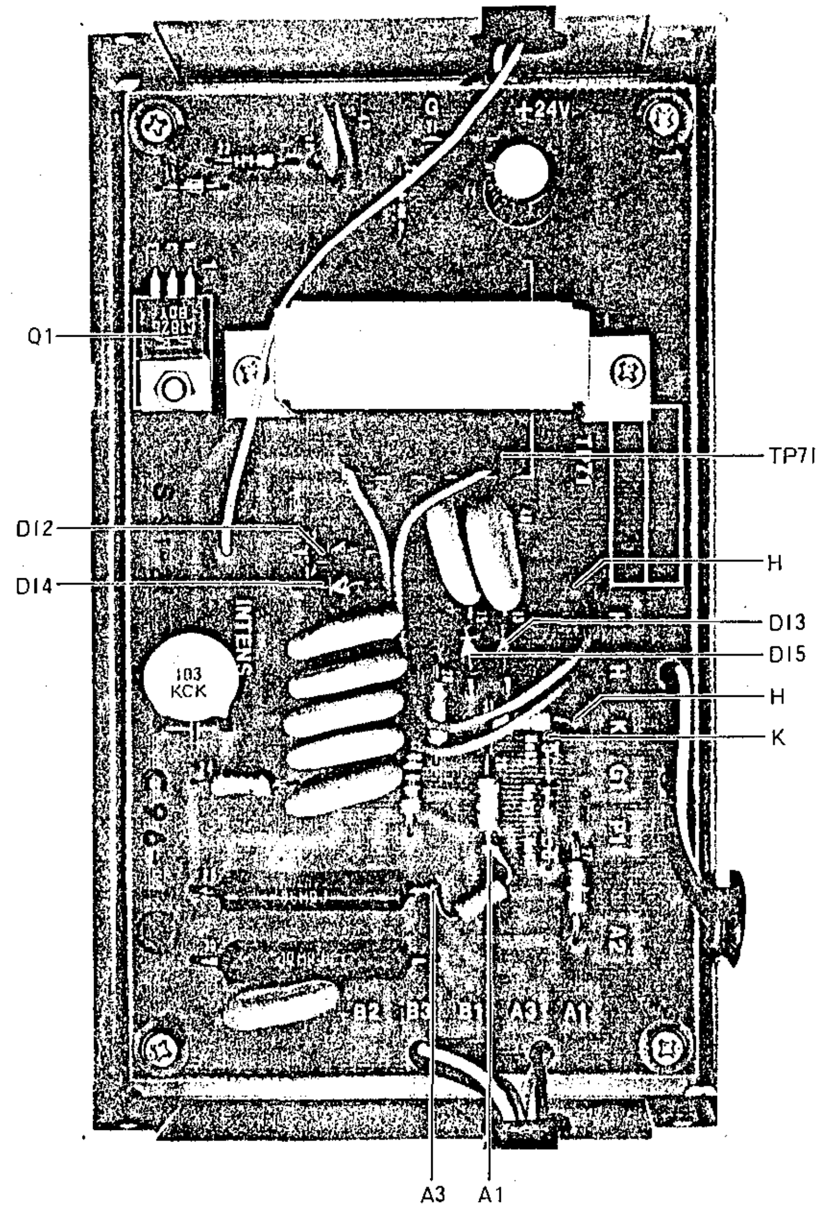
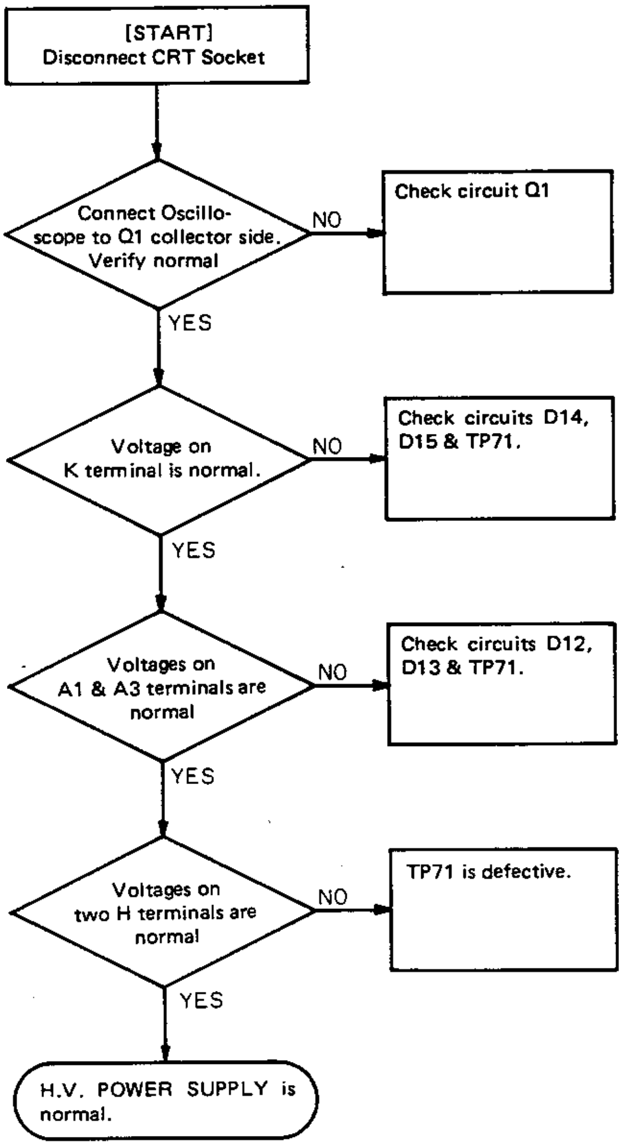
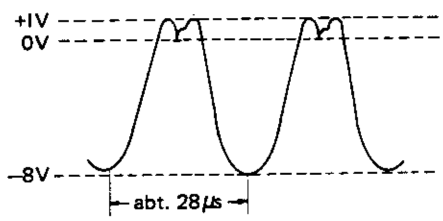


Fig. 6-5 MEP265 (H.V. POWER SUPPLY) Check Point

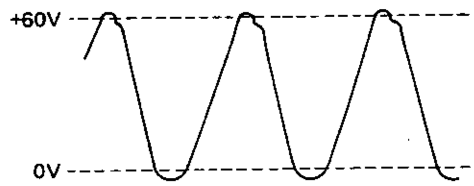
CHART—8 (BOARD MEP265 H. V. POWER SUPPLY)



●Q1 Base Voltage



●Q1 Collector Voltage



●K terminal voltage	abt. –2kV
●A1 terminal voltage	abt. –2.1kV
●A3 terminal voltage	abt. –2kV
●H terminal voltage	abt. –2kV

6-4 Replacement of CRT

1) Remove the top and bottom covers.
2) Disconnect the lead wire from CRT coil as shown in [Fig. 6-6].
3) Remove 4 pieces of the screw and the connector for **CRT DRIVER** (SG 210) Board.
4) Remove **CRT** socket ① in [Fig. 6-7].
5) Loosen 4 pieces of the screw for **CRT** band ② in [Fig. 6-7].
6) Loosen the screw ③ in [Fig. 6-7].
7) Remove the front panel **CRT** filter together with the hood.
8) Take out **CRT** pressing the arrow marked part in [Fig. 6-7].
9) Replace with a new **CRT** (Stock No. 140-BMB31) and proceed the mounting in the reverse order of dismounting as above.
10) Perform adjustment of **CRT DRIVER** in accordance with Section 4, Paragraph 4-3.
11) Mount the top and bottom covers after the adjustments.

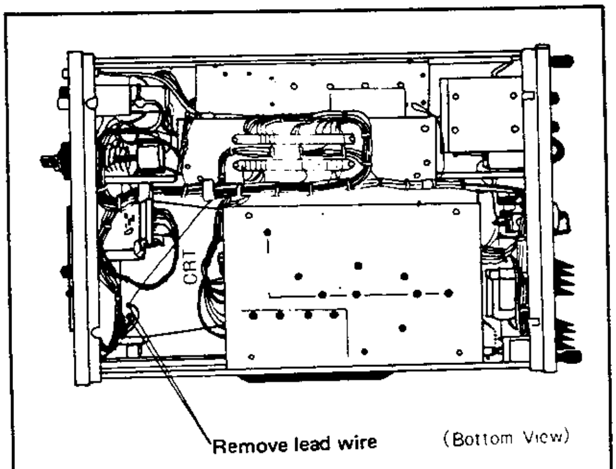


Fig. 6-6 CRT Replacement

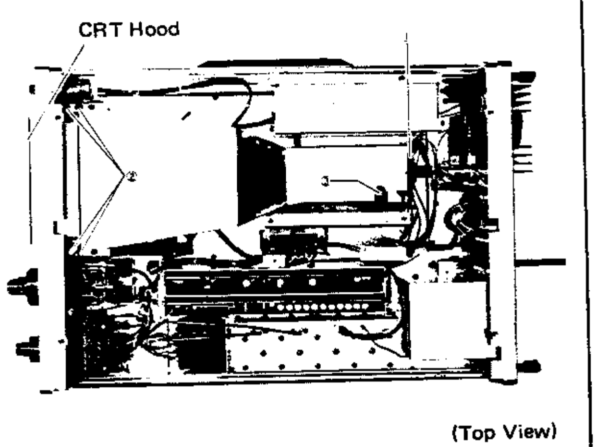


Fig. 6-7 CRT Replacement

6-5 Replacement of YIG Tuned Oscillator

1) Remove the four screws ⓐ with which the **YIG** tuned oscillator is secured. Then loosen the two screws ⓑ to remove the TOP-1100. Note the connectors' position for alignment on replacement.
2) Disconnect the lead wire connected to each terminal of **YIG TUNED OSC.**
3) Replace with a new **YIG** (Stock No. TOP-1100) and proceed remounting in the reverse order of above procedure.
4) After the mounting, perform checks referring to the following paragraphs of this Manual.

Section 3	Para 3-4-10	Para 3-4-12
Section 4	Para 4-6-2	Para 4-6-3
	Para 4-6-4	Para 4-6-5

6-6 Replacement of RF. Block

1) A new RF. block (Stock No. MEP-262) must be secured from the factory in case of failure of any part of the block.
2) In removing **RF. block**, loosen 4 pieces of the screw ③ in [Fig. 6-9].
3) After the remounting, perform checks in reference to Section 4 Paragraph 4-8.

CAUTION

Do not carelessly rotate the screw projected on the **RF. block**, which is for adjusting 1153MHz B.P.F. (Cavity) and 2nd LO. OSC.

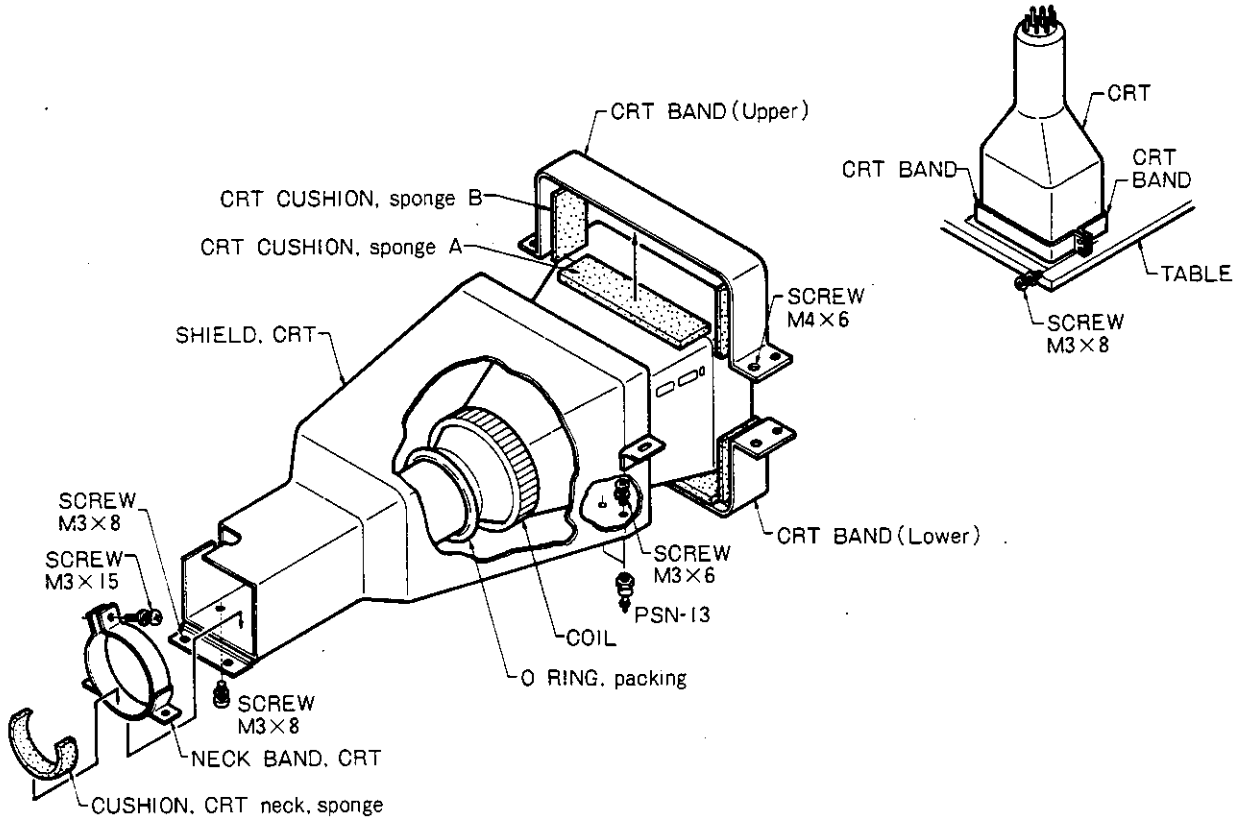


Fig. 6-8 CRT Assembly Diagram

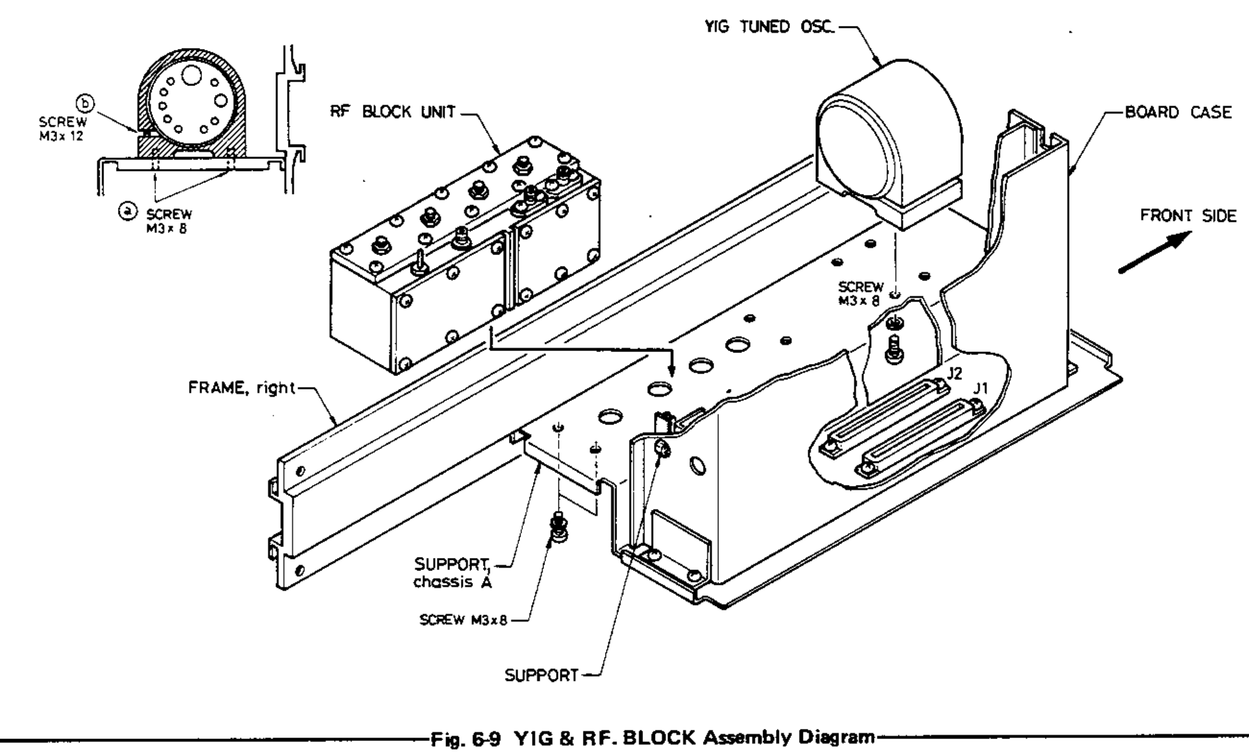


Fig. 6-9 YIG & RF. BLOCK Assembly Diagram

6-7 Digital Memory Adjustments

6-7-1 Preparations for Adjustments

The X, Y, and Z axis signals and AC power for the **TR1604** Digital Memory are supplied by the **TR4132/4132N** Spectrum Analyzers.

Loosen 4 pieces of the screw shown in [Fig. 6-10] and remove the **TR1604** from the **TR4132/4132N** mainframe.

On the **TR1604** circuit board are jumper wires for **TR4132/4132N** and **TR4120**.

Check that the jumper wires for the **TR4120** are disconnected. The locations of the jumper wires are shown in [Fig. 6-11].

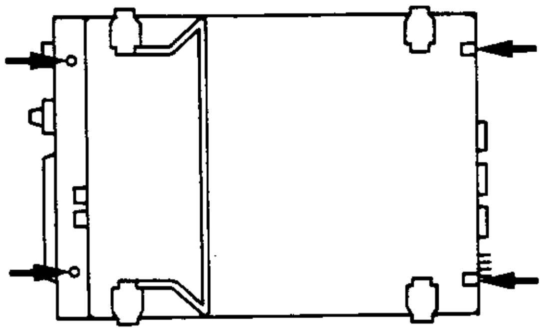


Fig. 6-10 TR1604 Removal

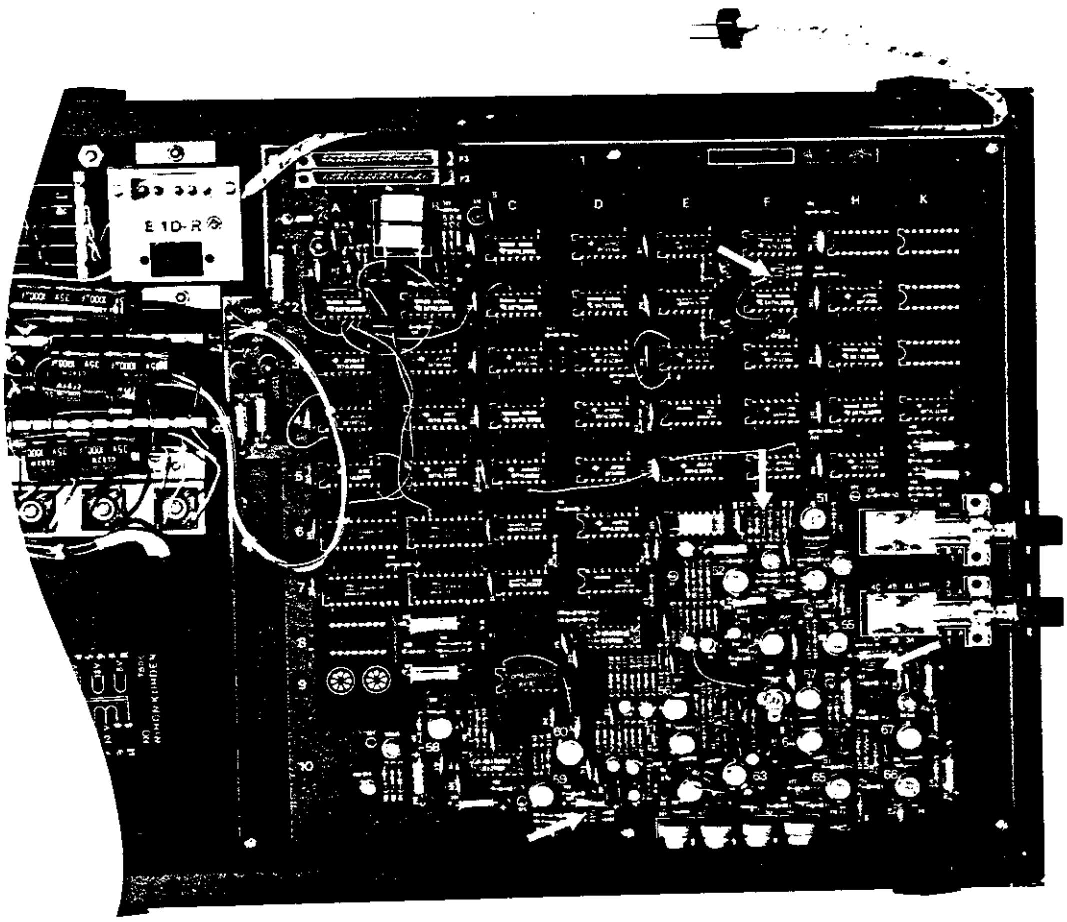


Fig. 6-11 Jumper Wire Locations

6-7-2 Check before Power On

Disconnect cable connectors from Power Source Connector P1 and Signal Connector P2, and check impedances across each pin of the connectors.

(1) Check impedances across power source pins and the ground pin of Connector P1 against the following specifications:

P1-1 (GND)	0Ω
P1-2 (+5V)	Approx. 4.7kΩ
P1-3 (+15V)	Approx. 5.9kΩ
P1-4 (−15V)	Approx. 6.0kΩ

(2) Check impedances across each signal pin and the ground pin of Connector P2. The pin assignments are shown below:

P2-3	Y OUT.
P2-5	Y'' IN.
P2-7	X OUT.
P2-9	X' IN.
P2-11	Z OUT.
P2-13	Z'' IN.

6-7-3 Power Source Voltages

(1) Set the **MEMORY** switch on the **TR1604** and the **POWER** switch on the **TR4132/4132N** to **OFF**. Disconnect the cable connector from Connector P1 on the **TR1604.**

(2) Connect the AC Power Cable J1 to the **TR4132/4132N,** and then turn the **TR4132/4132N POWER** switch to **ON**.

(3) Check the power source voltages at each pin of Connector P1 aginst the followings:

P1-1	+15V ±0.6V
P1-2	+5V ±0.2V
P1-3	GND
P1-4	−15V ±0.6V

Check the power source voltages at each pin of Terminal Block J9 against the followings:

A	GND
B	Approx. +9.9V
C	Approx. +24.6V
D	Approx. −14.8V
E	Approx. +9.2V

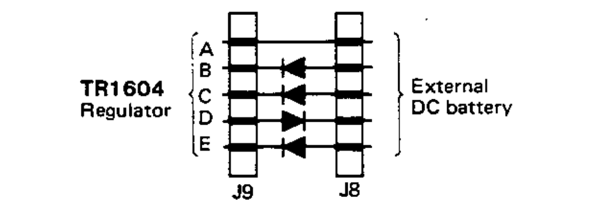


Fig. 6-12 Power Source Voltage Measurement

6-7-4 Timing Generator Check

(1) Set the **TR4132/4132N POWER** switch and the **TR1604 MEMORY** switch to **OFF**, and then connect the Connector P1 to the **TR1604** circuit board. And turn the **TR4132/4132N POWER** switch to **ON**.

(2) Check the 1MHz clock and Clocks ① through ⑨. See Fig. 6-13.

6-7-5 X Axis Adjustment

(1) Set the **TR4132/4132N POWER** switch to **OFF**. Connect the **TR1604** Connector P2 to the **TR4132/4132N** Connector J23 with the supplied cable. Check that Slide Switch S10 on the connector panel of the **TR4132/4132N** is set to the **TR1604** side.

After the **TR1604 MEMORY** switch is set to **ON**, turn the **TR4132/4132N POWER** switch **ON**.

(2) Check that the ramp signal (X' IN.) as shown in Fig. 6-14 is observed at Pin 9 of Connector P2.

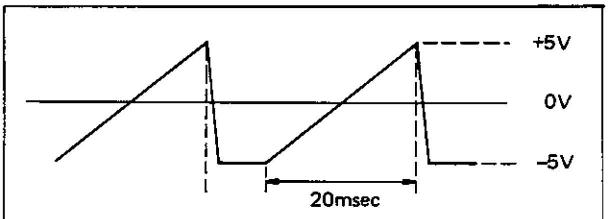


Fig. 6-14 Input Ramp Signal

(3) Check that the blanking signal (Z'' IN.) as shown in Fig. 6-15 is observed at Pin 13 of Connector P2.

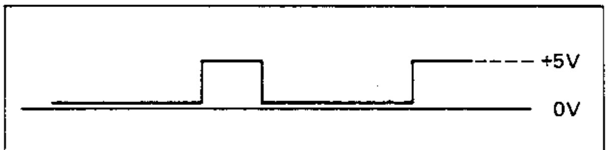


Fig. 6-15 Blanking Signal

(4) Adjust the upper and lower limits of the ramp signal (at TP1) with R247 and R248 respectively so that the ramp signal voltage is within −0.4 to +10.4V.

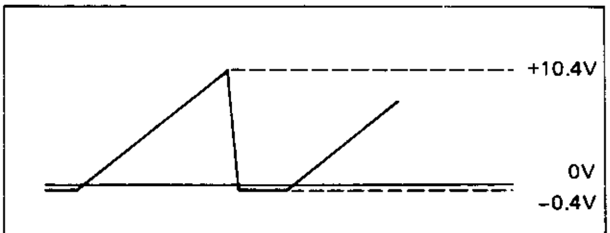


Fig. 6-16 Waveform at TP1

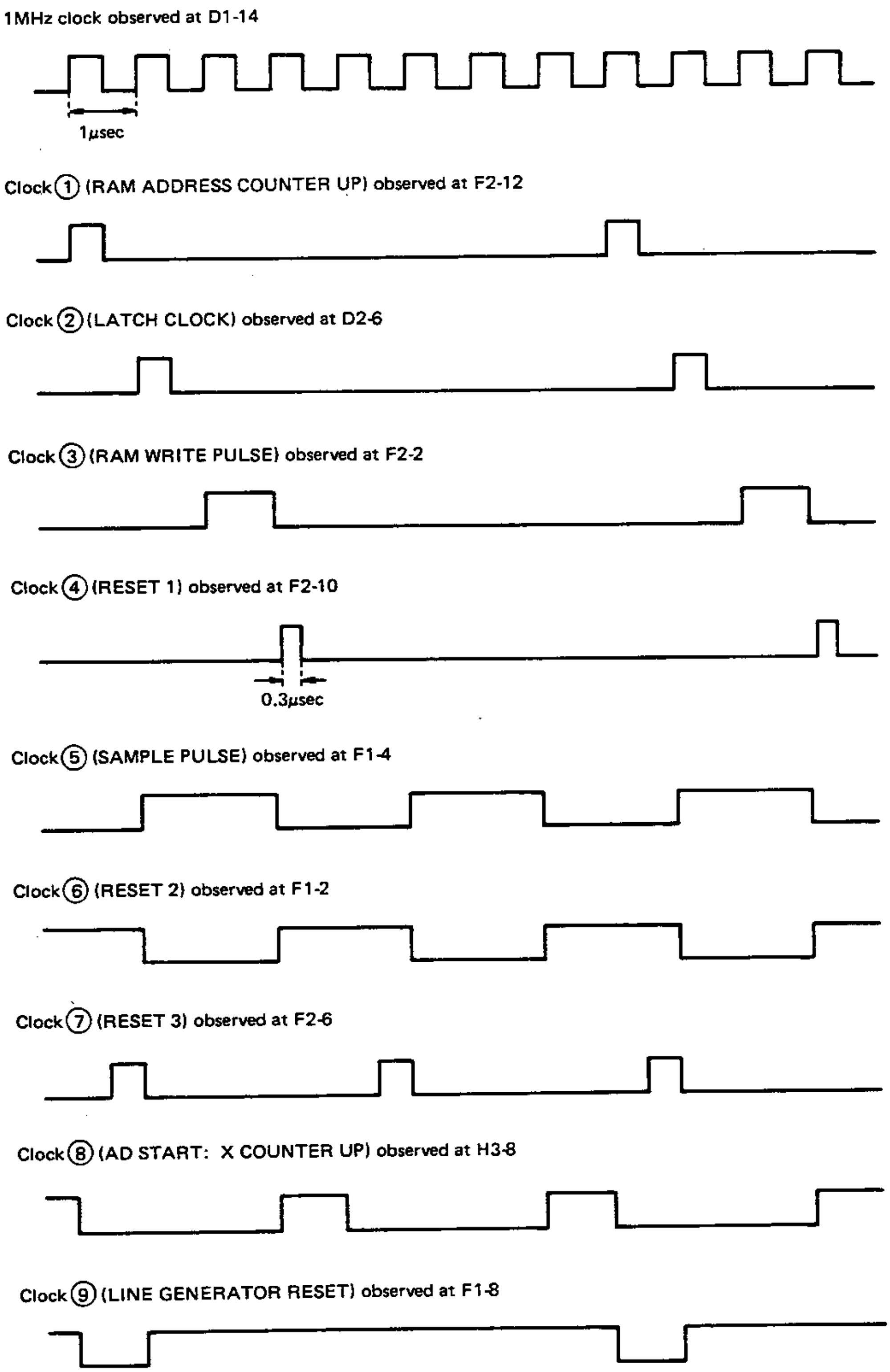


Fig. 6-13 Clocks Check

(5) Check that TTL signals are applied to Pins 5 through 13 (Bits 9 through 1) of A/D Converter E6. See Fig. 6-17.

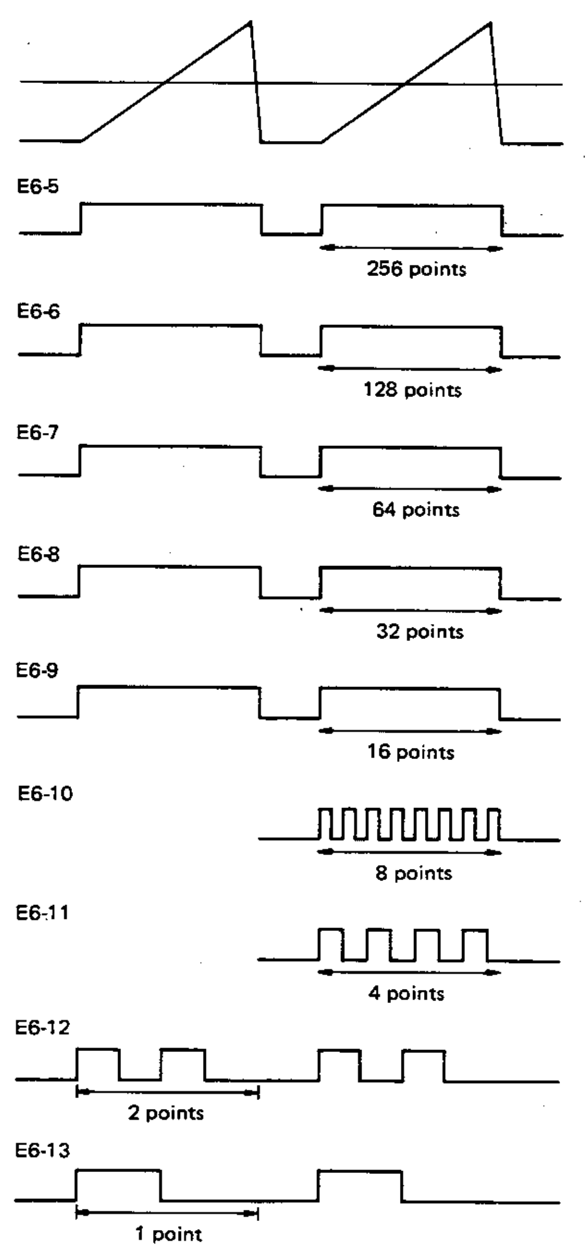


Fig. 6-17 A/D Converter TTL Signals

(6) Check that the comparator output is present at TP2. See Fig. 6-18.

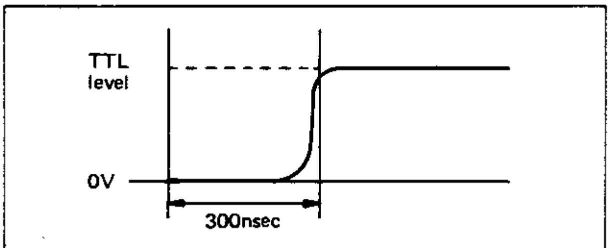


Fig. 6-18 Waveform at TP2

(7) Check that the ramp signal as shown in Fig. 6-19 is observed at TP3.

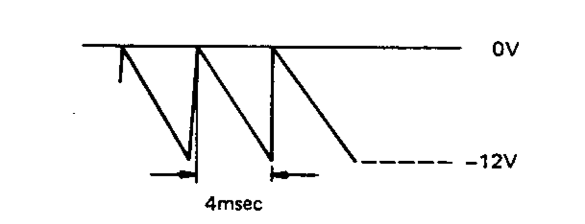


Fig. 6-19 Waveform at TP3

(8) Check that the blanking signal (Z' OUT.) as shown in Fig. 6-20 is observed at H2-4.

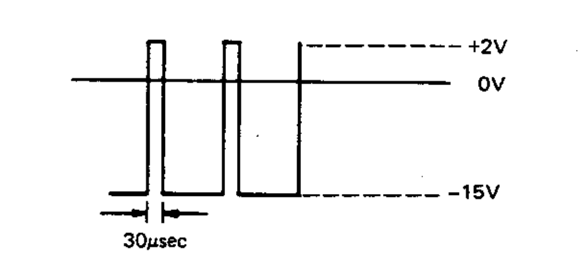


Fig. 6-20 Waveform at H2-4

6-7-6 Y Axis Adjustment

(1) Perform the same initial settings as those for X axis adjustment.

(2) Check that the signal waveform input from **TR4132/4132N** as shown in Fig. 6-21 is observed at Pin 5 of Connector P2.

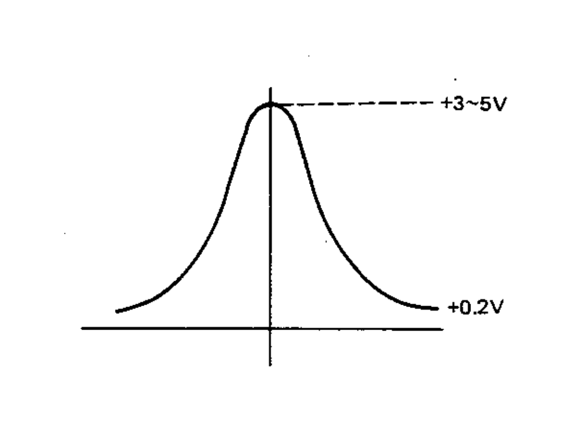


Fig. 6-21 Input Signal Waveform at P2-5

(3) Check that the signal waveform output from peak detector as shown in Fig. 6-22 is observed at TP4.

(4) The signal present at TP5 is used for sampling and hold time check. Check the signal waveform against Fig. 6-23.

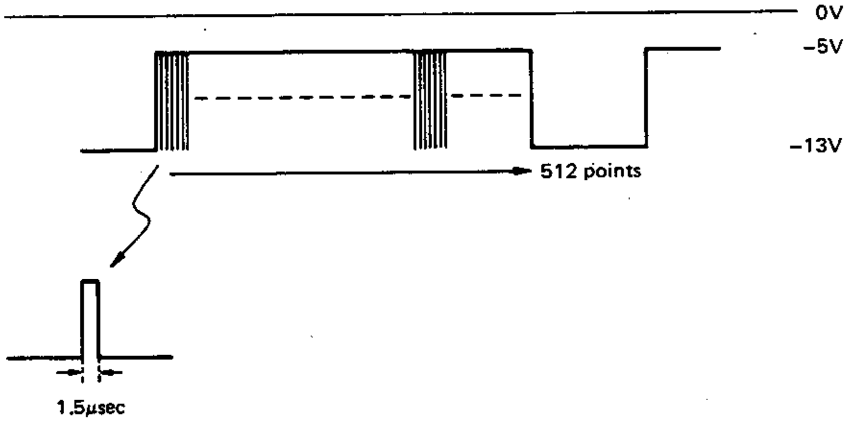


Fig. 6-22 Waveform at TP4

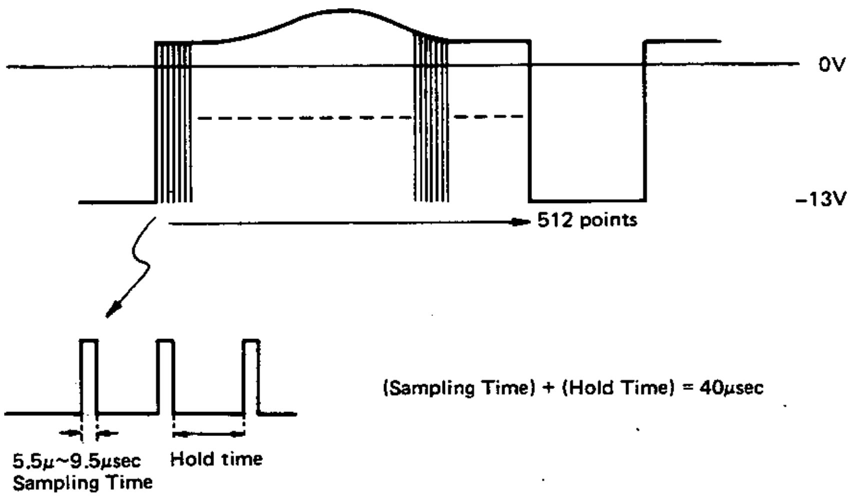


Fig. 6-23 Waveform at TP5

(5) Adjust R246 so that the waveform at TP6 observed on the oscilloscope moves by +0.4V (as shown in Fig. 6-24) when the base line is placed at –80dB graticule line on the CRT of the **TR4132/4132N.**

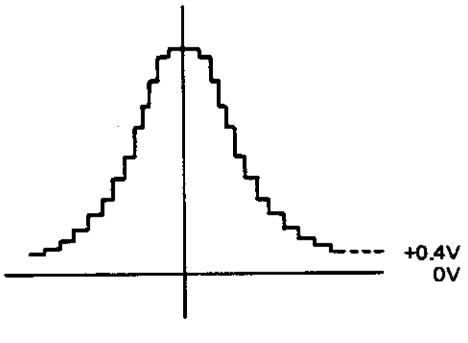


Fig. 6-24 Waveform at TP6

(6) Adjust R245 so that the reference voltage for the D/A converter is 4.7V at TP7.

(7) Observe the signal waveform at TP8. Then check the waveform at TP10 and adjust C290 so that points P0 through P5 on the waveform overlap with those on the waveform at TP8 (line generator adjustment). See Fig. 6-25.

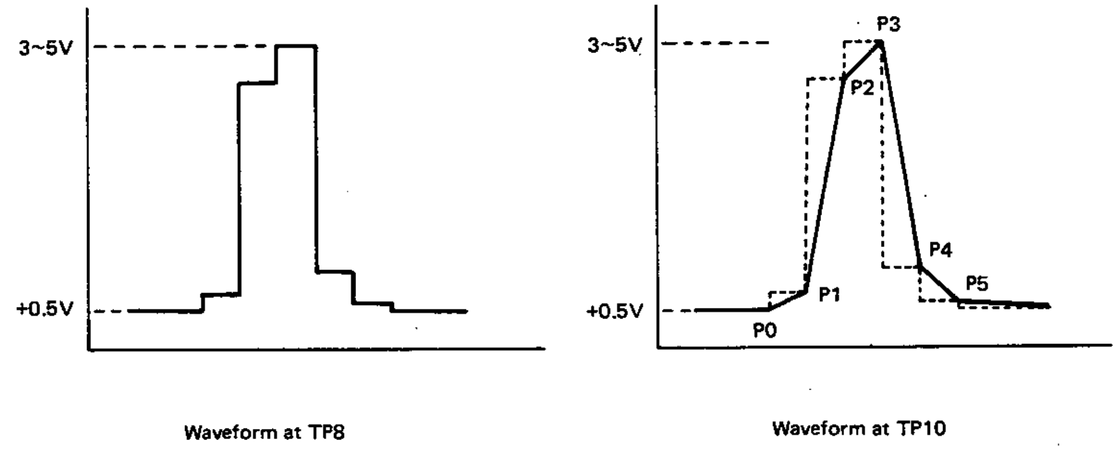


Fig. 6-25 Line Generator Adjustment

6-7-7 X Axis Final Adjustment

This paragraph describes the procedure of the X axis output waveform adjustment using the **CAL. OUT.** signal from the **TR4132/4132N.** Connect the **CAL. OUT.** connector to the **INPUT** connector using the supplied BNC-BNC cable (**MI-02**) with an N-BNC Conversion adapter. For the **TR4132/4132N**, use the **MO-15** input cable for this connection. See Fig. 6-26.

Set the **DISPERSION/DIV.** to 100MHz/DIV., **BAND WIDTH** to **AUTO**, **IF GAIN** to 0dB, and **RF. ATT.** to 0dB.

(1) Set the **TR1604 MEMORY** switch to **OFF**, then position the 500MHz **CAL. OUT.** signal to the center of the CRT. Verify that the 0 and 1GHz signals correspond to the leftmost and rightmost graticule lines on the CRT respectively. If not, readjust the **X-POSI. GAIN** and **Y-POSI. GAIN** of the **TR4132/4132N** leaving the **TR1604 MEMORY** switch to **OFF**.

(2) Set the **TR1604 MEMORY** switch to **ON**.

(3) Using R242, position the 500MHz signal to the center of the CRT.

(4) Adjust R241 so that the 0 and 1GHz signals correspond to the leftmost and rightmost graticule lines on the CRT respectively.

(5) Set the **MEMORY** switch to **ON** and **OFF** to make sure that no change occurs in the signal trace.

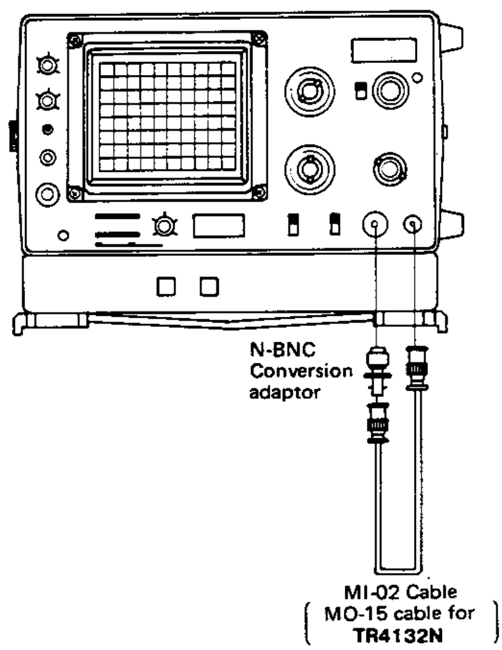
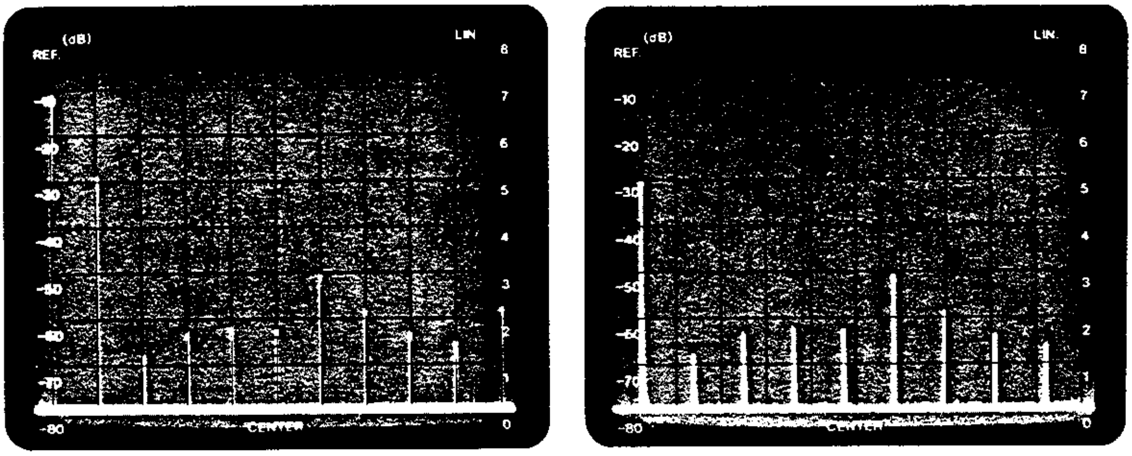


Fig. 6-26 X Axis Final Adjustment Setup



MEMORY switch OFF MEMORY switch ON

Fig. 6-27 X Axis Final Adjustment

6-7-8 Y Axis Final Adjustment

The Y axis output waveform adjustment also uses the **CAL. OUT.** signal via an external Attenuator. The adjustment setup is shown in Fig. 6-28. Reset the **IF GAIN** to 30dB, leaving all other switches in the positions set for the X axis final adjustment.

(1) Set the **TR1604 MEMORY** switch to **OFF**.

(2) Set the external Attenuator to 0dB, and check that the signal peak is on the 0dB graticule line on the CRT display. If not, readjust the **X-POSI. GAIN** and **Y-POSI. GAIN** of the **TR4132/4132N** leaving the **TR1604 MEMORY** switch to **OFF**.

(3) Set the external Attenuator to 40dB and the **IF GAIN** of the **TR4132/4132N** to 0dB, then check that the signal peak is at −70dB graticule line on the CRT display.

(4) Set the **TR1604 MEMORY** switch to **ON**. Adjust R242 so that the signal peak is positioned at −70dB graticule line on the CRT display.

(5) Set the external Attenuator to 0dB and **IF GAIN** of the **TR4132/4132N** to 30dB. Adjust R243 so that the signal peak is at 0dB graticule line on the CRT display.

(6) Repeat above procedures (4) and (5) several times.

(7) Set the **TR1604 MEMORY** switch to **ON** and **OFF** to make sure that no change occurs in the signal trace.

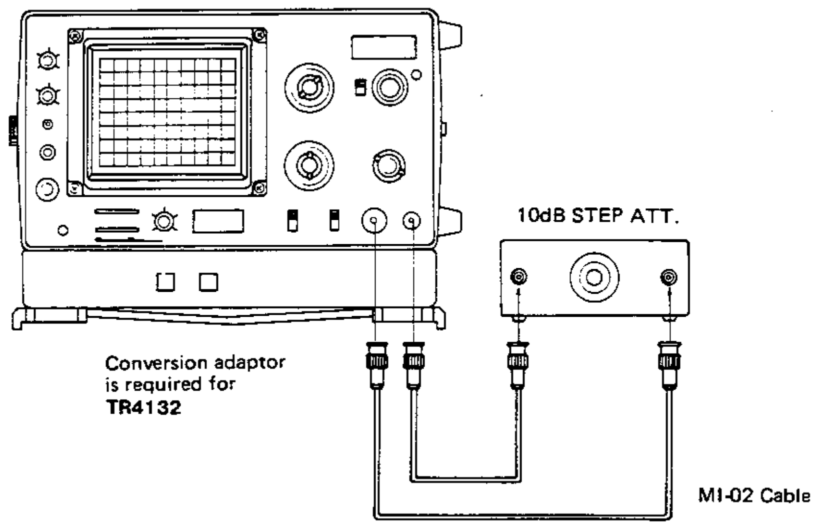
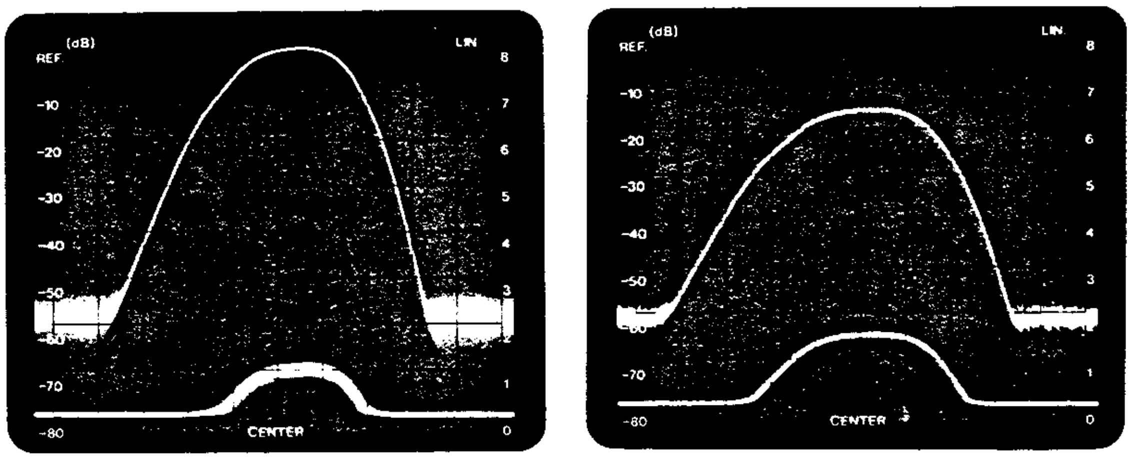


Fig. 6-28 Y Axis Final Adjustment Setup



MEMORY switch OFF

MEMORY switch ON

Fig. 6-29 Y Axis Final Adjustment

6-7-9 Connecting the TR1604 to TR4132/4132N

After establishing the Y axis final adjustment, check the following items before mounting the **TR1604** Digital Memory to the **TR4132/4132N** Spectrum Analyzers.

(1) Connect the **TR1604** to **TR4132/4132N** with three cables (AC power cable, external DC power supply cable, and signal cable).

(2) Set slide switch S10 on the connector panel of the **TR4132/4132N** mainframe to the **TR1604** side.

6-7-10 Operation Check

Use the **CAL. OUT.** signal from the **TR4132/4132N** mainframe as an input signal for operation check.

(1) **MEMORY** switch **ON/OFF** check

OFF .... **TR4132/4132N** functions are activated.

ON ..... **TR1604** Digital Memory function is activated.

(2) MEMORY A function check

Set the **MEMORY** switch to **ON** and the **A, A/B** selector switch to **A**. Check that a single page of data is stored in memory A to display and the memory A contents are updated each time the spectrum analyzer repeats sweeping.

(3) MEMORY A/B function check

Set the **MEMORY** switch to **ON** and the **A, A/B** selector switch to **A/B**. Check that the signal waveform is fixed on the CRT display when the **A, A/B** selector switch is switched from **A** to **A/B**.

Then check that when the signal level is changed by the **IF GAIN** or **RF ATT.** control, the current signal is stored in memory B to display over the fixed spectrum and the memory B contents are updated for each sweep.

(4) Store function check

Set the **SCAN MODE** on the mainframe to **MANUAL**.

Check that the memory contents are fixed in items (2) and (3) above.

(5) Sampling error

Set the **DISPERSION/DIV.** to 100MHz/DIV. and **BAND WIDTH** to **AUTO**. Turn the **TUNING FINE** control fully clockwise from leftmost detent to check that the signal level variation width is within 0.2 divisions. (Y axis, within 2.5%)

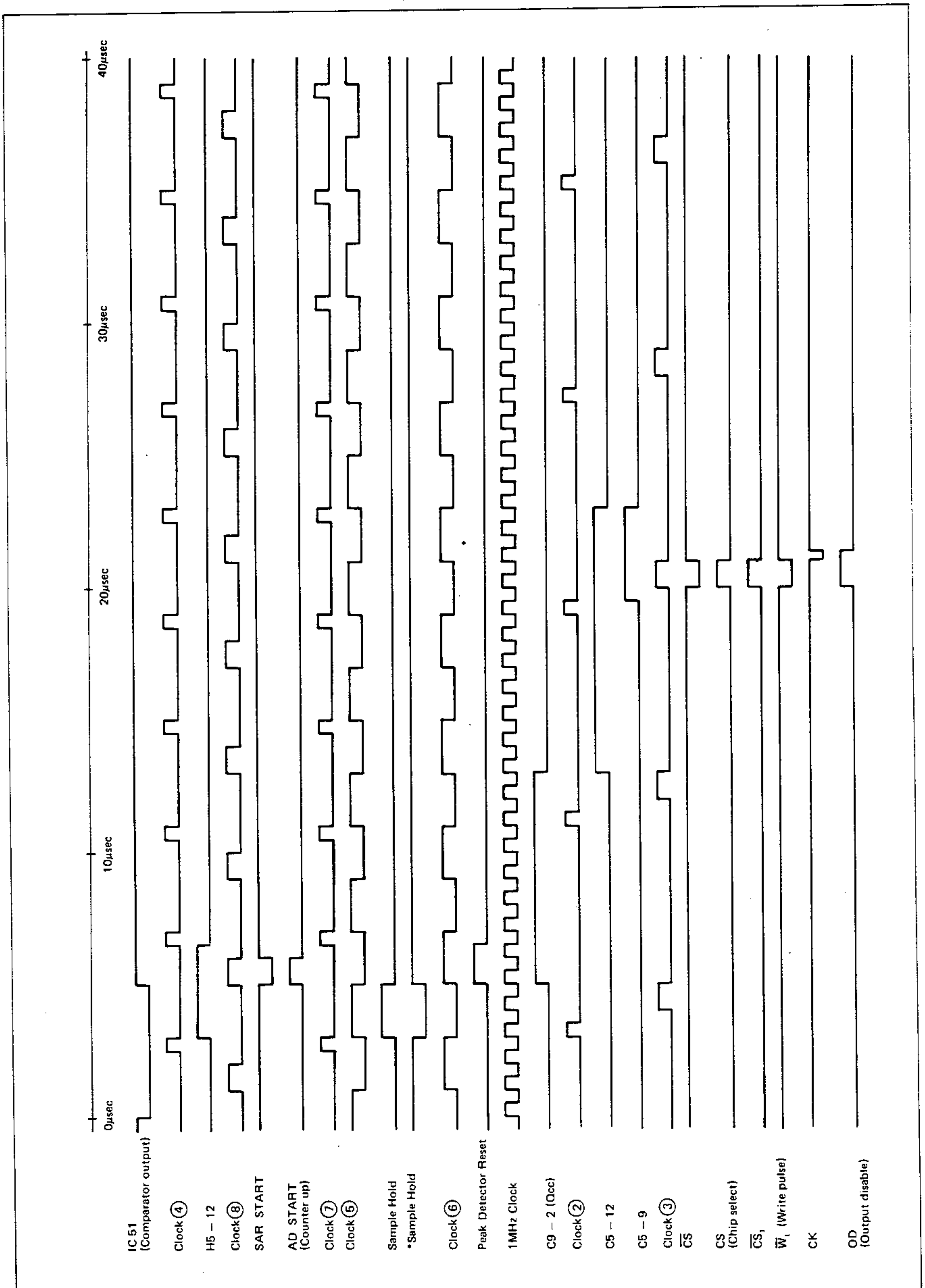
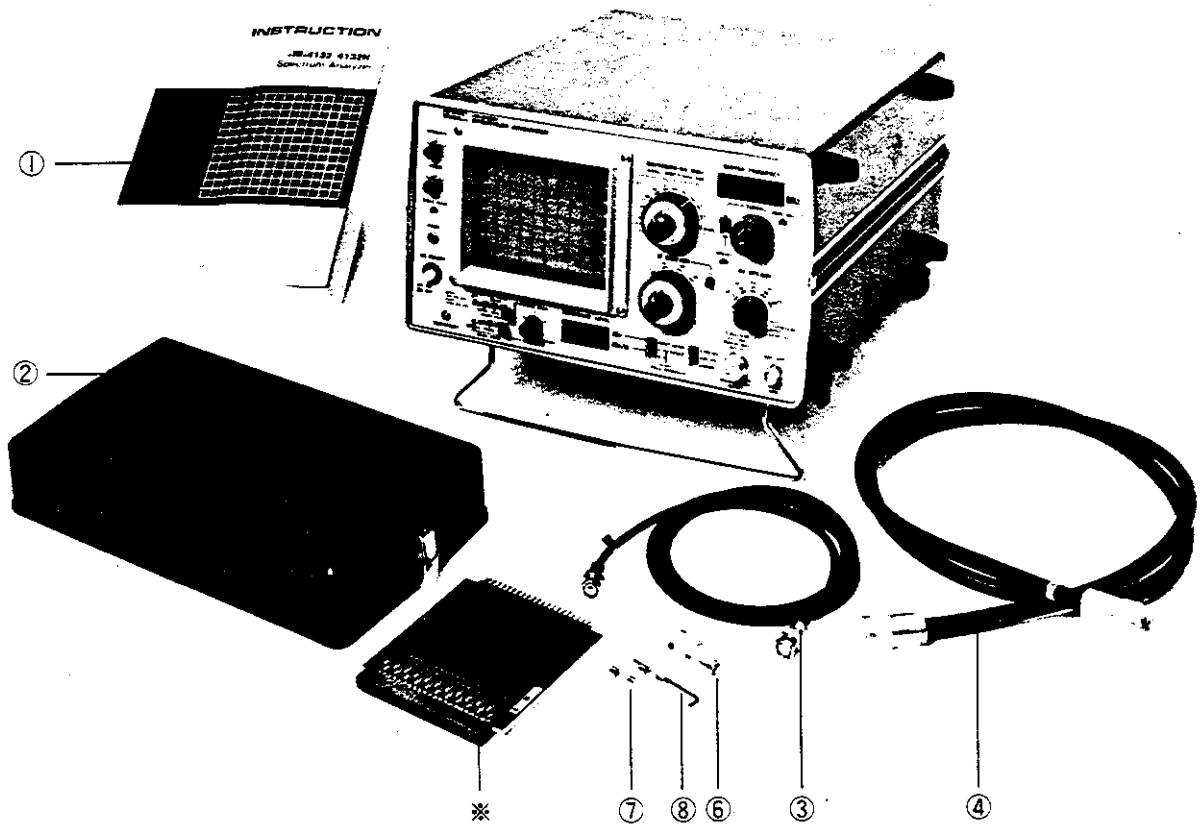


Fig. 6-30 TR1604 Timing Chart

SECTION 7
ACCESSORY (Standard and Optional)

50Ω - 75Ω Conversion Adapter(TR1612)
N-BNC Conversion Adapter
CB Band High Pass Filter (MEP-292)
BNCP-FJ Conversion Adapter
Sound Moniter Earphone (PR-30A)
RF Coupler (DC to 1500MHz)(TR1625)
RF Coupler (DC to 500MHz)(TR1626)
Carring Case (TR1638)
Camera Mount Complete Set
CRT Hood (TR1656)
Digital Memory (TR1604)
Front Panel Hood(TR1657)
Log.-Periodic Antenna (TR1711)
Halfwave Dipole Antenna(TR1722)
Loop Antenna (TR1720)
Battery Pack (TR1927)
Trolley (TR1821) and Duralumin Case (TR16013)
Input Cable (MI-02)
Connection Cable (MO-15)
Connection Cable (MC-36)
Connection Cable (MC-37)
Input Cable (MI-04)
Linear Adapter

TR4132/4132N STANDARD ACCESSORY



*The power cable is connected to the instrument.
The standard accessory includes a KPR-18 Adapter for 3 to 2-pin Converter. Refer to Para 2-2-3 for the use.

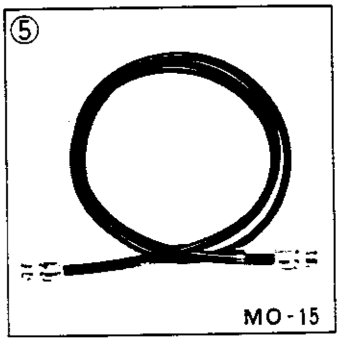
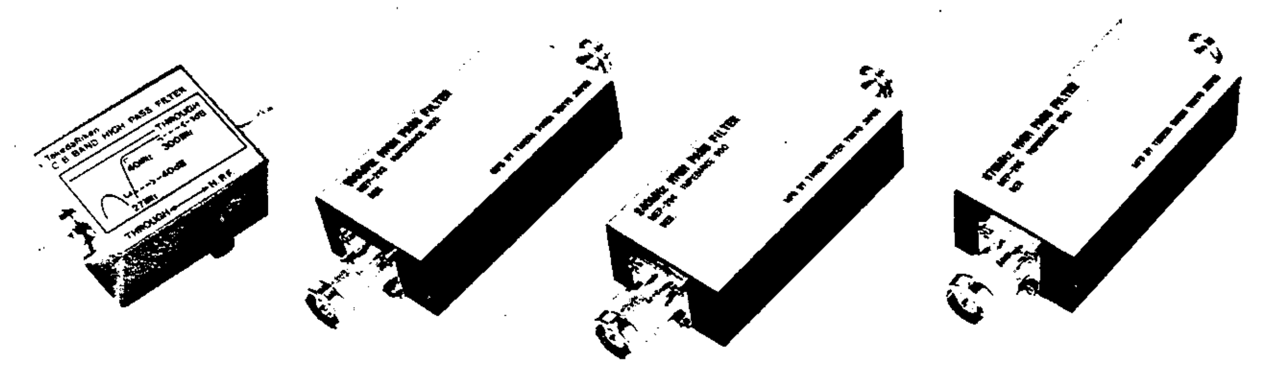


Table 7-1 TR4132/4132N Standard Accessory List

Index No.	Stock No.	Model No., Description	TR4132	TR4132N	
1		Instruction Manual	1	1	
2	MEG-0036-0165-3	Front Cover	1	1	
3	MI-02	MI-02 Connector UG-88/U, BNC-BNC	1	0	
4	MI-04	MI-04 Connector UG-21P/U, N-N	1	0	
5	MO-15	MO-15 Connector 3CV-P2, BNC-BNC (75 Ω)	0	1	
6	JUG-201	Connector JUG-201A/U, N-BNC	1	0	
7		Fuse 0.5A/100V, 120VAC, 0.25A/200V, 240VAC	2	2	
8		Allen Wrench 3mm	1	1	
*		Adjusting Plain Board (Optional)			

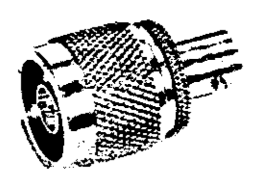
MEP-290 Series High-pass Filter



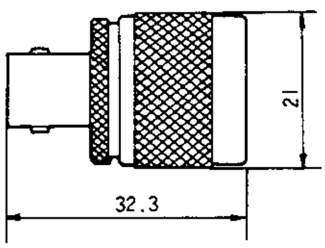
MEP-292 **MEP-293** **MEP-294** **MEP-295**

	MEP-292	MEP-293	MEP-294	MEP-295
Frequency Band	27MHz	60MHz	150MHz	400MHz
Frequency Range	26MHz to 30MHz	50MHz to 80MHz	120MHz to 190MHz	335MHz to 520MHz
Cut-off Frequency	40MHz	100MHz	240MHz	670MHz
Attenuation Characteristic	35dB or more/28MHz or less 40dB or more /27MHz	50dB or more at 70MHz 30dB or more at 80MHz	50dB or more at 170MHz 30dB or more at 190MHz	50dB or more at 470MHz 30dB or more at 520MHz
Pass Band	40MHz to 300MHz	100MHz to 1000MHz	240MHz to 1000MHz	670MHz to 1500MHz
Insertion Loss	1dB or less at Pass Band	2dB or less at Pass Band	2dB or less at Pass Band	2dB or less at Pass Band
Impedance	50Ω (BNCJ-BNCJ)	50Ω (NP-NJ)	50Ω (NP-NJ)	50Ω (NP-NJ)
Stock No.	MEP-292	MEP-293	MEP-294	MEP-295

N–BNC Conversion Adapter

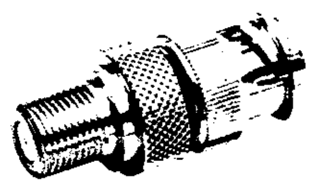


Type : Open terminal NP–BNCJ.
Length : 32.3mm

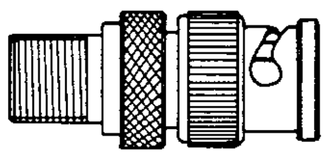


Stock No. : JUG201

BNCP-FJ Conversion Adapter



Withstand voltage : AC500V/1min.
Insulation resistance : 500MΩ/DC500V
Contact resistance : 5mΩ or less
V.S.W.R. : 1.2 or less/0.1GHz or lower

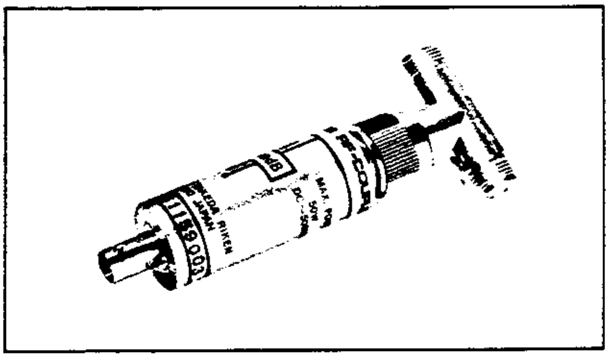


Stock No. : BA-A209

PR-30A Sound Monitor Earphone

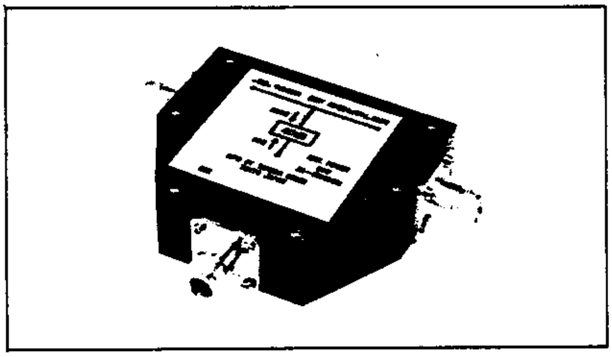
TR4132 and **TR4132N** Spectrum Analyzers are designed so that, when setting **DISPERSION/ DIV.** to **ZERO** and centering the frequency by **TUNING**, the demodulated wave can not only be displayed on CRT but also be listened by earphone.
Stock No. : RP-30A

TR1626 RF Coupler



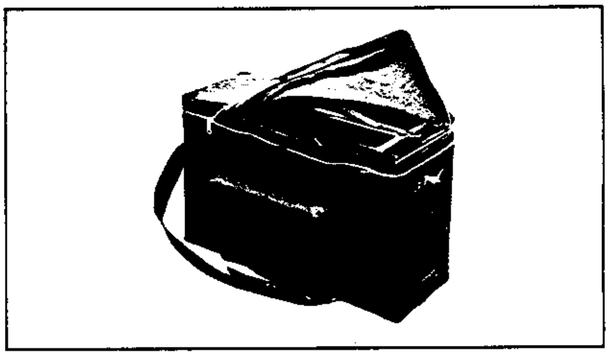
Frequency range: DC to 500MHz
Maximum input: 50W
Coupling degree: 40dB ± 1dB
Impedance : 50Ω/main & sub routes
V.S.W.R. : 1.5 or less
Insertion loss : 1dB or less
Connector : Main route/N type, sub routes/ BNC type
Stock No. : 1626

TR1625 RF Coupler



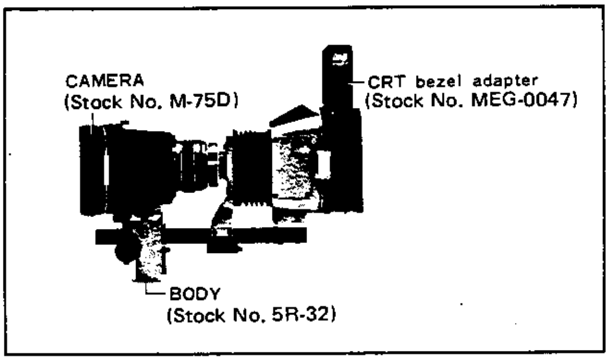
Frequency range: DC to 1500MHz
Maximum input: 50W
Coupling degree: 40dB ± 1dB
Impedance : 50/main & sub routes
V.S.W.R. : 1.5 or less
Insertion loss : 1dB or less
Connector : Main route/N type, sub routes/ BNC type
Stock No. : 1625

TR1638 Carrying Case



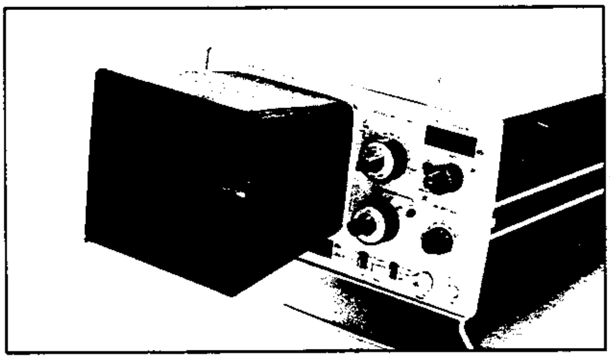
It is duck made case for **TR4132/4132N** Spectrum Analyzer and is convenient to prevent dust and water and also for portable use. With pocket for accessory and duck made belt.
Stock No. : 1638

Camera Mount Complete Set



This set is composed of camera mount, camera and attachment, and is stored in a steel bag.

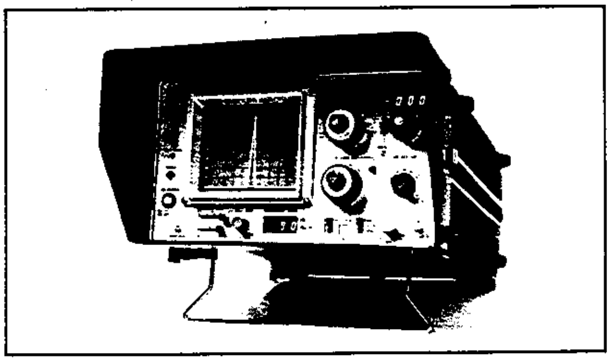
TR1656 CRT Hood



It is designed to cover the CRT section of Spectrum Analyzer for use outdoors or at bright environment. Open section 140 x 155mm and 160mm long. Made of chloridized vynil and can be folded.

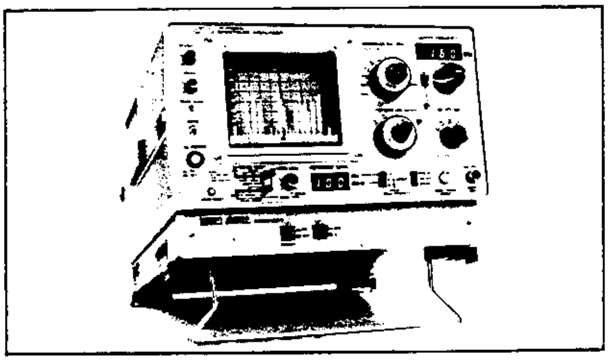
Stock No.: 1656

TR1657 Front Panel Hood



Stock No.: 1657

TR1604 Digital Memory



Display resolution : X axis 9-bit 512-point
Y axis 8-bit 256-point

Horizontal input sweep rates : 20 ms to 10s

Display refresh rate : Approx. 4ms, repetition of fullscale

Sampling error : Y axis, within ±25%

Store function : Content of memory is stored by setting **SCAN MODE** to **"MANUAL"**.

Display function : A Content of memory A displayed.
A/B Content of memory A and B displayed

Operating temperature range : 0°C to +40°C

Power requirement: Supplied from **TR4132/4132N**

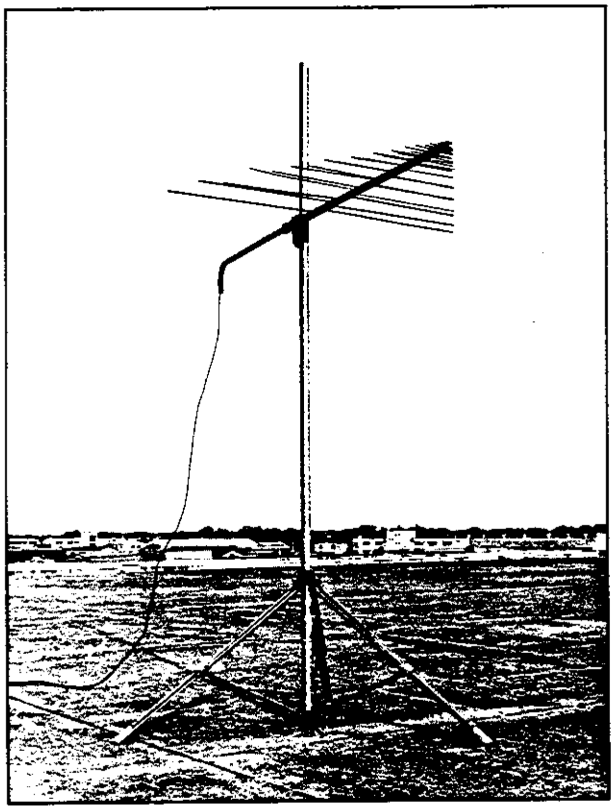
Power consumption : Approx. 25 VA

Dimensions : about 290(W) x 40(H) x 390 (D) mm

Weight : about 3.2 kg

Stock No. : 1604 (Factory Option)

TR1711 Log.-Periodic Antenna



This is an antenna for wideband reception with the frequency range from 80 to 1000MHz.
Can be effectively used for radiowave surveillance and for analyzing interference waves generated in wide range.

Frequency range: 80MHz to 1000MHz

Gain : 5dB (λ/2 dipole antenna ratio)

Front/back ratio: 14dB or more

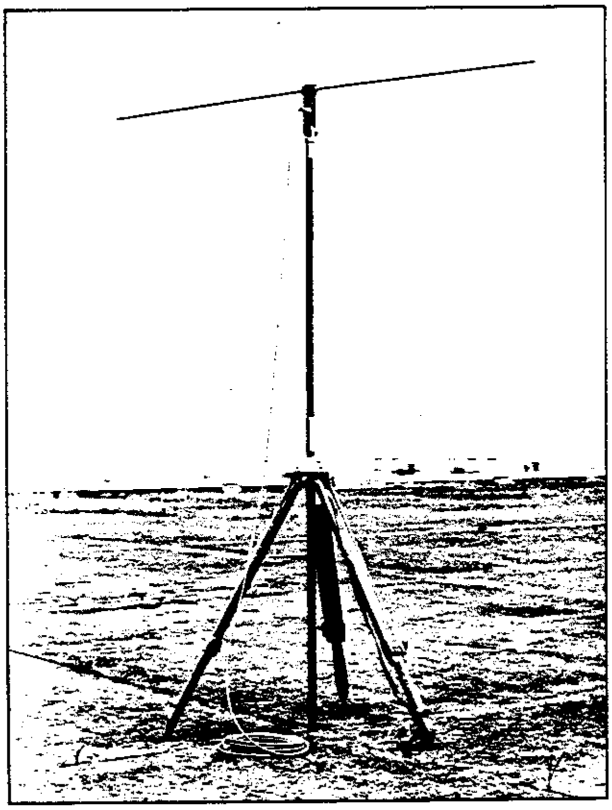
Input/output impedance: 50Ω

Weight : Antenna main only about 5kg

Composition : log.-periodic antenna (31-element 2 pcs, antenna main & balancer), angle adjuster (45°–0°–90°), Supporting pole, tripod, measurement cable (10 meters with N type connector), element bag, antenna main bag.

Stock No. : 1711

TR1722 Halfwave Dipole Antenna



This antenna is used with the element length specifically changed in accordance with the measuring frequency in field strength and interference wave measurements with Spectrum Analyzer.

Frequency range: 25MHz to 1000MHz

- Element 1 : 25MHz to 80MHz
- Element 2 : 80MHz to 250MHz
- Element 3 : 250MHz to 600MHz
- Element 4 : 600MHz to 1000MHz

Impedance : 50Ω

Polarized wave : Horizontal and vertical switchable

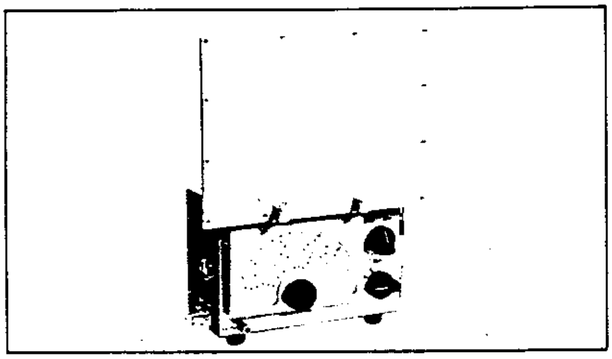
On ground antenna height
: 1meter to 4 meters approx.

Tripod : Folding type

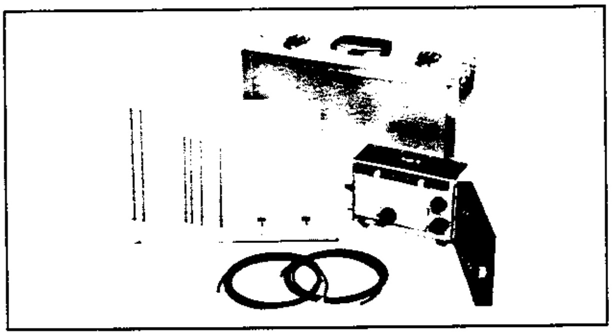
Accessory coaxial cable
: 50D·2W, 10 meters with N type connector

Stock No. : 1722

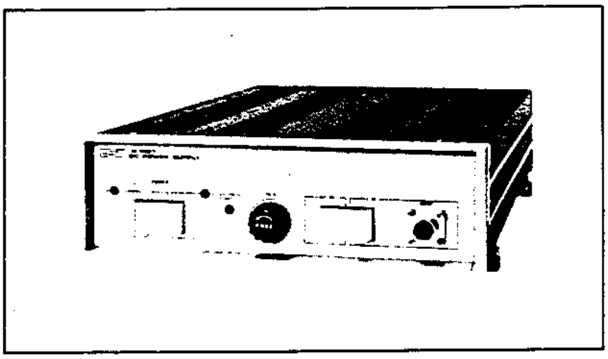
TR1720 Loop Antenna



Frequency range: 100kHz to 30MHz
Antenna tuning section
: Band 1 100kHz to 200kHz
Band 2 150kHz to 300kHz
Band 3 300kHz to 600kHz
Band 4 600kHz to 1400kHz
Band 5 1.4MHz to 3.5MHz
Band 6 3.5MHz to 10MHz
Band 7 10MHz to 30MHz
Loop antenna section
: 7 loop antennas for Band 1 to 7
Vertical antenna section
: Settable to total 2 meters & 1 meter
Impedance : 75Ω or 50Ω
Dimensions and weight
Tuning section : abt. 210(W) x 140(H) x 110(D) mm, 2kg
Loop antenna section; about 3 kg/set
large abt. 360(W) x 250(H) x 6(D)mm
small abt. 250(W) x 190(H) x 6(D)mm
Vertical antenna section
: 2m total 5-stages, 1 m flexible, 0.2kg
Storing case : abt. 495(W) x 259(H) x 155(D) mm, alminum made abt. 1.9kg
Stock No. : 1720

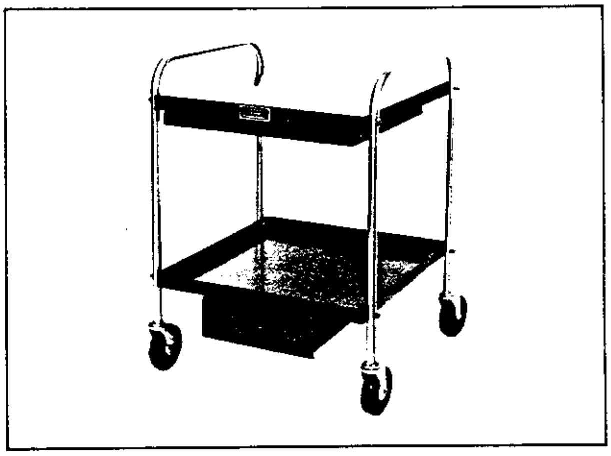


TR1927 Battery Pack

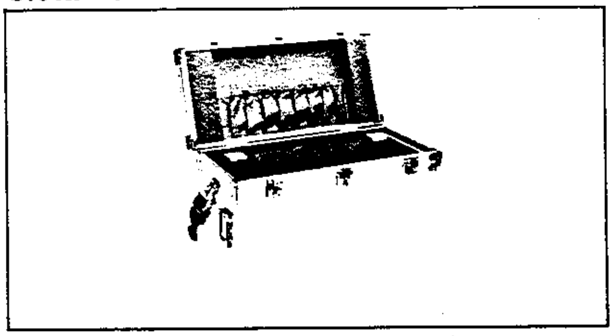


Internal battery capacity : 10AH (12V) Ni-Cd
Continuous operating hour
: about 3.0 hours
Charging hour : about 15 hours
External battery : +10V to +15V
Discharging hour : AC100V±10%, 50/60Hz, about 35VA
Environment temperature
: 0°C to +35°C (in operation)
−30°C to +35°C (in long storage)
Dimensions : abt. 294(W) x 87(H) x 500(D) mm
Weight : about 12kg
Stock No. : 1927

TR1821 Trolley

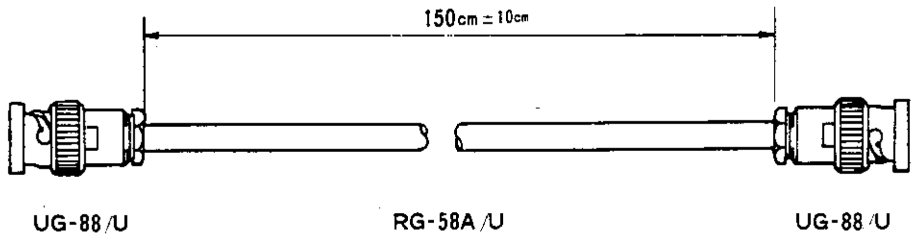


Stock No. : 1821

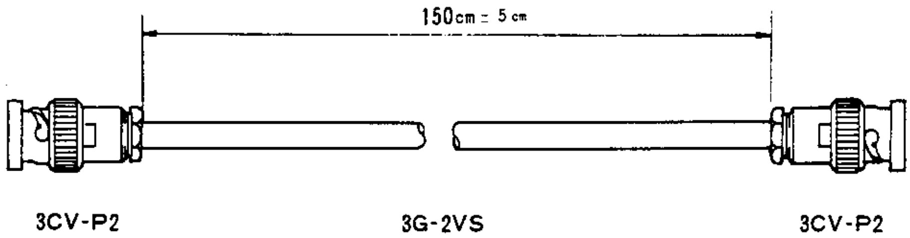


Duralumin Case (Stock No.: 16013)

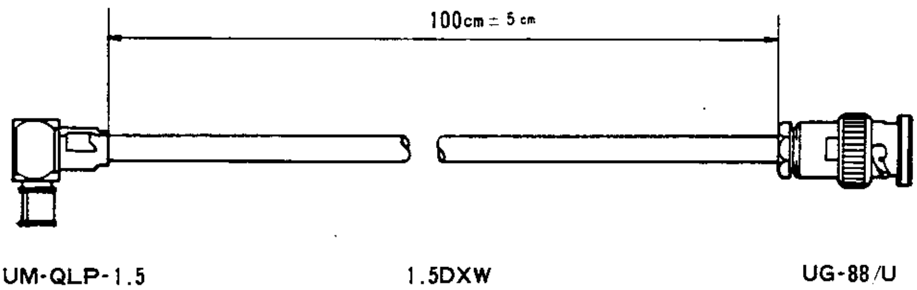
Article	Specifications	Stock No.
MI–02 Input Cable	BNC–BNC	(MI-02)



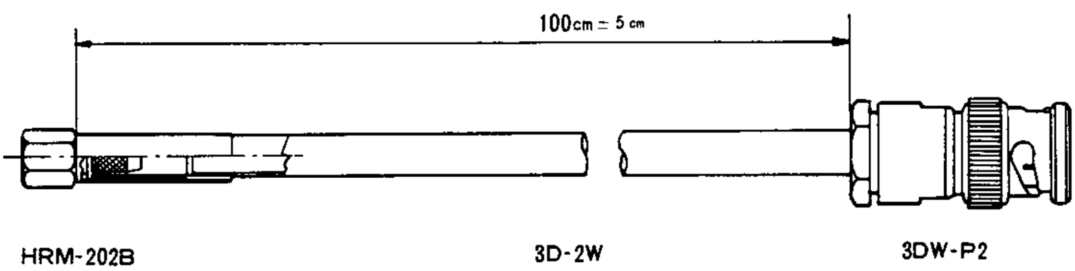
MO–15 Connection Cable	BNC–BNC (75Ω)	(MO-15)



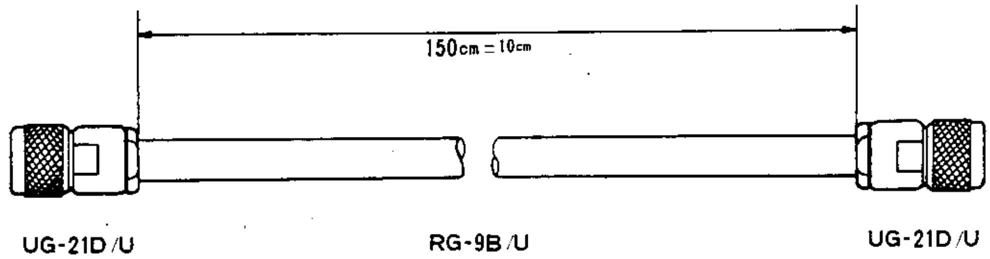
MC–36 Connection Cable	BNC–UM	(MC-36)



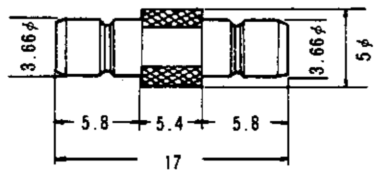
MC–37 Connection Cable	BNC–SMA	(MC-37)



Article	Specifications	Stock No.
MI–04 Input Cable	N–N	(MI-04)



Linear Adapter	UM–UM	



UM-QA-JJ

SECTION 8
PARTS LIST

8-1 Description

This section covers the electrical parts and mechanical parts used for **TR4132** and **TR4132N** Spectrum Analyzers. It is suggested to use the parts of equivalent specifications or performance referring to the lists when replacing them due to failure.

In the case of the parts marked* and also for mechanical parts contact ADVANTEST or its local distributor.

Please clearly mention the Parts No. and Stock No. for electrical parts and Name of the Parts and the Stock No. for mechanical parts when placing an order or for an inquiry.

Note: The parts and the specifications may be changed with or without notice following necessary modifications.

8-2 Symbols and Abbreviations

Table 8-1 shows the symbols and abbreviations as used in the Parts Lists and the Circuit Diagrams.

In the case the letters in the manual description means respective performance or function, the same style of the character as used in the printings on the panel of the instrument is applied for easier identification.

REFERENCE DESIGNATIONS

C	Capacitor
Ca	Cable
F	Fuse
FH	Fuse Holder
IC	Integrated Circuit
J	Electrical Connector, Jack
L	Coil, Inductor
Q	Transistor
R	Resistor
S	Switch (Slide, Lever, Push Button rotary)
T	Transformer
TP	Test Point (Check Point)
X	Crystal

MULTIPLIERS

Abbreviation	Prefix	Multiple
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}

ABBREVIATIONS

A	ampere
AC	alternating current
ADJ.	adjustment
A/D	analog-to-digital
AMP.	amplifier
ATT.	attenuator
ASTIG.	astigmatism
ANT.	antenna
AUTO	automatic, -operation
BCD	binary coded decimal
B.P.F.	bandpass filter
B.W.	band width
CAR	carbon
CAL.	calibrate
CER	ceramic
cm	centimeter
COM.	common
CRT	cathode-ray tube
D/A	digital-to-analog
dB	decibel
dBm	decibel referred to 1mW
dBμ	decibel (0dBμ=1 μVrms.)
DC	direct current
DET.	detector
DIV.(div.)	division
DISP.	dispersion
ELECT	electrolytic
EXT.	external
F	farad
FET.	field-effect transistor
FM	frequency modulation
FREQ.	frequency
FXD	fixed
FLM	film
g	gram
GHz	gigahertz
GND	ground
H	henry
h	hour

Table 8-1 ABBREVIATIONS

HI	high
H.P.F.	high pass filter
Hz	Hertz
H.POSI.	Horizontal Position
H.GAIN	Horizontal Gain
IC	integrated circuit
IF	intermediate frequency
INT	internal
kg	kilogram
kHz	kilohertz
kΩ	kiloohm
kV	kilovolt
LED	light-emitting diode
LIN.	linear
LO	low, local oscillator
LOG.	logarithm
L.P.F.	low pass filter
LEV.	level
m	meter
mA	milliampere
MAX.	maximum
MΩ	megohm
mg	milligram
MHz	megahertz
MIN.	minimum
min.	minute (time)
mm	millimeter
MOD.	modulator
ms	millisecond
mV	millivolt
mVrms.	millivolt rms
mW	milliwatt
μA	microampere
μF	microfarad
μH	microhenry
μs	microsecond
μV	microvolt
μVrms.	microvolt rms
μW	microwatt
MANU.	manual
MIX.	mixer
NPN	negative-positive-negative
nA	nanoampere
NC	no connection
NORM.	normal
ns	nanosecond
nW	nanowatt
OPT.	option
OSC.	oscillator
Ω	ohm
OUT.	output
p	peak
pF	picofarad
PL	phase lock
PLO	phase lock oscillator
PM	phase modulation
p-p	peak-to-peak
PPM	pulse-position-modulation
PRF	pulse-repetition frequency
ps	picosecond
POSI.	position
PNP	positive-negative-positive
Q.P.	Quasi Peak Value
REF.	reference
RF	radio frequency
rms.	root-mean-square
SI	silicon
s	second (time)
S.G.	single generator
SSB	single sideband
S.W.R	standing-wave ratio
T	timed (slow-blow fuse)
TTL	transistor-transistor logic
TV	television
TP	test point
VAR	variable
V	volt
VA	voltampere
VCO	voltage-controlled oscillator
VFO	variable-frequency oscillator
Vp-p	volts peak-to-peak
Vrms.	volts rms
V.S.W.R.	voltage standing wave ratio
V.POSI.	vertical position
V.GAIN	vertical gain
W	watt
YIG.	yttrium-iron-garnet
1st	the first
2nd	the second
3rd	the third

Table 8-1 ABBREVIATIONS

Parts No.	Stock No.	Description	
4132-SS-IC1	UPC7805H	IC: Voltage Regulator	
" -IC2	μA7815KC	IC: Voltage Regulator	
" -IC3	μA7815KC	IC: Voltage Regulator	
" -IC4	μA7824KC	IC: Voltage Regulator	
" -D1 thru " -D4	W02	Diode SI Bridge	
" -D5 thru " -D11	SM-1-08	Diode SI	
" -R1	CRB 1/4FX 10KΩ	R: FXD Metal FLM 10kΩ ±1% 1/4W	
" -R2	CRB 1/4FX 6KΩ	R: FXD Metal FLM 6kΩ ±1% 1/4W	
" -R3	CRB 1/4FX 2KΩ	R: FXD Metal FLM 2kΩ ±1% 1/4W	
" -R4	CRB 1/4FX 1KΩ	R: FXD Metal FLM 1kΩ ±1% 1/4W	
" -R5	CRB 1/4FX 600Ω	R: FXD Metal FLM 600Ω ±1% 1/4W	
" -R6	CRB 1/4FX 200Ω	R: FXD Metal FLM 200Ω ±1% 1/4W	
" -R7	CRB 1/4FX 100Ω	R: FXD Metal FLM 100Ω ±1% 1/4W	
" -R8	CRB 1/4FX 60Ω	R: FXD Metal FLM 60Ω ±1% 1/4W	
" -R9	CRB 1/4FX 20Ω	R: FXD Metal FLM 20Ω ±1% 1/4W	
" -R10	CRB 1/4FX 20Ω	R: FXD Metal FLM 20Ω ±1% 1/4W	
" -R11	RVE16YN15RB4M	R: VAR CAR 4MΩ	*
" -R12	RVE16YN15RB4M	R: VAR CAR 4MΩ	*
" -R13		Not assigned	
" -R14	VM11AB39A-5M1112-50KB	R: VAR CAR 50kΩ	*
" -R15		Not assigned	
" -R16		Not assigned	
" -R17	X-13B-5KΩ	R: VAR WW 5kΩ	
" -R18	X-13B-10kΩ	R: VAR WW 10kΩ	
" -R19	X-13B-10KΩ	R: VAR WW 10kΩ	
" -R20	R25-22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R21 thru " -R24	CRB1/4FX1KΩ	R: FXD Metal FLM 1kΩ ±1% 1/4W	
4132-SS-R25	R25-33KΩJ	R: FXD CAR 33kΩ ±5% 1/4W	

Parts No.	Stock No.	Description	
4132-SS-R26	RV16YN15SB5KΩ	R: VAR CAR 5kΩ (for TR4132)	
" -R27	X-13B-5KΩ	R: VAR WW 5kΩ (for TR4132N)	
-R30	AT-103	R: 3dB PAD	
" -C1	25LASN2200	C: FXD ELECT 2200μF 25V	
" -C2	50LASN2200	C: FXD ELECT 2200μF 50V	
" -C3	50LASN2200	C: FXD ELECT 2200μF 50V	
" -C4	50LASN2200	C: FXD ELECT 2200μF 50V	
" -C5	160T10	C: FXD ELECT 10μF 160V	
" -C6	160T10	C: FXD ELECT 10μF 160V	
" -C7 thru " -C11	0.1UF 50WV	C: FXD CER 0.1μF +80, -20% 50V	
" -J1	CR7E-44DB-3.96E	Connector	
" -J2	CR7E-44DB-3.96E	Connector	
" -J3		Not assigned	
" -J4	TOC-M19060N	Connector	
" -J5	TOC-M15060N	Connector	
" -J6	PCN615S-2.5E	Connector	
" -J7		Not assigned	
" -J8	BNC078	Connector	*
" -J9	BNC078	Connector	*
" -J10 thru " -J14		Not assigned	
" -J15	PCN6-10S-2.5E	Connector	
" -J16	PCN6-10S-2.5E	Connector	
" -J17	NO. 10-4	Earphone Jack	
" -J18	JRC21RG-16S	Connector	
" -J19	JRC21RC	Connector	
" -J20		Not assigned	
" -S1	YSNH-166	Rotary Switch	*
" -S2	SSB042NL	Slide Switch	
4132-SS-S3	SSB023SL	Slide Switch	

Parts No.	Stock No.	Description	
4132-SS-S4	SSB023SL	Slide Switch	
" -S5	ESD-27D	Slide Switch	
" -S6	LS19P 1-3-3D	Lever Switch	
" -S7	LS19P 1-2-4D	Lever Switch	
" -S8	MPS-17	Push Button Switch	
" -S9	MSP-103C	Push Switch	
" -S10	SSB042NL	Slide Switch	
" -F1	EAWK 500mA	Fuse 0.5A slow-blow (AC100V)	
" -FH1	FH003	Fuse Holder	
" -T1	TP-1066	Power Transformer	*
	NF-13502	Noise Filter	*
" -C01	CRT-L3A	Coil for CRT	*
	SD-503F	Socket for CRT	
" -V1	140BMB31A	CRT	
" -J21	CN7035	Connector	
" -J22	S-I0307	Pin Connector	
" -J23	PCN6-15P-2.5E	Connector	
" -D12	SM-1-08	Diode SI	
" -R28		Not assigned	
" -R29		Not assigned	
" -R31	RD25S 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -Ca1	DCB-FF0934X1	Cable	
" -Ca2	DCB-FF0934X27	Cable	
4132-SS-Ca3	DCB-FF0934X15	Cable	

TR4132/4132N
IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK030-Q1	2SC2026	Transistor SI NPN	
" -Q2	2SC1254	Transistor SI NPN	
" -Q3	2N4393	FET Junction N-Channel	
" -Q4	2SC2901	Transistor SI NPN	
" -Q5	2SA1015	Transistor SI PNP	
" -Q6	2SC1815GR	Transistor SI NPN	
" -Q7	2SA1015	Transistor SI PNP	
" -Q8	2SC2901	Transistor SI NPN	
" -Q9	2SC2901	Transistor SI NPN	
" -Q10	2SC1815GR	Transistor SI NPN	
" -Q11	2SA1015	Transistor SI PNP	
" -Q12	2SC2901	Transistor SI NPN	
" -Q13	2SA1015	Transistor SI NPN	
" -Q14 thru " -Q18	2SC2901	Transistor SI NPN	
" -D21	1SS97	Diode Schottky	
" -D22	1SS97	Diode Schottky	
" -D23	1S2222	Diode SI	
" -D24	1S2222	Diode SI	
" -D25	1S953	Diode SI	
" -D26	1S953	Diode SI	
" -D27 thru " -D34	1S2222	Diode SI	
" -D35	1S953	Diode SI	
" -D36	1S2222	Diode SI	
" -D37	1S953	Diode SI	
" -D38	1S953	Diode SI	
" -D39 thru " -D46	1S2222	Diode SI	
" -D47 thru " -D49	1S953	Diode SI	
4132-SK030-D50	1S2222	Diode SI	

TR4132/4132N
IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK030-D51	1S2222	Diode SI	
" -D52 thru " -D62	1S953	Diode SI	
" -R71	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R72	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R73	R25 2.2KΩJ	R: FXD CAR 2.2kΩ ±5% 1/4W	
" -R74	R25 12KΩJ	R: FXD CAR 12kΩ ±5% 1/4W	
" -R75	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R76	R25 150ΩJ	R: FXD CAR 150Ω ±5% 1/4W	
" -R77	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R78	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R79		Not assigned	
" -R80	R25 270ΩJ	R: FXD CAR 270Ω ±5% 1/4W	
" -R81	R25 33ΩJ	R: FXD CAR 33Ω ±5% 1/4W	
" -R82	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R83	R25 39KΩJ	R: FXD CAR 39kΩ ±5% 1/4W	
" -R84	R25 8.2KΩJ	R: FXD CAR 8.2kΩ ±5% 1/4W	
" -R85	R25 12KΩJ	R: FXD CAR 12kΩ ±5% 1/4W	
" -R86	R25 33ΩJ	R: FXD CAR 33Ω ±5% 1/4W	
" -R87	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R88	R25 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" -R89	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R90	R25 560ΩJ	R: FXD CAR 560Ω ±5% 1/4W	
" -R91	R25 560ΩJ	R: FXD CAR 560Ω ±5% 1/4W	
" -R92	R25 1kΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R93	R25 33ΩJ	R: FXD CAR 33Ω ±5% 1/4W	
" -R94	R25 33ΩJ	R: FXD CAR 33Ω ±5% 1/4W	
" -R95 thru 4132-SK030-R103	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	

IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
" -R104	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R105	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R106	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R107	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R108	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R109	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R110	R25 820ΩJ	R: FXD CAR 820Ω ±5% 1/4W	
" -R111	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R112 thru " -R116	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R117	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R118	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R119	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R120	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R121	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R122	R25 820ΩJ	R: FXD CAR 820Ω ±5% 1/4W	
" -R123	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R124	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R125	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R126	R25 330ΩJ	R: FXD CAR 330Ω ±5% 1/4W	
" -R127	3321H-1-501	R: VAR CERMET 500Ω ±20% 1/2W	
" -R128	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R129	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R130	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R131	R25 8.2KΩJ	R: FXD CAR 8.2kΩ ±5% 1/4W	
" -R132	R25 12KΩJ	R: FXD CAR 12kΩ ±5% 1/4W	
" -R133	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R134	R25 150ΩJ	R: FXD CAR 150Ω ±5% 1/4W	
" -R135	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R136	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
4132-SK030-R137	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	

IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK030-R138	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R139	R25 33ΩJ	R: FXD CAR 33Ω ±5% 1/4W	
" -R140	R25 33ΩJ	R: FXD CAR 33Ω ±5% 1/4W	
" -R141 thru " -R144	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R145	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R146	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R147	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R148	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R149	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R150	R25 820ΩJ	R: FXD CAR 820Ω ±5% 1/4W	
" -R151	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R152	3321H-1-501	R: VAR WW 500Ω ±20% 1/2W	
" -R153	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R154 thru " -R158	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R159	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R160	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R161	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R162	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R163	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R164	R25 820ΩJ	R: FXD CAR 820Ω ±5% 1/4W	
" -R165	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R166	R25 560ΩJ	R: FXD CAR 560Ω ±5% 1/4W	
" -R167	21D-28	R: Thermister	
" -R168	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R169	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R170	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R171	R25 330ΩJ	R: FXD CAR 330Ω ±5% 1/4W	
" -R172	R25 510ΩJ	R: FXD CAR 510Ω ±5% 1/4W	
" -R173	R25 560ΩJ	R: FXD CAR 560Ω ±5% 1/4W	
" -R174	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
4132-SK030-R175	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	

TR4132/4132N
IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK030-R176	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R177	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R178	R25 1.8KΩJ	R: FXD CAR 1.8kΩ ±5% 1/4W	
" -R179	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R180	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R181	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R182	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R183	R25 820ΩJ	R: FXD CAR 820Ω ±5% 1/4W	
" -R184	R25 47ΩJ	R: FXD CAR 47Ω ±5% 1/4W	
" -R185	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R186	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R187	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R188	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R189	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R190	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R191	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R192	R25 12KΩJ	R: FXD CAR 12kΩ ±5% 1/4W	
" -R193	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R194	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R195	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R196	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -C201	DM10D360J5	C: FXD DIPPED MICA 36pF ±5% 500V	
" -C202	DM10D360J5	C: FXD DIPPED MICA 36pF ±5% 500V	
" -C203	DM10D331J3	C: FXD DIPPED MICA 330pF ±5% 300V	
" -C204	0.01UF 50WV	C: FXD CER 0.01µF +80, -20% 50V	
" -C205	DM10D330J5	C: FXD DIPPED MICA 33pF ±5% 500V	
" -C206	DM10D330J5	C: FXD DIPPED MICA 33pF ±5% 500V	
" -C207	0.01UF 50WV	C: FXD CER 0.01µF +80, -20% 50V	
" -C208	0.01UF 50WV	C: FXD CER 0.01µF +80, -20% 50V	
" -C209	0.1UF 25WV	C: FXD CER 0.1µF +80, -20% 25V	
" -C210	0.1UF 25WV	C: FXD CER 0.1µF +80, -20% 25V	
" -C211	0.01UF 50WV	C: FXD CER 0.01µF +80, -20% 50V	
4132-SK030-C212	0.1UF 25WV	C: FXD CER 0.1µF +80, -20% 25V	

IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK-030-C213	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C214	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C215	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C216 thru " -C224	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C225	ECV-1ZW20X32	C: VAR CER 20pF	
" -C226	CQ08S2B-10000-J02	C: FXD Styrol 1000pF	
" -C227	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C228		Not assigned	
" -C229 thru " -C234	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50WV	
" -C235	ECV-1ZW20X32	C: VAR CER 20pF	
" -C236	CQ08S2B-10000-J02	C: FXD Styrol 1000pF	
" -C237		Not assigned	
" -C238	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C239	0.1UF 25WV	C: FXD CER 0.01μF +80, -20% 25V	
" -C240 thru " -C243	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C244	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C245 thru " -C255	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C256	ECV-1ZW20-X32	C: VAR CER 20pF	
" -C257	CQ08S2B-10000-J02	C: FXD Styrol 1000pF	
" -C258	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C259	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C260 thru " -C265	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C266	0.01UF 50WV	C: FXD CER 0.01uF +80, -20% 50V	
" -C267	0.01UF 50WV	C: FXD CER 0.01μ +80, -20% 50V	
" -C268	ECV-1ZW20-X32	C: VAR CER 20pF	
" -C269	CQ08S2B-10000-J02	C: FXD Styrol 1000pF	
4132-SK030-C270	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	

IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK030-C271	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C272	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C273	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C274	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C275	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C276		Not assigned	
" -C277	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C278	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C279 thru " -C283	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C284	ECV-1ZW20-X32	C: VAR CER 20pF	
" -C285	CQ08S2B-10000-J02	C: FXD Styrol 1000pF	
" -C286	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C287 thru " -C289	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C290	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C291	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C292	SL-25TH-10	C: FXD ELECT 10μF 25V	
" -C293	SL-25TH-10	C: FXD ELECT 10μF 25V	
" -C294		Not assigned	
" -C295	8PF 50WV	C: FXD CER 8pF ±0.5pF 50V	
" -L301 thru " -L305	LCL-C00128A-2	L: FXD Coil	*
" -L306	CSL0609-471-K	L: FXD Coil 470μH	
" -L307	L07A-2	L: FXD Coil	*
" -L308		Not assigned	
" -L309	TPF0410L-330K	L: FXD Coil 330μH	*
" -L310 thru " -L313	CSL0609-471-K	L: FXD Coil 470μH	
" -L314	CSL0609-181K	L: FXD Coil 180μH	
4132-SK030-L315	CSL0609-471K	L: FXD Coil 470μH	

IF FILTER SECTION (Board SK030)

Parts No.	Stock No.	Description	
4132-SK030-L316 thru " -L319	1.07UH L-0004 B	L: FXD Coil	*
" -L320	LF-20A	L: FXD Coil	*
" -X321	XU-030	Crystal	*
" -T325	LCL-E00389-1	Transformer	*
" -J331	5049-19	Connector	
" -J332	UM-LR-PC	Connector	
" -J333	UM-QLR-1.5(01)	Connector	
" -C336	8PF 50WV	C: FXD CER 8pF ±0.5pF 50V	
" -C337	DM10C010D5	C: FXD DIPPED MICA 1pF ±0.5% 500V	
" -C338		Not assigned	
" -C339	DM10C010D5	C: FXD DIPPED MICA 1pF ±0.5% 500V	
" -C340	DM10C010D5	C: FXD DIPPED MICA 1pF ±0.5% 500V	
" -C341		Not assigned	
" -C342	DM10C010D5	C: FXD DIPPED MICA 1pF ±0.5% 500V	
" -C343	8PF 50WV	C: FXD CER 8pF ±0.5% 50V	
" -C344 thru " -C347	ECV-1ZW10X32	C: VAR CER 10pF	
	MXP-0223-0132-3	Insulation sheet	
" -R197	RD25S 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R198	RD25S 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R199	RD25S 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R200	RD25S 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -C348	DM10D680J3	C: FXD DIPPED MICA 68pF ±5% 300V	
" -C349	DM10D680J3	C: FXD DIPPED MICA 68pF ±5% 300V	
" -L355	TPF0410-330K	L: FXD Coil 330uH	
" -R400	3321H-1-501	R: VAR CERMET 500Ω ±20% 1/2W	
" -R401	RD25S 3.3ΩJ	R: FXD CAR 3.3Ω ±5% 1/4W	

LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-IC1	LM301A	IC: Operational Amplifier	
" -IC2	LM301A	IC: Operational Amplifier	
" -IC3	TL084CN	IC: JFET-Input Operational Amplifier	
" -Q11 thru " -Q33	2SC641	Transistor SI NPN	
" -Q34	2SA603H	Transistor SI PNP	
" -Q35	2SC641	Transistor SI NPN	
" -Q36	2SC641	Transistor SI NPN	
" -Q37	2SA603H	Transistor SI PNP	
" -Q38	2SC1834	Transistor SI NPN	
" -Q39	MP311	Transistor SI NPN Twin	
" -D41	1S97	Diode SI	
" -D42	1S97	Diode SI	
" -D43	1S953	Diode SI	
" -D44	LD-1	Diode Zener	*
" -D45	1S953	Diode SI	
" -D46	1S953	Diode SI	
" -R51	R25 150ΩJ	R: FXD CAR 150Ω ±5% 1/4W	
" -R52	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R53	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R54	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R55	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R56	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R57	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R58	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R59	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R60	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R61	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R62	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R63	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R64	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
4132-PH209-R65	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	

Parts No.	Stock No.	Description	
4132-PH209-R66	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R67	R25 15kΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R68	R25 1.5kΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R69	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R70	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R71	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R72	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R73	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R74	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R75	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R76	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R77	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R78	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R79	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R80	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R81	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R82	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R83	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R84	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R85	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R86	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R87	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R88	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R89	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R90	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R91	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R92	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R93	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R94	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R95	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R96	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R97	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R98	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
4132-PH209-R99	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	

LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-R100	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R101	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R102	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R103	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R104	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R105	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R106	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R107	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R108	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R109	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R110	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R111	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R112	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R113	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R114	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R115	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R116	R25 1.5KΩJ	R: FXD CAF 1.5kΩ ±5% 1/4W	
" -R117	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R118	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R119	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R120	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R121	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R122	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R123	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R124	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	
" -R125	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R126	R25 4.7kΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R127	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R128	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R129	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R130	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R131	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R132	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
4132-PH209-R133	R25 82ΩJ	R: FXD CAR 82Ω ±5% 1/4W	

LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-R134	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R135	R25 4.7KΩJ	R; FXD CAR 4.7kΩ ±5% 1/4W	
" -R136	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R137	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R138	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R139	R25 2.2KΩJ	R: FXD CAR 2.2kΩ ±5%n 1/4W	
" -R140	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R141	R25 820ΩJ	R: FXD CAR 820Ω ±5% 1/4W	
" -R142	R25 150ΩJ	R: FXD CAR 150Ω ±5% 1/4W	
" -R143	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R144	R25 150ΩJ	R: FXD CAR 150Ω ±5% 1/4W	
" -R145	R25 2.2KΩJ	R: FXD CAR 2.2kΩ ±5% 1/4W	
" -R146	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R147	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R148	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R149	R25 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" -R150	3321W-1-500	R: VAR CERMET 50Ω ±20% 1/2W	
" -R151	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R152	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R153	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R154	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R155	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R156	R25 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" -R157	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R158	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R160	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R161	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R162	R25 56KΩJ	R: FXD CAR 56kΩ ±5% 1/4W	
" -R163	3321W-1-103	R: VAR CERMET 10kΩ ±20% 1/2W	
" -R164	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R165	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R166	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R167	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
4132-PH209-R168	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	

LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-R169		Not assigned	
" -R170		Not assigned	
" -R171	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R172	R25 33KΩJ	R: FXD CAR 33kΩ ±5% 1/4W	
" -R173	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R174	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R175	R25 68ΩJ	R: FXD CAR 68Ω ±5% 1/4W	
" -R176	3321W-1-101	R: VAR CERMET 100Ω ±20% 1/2W	
" -R177	R25 12KΩJ	R: FXD CAR 12kΩ ±5% 1/4W	
" -R178	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R179	R25 1.8KΩJ	R: FXD CAR 1.8kΩ ±5% 1/4W	
" -R180	R25 330ΩJ	R: FXD CAR 330Ω ±5% 1/4W	
" -C181	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C182	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C183	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C184	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C185 thru " -C187	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C188	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C189 thru " -C192	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C193	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C194 thru " -C197	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C198	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C199	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C200	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C201	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C202	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C203	0.01UF 50WV	C: FXD CER 0.01μF +80, -20- 50V	
4132-PH209-C204	330PF 50WV	C: FXD CER 330pF ±10% 50V	

LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-C205 thru " -C208	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C209	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C210 thru " -C213	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C214	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C215	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C216	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C217	0.01μF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C218	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C219	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C220	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C221 thru " -C224	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C225	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C226 thru " -C230	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C231	0.01μF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C232 thru " -C245	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C246	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" -C247	DM10C200K5	C: FXD DIPPED MICA 20pF ±10% 500V	
" -C248	DM10C200K5	C: FXD DIPPED MICA 20pF ±10% 500V	
" -C249	DM10D510J3	C: FXD DIPPED MICA 51pF ±5% 300V	
" -C250	DM10D510J3	C: FXD DIPPED MICA 51pF ±5% 300V	
" -C253	330PF 50WV	C: FXD CER 330pF ±10% 50V	
" -C254	501N5002-473K	C: FXD Polyester FLM 0.047μF ±10% 50V	
" -C255 thru " -C259	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C260	33PF 50WV	C: FXD CER 33pF ±10% 50V	
4132-PH209-C261	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	

TR4132/4132N
LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-C262	SL-25TH-10	C: FXD ELECT 10μF 25V	
" -C263	SL-25TH-10	C: FXD ELECT 10μF 25V	
" -C264	0.1UF 25WV	C: FXD CER 0.1μF +80, -20% 25V	
" -C265 thru " -C267	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C268	221M2502-106M	C: FXD ELECT TANTAL 10uF+20% 25V	
" -C269		Not assigned	
" -L271	TPF0410-120K	L: FXD Coil 12μH	
" -L272	LF-16A	L: FXD Coil 28.8μH	*
" -L273 thru " -L275	CSL0609-181K	L: FXD Coil 180μH	
" -R281	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R282	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R283	R25 15KΩJ	R: FXD CAR 15kΩ +5% 1/4W	
" -R284	HM1/4 12MΩJ	R: FXD CAR 12MΩ ±5% 1/4W	
" -R285	HM1/4 5.6MΩJ	R: FXD CAR 5.6MΩ ±5% 1/4W	
" -R286	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R287	R25 3.9KΩJ	R: FXD CAR 3.9kΩ ±5% 1/4W	
" -R288	3321W-1-103	R: VAR CERMET 10kΩ ±20% 1/2W	
" -R289	31D-26	R: Thermistor	
" -R290	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R291	R25 3.9KΩJ	R: FXD CAR 3.9kΩ ±5% 1/4W	
" -R292	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R293	3321W-1-201	R: VAR CERMET 200Ω ±20% 1/2W	
" -R294	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R295	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R296	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R297	3321W-1-103	R: VAR CERMET 10kΩ ±20% 1/2W	
" -R298	R25 33KΩ	R: VFXD CAR 33kΩ ±5% 1/4W	
" -R299	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R300	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
4132-PH209-R301	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	

LOG.AMP.SECTION (Board PH209)

Parts No.	Stock No.	Description	
4132-PH209-R302	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R303	R25 330ΩJ	R: FXD CAR 330Ω ±5% 1/4W	
" -R304	R25 330ΩJ	R: FXD CAR 330Ω ±5% 1/4W	
" -R305	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
	401-8079	Board Handle	*
4132-PH209-R159	R25 6.8KΩJ	R:FXD CAR 6.8kΩ ±5% 1/4W	
" -C251	DM10D680J3	C:FXD DIPPED MICA 68pF ±5% 300V	
" -C252	DM10D510J3	C:FXD DIPPED MICA 51pF ±5% 300V	

TR4132/4132N
RAMP & YIG DRIVER SECTION (Board PF130)

Parts No.	Stock No.	Description	
4132-PF130-IC1 thru " -IC4	LM301A	IC: Operational Amplifier	
" -IC5	LM324	IC: Quadruple Operational Amplifier	
" -IC6	TL084CN	IC: JFET-Input Operational Amplifier	
" -IC7		Not assigned	
" -IC8	SN74LS76	IC: Dual J-K Master-Slave Flip-Flop with Preset and Clear Low Power	
" -IC9	SN74LS123	IC: Dual Retriggerable Monostable Multivibrator with Clear Low Power	
" -IC10	SN74LS26	IC: Quadruple 2-Input High-Voltage Interface NAND Gate Low Power	
" -Q21	ITS30088	Transistor FET	
" -Q22	ITS30088	Transistor FET	
" -Q23	2SA1015	Transistor SI PNP	
" -Q24	2SA1015	Transistor SI PNP	
" -Q25	2SC1815GR	Transistor SI NPN	
" -Q26	2SA1015	Transistor SI PNP	
" -Q27	2SD92	Transistor SI NPN	
" -Q28	MP311	Transistor SI NPN Twin	
" -Q29	2SA1015	Transistor SI PNP	
" -Q30	2N4393	Transistor FET	
" -D31 thru " -D34	1S953	Diode SI	
" -D35	WZ-050	Diode Zener	
" -D36	1S953	Diode SI	
" -D37	1S953	Diode SI	
" -D38	1S2192	Diode SI	
" -D39	1S953	Diode SI	
" -R41	R25 18kΩJ	R: FXD CAR 18kΩ ±5% 1/4W	
4132-PF130-R42	SN14K2E9.1KΩF	R: FXD Metal FLM 9.1kΩ±1% 1/4W	

RAMP & YIG DRIVER SECTION (Board PF130)

Parts No.	Stock No.	Description	
4132-PF130-R43	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R44	SN14K2E23.2KΩF	R: FXD Metal FLM 23.2kΩ±1% 1/4W	
" -R45	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R46	R25 330ΩJ	R: FXD CAR 330Ω ±5% 1/4W	
" -R47	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R48	3321W-1-502	R: VAR CERMET 5kΩ ±20% 1/2W	
" -R49	R25 5.6KΩJ	R: FXD CAR 5.6KΩ ±5% 1/4W	
" -R50	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R51	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R52	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R53	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R54	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R55	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R56 thru " -R58	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R59	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R60	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R61	R25 33KΩJ	R: FXD CAR 33kΩ ±5% 1/4W	
" -R62 thru " -R64	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R65	R25 15KΩJ	R: FXD CAR 15kΩ ±5% 1/4W	
" -R66 thru " -R68	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R69	CRB1/4FX33KΩ	R: FXD Metal FLM 33kΩ ±1% 1/4W	
" -R70	R25 330KΩJ	R: FXD CAR 330kΩ ±5% 1/4W	
" -R71	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R72	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R73	CRB1/4FX12KΩ	R: FXD Metal FLM 12KΩ ±1% 1/4W	
" -R74	CRB1/4FX3.3KΩ	R: FXD Metal FLM 3.3kΩ ±1% 1/4W	
" -R75	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R76 thru " -R78	RF1/2N330ΩFT	R: FXD Metal FLM 330Ω ±1% 1/2W	
4132-PF130-R79	RF1/2N1KΩTF	R: FXD Metal FLM 1KΩ ±1% 1/2W	

RAMP & YIG DRIVER SECTION (Board PF130)

Parts No.	Stock No.	Description	
4132-PF130-R80	HM1/4 22MΩJ	R: FXD CAR 22MΩ ±5% 1/4W	
" -R81	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R82	R1/2 470ΩJ	R: FXD CAR 470Ω ±5% 1/2W	
" -R83	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R84	3321W-1-201	R: VAR CERMET 200Ω ±20% 1/2W	
" -R85	R25 390ΩJ	R: FXD CAR 390Ω ±5% 1/4W	
" -R86	3321W-1-502	R: VAR CERMET 5kΩ ±20% 1/2W	
" -R87	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R88	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R89	CRB1/4FX9.1KΩ	R: FXD Metal FLM 9.1kΩ ±1% 1/4W	
" -R90	CRB1/4FX10KΩJ	R: FXD Metal FLM 10kΩ ±1% 1/4W	
" -R91	3321W-1-202	R: VAR CERMET 2kΩ ±20% 1/2W	
" -R92	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R93	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R94	CRB1/4FX10kΩJ	R: FXD Metal FLM 10kΩ ±1% 1/4W	
" -R95	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R96	CRB1/4FX33KΩ	R: FXD Metal FLM 33kΩ ±1% 1/4W	
" -R97	3321W-1-103	R: VAR CERMET 10kΩ ±20% 1/2W	
" -R98	R1/2 2.2MΩJ	R: FXD CAR 2.2MΩ ±5% 1/2W	
" -R99	CRB1/4FX33KΩ	R: FXD Metal FLM33kΩ ±1% 1/4W	
" -R100	3321W-1-502	R: VAR CERMET 5kΩ ±20% 1/2W	
" -R101	CRB1/4FX-18KΩ	R: FXD Metal FLM 18kΩ ±1% 1/4W	
" -R102	CRB1/4FX2KΩ	R: FXD Metal FLM 2kΩ ±1% 1/4W	
" -R103	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R104	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R105	31D-26	Thermister	
" -R106	CRB1/4FX 1KΩ	R: FXD Metal FLM 1kΩ ±1% 1/4W	
" -R107	CRB1/4FX 15KΩ	R: FXD Metal FLM 15kΩ ±1% 1/4W	
" -R108	3321W-1-201	R: VAR CERMET 200Ω ±20% 1/2W	
" -R109	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R110	3321W-1-204	R: VAR CERMET 200kΩ ±20% 1/2W	
" -R111	R25 390KΩJ	R: FXD CAR 390kΩ ±5% 1/4W	
" -R112	RD25S270KΩJ	R:FXD CAR 270kΩ ±5% 1/4W	
4132-PF130-R113	3321W-1-204	R: VAR CERMET 200kΩ ±20% 1/2W	

RAMP & YIG DRIVER SECTION (Board PF130)

Parts No.	Stock No.	Description	
4132-PF130-R114	R25 330KΩJ	R: FXD CAR 330kΩ ±5% 1/4W	
" -R115	CRB1/4FX39KΩ	R: FXD Metal FLM 39kΩ ±1% 1/4W	
" -R116	CRB1/4FX15KΩ	R: FXD Metal FLM 15kΩ ±1% 1/4W	
" -R117	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R118	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R119	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R120	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R121	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R122	3321W-1-502	R: VAR CERMET 5kΩ ±20% 1/2W	
" -R123	CRB1/4FX1.8KΩ	R: FXD Metal FLM 1.8kΩ ±1% 1/4W	
" -R124	CRB1/4FX 18KΩ	R: FXD Metal FLM 18kΩ ±1% 1/4W	
" -R125	3321W-1-501	R: VAR CERMET 500Ω ±20% 1/2W	
" -R126	R25 10KΩ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R127	CRB1/4FX 5.6K	R: FXD Metal FLM 5.6kΩ ±1% 1/4W	
" -R128	CRB1/4FX 1.8K	R: FXD Metal FLM 1.8kΩ ±1% 1/4W	
" -R129	CRB1/4FX 75KΩ	R: FXD Metal FLM 75kΩ ±1% 1/4W	
" -R130	R1-68ΩJ	R: FXD CAR 68Ω ±5% 1W	
" -R131	R1/2-47ΩJ	R: FXD CAR 47Ω ±5% 1/2W	
" -R132	CRB1/4FX36KΩ	R: FXD Metal FLM 36kΩ ±1% 1/4W	
" -R133	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R134	R25 33KΩJ	R: FXD CAR 33kΩ ±5% 1/4W	
" -R135	R25 68KΩJ	R: FXD CAR 68kΩ ±5% 1/4W	
" -C141	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" -C142	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C143	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C144	431M2003 105K	C: FXD Polyester FLM 1μF ±10% 200V	
" -C145	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C146	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" -C147	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C148	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C149	35VB4R7	C: FXD ELECT 4.7μF 35V	
" -C150	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
4132-PF130-C151	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	

RAMP & YIG DRIVER SECTION (Board PF130)

Parts No.	Stock No.	Description	
4132-PF130-C152	35VB4R7	C: FXD ELECT 4.7μF 35V	
" -C153	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" -C154 thru " -C157	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C158	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" -C159	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C160	431M2003 104K	C: FXD Polyester FLM 0.1μF ±10% 200V	
" -C161	TA-050TN1R0-P	C: FXD ELECT TANTAL 1μF+100,-0% 50V	
" -C163 thru " -C172	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C173	0.1UF 50WV	C: FXD CER 0.1μF +80, -20% 50V	
" -C174 thru " -C179	25VB10	C: FXD ELECT 10μF 25V	
" -C180	25VB10	C: FXD ELECT 10μF 25V	
" -L191	CSL0609-471K	L: FXD Coil 470μH	
" -L192	CSL0609-471K	L: FXD Coil 470μH	
	401-9630	Test point	*
	431-5790	Heat Sink	*
	401-8079	Board Handle	*
" -R136	R25 68KΩJ	R: FXD CAR68kΩ ±5% 1/4W	
" -R137	CRB1/4FX 300KΩ	R: FXD Metal FLM 300kΩ ±1% 1/4W	
" -R138	CRB1/4FX 75KΩ	R: FXD Metal FLM 75kΩ ±1% 1/4W	
	MBB-0602-0152-9	Heat Sink	*
" -Q194	2SA473	Transistor SI PNP	
" -R196	RD25S 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R197	SN14K2E1.5KΩF	R: FXD Metal FLM 1.5kΩ ±1% 1/4W	
" -R198	RJ6X500Ω	R: VAR CERMET 500Ω	
" -R199	SN14K2E2.49KΩF	R: FXD Metal FLM 2.49kΩ ±1% 1/4W	
" -C162	0.022UF 50WV	C: FXD CER 0.022μF +80, -20% 50V	

CRT DRIVER SECTION (Board SG210)

Parts No.	Stock No.	Description	
4132-SG210-IC1	LM318H	IC: Operational Amplifier	
" -Q11	2SC505	Transistor SI NPN	
" -Q12	2SC505	Transistor SI NPN	
" -Q13	2SC1815GR	Transistor SI NPN	
" -Q14	2SC1815GR	Transistor SI NPN	
" -Q15	2SC505	Transistor SI NPN	
" -Q16	2SC505	Transistor SI NPN	
" -Q17	2SC1815GR	Transistor SI NPN	
" -Q18	2SC505	Transistor SI NPN	
" -Q19	2SC505	Transistor SI NPN	
" -Q20 thru " -Q22	2SC1815GR	Transistor SI NPN	
" -Q23	2N3585	Transistor SI NPN	
" -Q24 thru " -Q26	2SC505	Transistor SI NPN	
" -Q27	2N4393	FET Junction N-Channel	
" -Q28	2SC1815GR	Transistor SI NPN	
" -Q29	2SC1815GR	Transistor SI NPN	
" -Q30	2SA1015	Transistor SI PNP	
" -Q31	2SC510	Transistor SI NPN	
" -D41 thru " -D45	1S953	Diode SI	
" -D46	05Z68	Diode Zener	
" -D47	05Z68	Diode Zener	
" -D48	1S953	Diode SI	
" -D49	1S953	Diode SI	
" -R51	R25 180ΩJ	R: FXD CAR 180Ω ±5% 1/4W	
" -R52	R1 47KΩJ	R: FXD CAR 47kΩ ±5% 1W	
" -R53	R1 47KΩJ	R: FXD CAR 47kΩ ±5% 1W	
" -R54	R25 2.2KΩJ	R: FXD CAR 2.2kΩ ±5% 1/4W	
4132-SG210-R55	X13S-5KΩJ	R: VAR WW 5kΩ	

CRT DRIVER SECTION (Board SG210)

Parts No.	Stock No.	Description	
4132-SG210-R56	R25 2.7KΩJ	R: FXD CAR 2.7kΩ ±5% 1/4W	
" -R57	R25 2.7KΩJ	R: FXD CAR 2.7kΩ ±5% 1/4W	
" -R58	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R59	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R60	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R61	X13S-2KΩJ	R: VAR WW 2kΩ	
" -R62	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R63	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R64	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R65	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R66	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R67	R25 82KΩJ	R: FXD CAR 82kΩ ±5% 1/4W	
" -R68	R25 82KΩJ	R: FXD CAR 82kΩ ±5% 1/4W	
" -R69	R1 47KΩJ	R: FXD CAR 47kΩ ±5% 1W	
" -R70	R1 47KΩJ	R: FXD CAR 47kΩ ±5% 1W	
" -R71	R25 3.9KΩJ	R: FXD CAR 3.9kΩ ±5% 1/4W	
" -R72	RJ13S-20KΩ	R: VAR CAR 20kΩ	
" -R73	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R74	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R75	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R76	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R77	R25 1.8KΩJ	R: FXD CAR 1.8kΩ ±5% 1/4W	
" -R78	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R79	R25 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" -R80	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R81	R25 3.3kΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R82	R25 220KΩJ	R: FXD CAR 220kΩ ±5% 1/4W	
" -R83	R25 220KΩJ	R: FXD CAR 220kΩ ±5% 1/4W	
" -R84	R25 68KΩJ	R: FXD CAR 68kΩ ±5% 1/4W	
" -R85	3321H-1-503	R: VAR CERMET 50kΩ ±20% 1/2W	
" -R86	RJ13S-500KΩ	R: VAR WW 500KΩ ±20% 1/2W	
" -R87	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
" -R88	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W	
4132-SG210-R89	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	

CRT DRIVER SECTION (Board SG210)

Parts No.	Stock No.	Description	
4132-SG210-R90	CRB1/4FX-15KΩ	R: FXD Metal FLM 15kΩ ±1% 1/4W	
" -R91	CRB1/4FX-15KΩ	R: FXD Metal FLM 15kΩ ±1% 1/4W	
" -R92	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R93	R25 33KΩJ	R: FXD CAR 33kΩ ±5% 1/4W	
" -R94	R25 2.2KΩJ	R: FXD CAR 2.2kΩ ±5% 1/4W	
" -R95	X13S-1KΩ	R: VAR WW 1kΩ	
" -R96	R25 3.9KΩJ	R: FXD CAR 3.9kΩ ±5% 1/4W	
" -R97	R25 18KΩJ	R: FXD CAR 18kΩ ±5% 1/4W	
" -R98	R25 3.9KΩJ	R: FXD CAR 3.9kΩ ±5% 1/4W	
" -R99	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R100	R25 3.3KΩJ	R: FXD CAR 3.3kΩ ±5% 1/4W	
" -R101	R25 5.6KΩJ	R: FXD CAR 5.6kΩ ±5% 1/4W	
" -R102	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R103	R25 150KΩJ	R: FXD CAR 150kΩ ±5% 1/4W	
" -R104	R25 220KΩJ	R: FXD CAR 220kΩ ±5% 1/4W	
" -R106	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R107	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R108	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R109	R25 3.9KΩJ	R: FXD CAR 3.9kΩ ±5% 1/4W	
" -R110	R25 2.2KΩJ	R: FXD CAR 2.2kΩ ±5% 1/4W	
" -R111	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R112	R25 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" -R113	X13S-1KΩ	R: VAR WW 1kΩ	
" -C121 thru " -C124	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -C125	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" -C126	221M-3502-105M	C: FXD ELECT TANTAL 1μF ±20% 35V	
" -C127	501N-5002-103	C: FXD Polyester FLM 0.01μF 50V	
" -C128	25T10	C: FXD ELECT 10μF 25V	
" -C129	25T10	C: FXD ELECT 10μF 25V	
" -C130	16VBSN10	C: FXD ELECT 10μF 16V	
4132-SG210-C131	16VBSN100	C: FXD ELECT 100μF 16V	

CRT DRIVER SECTION (Board SG210)

Parts No.	Stock No.	Description	
4132-SG210-C132	16VBSN10	C: FXD ELECT 10μF 16V	
" -C133	25VBSN10	C: FXD ELECT 10μF 25V	
" -C134 thru " -C138	0.01UF 500WV	C: FXD CER 0.01μF +80, -20% 500V	
" -C139 thru " -C142	0.01UF 50WV	C: FXD CER 0.01μF +80, -20% 50V	
" -L151	CSL0609-471K	L: FXD Coil 470μH	
" -L152	CSL0609-471K	L: FXD Coil 470μH	
"			
" -J156	5049-15A	Connector	
"	PCN6-15PA-2.5DS	Connector	
	401-9630	Test point	*
	431-5790	Heat sink	*
4132-SG210-R105		Not assigned	

TR4132/4132N
FREQ. DISPLAY (Board SZ441-01)
LEVEL DISPLAY (Board SZ441-02)

Parts No.	Stock No.	Description	
4132-SZ441-IC1	ICL7107CPL	IC: 3 1/2 Digit A/D Converter	
" -R21	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W (for TR4132)	
" -R21	R25 470KΩJ	R: FXD CAR 470kΩ ±5% 1/4W (for TR4132N)	
" -R22	R25 330KΩJ	R: FXD CAR 330kΩ ±5% 1/4W	
" -R23	CRB1/4FX 2KΩ	R: FXD Metal FLM 2kΩ ±1% 1/4W	
" -R24	CRB1/4FX 18KΩ	R: FXD Metal FLM 18kΩ ±1% 1/4W	
" -R25	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W (for TR4132)	
" -R25	R25 100KΩJ	R: FXD CAR 100kΩ ±5% 1/4W (for TR4132N)	
" -C31	431M2003-224K	C: FXD Polyester FLM 0.22µF ±10% 200V	
" -C32	501N5002-473K	C: FXD Polyester FLM 0.047µF ±10% 50V	
" -C33	0.01UF 50WV	C: FXD CER 0.01µF +80, -20% 50V	
" -C34	431M2003-104K	C: FXD Polyester FLM 0.1µF ±10% 200V	
" -C35	DM10D-101J3	C: FXD DIPPED MICA 100pF ±5% 300V	
" -C36	0.01UF 50WV	C: FXD CER 0.01µF 80, -20% 50V	
" -C37	0.01UF 50WV	C: FXD CER 0.01µF +80, -20% 50V	
" -C38	16VB10	C: FXD ELECT 10µF 16V	
4132-SZ441-J51	PCN6-10PA-2.5DS	Connector	
	781-5789	Sponge	

FREQ. DISPLAY (Board SG231-01)
LEVEL DISPLAY (Board SG231-02)

Parts No.	Stock No.	Description	
4132-SZ231-D11	TLR314	Diode Light Emitting	*
" -D12 thru " -D14	TLR313	Diode Light Emitting	*
4132-SZ231-J53	1-163740-9	Connector	*

CAL. OSC. SECTION (Board SF145)

Parts No.	Stock No.	Description	
4132-SF145-Q1	2SC2026	Transistor SI NPN	
" -D3	1S953	Diode SI	
" -D4	1S953	Diode SI	
" -R11	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R12	R25 22KΩJ	R: FXD CAR 22kΩ ±5% 1/4W	
" -R13	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R14	R25 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	
" -R15	R25 180ΩJ	R: FXD CAR 180Ω ±5% 1/4W	
" -R16	3321H-1-501	R: VAR CERMET 500Ω ±20% 1/2W	
" -R17	R25 56ΩJ	R: FXD CAR 56Ω ±5% 1/4W (for TR4132)	
" -R18	R25 75ΩJ	R: FXD CAR 75Ω ±5% 1/4W (for TR4132N)	
" -C26	DM10C020D5	C: FXD DIPPED MICA 2pF ±0.5pF 500V	
" -C27	DM10C150K5	C: FXD DIPPED MICA 15pF ±10% 500V	
" -C28	DM10C150K5	C: FXD DIPPED MICA 15pF ±10% 500V	
" -C29	DM10D101J3	C: FXD DIPPED MICA 100pF ±5% 300V	
" -C30	E50SJ-YU050C	C: FXD CER 5pF ±0.25% 50V	
" -C31	35VB10	C: FXD ELECT 10μF 35V	
" -C32	KFD51AYZB102P50	C: FXD Feed-through 1000pF 50V	
" -L41	L07A19	L: FXD Coil	*
" -L42	CSL0609-471K	L: FXD Coil 470μH	
" -J51	UG-291/U	Connector 50Ω BNC (for TR4132)	
4132-SF145-J52	BNC-PJ608	Connector 75Ω BNC (for TR4132N)	

RF.BLOCK (Unit MEP-262)

Parts No.	Stock No.	Description	
	MEK-0169-0133-6	Cavity Cover	*
	MEK-0171-0172-4	Center Conductor	*
	MIB-0462-0133-7	RF Cover	*
	SX052	1st.MIXER	*
	SX053	2nd.MIXER	*
	MEK-0198-0172-7	Center Conductor S	*
	MEK-0164-0124-9	RF. Block	

1st. MIXER SECTION (Board SX052)

Parts No.	Stock No.	Description	
4132-SX052-D1	1SS97	Diode SI Schottky	
" -D2	1SS97	Diode SI Schottky	
" -R6	THP-007-3	R: FXD PAD TAKEDA SPEC	
" -R7	RD25S 22ΩJ	R: FXD CAR 22Ω ±5% 1/4W	
" -R8	RD25S 22ΩJ	R: FXD CAR 22Ω ±5% 1/4W	
" -R9	RD12S 22ΩJ	R: FXD CAR 22Ω ±5% 1/8W	
" -R13	RD12S 150ΩJ	R: FXD CAR 150Ω ±5% 1/8W	
" -C10	DM10D220J5	C: FXD DIPPED MICA 22pF ±5% 500V	
" -J11	50-645-4526-89	Connector	
4132-SX052-J12	50-645-4526-89	Connector	
	MCT-160	Cable	

2nd. MIXER SECTION (Board SX053)

Parts No.	Stock No.	Description	
4132-SX053-Q1	2SC1275	Transistor SI NPN	
" -Q2	2SC2026	Transistor SI NPN	
" -D6	1SS97	Diode SI Schottky	
" -D7	1SS97	Diode SI Schottky	
" -R11	R25 1.2KΩJ	R: FXD CAR 1.2kΩ ±5% 1/4W	
" -R12	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R13	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -R14	R25 4.7KΩJ	R: FXD CAR 4.7kΩ ±5% 1/4W	
" -R15	R25 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	
" -R16	R25 150ΩJ	R: FXD CAR 150Ω ±5% 1/4W	
" -R17	R25 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" -R18	R25 10ΩJ	R: FXD CAR 10Ω ±5% 1/4W	
" -C26	BLMIH 472NA	C: FXD BL 4700pF 50V	
" -C27	DM10C 030D5	C: FXD DIPPED MICA 3pF ±0.5% 500V	
" -C28	FD76F1H104Z	C: FXD CER 1uF+80, -20% 50V	
" -C29	0.001UF 50WV	C: FXD CER 0.001μF +80, -20% 50V	
" -C30	0.001UF 50WV	C: FXD CER 0.001μF +80, -20% 50V	
" -C31	25T10	C: FXD ELECT 10μF 25V	
" -C32	KFD51AYZB102P50V	C: FXD Feel-through 1000pF 50V	
" -L41	LR-1	L: FXD Coil	
" -L42	CSL0609-471K	L: FXD Coil 470μH	
4132-SX053-J46	UM-QR-1	Connector	

DC CUT SECTION (MEP-264)

Parts No.	Stock No.	Description	
4132-MEP264-C1	C65AF2A104Z	C: FXD CER 0.1μF +80, -20% 100V	
" -R3	CHR-2-24ΩJ	R: FXD CHIP 24Ω (for TR4132N)	
" -J6	50-645-4526-89	Connector	
" -J7	UG-58A/U	Connector 50Ω N Type (for TR4132)	
4132-MEP264-J8	BNC-R601	Connector 75Ω BNC Type (for TR4132N)	
	MEK-0170-0122-7	DC Cut Block Case A (for TR4132)	
	MEK-0172-0122-3	DC Cut Block Case B (for TR4132N)	
	MIB-0461-0132-3	DC Cut Block Cover	

1dB STEP ATT. (MEP-263)

Parts No.	Stock No.	Description	
4132-MEP263-R1 thru " -R3	CRB1/4FX-1KΩ	R: FXD Metal FLM 1kΩ ±1% 1/4W	
" -R4 thru " -R15	R25 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" -R16 thru " -R27	R25 68ΩJ	R: FXD CAR 68Ω ±5% 1/4W	
" -R28	R25 560ΩJ	R: FXD CAR 560Ω ±5% 1/4W	
" -R29 thru " -R39	R25 5.1KΩJ	R: FXD CAR 5.1kΩ ±5% 1/4W	
" -R40	R25 10KΩJ	R: FXD CAR 10kΩ ±5% 1/4W	
" -SW51	YSNH-165A	Rotary Switch	
4132-MEP263-J53	UM-QLP-1.5 (01)	Connector	
	MNB-0459-0102-8	Shield Cover	

HIGH VOLTAGE SECTION (MEP-265)

Parts No.	Stock No.	Description	
4132-MEP265-Q1	2SC1826(O)	Transistor SI NPN Selected	
" -D11	1S953	Diode SI	
" -D12 thru " -D15	ED-7TV1	Diode SI	
" -D16	1N989A	Diode Zener	
" -R21	R25 6.8KΩJ	R: FXD CAR 6.8kΩ ±5% 1/4W	
" -R22	R25 120ΩJ	R: FXD CAR 120Ω ±5% 1/4W	
" -R23	R25 10ΩJ	R: FXD CAR 10Ω ±5% 1/4W	
" -R24	R1/2 33KΩJ	R: FXD CAR 33kΩ ±5% 1/2W	
" -R25	RH-2HVS-36MΩJ	R: FXD Metal Grazed 36MΩ ±5% 2W	
" -R26	R1/2 220KΩJ	R: FXD CAR 220kΩ ±5% 1/2W	
" -R27	R1/2 220KΩJ	R: FXD CAR 220kΩ ±5% 1/2W	
" -R28	R1/2 22KΩJ	R: FXD CAR 22kΩ ±5% 1/2W	
" -R29	R1/2 1MΩJ	R: FXD CAR 1MΩ ±5% 1/2W	
" -R30	RH-2HVS-10MΩJ	R: FXD Metal Graged 10MΩ ±5% 2W	
" -R31	R1/2 27KΩJ	R: FXD CAR 27kΩ ±5% 1/2W	
" -R32	R1/2 2.2MΩJ	R: FXD CAR 2.2MΩ ±5% 1/2W	
" -C41	441N-1003-154K	C: FXD Polyester FLM 0.15μF ±10% 100V	
" -C42	0.1UF 50WV	C: FXD CER 0.1μF +80, -20% 50V	
" -C43	0.1UF 50WV	C: FXD CER 0.1μF +80, -20% 50V	
" -C44	50VB33	C: FXD ELECT 33μF 50V	
" -C45	0.01UF 500WV	C: FXD CER 0.01μF +80, -20% 500V	
" -C46 thru " -C53	DD3160-362E-152P3KV	C: FXD CER 1500pF 3kV	
" -C54	DD3250E682P2KV02	C: FXD CER 6800pF 2kV	
4132-MEP265-TP71	LTP-000196A	High Voltage Transformer	*
	MIB-0456-0164-1	High Voltage Block Case	*
	MIB-0457-0164-9	High Voltage Block Case Cover	*
	MIB-0460-0103-7	High Voltage Transformer Holder	*
	NG-79C	Grommet	*
	MSN-0079-0133-1	Name Plate	*

CABLE

Parts No.	Stock No.	Description	
4132-CBL-Ca1	KCA-25A-12	Cable (DC CUT to RF ATT.)	*
" -Ca2	KCA-25A-14	Cable (RF ATT. to RF BLOCK)	*
4132-CBL-Ca3	KCA-25A-13	Cable (YIG. OSC. to RF BLOCK)	*

Fig.NO.	Stock.NO	Description	TR-4132	TR-4132N	
	SK030-01	IF FILTER	1	0	
	SK030-02	IF FILTER	0	1	
	PH209	LOG. AMP.	1	1	
	PF130	RAMP.& YIG DRIVER	1	1	
	SG210	CRT DRIVER	1	1	
	MEP-273	TUNING BLOCK	1	1	
	MEP-262	RF. BLOCK	1	1	
	TSA-40BS-2	RF. ATT.	1	1	
	MEP-158	YIG. OSC.	1	1	
	SF145-01	CAL. OSC.	1	0	
	SF145-02	CAL. OSC.	0	1	
	MEP-264-01	DC CUT	1	0	
	MEP-264-02	DC CUT	0	1	
	MEP-263	1dB STEP ATT.	1	1	
	MEP-265	HIGH VOLTAGE	1	1	
	SZ441-01,SG231-01	FREQ.& LEVEL DISPLAY	1	1	
	SZ441-02,SG231-02	FREQ.& LEVEL DISPLAY	1	1	
	KCA-25	Cable, YIG to RF. BLOCK	1	1	

TR4132 ∕ 4132N
Mechanical Parts List (FRONT)

Fig. & INDEX No.		Stock No.	Description	TR-4132	TR-4132N	
8-1	1	MPX-14992A-1	KNOB, DISPERSION/DIV.	2	2	
	2	MKS-14527B001B	PLATE, B.W. (Hz) 6dB	1	1	
	3	MKS-14527B002B	PLATE, IF GAIN (1dB step)	1	1	
	4	MBZ-15138A-1	PIN, fixed	2	2	
	5	MPX-11178A-1	SPACER, nylon	2	2	
	6	MMX-15914A-1	KNOB, B.W. and IF GAIN (10dB step)	2	2	
	7	MME-10649A-1	KNOB, TUNING	1	1	
	8	MMX-10480A-1	KNOB, TUNING-FINE	1	1	
	9	MNS-10932A-1	PLATE, FINE	1	1	
	10	MMX-10483A-1	KNOB, RF ATT.	1	1	
	11	MMX-12223A-1	KNOB, MANU. SCAN, SCAN TIME	1	1	
	12	YEE-000080-1	BUSHING	1	1	
	13	MMX-10464A-1	KNOB, FOCUS, INTENSITY	2	2	
	14	MNS-12367A-1	PLATE, FOCUS, INTENSITY	2	2	
	15	MPS-14586A001A-1	FILTER, CRT	1	1	
	16	MMX-10258A-1	HOOD, CRT	1	1	

TR4132/4132N
Mechanical Parts List (FRONT CHASSIS)

Fig. & INDEX No.		Stock No.	Description	TR-4132	TR-4132N	
8-2	1	MPX-14993A-1	FILTER, A (Frequency display)	1	1	
8-3	2	MBS-14428A001A-1	PANEL, front	1	0	
		MBS-14429A001A-1	PANEL, front	0	1	
	3	MBJ-13881A-1	PLATE, sub-panel	1	0	
		MBJ-13884A-1	PLATE, sub-panel	0	1	
	4	MPX-11181A-1	CAP, power switch	1	1	
	5	MKX-14926A-1	SHAFT, power switch	1	1	
	6	MKJ-14285A-1	HOLDER, CRT	2	2	
	7	MPX-14994A-1	FILTER, B (Reference level display)	1	1	
	8	MBN-14317A-1	COVER, shield (1dB STEP ATT.)	1	1	
	9	MCC-15425A-1	R.FRAME	2	2	
	10	MKE-10648A-1	KNOB, CAL.	1	0	
	11	MKJ-10846A-1	HOLDER, VR (R26)	1	0	
	12	YEE-000153-1	SHEET METAL NUT	8	8	

Mechanical Parts List (REAR CHASSIS)

Fig. & INDEX No.		Stock No.	Description	-TR-4132	-TR-4132N	
8-4	1	MBS-14425A001A-1	PANEL, rear	1	1	
	2	MHA-13361A-1	HEAT SINK, IC	1	1	
	3	MMX-10509A-1	FOOT	4	4	
	4	JTT-AA010EX01-1	LUG	2	2	
	5	JTT-AA005EX01-1	LUG	2	2	
	6	JTF-AE001EX02-1	LUG, teflon	7	7	
	7	JTE-AG001EX01-1	LUG, ground	1	1	
	8	MKN-12043A-1	SPACER	2	2	
	9	MKX-14926A-1	SHAFT, power switch	1	1	
	10	MBZ-15156A-1	COVER, transformer	1	1	
	11	MBZ-15140A-1	HOLDER, transformer	1	1	
	12	MBJ-13869A-1	HOLDER, capacitor	1	1	

Mechanical Parts List (BOTTOM CHASSIS)

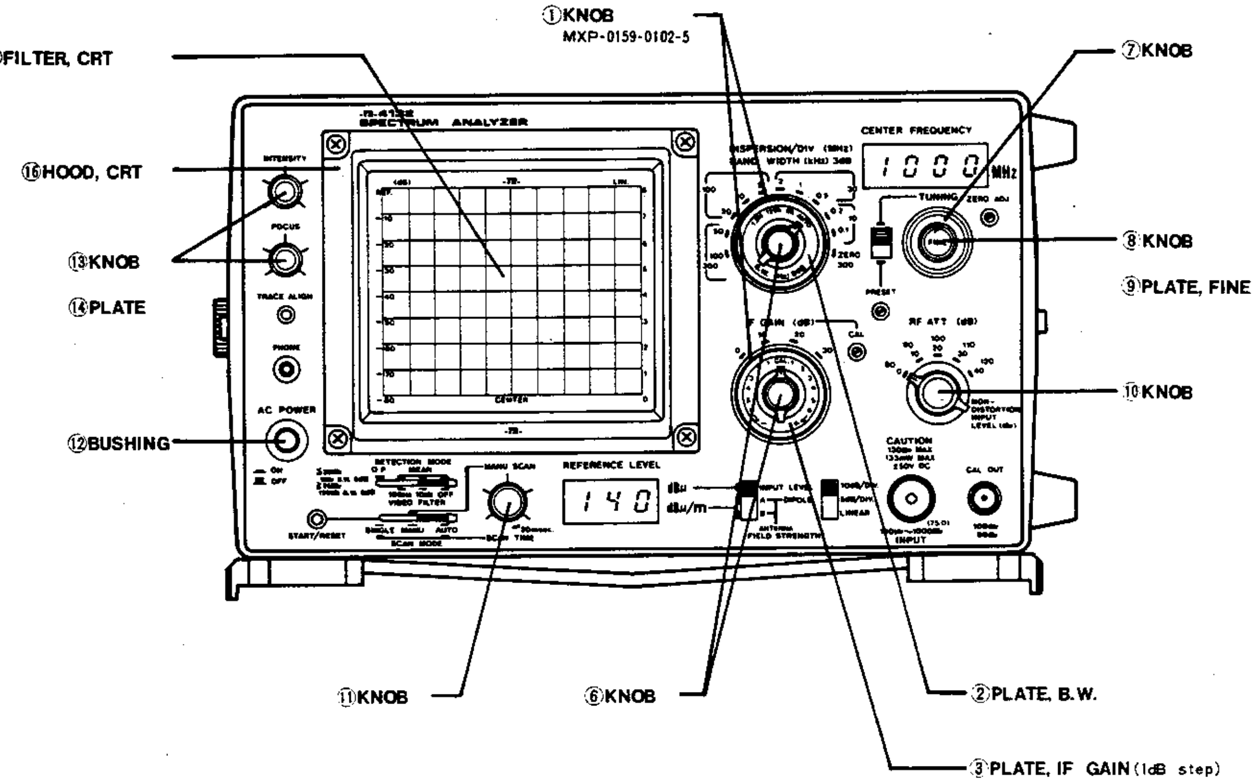
Fig. & INDEX No.		Stock No.	Description	TR-4132	TR-4132N	
8-5	1	MBJ-13879A-1	BOARD CASE	1	1	
	2		Not assigned			
	3	MHT-16059A-1	FRAME, right	1	1	
	4	MBJ-13873A-1	SUPPORT, chassis A	1	1	
	5	MHT-14730A-1	FRAME, left	1	1	
	6	MMT-10500A-1	HANDLE, carrying	1	1	
	7	MKN-10442A-1	SPACER, handle	2	2	
	8	MBJ-13877A-1	SUPPORT, chassis B	1	1	
	9	MHJ-14135A-1	SUPPORT	1	1	
	10	MKN-12968A-1	SPACER BOLT	4	4	
	11	MBS-14426A001A-1	CASE, IF FILTER SECTION	1	1	
	12	MBJ-13870A-1	HOUSING, CAL.	1	1	
	13	MBJ-13875A-1	BRACKET, CRT support	1	1	
	14	MPX-12296A-1	COVER, side	1	1	
	15	MPX-12295A-1	COVER, side	2	2	

TR4132 / 4132N
Mechanical Parts List (CABINET)

Fig. & INDEX No.		Stock No.	Description	-TR-4132	-TR-4132N	
8-6	1	MBX-13151A-1	CABINET, bottom	1	1	
	2	MMX-10510A-1	FOOT	4	4	
	3	MBC-13202A-1	STAND	1	1	
	4	MKC-10422A-1	NUT, for handle	4	4	
	5	YEE-000206-1	FOOT, rubber	4	4	
	6	MBX-14829A-1	CABINET, top	1	1	
	7	MPS-14585A-1	PLATE, VR	1	1	
	8	YEE-000386-1	BUSHING, plastic	6	6	

Mechanical Parts List (CRT & SHIELD ASSEMBLY)

Fig. & INDEX No.		Stock No.	Description	TR-4132	TR-4132N	
8-7	1	MBE-13514A-1	CRT BAND, upper	1	1	
	2	MBE-13515A-1	CRT BAND, lower	1	1	
	3	MEX-11047A-1	CUSHION, CRT, sponge B	4	4	
	4	MEX-11046A-1	CUSHION, CRT, sponge A	2	2	
	5	MBE-13516A-1	SHIELD CASE, CRT	1	1	
	6	JTF-AE001EX02-1	LUG, teflon	1	1	
	7	YEE-000306-1	O RING, packing	1	1	
	8	MBJ-13872A-1	NECK-BAND	1	1	
	9	MEX-11048A-1	CUSHION, CRT neck, sponge	1	1	



Rotary Switch(S1, SW51)

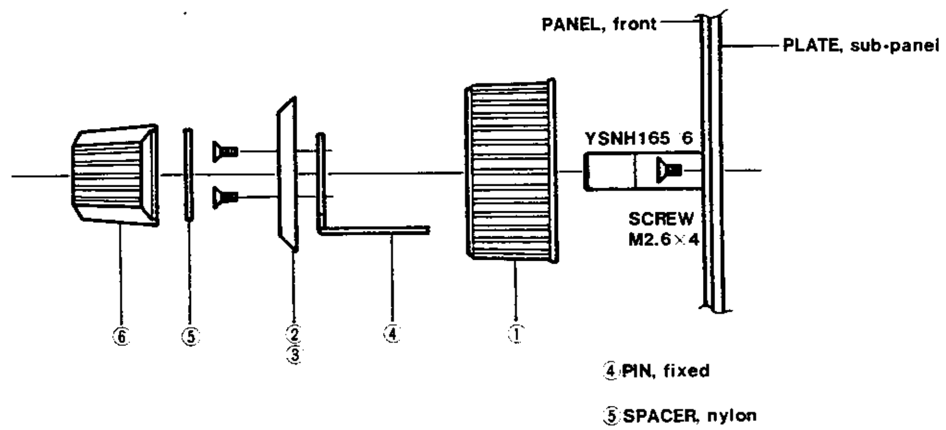


Fig. 8-1
TR4132/4132N
FRONT

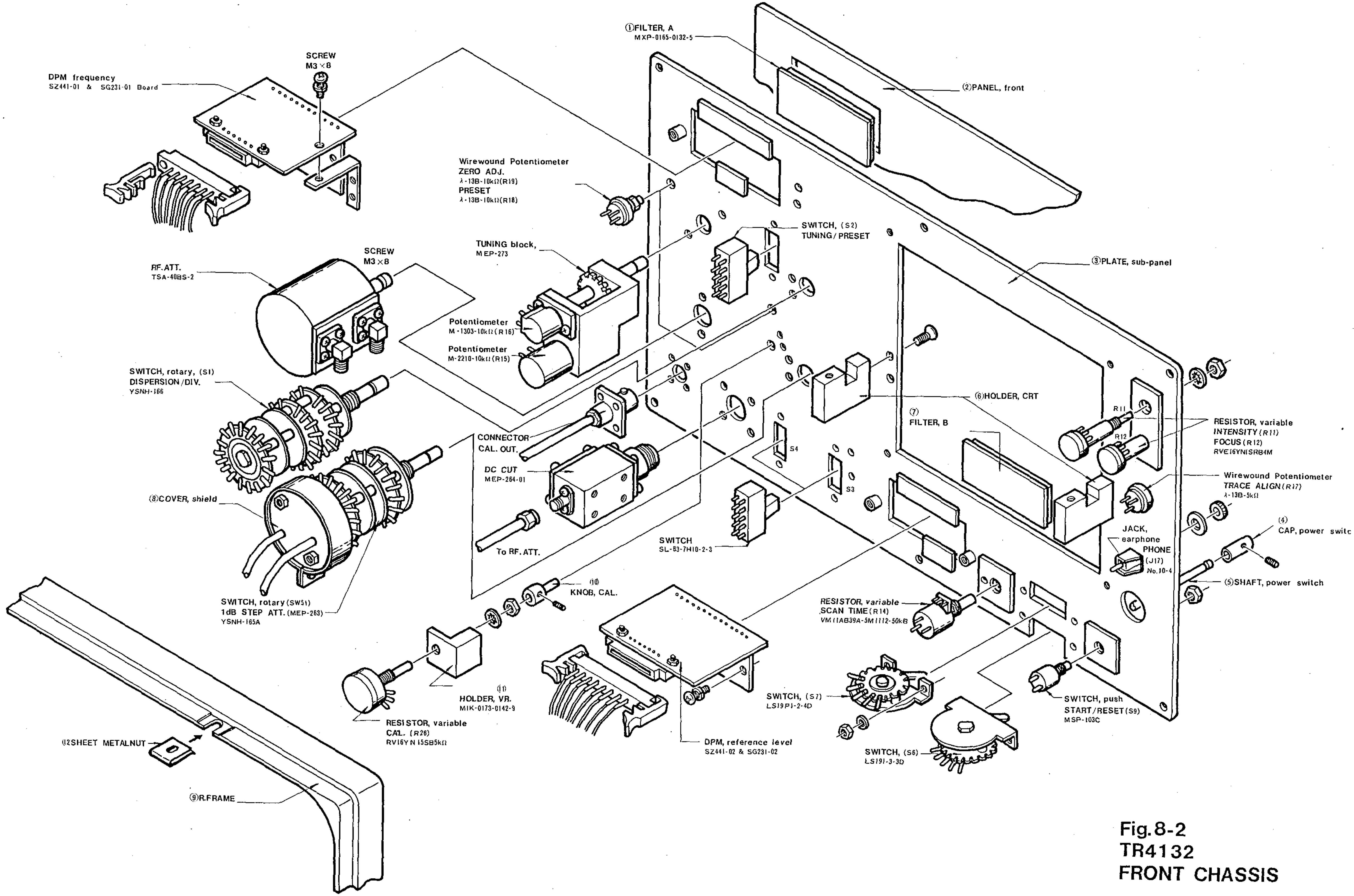


Fig.8-2
TR4132
FRONT CHASSIS

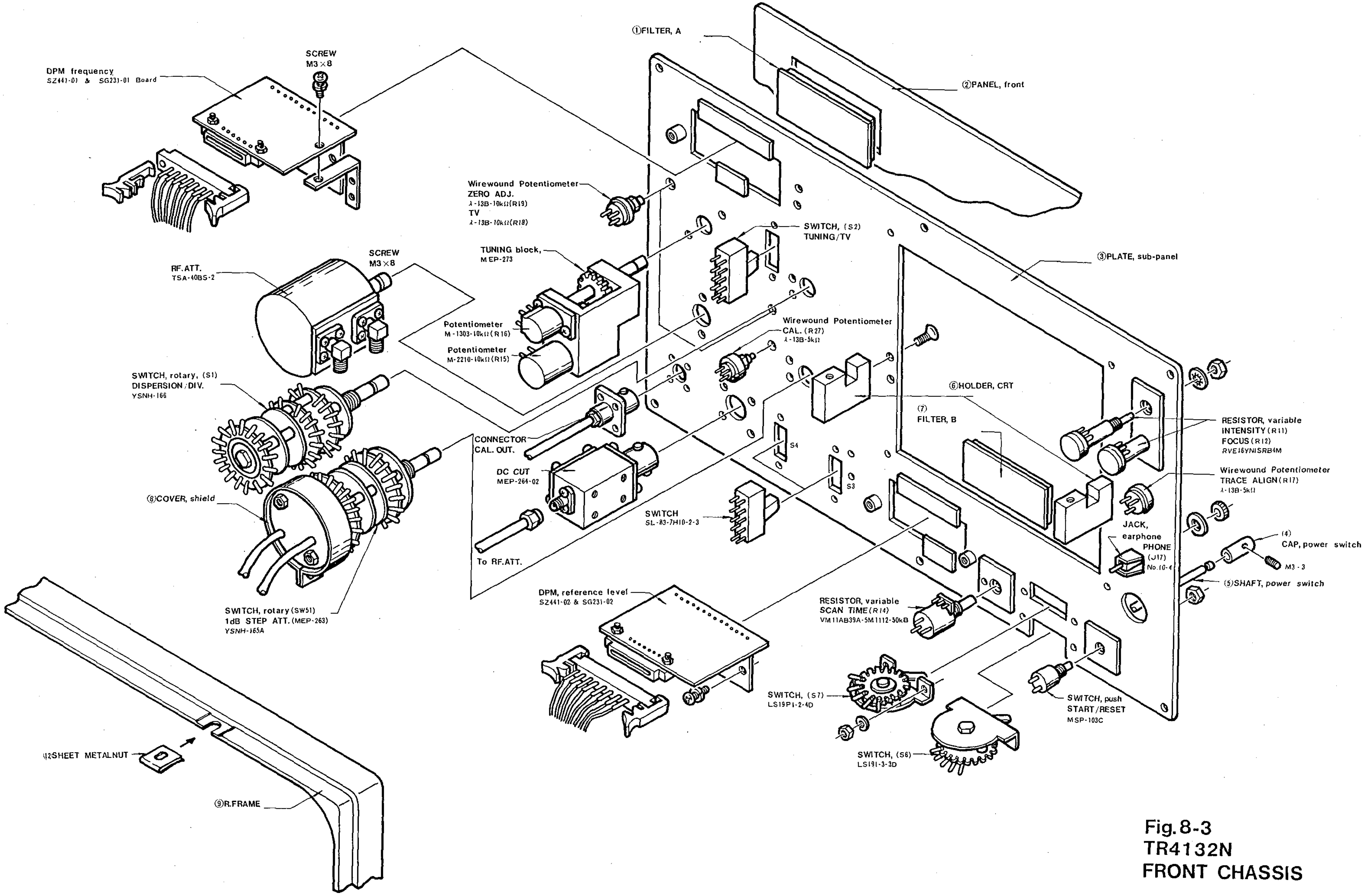


Fig. 8-3
TR4132N
FRONT CHASSIS

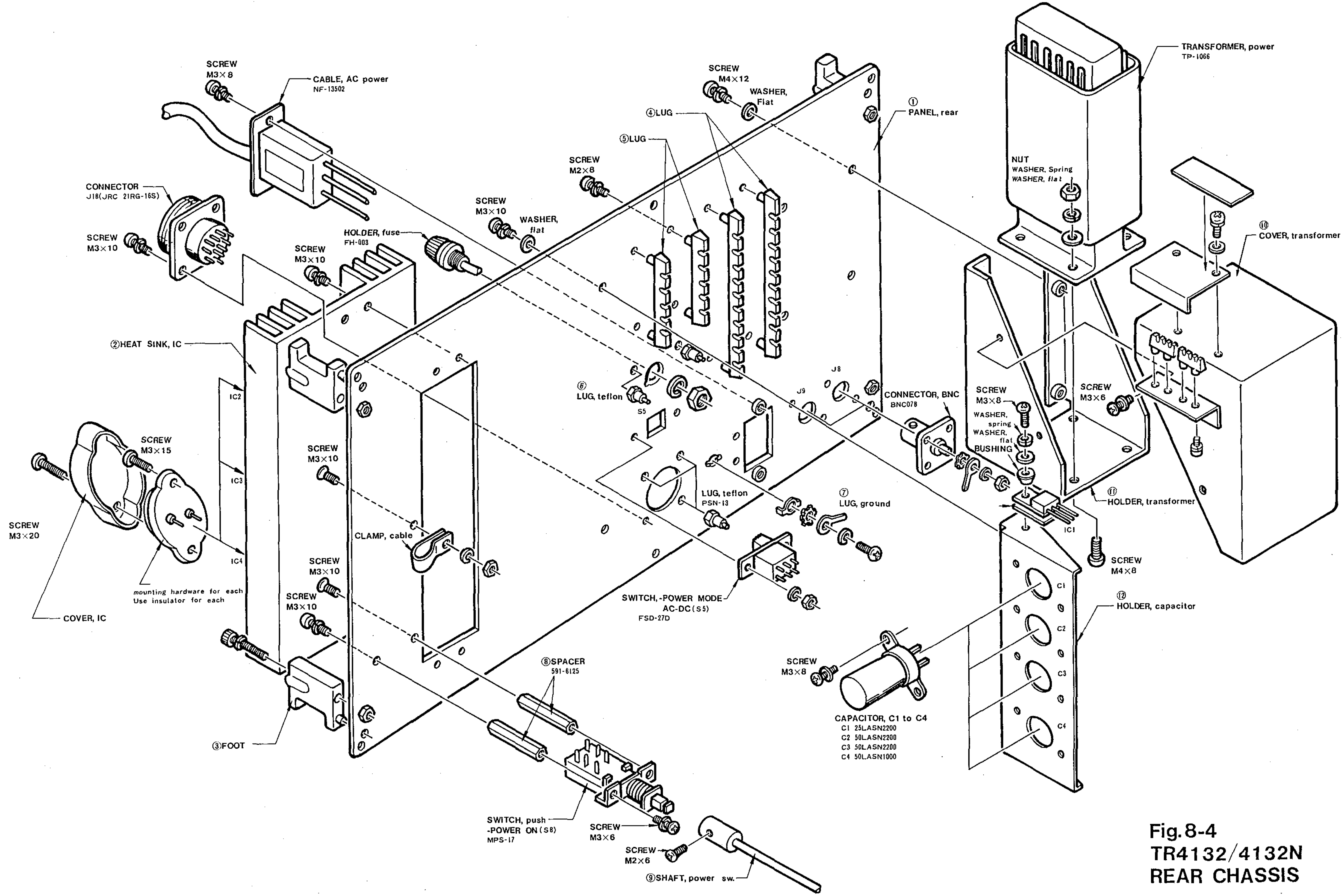


Fig. 8-4
TR4132/4132N
REAR CHASSIS

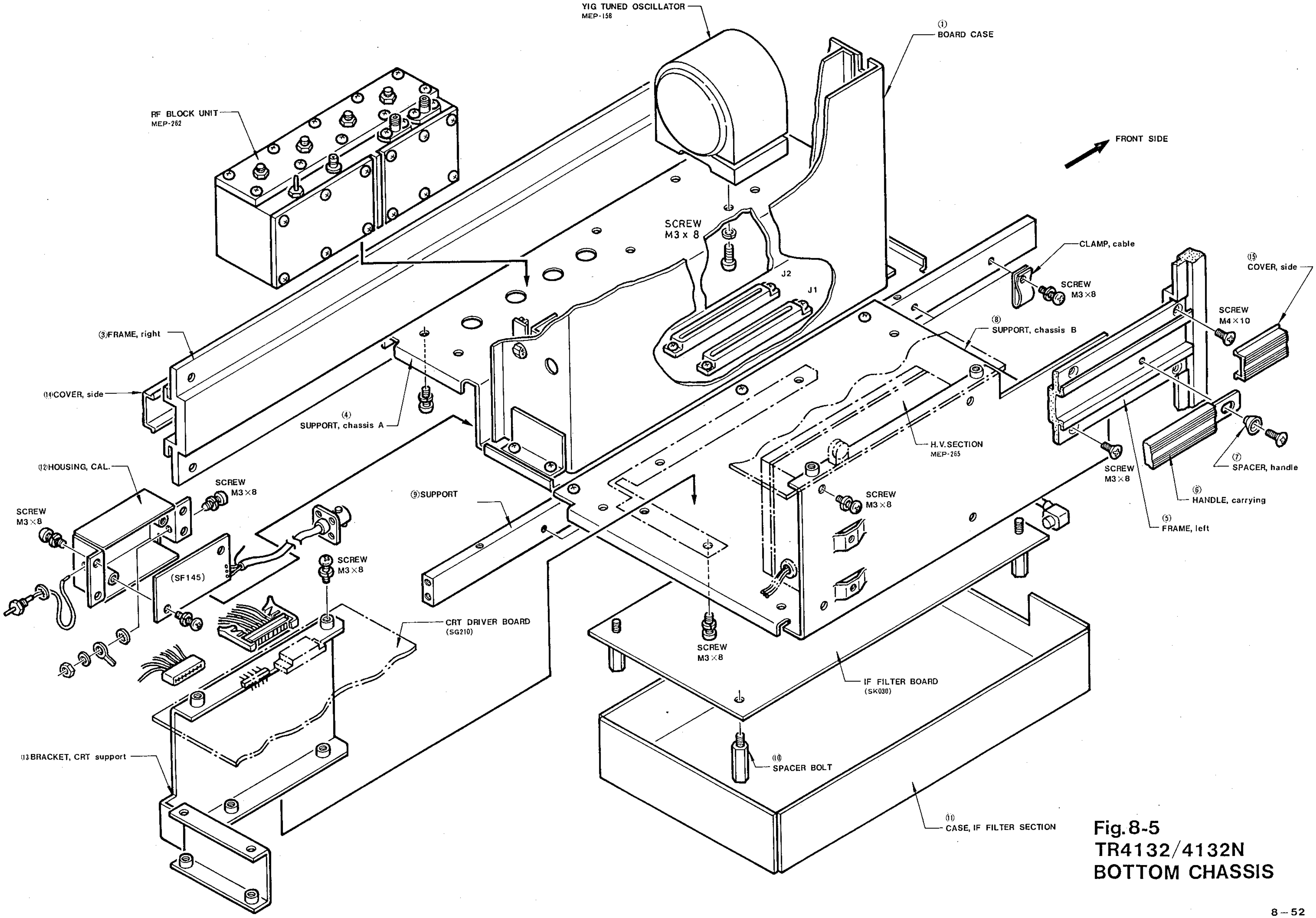


Fig. 8-5
TR4132/4132N BOTTOM CHASSIS

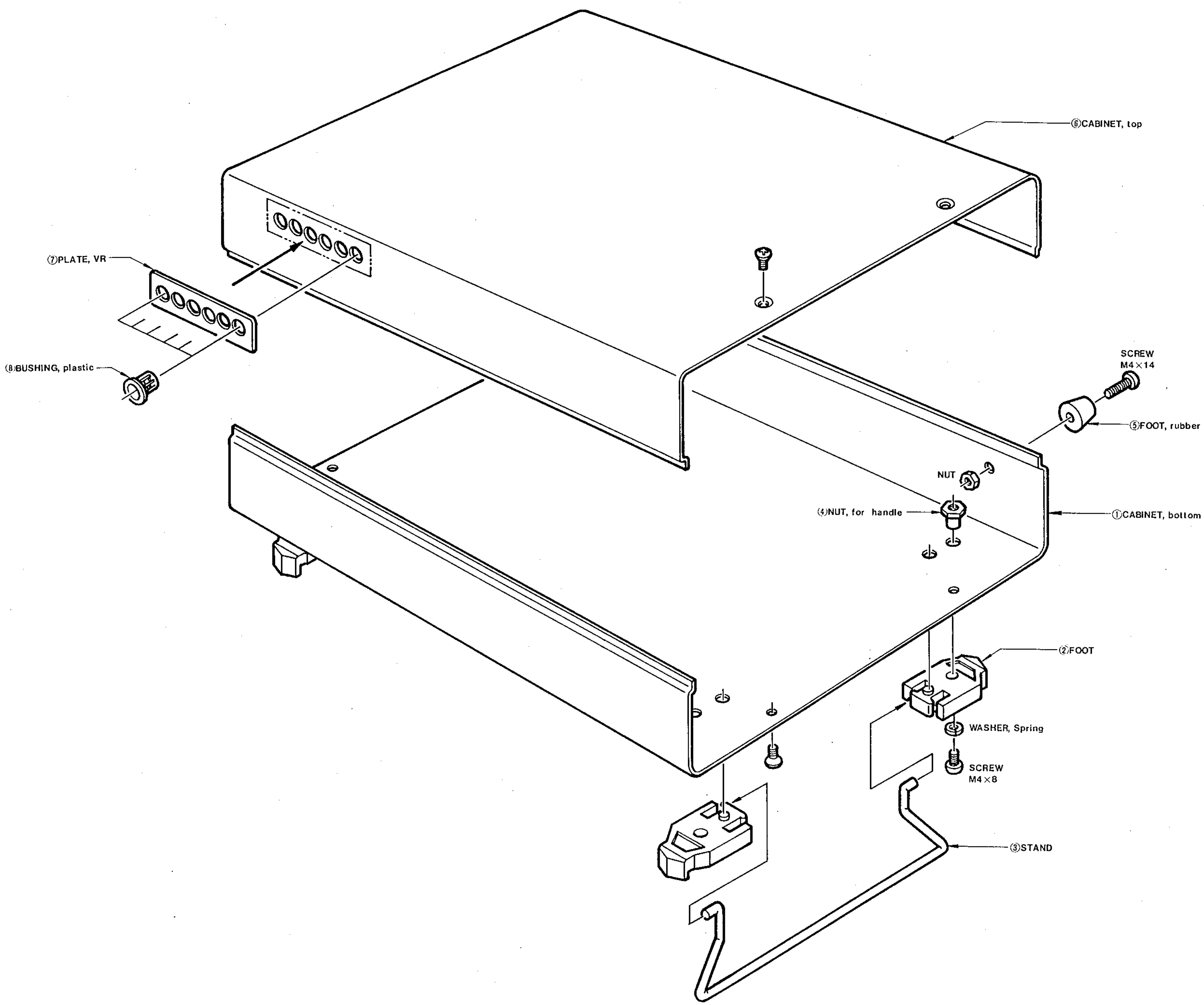
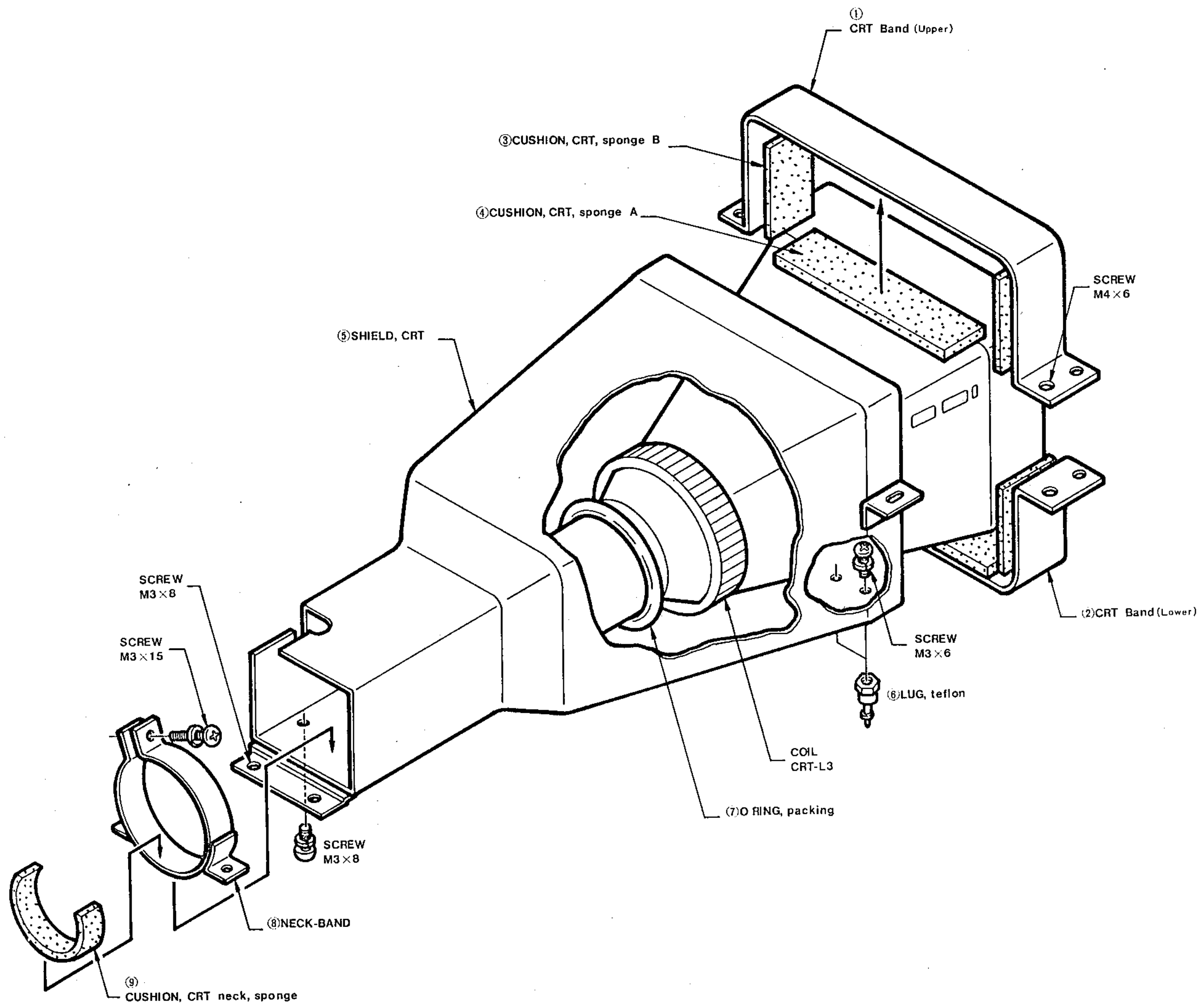


Fig. 8-6
TR4132/4132N
CABINET



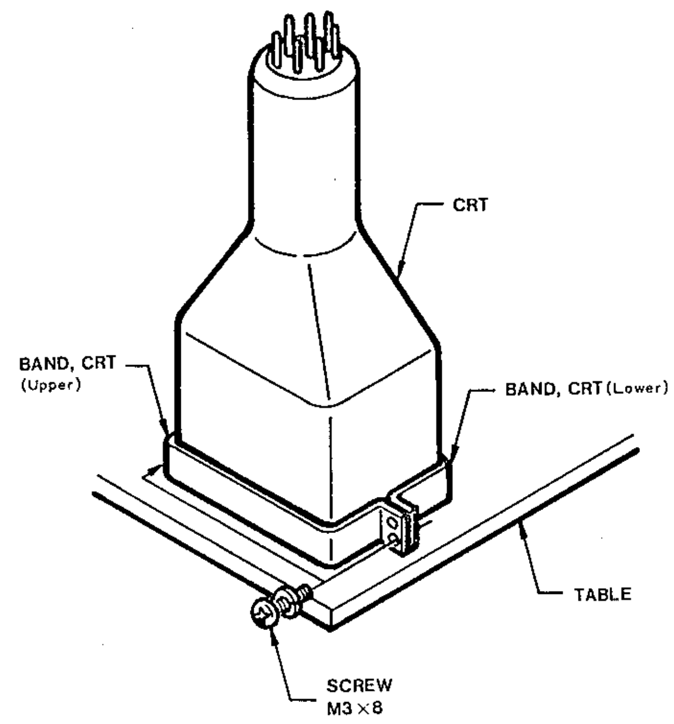


Fig. 8-7
TR4132/4132N
CRT & SHIELD ASSEMBLY

Parts No.	Stock No.	Description	
SS - IC1	μA7815KC	IC: Voltage Regulator	
" - IC2		Not assigned	
" - IC3	μA7805KC	IC: Voltage Regulator	
" - D1 thru " - D3	KBPC602	Diode SI	
" - D4 thru " - D7	SM-1-02	Diode SI	
" - R1 thru " - R3	RD50S 22KΩJ	R: FXD CAR 22KΩ ±5% 1/2W	
" - C1 thru " - C3	35T1000	C: FXD ELECT 1000μF 35V	
" - C4 thru " - C6	25T10	C: FXD ELECT 10μF 25V	
" - C11	0.047UF 50WV	C: FXD CER 0.047μF +80, -20% 50V	
" - C12	0.047UF 50WV	C: FXD CER 0.047μF +80, -20% 50V	
" - C13	35T1000	C: FXD ELECT 1000μF 35V	
" - J1	SI7502	Connector	
" - J2	CN7035	Connector	
" - J3		Not assigned	
" - J4	TOC-1A06030N	Connector	
" - J5	TOP-23A	GND Terminal	
" - J6	RGKS-10B	Connector	
" - J7	RGKS-10B	Connector	
" - J8	RGKS-5B	Connector	
" - J9	RGKS-5B	Connector	
" - J10	PCN6-15S-2.5E	Connector	
" - J11	SI7501	Connector	
" - J12	PCN6-15S-2.5E	Connector	
" - FH1	FH003	Fuse Holder	
SS - F1	EAWK0.2A	Fuse	

TR1604
SCHEMATIC SECTION

Parts No.	Stock No.	Description	
SS - T1	TP-1079A	Power Transformer	
" - C7	0.047UF 50WV	C: FXD CER 0.047μF +80, -20% 50V	
" - C8	0.047UF 50WV	C: FXD CER 0.047μF +80, -20% 50V	
" - C9		Not assigned	
" - C10		Not assigned	
" - IC4	CP3611	IC: DC/DC Converter	
" - Q1	2SD82	Transistor SI NPN	
" - D8	WZ-130	Zener Diode	
" - R4	RD25S 1.5KΩJ	R: FXD CAR 1.5kΩ ±5% 1/4W	

TR1604
DIGITAL MEMORY
PMO74-1/11

Parts No.	Stock No.	Description	
PM074 - ICA2	SN74LS00N	IC: Quadruple 2-Input NAND Gate Low Power	
" - ICA3		Not assigned	
" - ICA4	HD7493AP	IC: 4-Bit Binary Counter	
" - ICA5	SN74LS157N	IC: Quad 2-to-1-Line Data Selector/Multiplexer Low Power	
" - ICA6	TMM2114AP-15	IC: 1KW X 4Bit static RAM	
" - ICA7	TMM2114AP-15	IC: 1KW X 4Bit static RAM	
" - ICA8		Not assigned	
" - ICB2	SN74LS04N	IC: Hex Inverter Low Power	
" - ICB3	HD7493AP	IC: 4-Bit Binary Counter	
" - ICB4	SN74LS157N	IC: Quad 2-to-1-Line Data Selector/Multiplexer Low Power	
" - ICB5	SN74LS157N	IC: Quad 2-to-1-Line Data Selector/Multiplexer Low Power	
" - ICB6	TMM2114AP-15	IC: 1KW X 4Bit static RAM	
" - ICB7	TMM2114AP-15	IC: 1KW X 4Bit static RAM	
" - ICC1	SN74LS08N	IC: Quadruple 2-Input AND Gate Low Power	
" - ICC2	SN74LS04N	IC: Hex Inverter Low Power	
" - ICC3	HD7493AP	IC: 4-Bit Binary Counter	
" - ICC4	SN74LS00N	IC: Quadruple 2-Input NAND Gate Low Power	
" - ICC5	SN74LS73N	IC: Dual J-K Master-Slave Flip-Flop Low Power	
" - ICC6	SN74LS125N	IC: Quadruple Bus Buffer Gate with Three-state Output Low Power	
" - ICC7	SN74LS125N	IC: Quadruple Bus Buffer Gate with Three-state Output Low Power	
" - ICC9	AM2502DC	IC: 8-Bit analog to digital Conversion control	
" - ICC10	AM1408L8	IC: D/A Converter	
PM074 - ICD1	HD7493AP	IC: 4-Bit Binary Counter	

Parts No.	Stock No.	Description	
PM074 - ICD2	SN74LS04N	IC: Hex Inverter Low Power	
" - ICD3	SN74LS73N	IC: Dual J-K Master-Slave Flip-Flop Low Power	
" - ICD4	SN74LS73N	IC: Dual J-K Master-Slave Flip-Flop Low Power	
" - ICD5	HD7406P	IC: Hex Inverter Buffer/Driver	
" - ICD6	SN74LS175N	IC: Quad D-Type Flip-Flop Low Power	
" - ICD7	SN74LS174N	IC: Hex D-Type Flip-Flop Low Power	
" - ICD8	AM1408L8	IC: D/A Converter	
" - ICE1	SN74LS20N	IC: Dual 4-Input NAND Gate Low Power	
" - ICE2	SN74LS20N	IC: Dual 4-Input NAND Gate Low Power	
" - ICE3	HD7493AP	IC: 4-Bit Binary Counter	
" - ICE4	SN74LS174N	IC: Hex D-Type Flip-Flop Low Power	
" - ICE5	SN74LS175N	IC: Quad D-Type Flip-Flop Low Power	
" - ICE6	AD561JD	IC: D/A Converter	
" - ICF1	SN74LS10N	IC: Triple 3-Input NAND Gate Low Power	
" - ICF2	SN74LS04N	IC: Hex Inverter Low Power	
" - ICF3	SN74LS73N	IC: Dual J-K Master-Slave Flip-Flop Low Power	
" - ICF4	HD7493AP	IC: 4-Bit Binary Counter	
" - ICF5	SN74LS73N	IC: Dual J-K Master-Slave Low Power	
" - ICH1		Not assigned	
" - ICH2	HD7406P	IC: Hex Inverter	
" - ICH3	SN74LS04N	IC: Hex Inverter Low Power	
" - ICH4	SN74LS00N	IC: Quadruple 2-Input NAND Gate Low Power	
" - ICH5	SN74LS73N	IC: Dual J-K Master-Slave Low Power	
PM074 - ICK1		Not assigned	

Parts No.	Stock No.	Description	
PM074 - ICK2		Not assigned	
" - ICK3		Not assigned	
" - ICK4	SN74LS132N	IC: Quadruple 2-Input Positive NAND Schmitt Trigger	
" - IC51	LM311H	IC: Voltage Comparator	
" - IC52 thru " - IC55	LM301AH	IC: Operational Amplifier	
" - IC56	LM318H	IC: Operational Amplifier	
" - IC57	LM318H	IC: Operational Amplifier	
" - IC58	LM301A	IC: Operational Amplifier	
" - IC59	LF356H	IC: Junction FET INPUT Type Operational Amplifier	
" - IC60	LM311H	IC: Voltage Comparator	
" - IC61 thru " - IC63	LF356H	IC: Junction FET INPUT Type Operational Amplifier	
" - IC64	HA-2525-5	IC: Poerational Amplifier	
" - IC65	LM301AH	IC: Operational Amplifier	
" - IC66	LM301AH	IC: Operational Amplifier	
" - IC67	LF356H	IC: Junction FET INPUT Type Operational Amplifier	
" - Q81	2SC1834	Transistor SI NPN	
- Q82	2SC1834	Transistor SI NPN	
" - Q83		Not assigned	
" - Q84 thru " - Q86	2SA603H	Transistor SI PNP	
" - Q87	2N4393	FET Junction N-Channel	
" - Q88 thru " - Q91	2SA603H	Transistor SI PNP	
" - Q92	2N4393	FET Junction N-Channel	
" - Q93	2SK30A(R)-TM	FET Junction N-Channel	
" - Q94	2SK30A(R)-TM	FET Junction N-Channel	
" - Q95	2N4393	FET Junction N-Channel	
" - Q96	2N4393	FET Junction N-Channel	
PM074 - Q97	2SK30A(R)-TM	FET Junction N-Channel	

TR1604
DIGITAL MEMORY
PM074-4/11

Parts No.	Stock No.	Description	
PM074 - D106		Not assigned	
" - D107		Not assigned	
" - D108	1SS97	Diode SI	
" - D109	1SS97	Diode SI	
" - D110	1S953	Diode SI	
" - D111	1S953	Diode SI	
" - D112	1S2192	Diode SI	
" - D113	1S953	Diode SI	
" - D114	1S953	Diode SI	
" - D115		Not assigned	
" - D116		Not assigned	
" - D117	1S953	Diode SI	
" - D118	1S953	Diode SI	
" - D119	LD-1	Diode SI	
" - D120	1S953	Diode SI	
" - D121 thru " - D123		Not assigned	
" - D124	WZ-100	Diode SI	
" - R131	RD25S 1.5KΩJ	R: FXD CAR 1.5KΩ ±5% 1/4W	
" - R132	RD25S 27KΩJ	R: FXD CAR 27KΩ ±5% 1/4W	
" - R133	RD25S 27KΩJ	R: FXD CAR 27KΩ ±5% 1/4W	
" - R134	RD25S 15KΩJ	R: FXD CAR 15KΩ ±5% 1/4W	
" - R135	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R136	RD25S 33KΩJ	R: FXD CAR 33KΩ ±5% 1/4W	
" - R137		Not assigned	
" - R138		Not assigned	
" - R139	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R140	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R141	RD25S 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" - R142		Not assigned	
- R143	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R144	RD25S 1KΩJ	R: FXD CAR 1kΩ ±5% 1/4W	
" - R145		Not assigned	
PM074 - R146	RD25S 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	

TR1604
DIGITAL MEMORY
PM074-5/11

Parts No.	Stock No.	Description	
PM074 - R147	RD25S 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	
" - R148	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R149	RD25S 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	
" - R150	RD25S 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" - R151	RD25S 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" - R152	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R153	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R154	RD25S 3.3KΩJ	R: FXD CAR 3.3KΩ ±5% 1/4W	
" - R155	RD25S 4.7KΩJ	R: FXD CAR 4.7KΩ ±5% 1/4W	
" - R156	RD25S 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	
" - R157	SN14K2E22KΩF	R: FXD Metal FLM 22KΩ ±1% 1/4W	
" - R158	SN14K2E82KΩF	R: FXD Metal FLM 82KΩ ±1% 1/4W	
" - R159 thru " - R161	SN14K2E10KΩF	R: FXD Metal FLM 10KΩ ±1% 1/4W	
" - R162	SN14K2E4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R163		Not assigned	
" - R164	SN14K2E 3.3KΩF	R: FXD Metal FLM 3.3KΩ ±1% 1/4W	
" - R165	SN14K2E4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R166	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R167		Not assigned	
" - R168	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R169	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R170	SN14K2E 2KΩF	R: FXD Metal FLM 2KΩ ±1% 1/4W	
" - R171	SN14K2E 2KΩF	R: FXD Metal FLM 2KΩ ±1% 1/4W	
" - R172	RD25S 1.5KΩJ	R: FXD CAR 1.5KΩ ±5% 1/4W	
" - R173	RD25S 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	
" - R174	RD25S 6.8KΩJ	R: FXD CAR 6.8KΩ ±5% 1/4W	
" - R175	RD25S 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" - R176	RD25S 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" - R177	RD25S 1.8KΩJ	R: FXD CAR 1.8KΩ ±5% 1/4W	
" - R178	SN14K2E 100KΩF	R: FXD Metal FLM 100KΩ ±1% 1/4W	
" - R179	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
PM074 - R180	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	

TR1604
DIGITAL MEMORY
PM074-6/11

Parts No.	Stock No.	Description	
PM074 - R181	RD25S 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" - R182	SN14k2E 2.2KΩF	R: FXD Metal FLM 2.2KΩ ±1% 1/4W	
" - R183		Not assigned	
" - R184	SN14K2E 2.7KΩF	R: FXD Metal FLM 2.7KΩ ±1% 1/4W	
" - R185		Not assigned	
" - R186	SN14K2E 3.3KΩF	R: FXD Metal FLM 3.3KΩ ±1% 1/4W	
" - R187	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R188	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R189	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R190	RD25S 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" - R191	SN14K2E 3.9KΩF	R: FXD Metal FLM 3.9KΩ ±1% 1/4W	
" - R192	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R193	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R194		Not assigned	
" - R195	SN14K2E 10KΩF	R: FXD Metal FLM 10KΩ ±1% 1/4W	
" - R196	RD25S 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" - R197 thru " - R199	SW14K2E 2KΩF	R: FXD Metal FLM 2KΩ ±1% 1/4W	
" - R200	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R201	RD25S 1KΩF	R: FXD CAR 1KΩ ±5% 1/4W	
" - R202	SN14K2E 2.2KΩF	R: FXD Metal FLM 2.2KΩ ±1% 1/4W	
" - R203	RD25S 1.5KΩJ	R: FXD CAR 1.5KΩ ±5% 1/4W	
" - R204	RD25S 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	
" - R205	RD25S 6.8KΩJ	R: FXD CAR 6.8KΩ ±5% 1/4W	
" - R206	RD25S 470ΩJ	R: FXD CAR 470Ω ±5% 1/4W	
" - R207	RD25S 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" - R208	RD25S 1.8KΩJ	R: FXD CAR 1.8KΩ ±5% 1/4W	
" - R209	RD25S 1.5KΩJ	R: FXD CAR 1.5KΩ ±5% 1/4W	
" - R210	RD25S 10KΩJ	R: FXD CAR 10KΩ ±5% 1/4W	
" - R211	RD25S 6.8KΩJ	R: FXD CAR 6.8KΩ ±5% 1/4W	
" - R212	RD25S 750ΩJ	R: FXD CAR 750Ω ±5% 1/4W	
" - R213	RD25S 680ΩJ	R: FXD CAR 680Ω ±5% 1/4W	
" - R214	RD25S 1.8KΩJ	R: FXD CAR 1.8KΩ ±5% 1/4W	
PM074 - R215		Not assigned	

Parts No.	Stock No.	Description	
PM074 - R216	SN14K2E 15KΩF	R: FXD Metal FLM ±5% 1/4W	
" - R217	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R218	RD25S 51ΩJ	R: FXD CAR 51Ω ±5% 1/4W	
" - R219	SN14K2E 2KΩF	R: FXD Metal FLM 2KΩ ±1% 1/4W	
" - R220	RD25S 100ΩJ	R: FXD CAR 100Ω ±5% 1/4W	
" - R221	SN14K2E 15KΩF	R: FXD Metal FLM 15KΩ ±1% 1/4W	
" - R222	SN14K2E 2.2KΩF	R: FXD Metal FLM 2.2KΩ ±1% 1/4W	
" - R223	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R224	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R225	SN14K2E 10KΩF	R: FXD Metal FLM 10KΩ ±1% 1/4W	
" - R226	SN14K2E 10KΩF	R: FXD Metal FLM 10KΩ ±1% 1/4W	
" - R227	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R228		Not assigned	
" - R229	SN14K2E 1KΩF	R: FXD Metal FLM 1KΩ ±1% 1/4W	
" - R230	SN14K2E 10KΩF	R: FXD Metal FLM 10KΩ ±1% 1/4W	
" - R231	RD25S 1.5KΩJ	R: FXD CAR 1.5KΩ ±5% 1/4W	
" - R232	RD25S 1KΩJ	R: FXD CAR 1KΩ ±5% 1/4W	
" - R233	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R234	SN14K2E 4.7KΩF	R: FXD Metal FLM 4.7KΩ ±1% 1/4W	
" - R235	SN14K2E 2.2KΩF	R: FXD Metal FLM 2.2KΩ ±1% 1/4W	
" - R236	SN14K2E 470ΩF	R: FXD Metal FLM 470Ω ±1% 1/4W	
" - R237 thru " - R240		Not assigned	
" - R241	X13S 2KΩ	R: VAR WW 2KΩ	
" - R242	X13S 2KΩ	R: VAR WW 2KΩ	
" - R243	X13S 5KΩ	R: VAR WW 5KΩ	
" - R244	X13S 1KΩ	R: VAR WW 1KΩ	
" - R245	X6T 2KΩ	R: VAR WW 2KΩ	
" - R246	X6T 1KΩ	R: VAR WW 1KΩ	
" - R247	X6T 2KΩ	R: VAR WW 2KΩ	
" - R248	X6T 5KΩ	R: VAR WW 5KΩ	
" - R249 thru PM074 - R251	RD25S 220ΩJ	R: FXD CAR 220Ω ±5% 1/4W	

Parts No.	Stock No.	Description	
PM074 - R252 thru " - R254	RD25S 1.8KΩJ	R: FXD CAR 1.8KΩ ±5% 1/4W	
" - C255	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - C256	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C257	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C258		Not assigned	
" - C259	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - C260	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C261	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C262 thru " - C266	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C267	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - C268	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C269	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C270	33pF 50WV	C: FXD CER 33pF ±10% 50V	
" - C271	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C272	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C273	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C274	47PF 50WV	C: FXD CER 47pF ±10% 50V	
" - C275 thru " - C277	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C278	27PF 50WV	C: FXD CER 27pF ±10% 50V	
" - C279	DM10D101J3	C: FXD DIPPED MICA 100pF ±5% 300V	
" - C280 thru " - C282	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C283	DM15D 102J3	C: FXD DIPPED MICA 1000pF ±5% 300V	
" - C284	DM15D 102J3	C: FXD DIPPED MICA 1000pF ±5% 300V	
" - C285 thru PM074 - C288	0.01UF 50WV	C: FXD CER0.01μF +80,-20% 50V	

TR1604
DIGITAL MEMORY
PM074-9/11

Parts No.	Stock No.	Description	
PM074 - C289	DM15D391J5	C: FXD DIPPED MICA 390pF ±5% 500V	
" - C290	ECV1ZW70X32	C: VAR CER 70pF	
" - C291	DM10D221J3	C: FXD DIPPED MICA 220pF ±5% 300V	
" - C292	DM10D101J3	C: FXD DIPPED MICA 220pF ±5% 300V	
" - C293	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C294	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C295	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C296	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - C297	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C298	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C299	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C300	DM15D102J3	C: FXD DIPPED MICA 1000pF ±5% 300V	
" - C301	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C302	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C303	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C304	47PF 50WV	C: FXD CER 47pF ±10% 50V	
" - C305	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C306	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C307 thru " - C309	DM15D102J3	C: FXD DIPPED MICA 1000pF ±5% 300V	
" - C310 thru " - C317	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C318	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - C319	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C320	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - C321	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
PM074 - C322	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	

TR1604
DIGITAL MEMORY
PM074-10/11

Parts No.	Stock No.	Description	
PM074 - C323 thru PM074 - C326		Not assigned	
" - C327	DM15D471J3	C: FXD DIPPED MICA 470pF ±5% 300V	
" - C328	441N1003-473K	C: FXD Mylar 0.047uF ±10% 100V	
" - C329 thru " - C333	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C334	0.0022UF 50WV	C: FXD CER 0.0022μF +80,-20% 50V	
" - C335	0.001UF 50WV	C: FXD CER 0.001μF +80,-20% 50V	
" - C336	DM10C200K5	C: FXD DIPPED MICA 20pF ±10% 500V	
" - C337	DM10D221J3	C: FXD DIPPED MICA 220pF ±5% 300V	
" - C338	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C339	DM10D221J3	C: FXD DIPPED MICA 220pF ±5% 300V	
" - C340	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C341	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C342	111M1002-107M	C: FXD ELECT TANTAL 100μF ±20% 10V	
" - C343	111M2502-106M	C: FXD ELECT TANTAL 10μF ±20% 25V	
" - C344 thru " - C366	0.01UF 50WV	C: FXD CER 0.01μF +80,-20% 50V	
" - C367 thru " - C369	DM15D471J3	C: FXD DIPPED MICA 470pF ±5% 300V	
" - C370	33PF 50WV	C: FXD CER 33pF ±10% 50V	
" - L375 thru " - L377	CSL0609-1R0M	L: FXD Coil	
" - L378	CSL0609-181K	L: FXD Coil 180μH	
" - L379	CSL0609-181K	L: FXD Coil 180μH	
" - X390	XU-033	Crystal	
" - P501	FT-E-15	Teflon Terminal	
PM074 - P502	FT-E-15	Teflon Terminal	

TR1604
DIGITAL MEMORY
PM074-11/11

Parts No.	Stock No.	Description	
PM074 - TP1 thru " - TP10	401-9630	Terminal	
" - P1	A-1106	Connector	
" - P2	PCN6B-15P-2.5DS	Connector	
" - P3		Not assigned	
" - S385	1PFS-2U470-010-01-00	Switch	
" - S386	1PFS-2U470-010-01-00	Switch	
PM074- D125	1S953	Diode SI	

MEMO

Appendix

LIST OF FIGURES

TR4132 SCHEMATIC SECTION

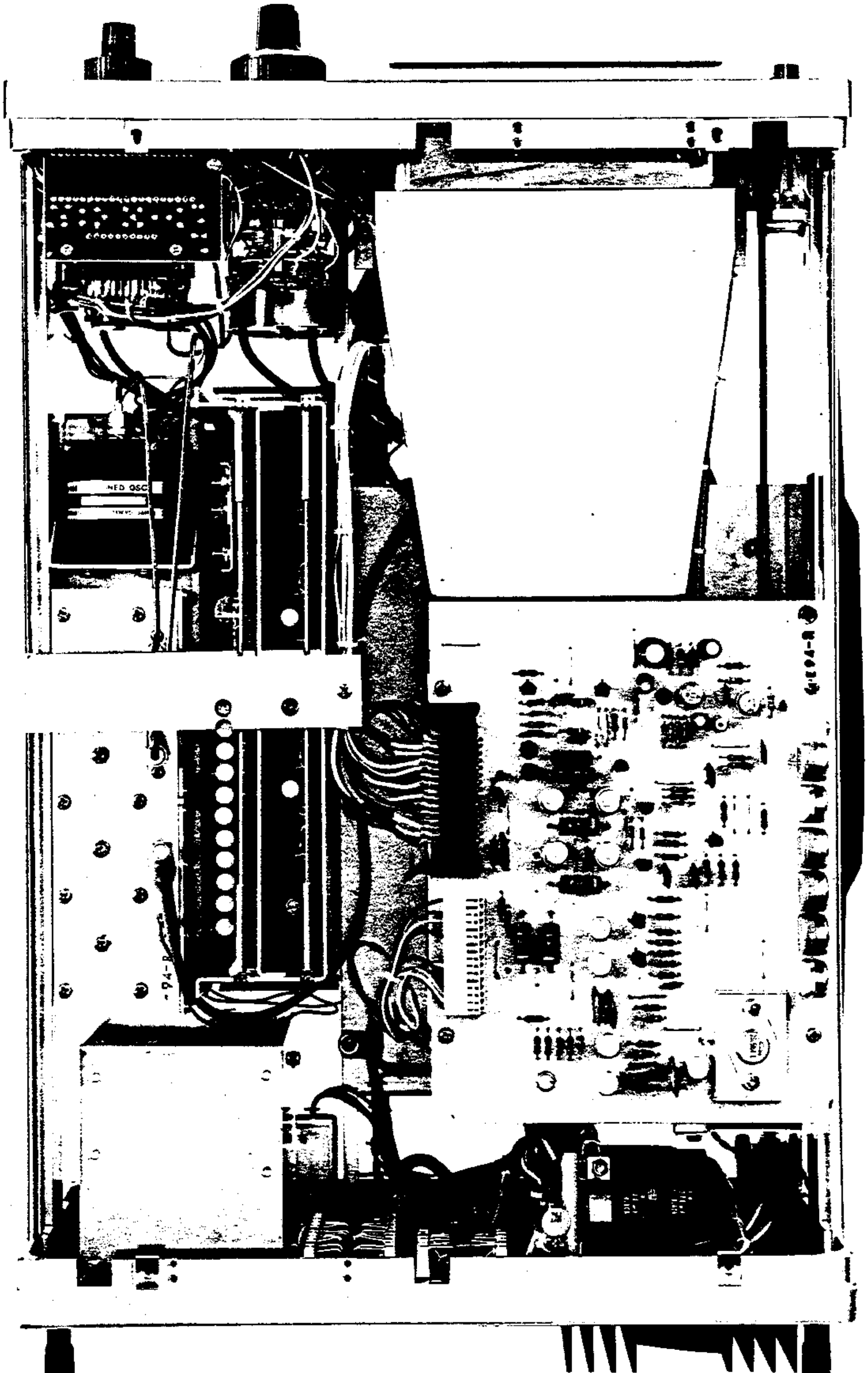
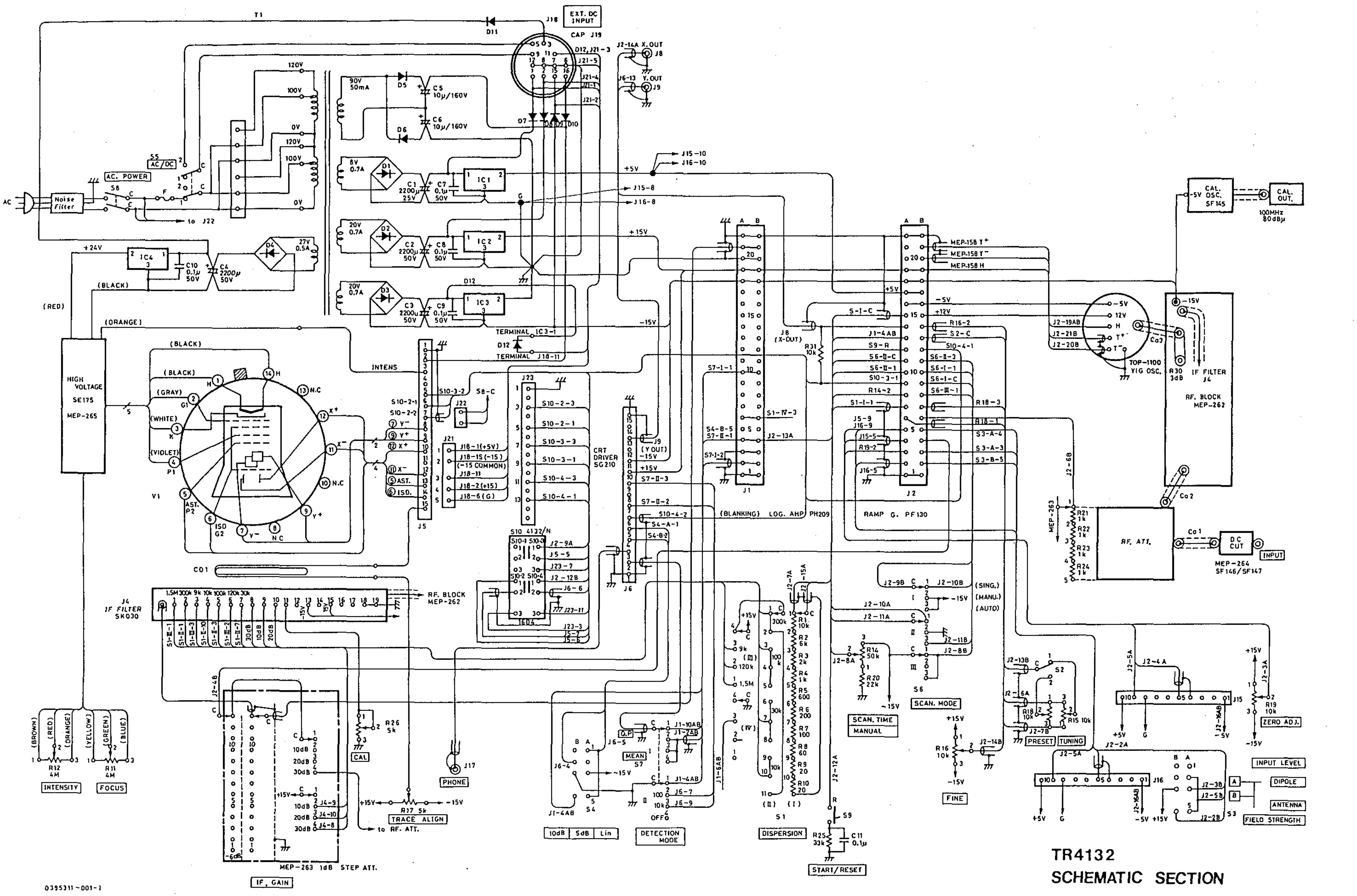


Fig. A-1 TR4132/4132N Top View



TR4132
SCHEMATIC SECTION

0395311-001-1

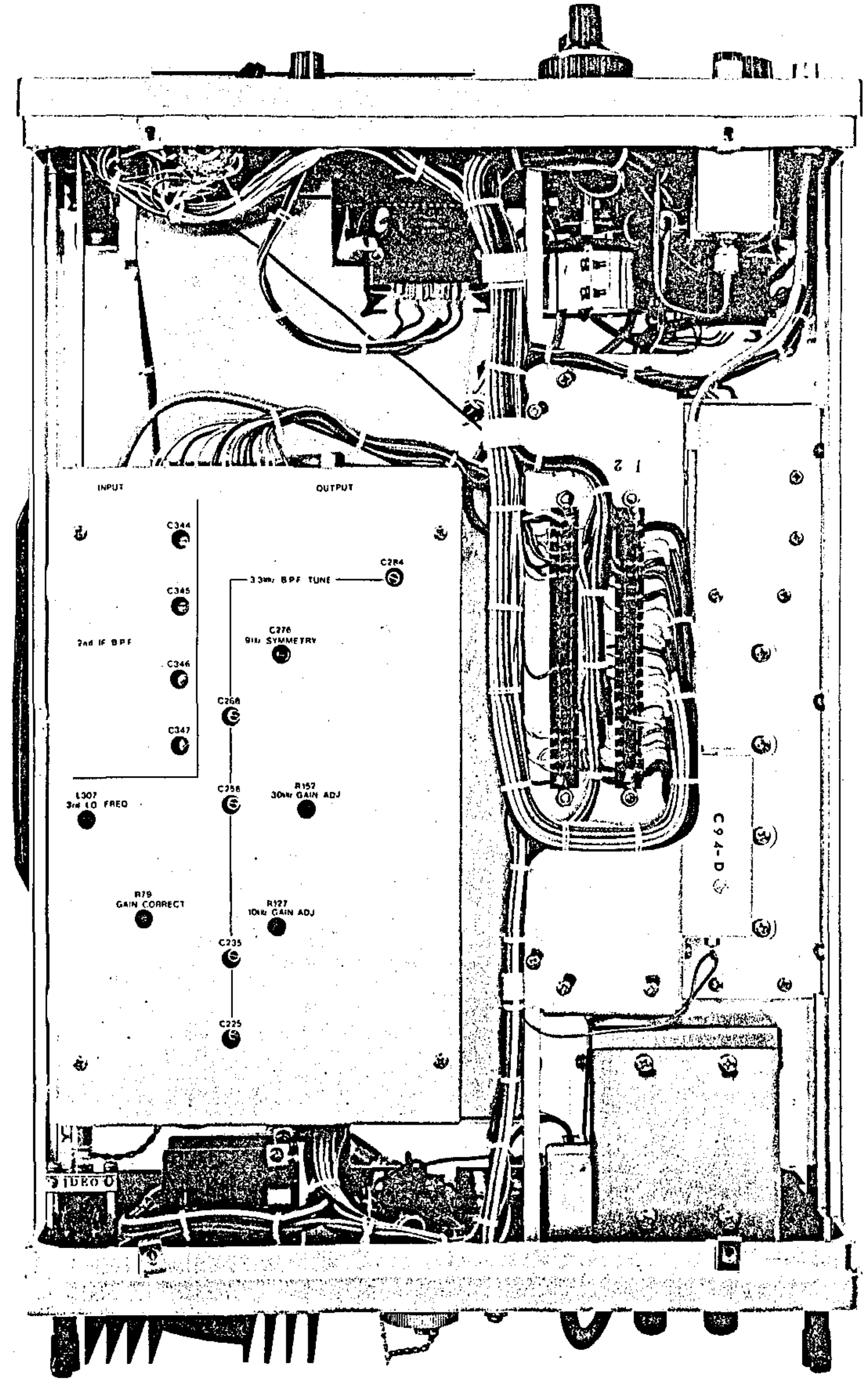
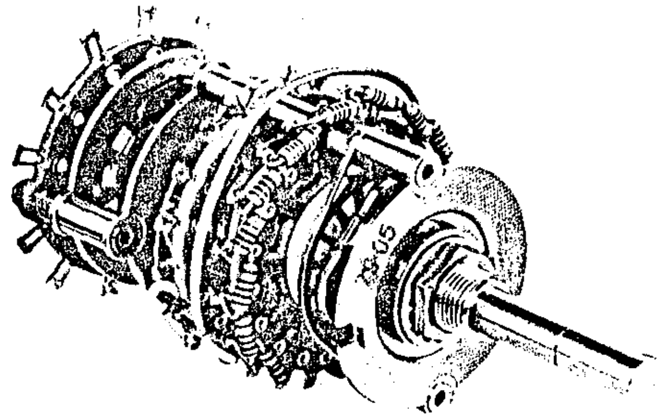
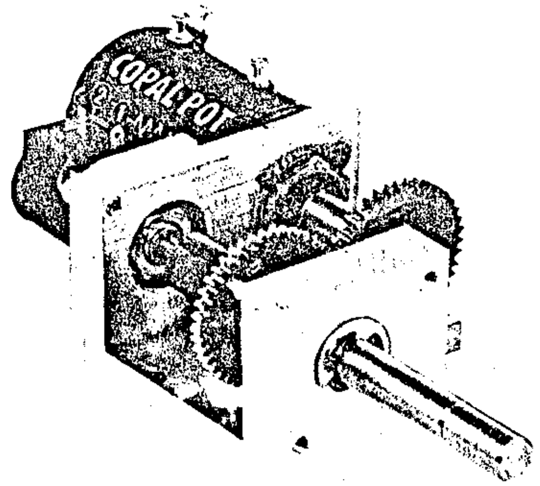


Fig. A-2 4132/4132N Bottom View

Rotary Switch (S1)
DISPERSION/DIV.
(YSNH－166)



TUNING BLOCK
(MEP－273)



RF.ATT.
(TSA－40BS－2)

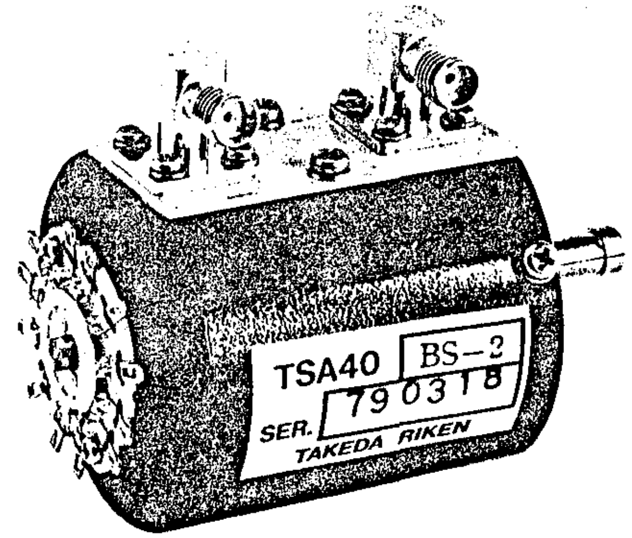
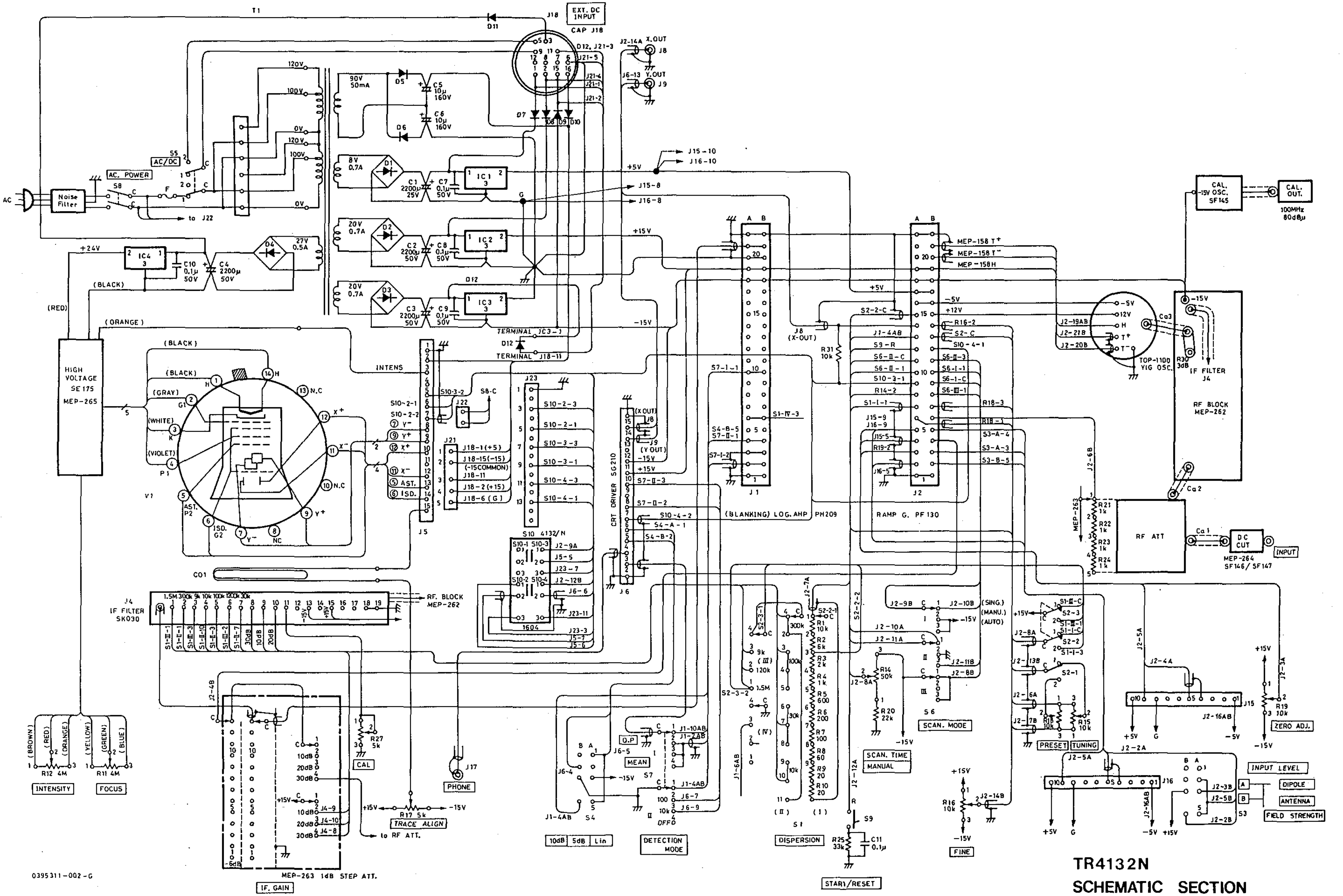


Fig. A-3 Rotary Switch, Tuning Block, RF. ATT. Ext. Views



TR4132N
SCHEMATIC SECTION

TR4132/4132N DC CUT SECTION

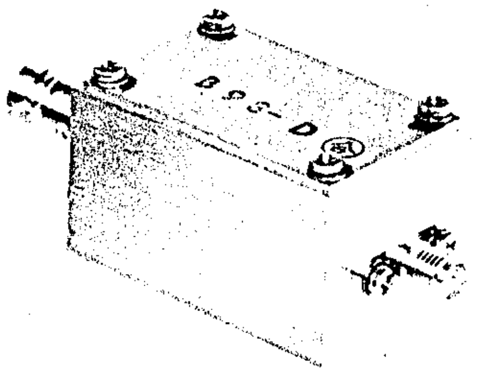
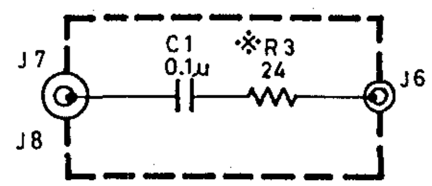


Fig. A-4 DC CUT SECTION View & Diagram



※R3 TR4132N Only mounted

0395906—003—B

TR4132/4132N
DC CUT
MEP-264-01/02

TR4132/4132N 1st. MIXER SECTION

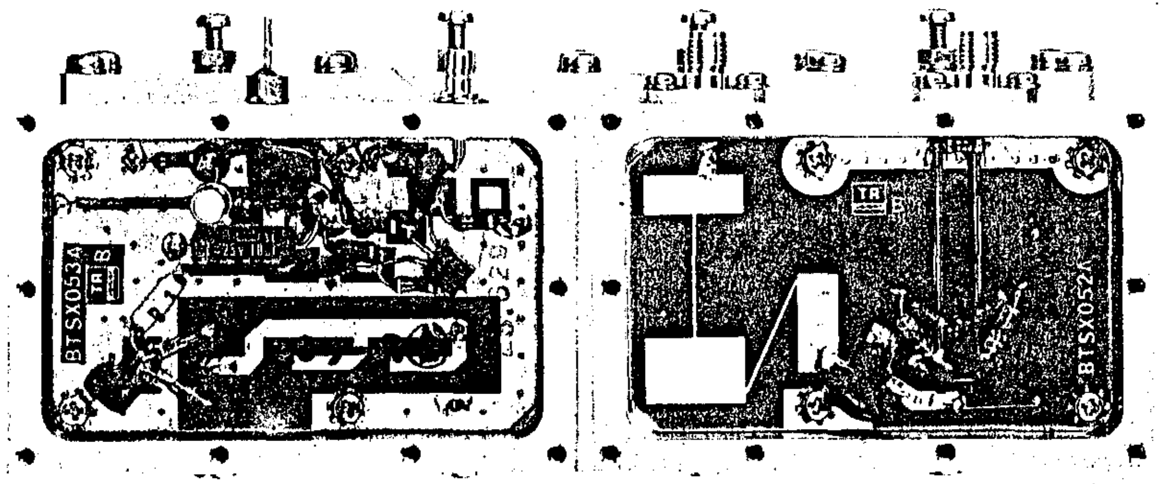
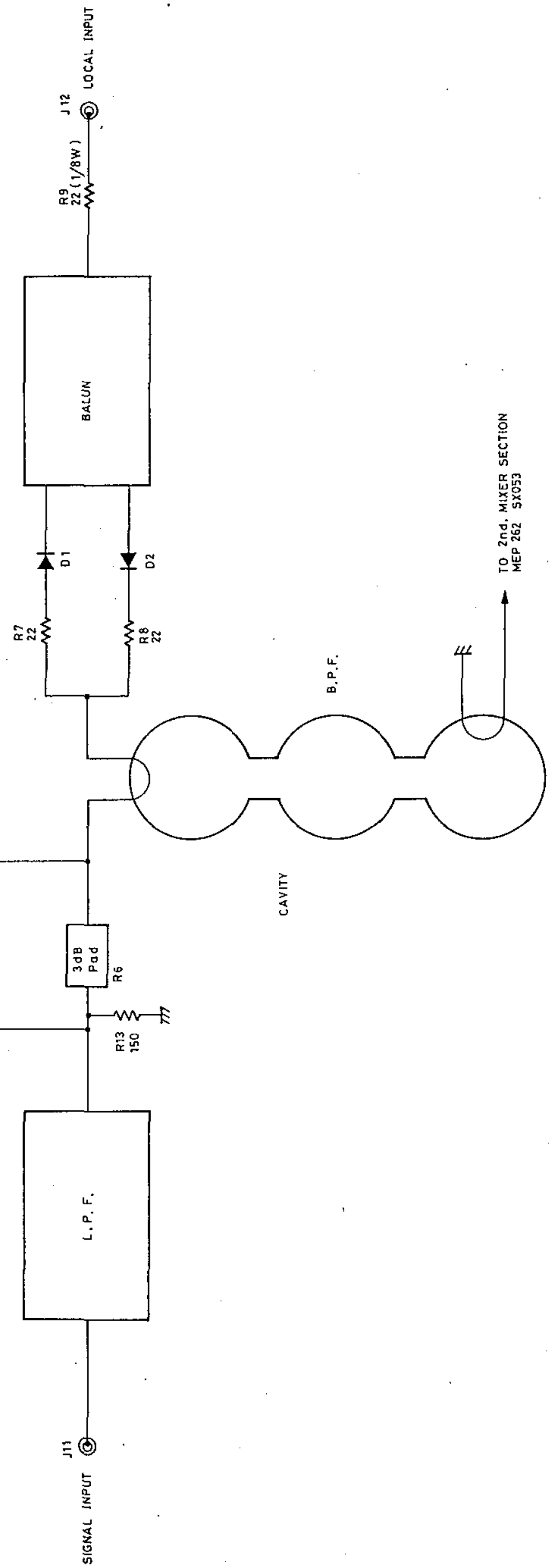


Fig. A-5 Locations & Diagrams, SX052 (1st, Mixer Assy)



TR4132/4132N
1ST. MIXER SECTION
MEP262
SX052

0395211-004-D

TR4132/4132N 2nd. MIXER SECTION

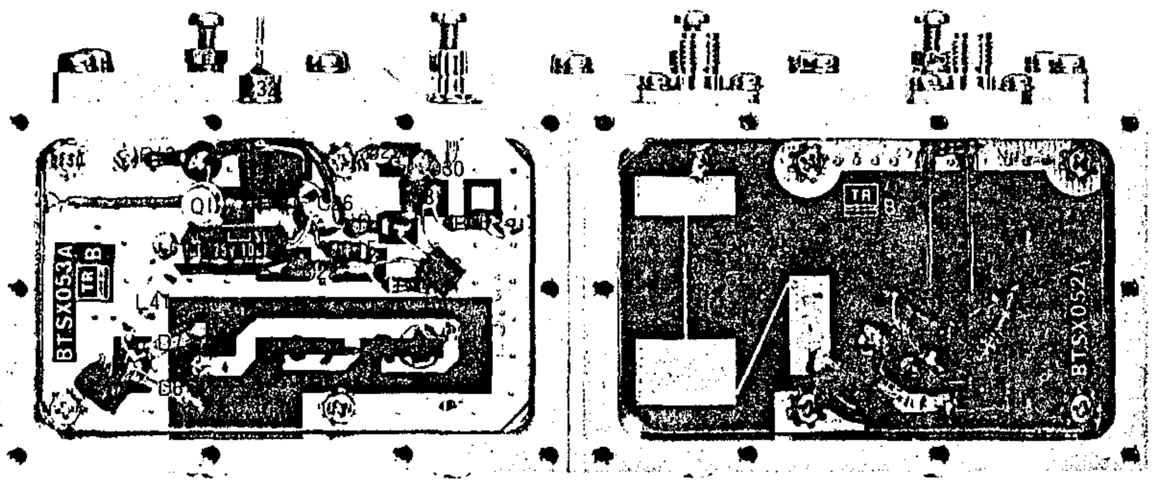
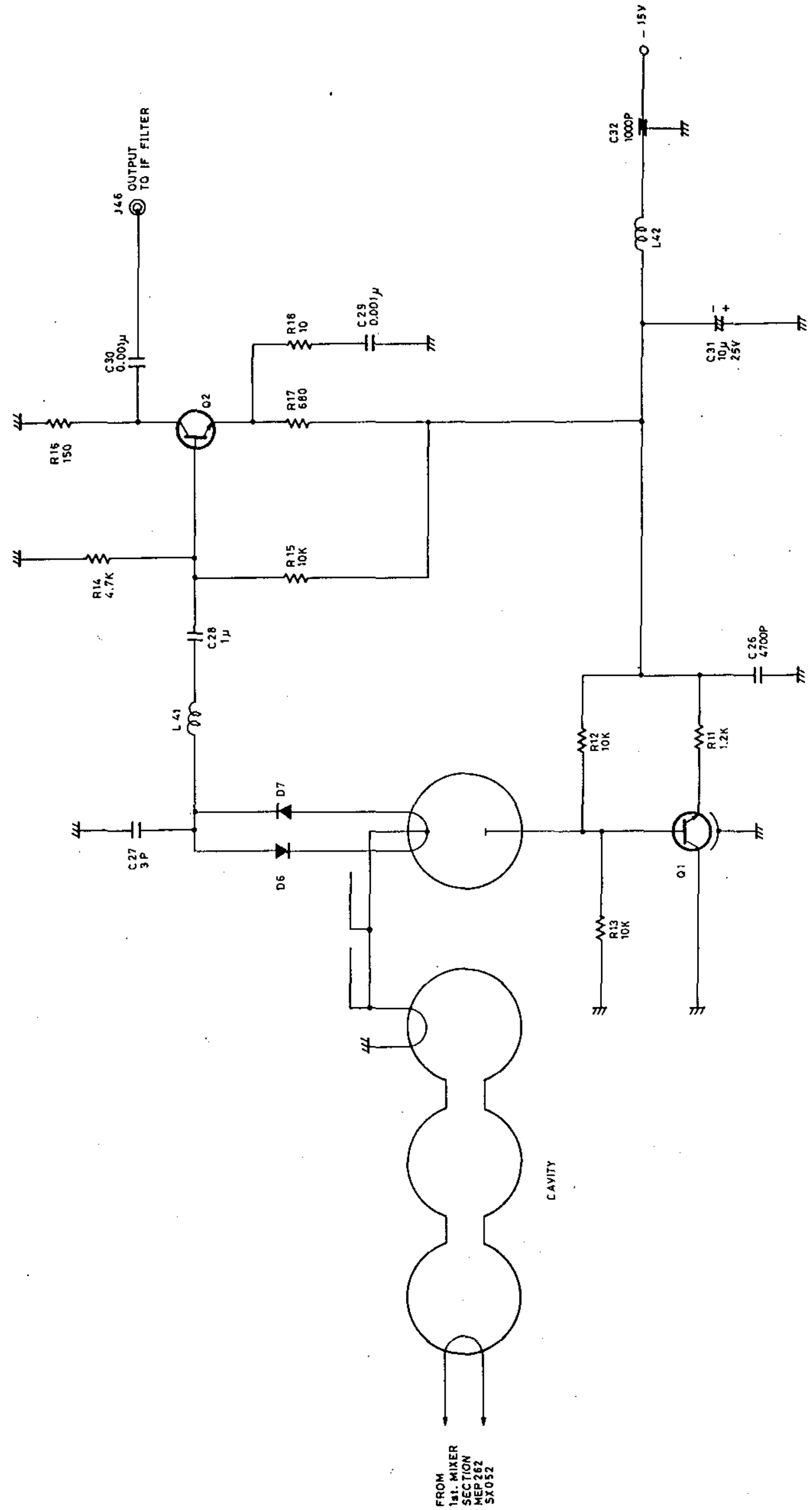


Fig. A-6 Locations & Diagrams, SX053 (2nd Mixer Assy)



TR4132/4132N
2ND. MIXER SECTION
MEP 262
SX053

0395112-005-B

Appendix—1—6
TR4132/4132N IF FILTER SECTION

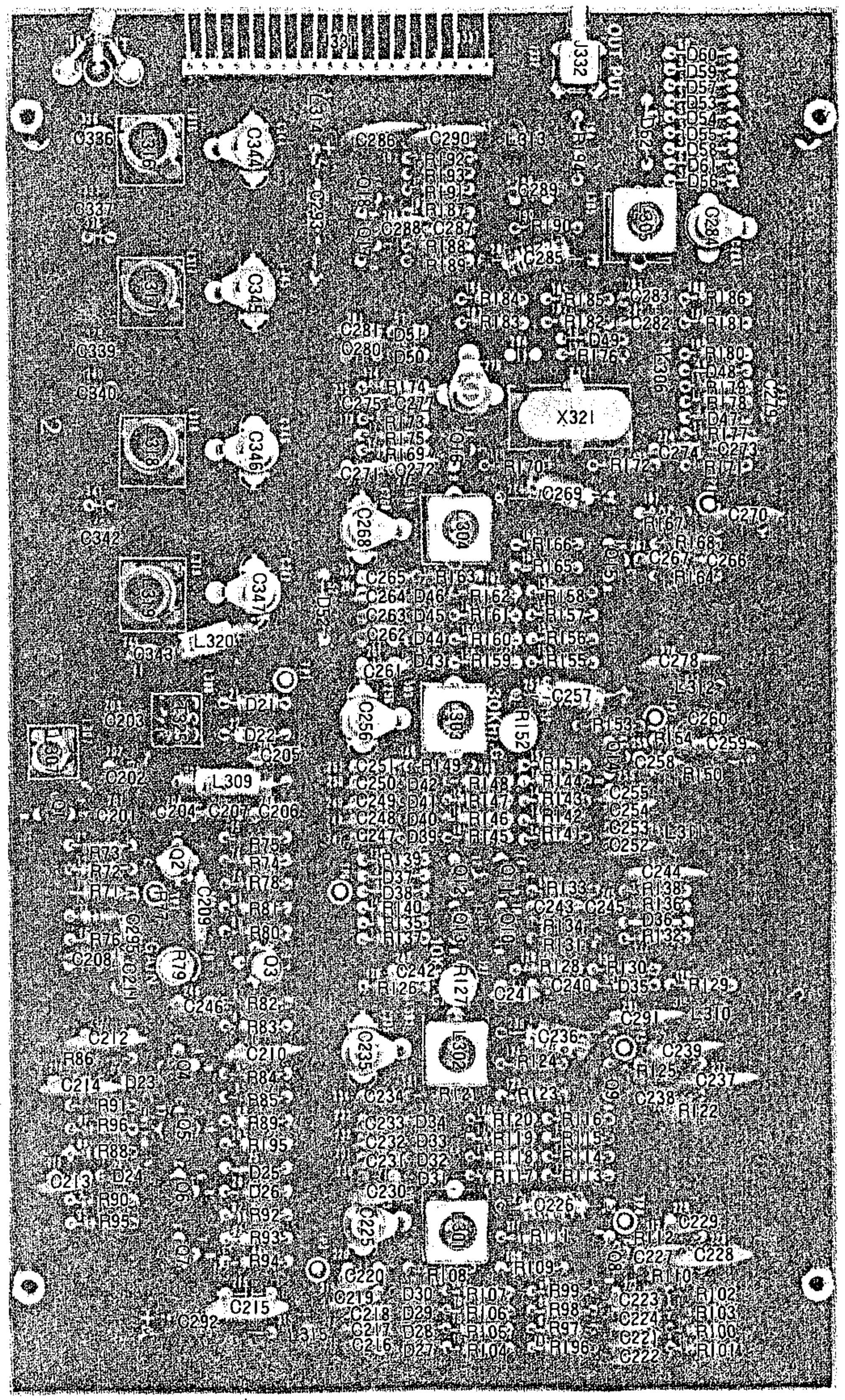
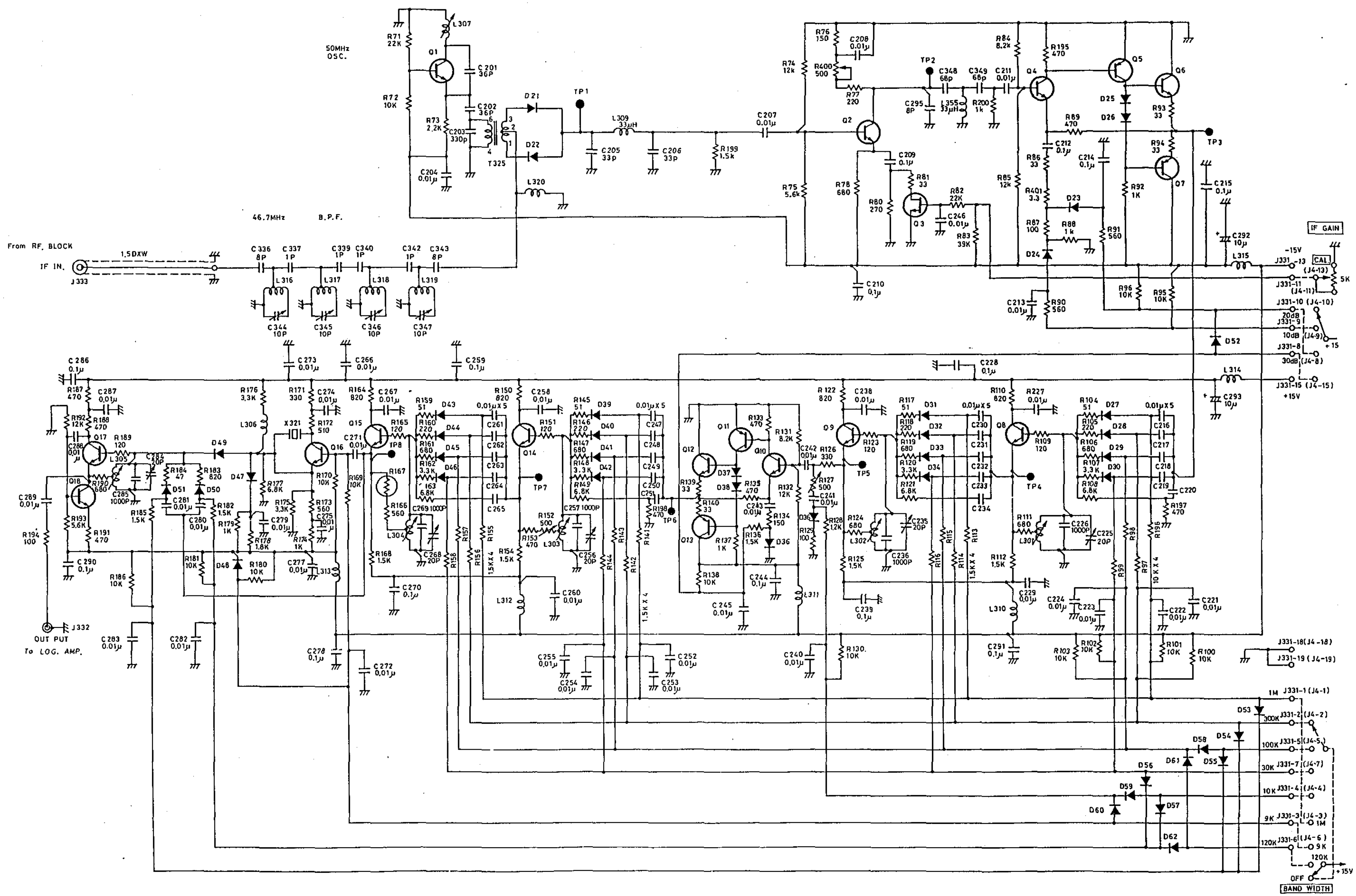


Fig. A-7 Locations & Diagrams, SK030 (IF FILTER Assy)



TR4132/4132N
IF FILTER SECTION
SK030

Appendix – 1 – 7
TR4132/4132N 1dB STEP ATT. SECTION

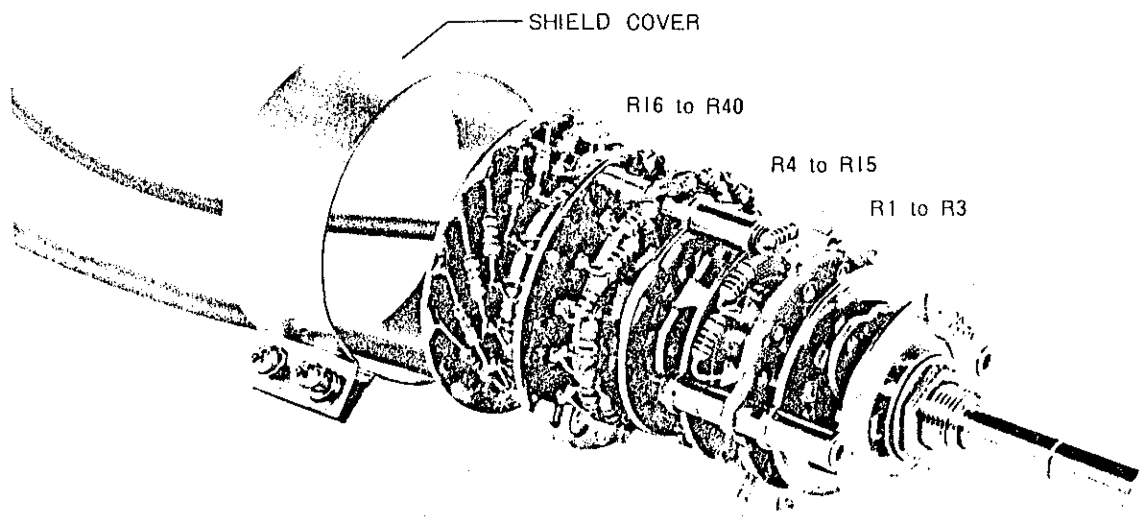
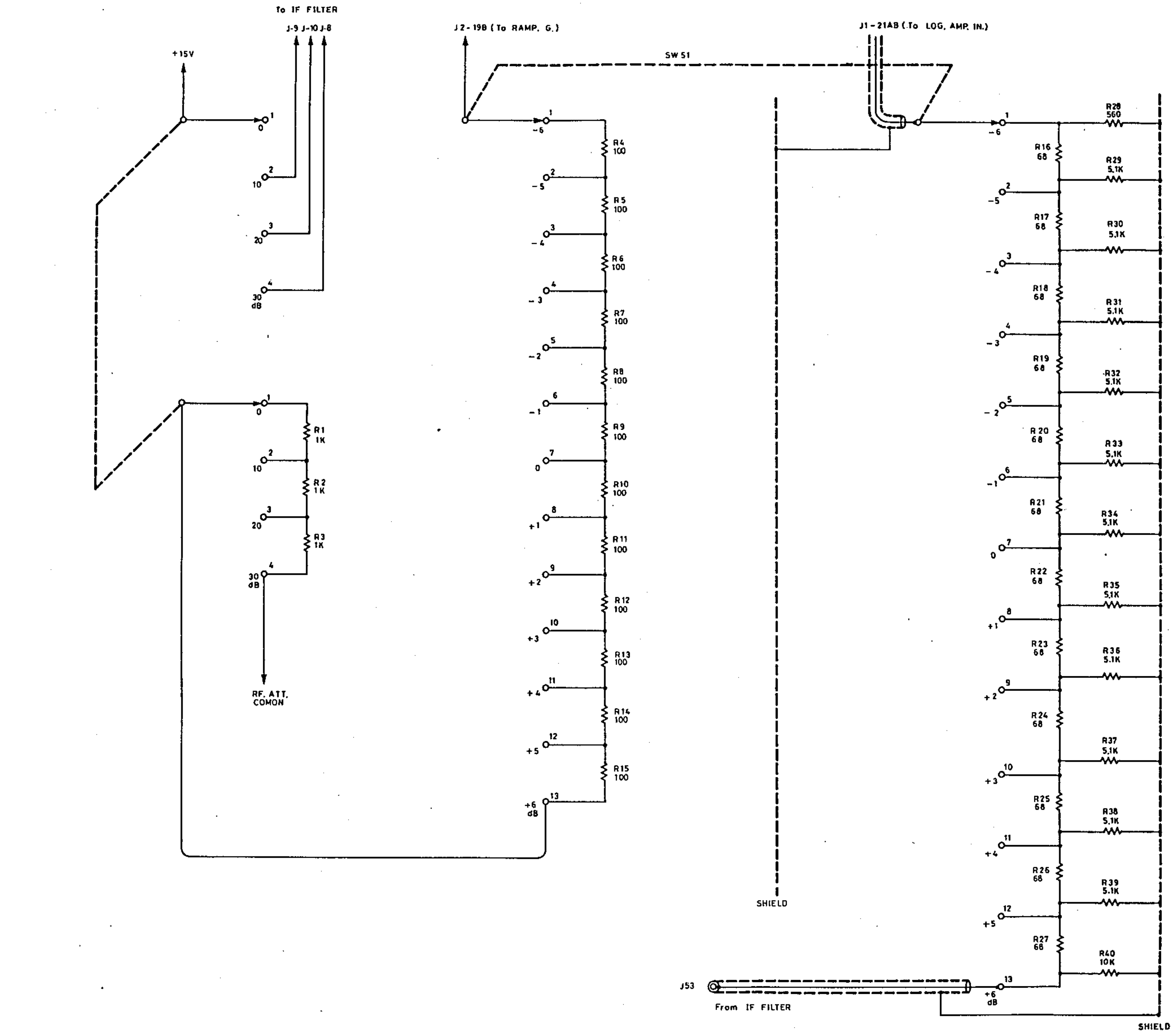


Fig. A-8 1dB STEP ATT. External View & Diagram



0395906-007-A

TR4132/4132N
1dB STEP ATT. SECTION
MEP-263

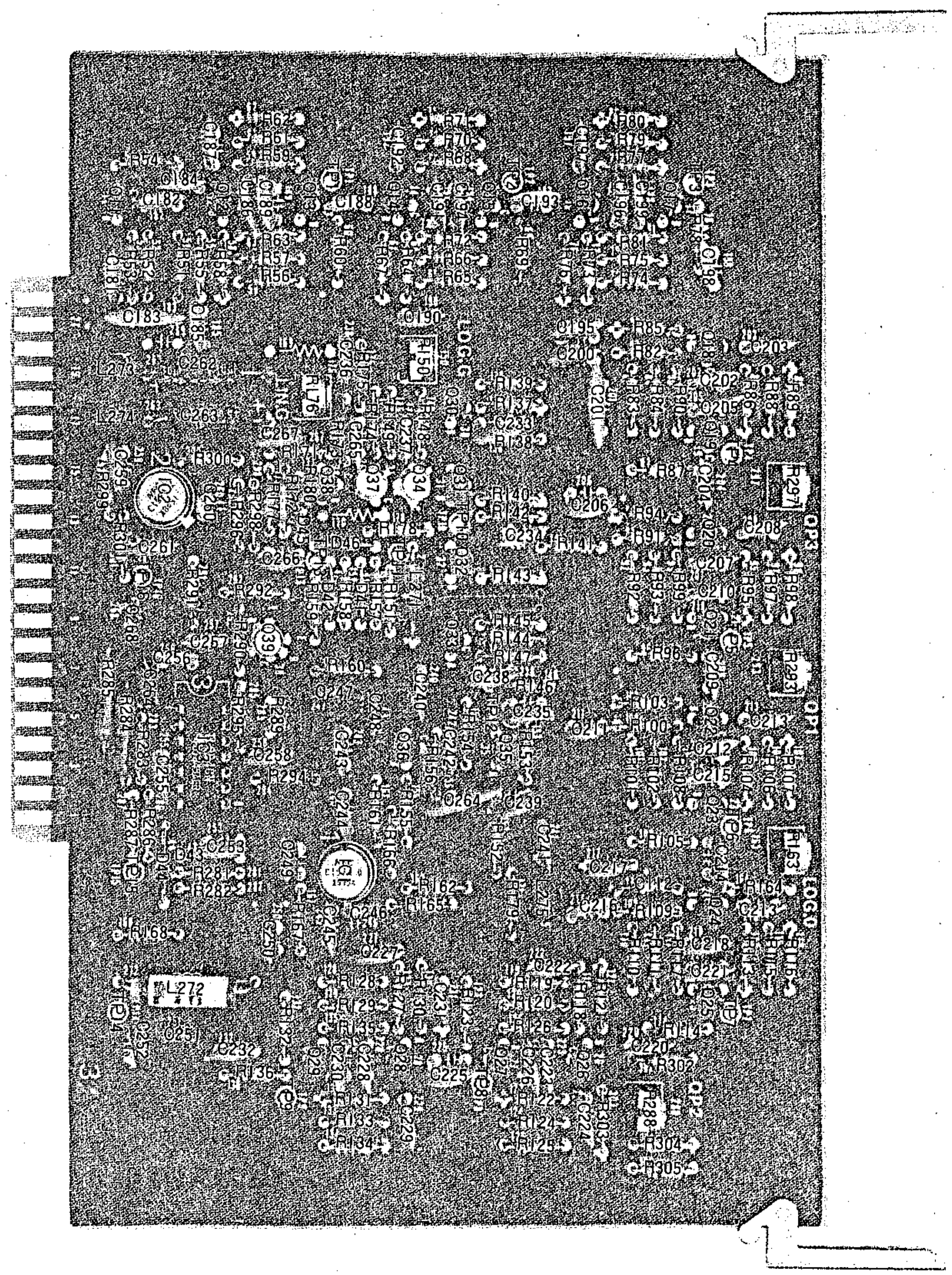
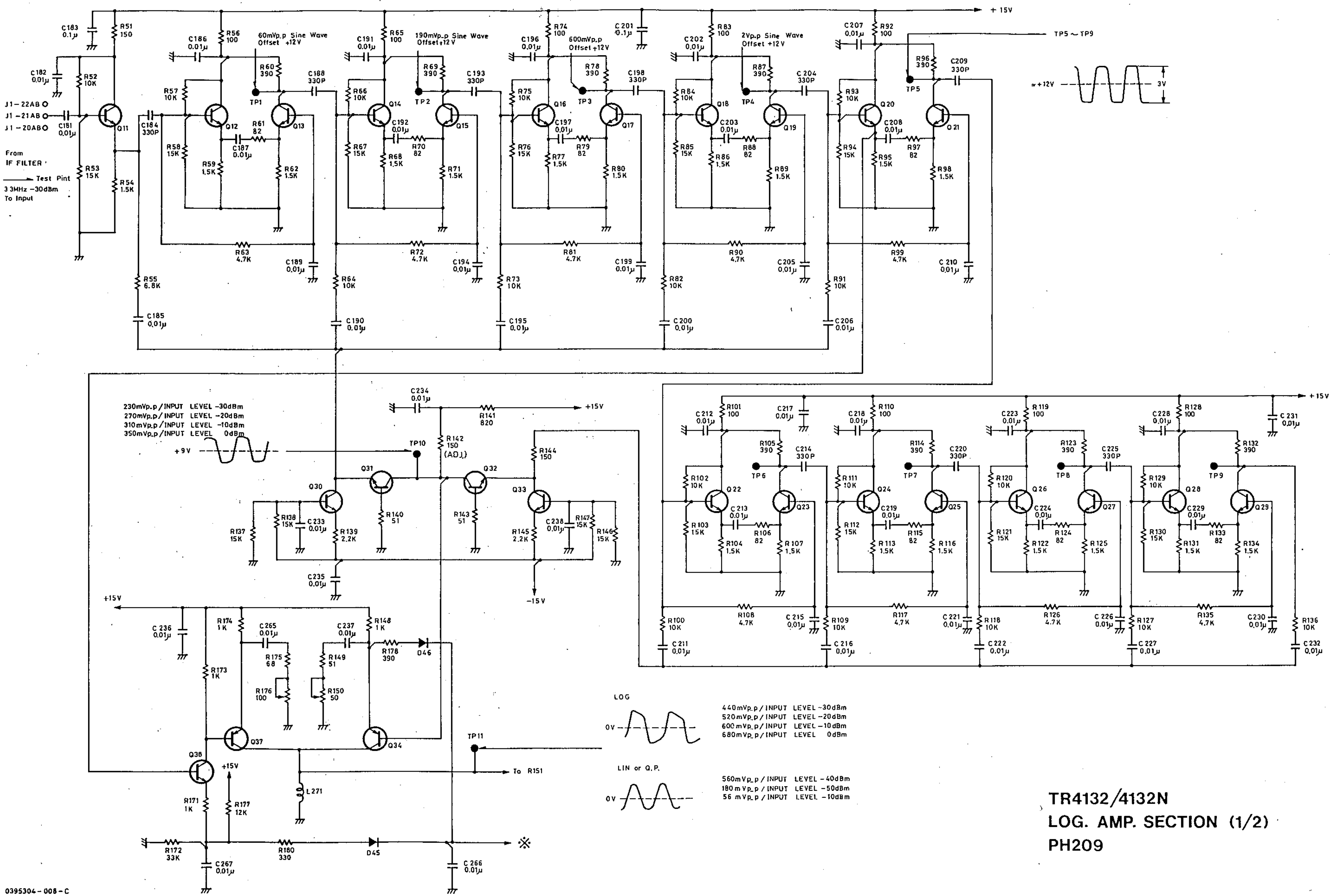


Fig. A-9 Locations & Diagrams, PH209 (LOG. AMP. Assy 1/2)



TR4132/4132N
LOG. AMP. SECTION (1/2)
PH209

Appendix—1—9
TR4132/4132N LOG. AMP. SECTION 2/2

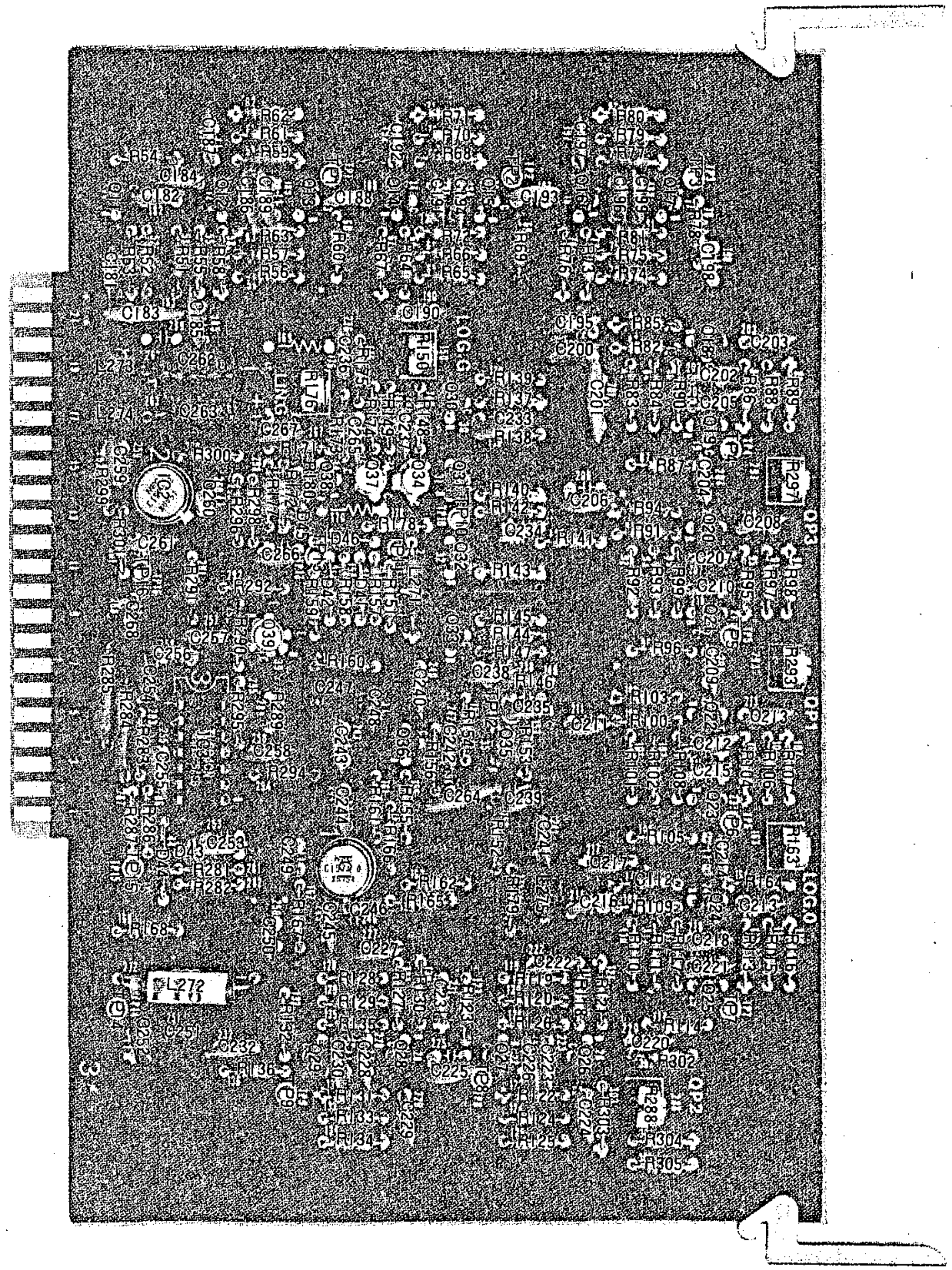
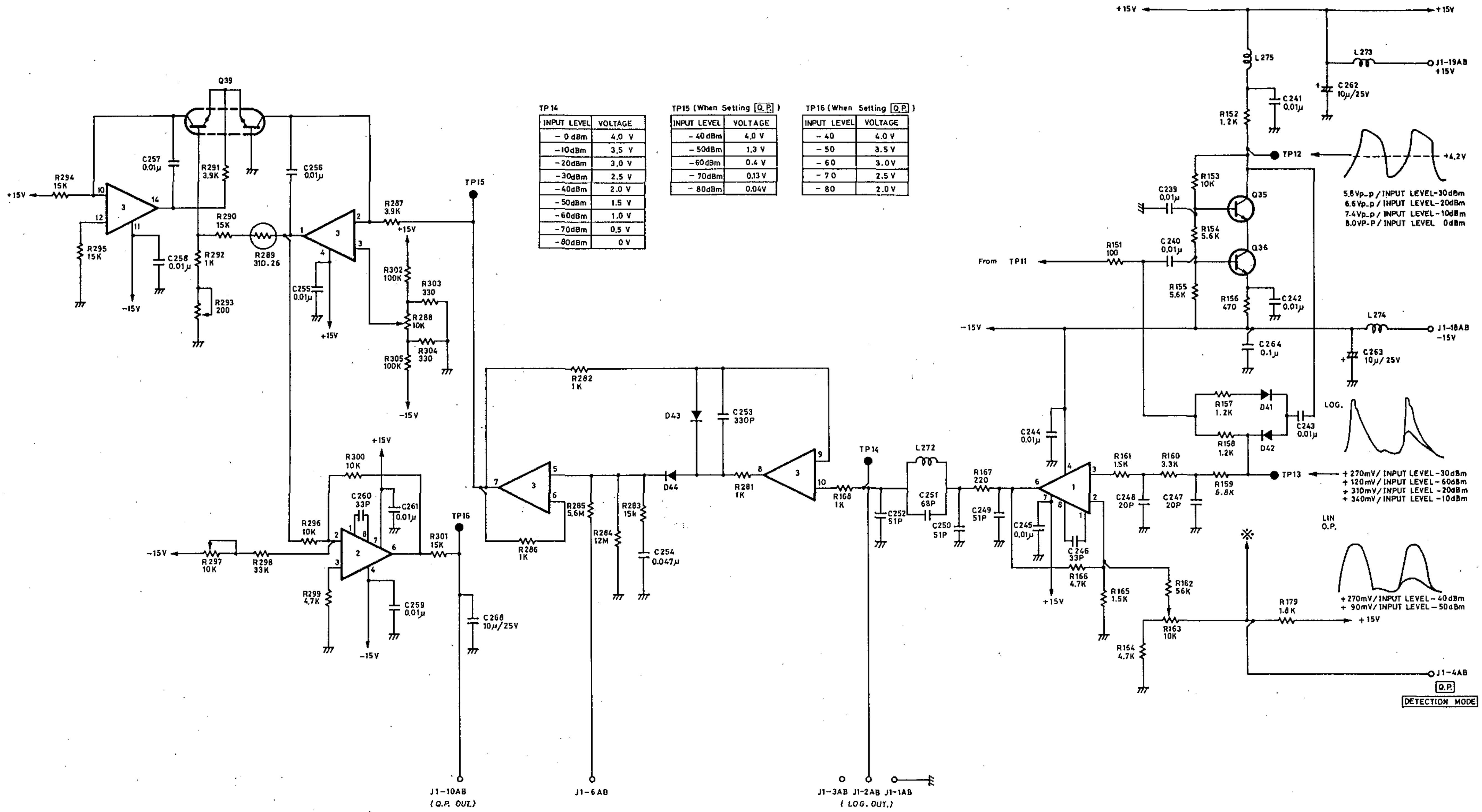


Fig. A-10 Locations & Diagrams, PH209 (LOG. AMP. Assy 2/2)



TP14

INPUT LEVEL	VOLTAGE
- 0 dBm	4.0 V
-10dBm	3.5 V
-20dBm	3.0 V
-30dBm	2.5 V
-40dBm	2.0 V
-50dBm	1.5 V
-60dBm	1.0 V
-70dBm	0.5 V
-80dBm	0 V

TP15 (When Setting [Q.P.])

INPUT LEVEL	VOLTAGE
- 40dBm	4.0 V
- 50dBm	1.3 V
- 60dBm	0.4 V
- 70dBm	0.13 V
- 80dBm	0.04V

TP16 (When Setting [Q.P.])

INPUT LEVEL	VOLTAGE
- 40	4.0 V
- 50	3.5 V
- 60	3.0 V
- 70	2.5 V
- 80	2.0 V

0395112-009-C

TR4132/4132N
LOG. AMP. SECTION (2/2)
PH209

14

TR4132/4132N RAMP & YIG DRIVER SECTION

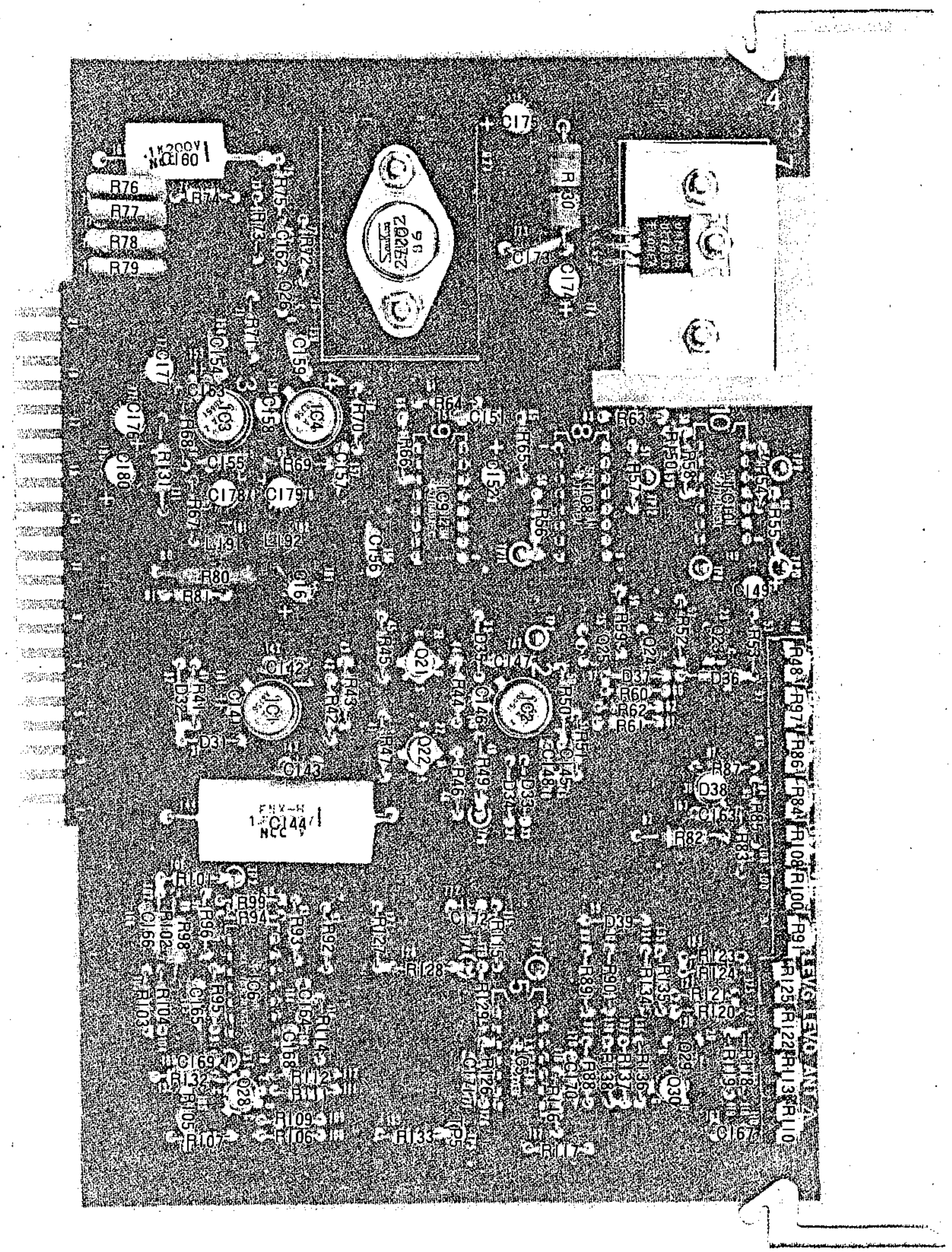
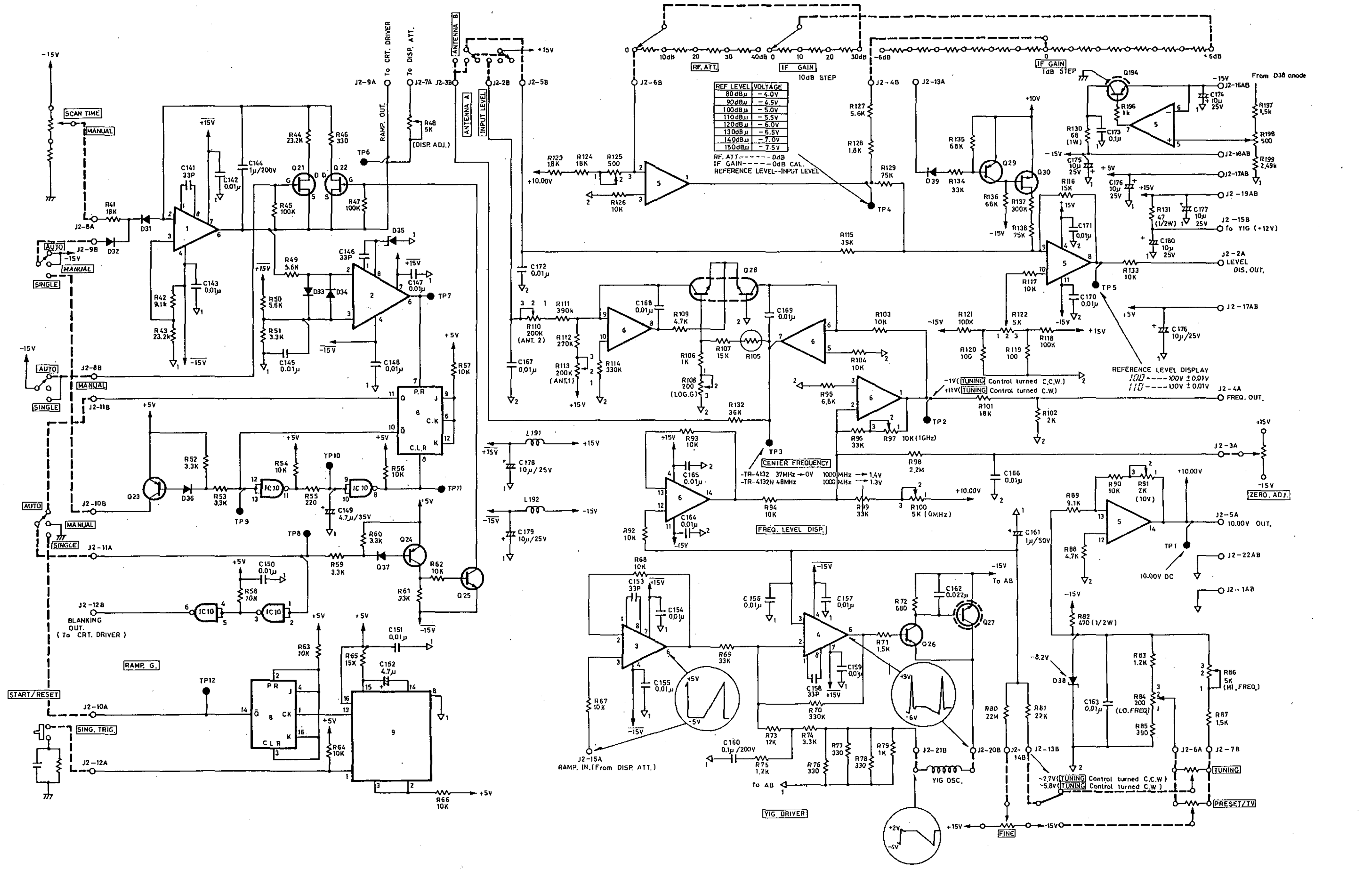


Fig. A-11 Locations & Diagrams, PF130 (RAMP & YIG DRIVER Assy)



REF LEVEL	VOLTAGE
80dBμ	-4.0V
90dBμ	-4.5V
100dBμ	-5.0V
110dBμ	-5.5V
120dBμ	-6.0V
130dBμ	-6.5V
140dBμ	-7.0V
150dBμ	-7.5V

0395210-010-G

TR4132/4132N
RAMP & YIG DRIVER SECTION
PF130

TR4132/4132N CRT DRIVER SECTION

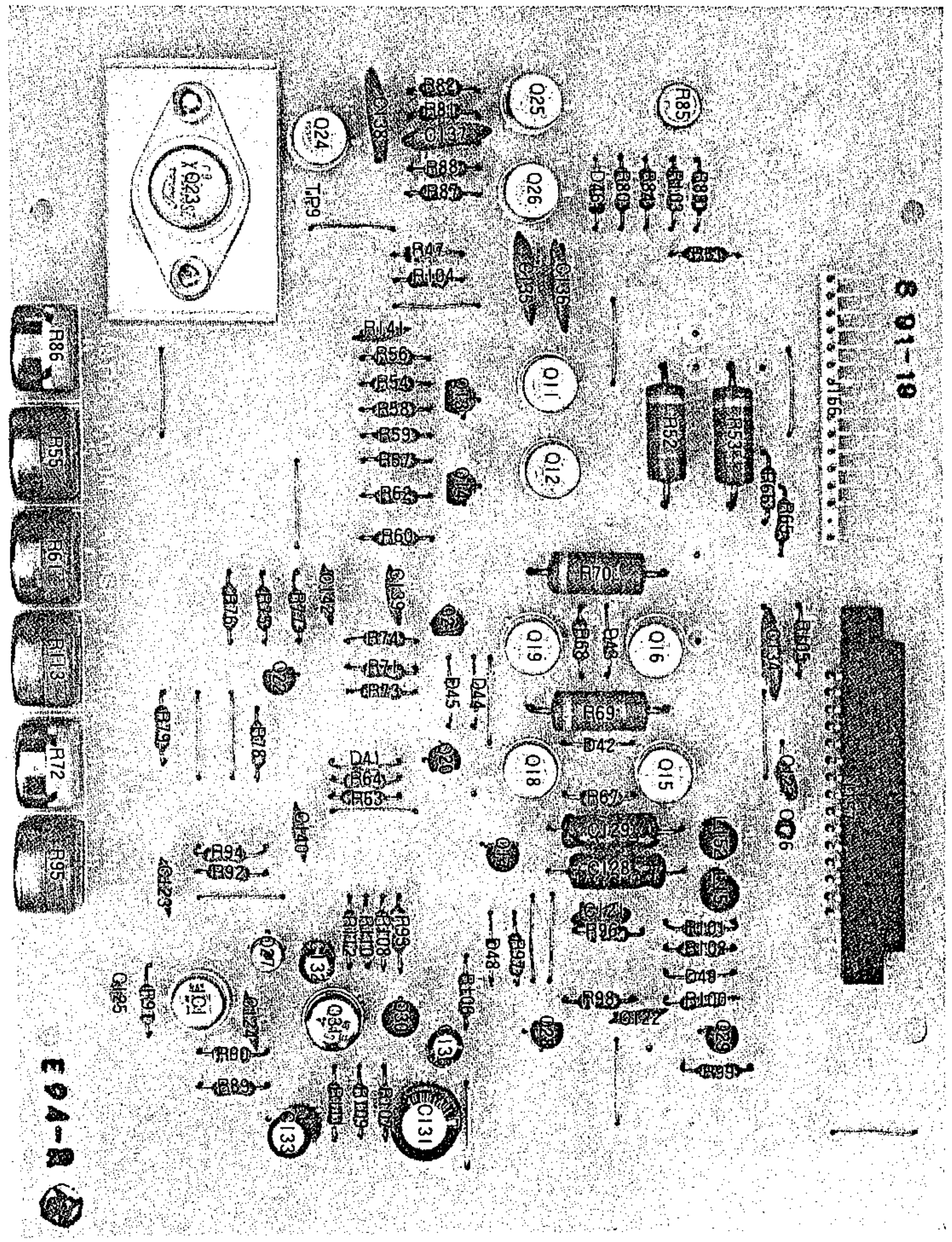
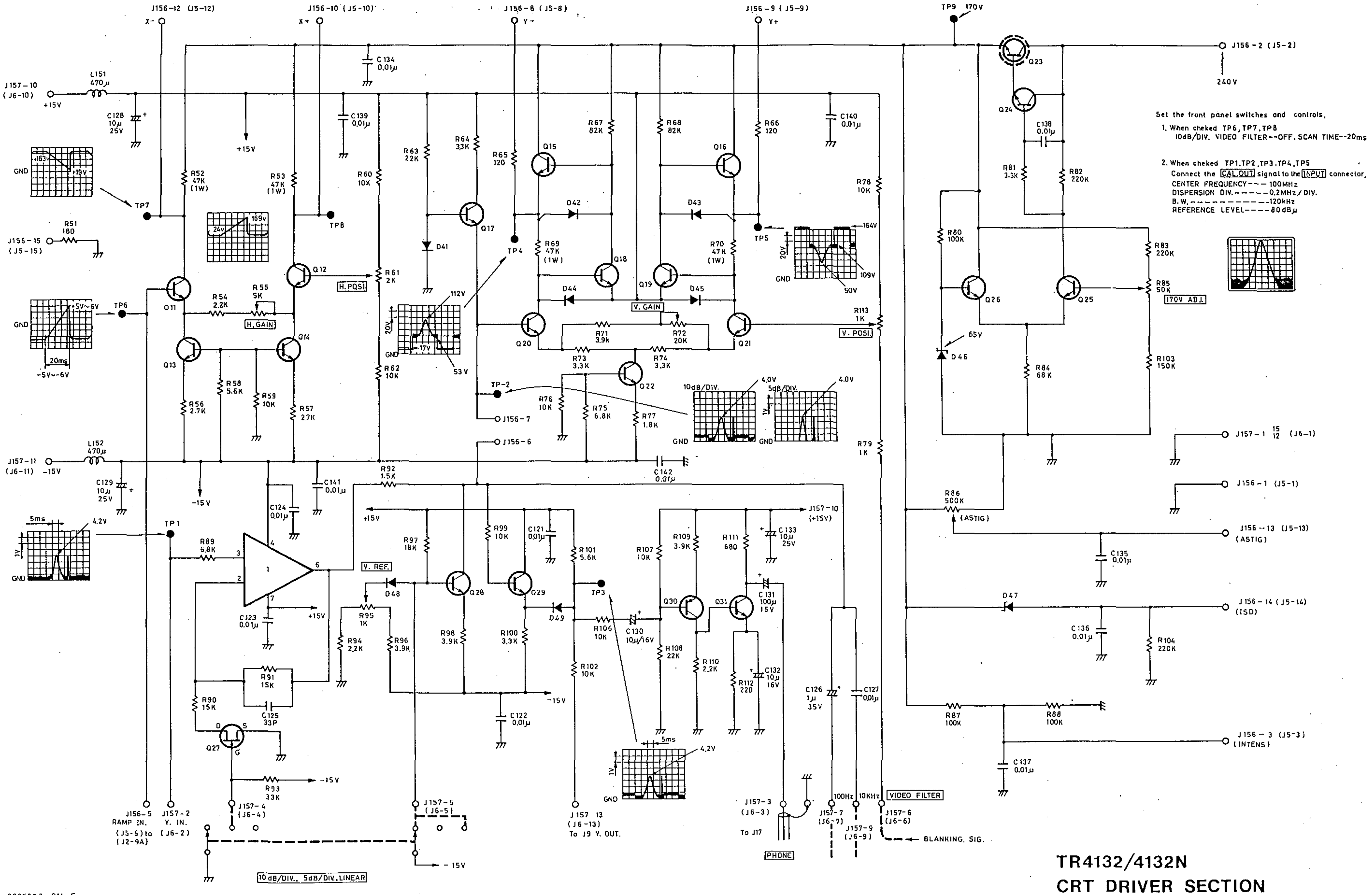


Fig. A-12 Locations & Diagrams, SG210 (CRT DRIVER Assy)



TR4132/4132N
CRT DRIVER SECTION
SG210

0395308-011-F

18

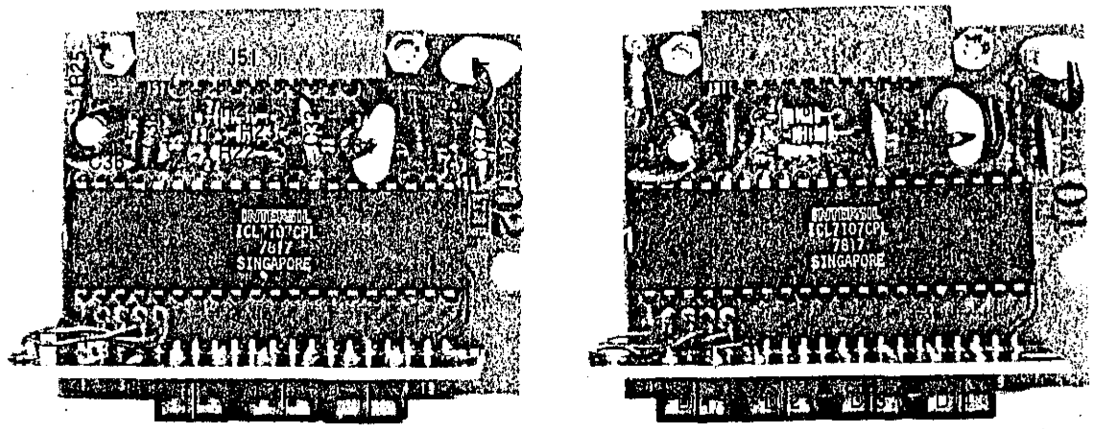
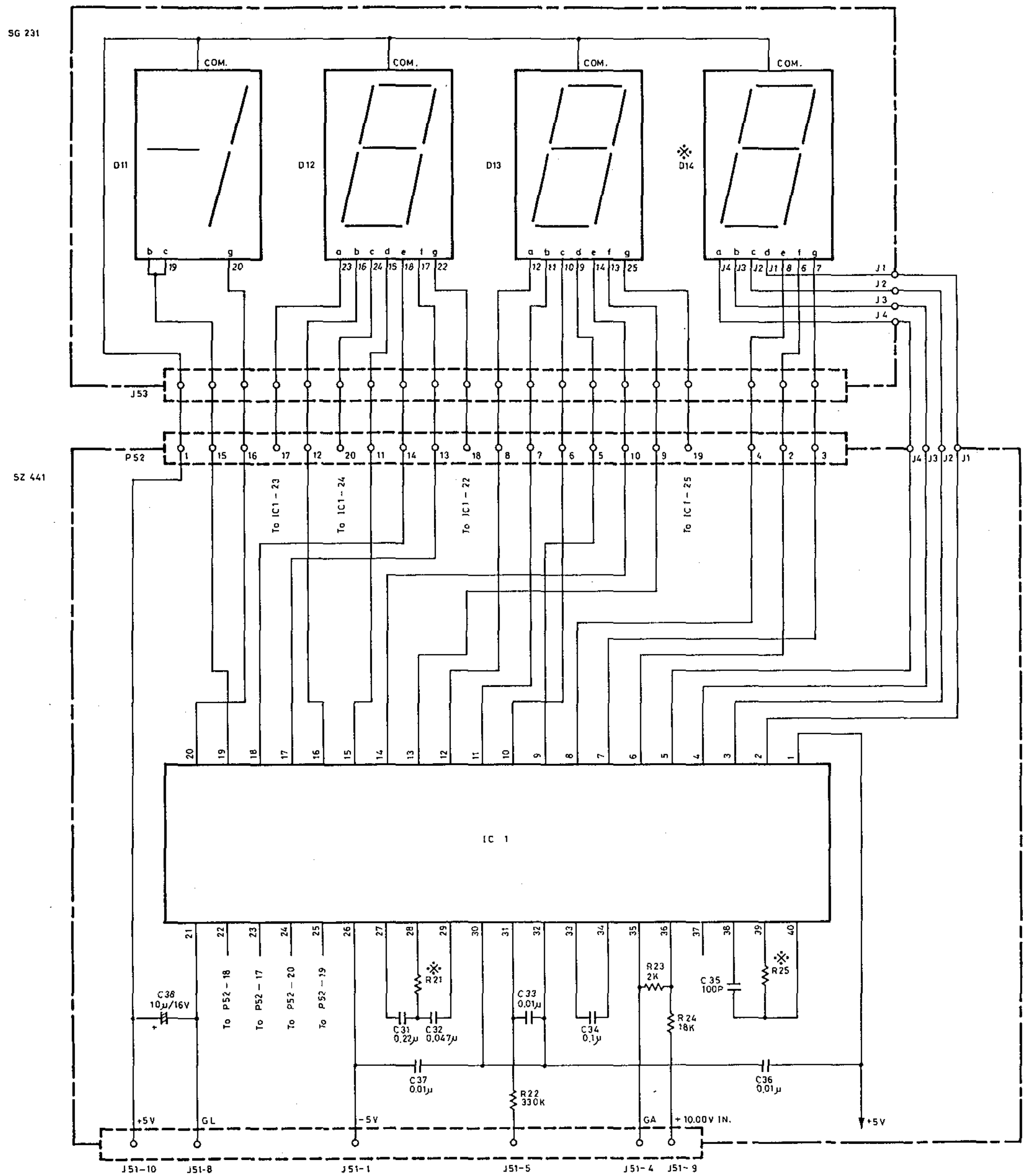


Fig. A-13 Locations & Diagrams, SG231, SZ441 (D.P.M. Assy)



※

	-TR-4132	-TR-4132N
	FREQUENCY DISPLAY	REFERENCE LEVEL DISPLAY
D14	mounted	not mounted
R21	100kΩ	470kΩ
R25	22kΩ	100kΩ

TR4132/4132N
D.P.M. SECTION
SG231 SZ441

0395906-012-B

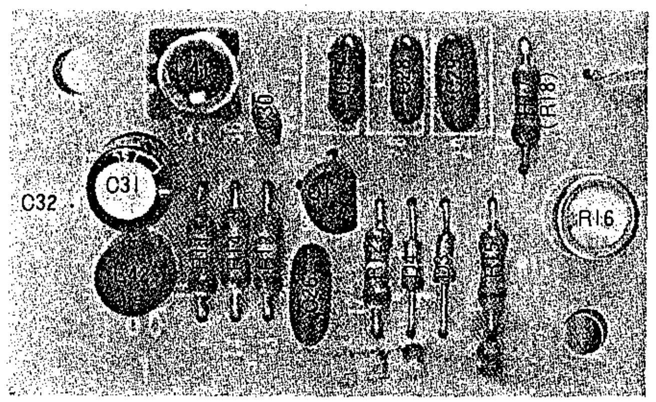
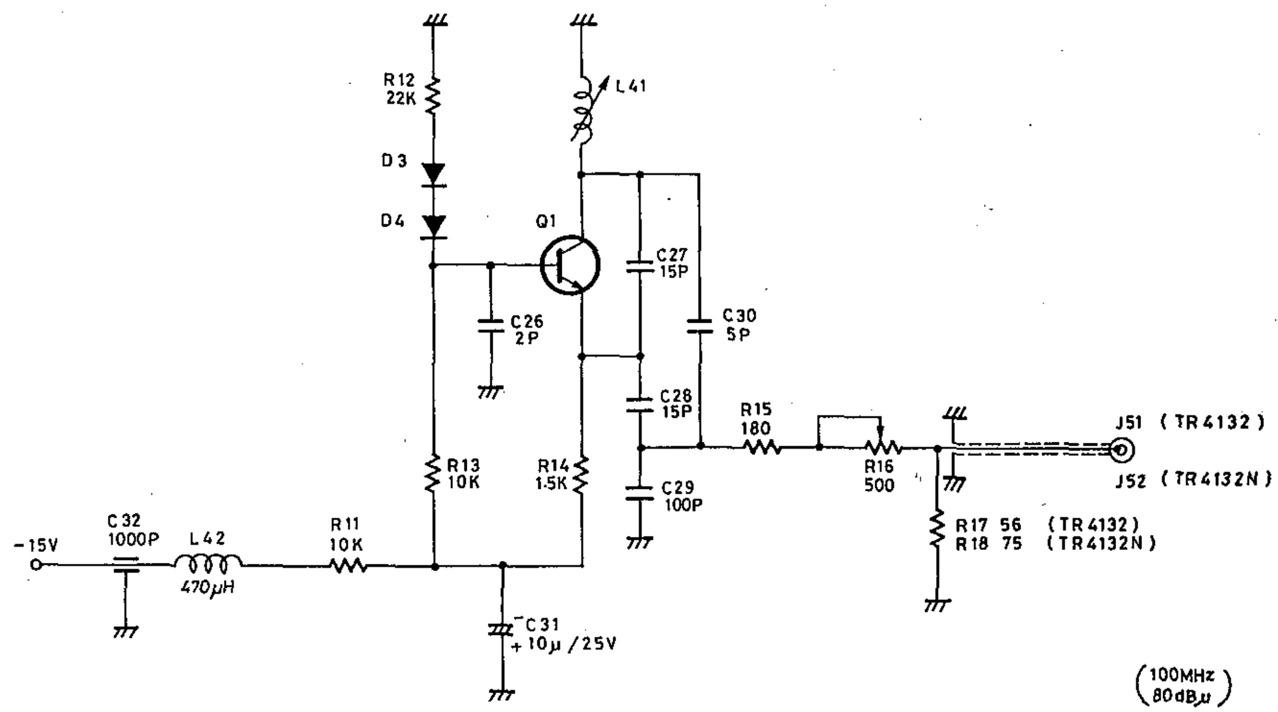


Fig. A-14 Locations & Diagrams, SF145 (CAL. OSC. Assy)



0395209-013 - C

TR4132 /4132N
CAL. OSC. SECTION
SF145

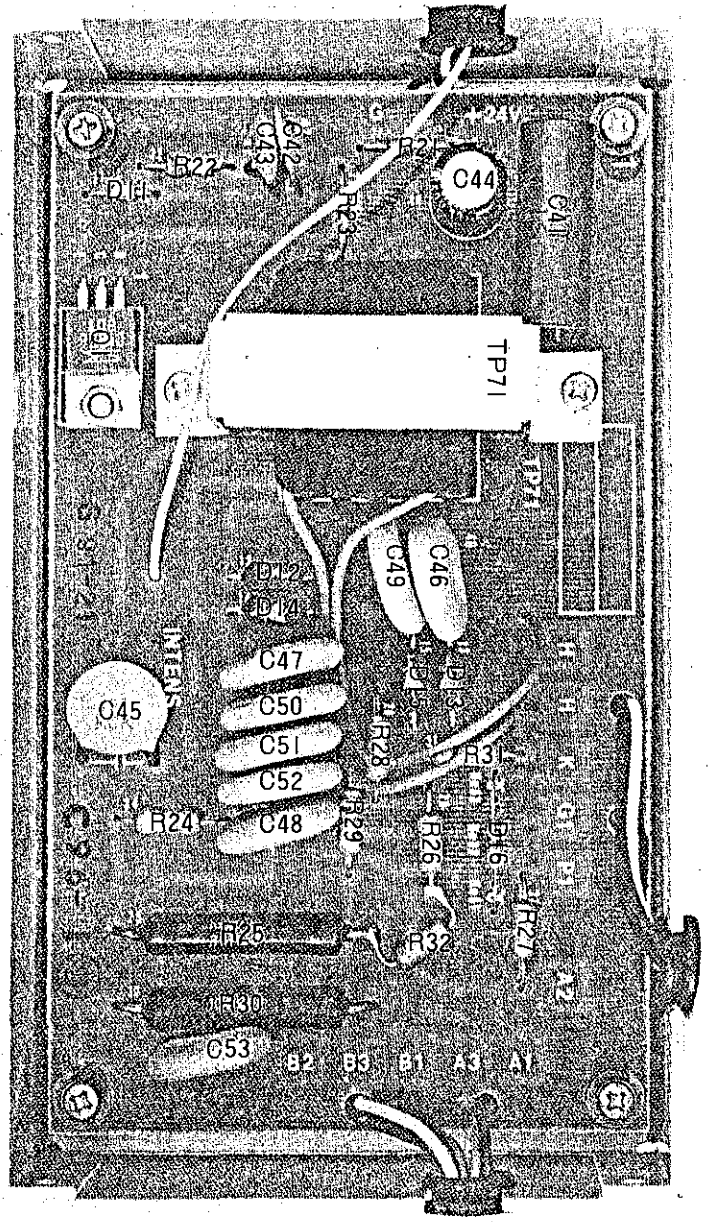
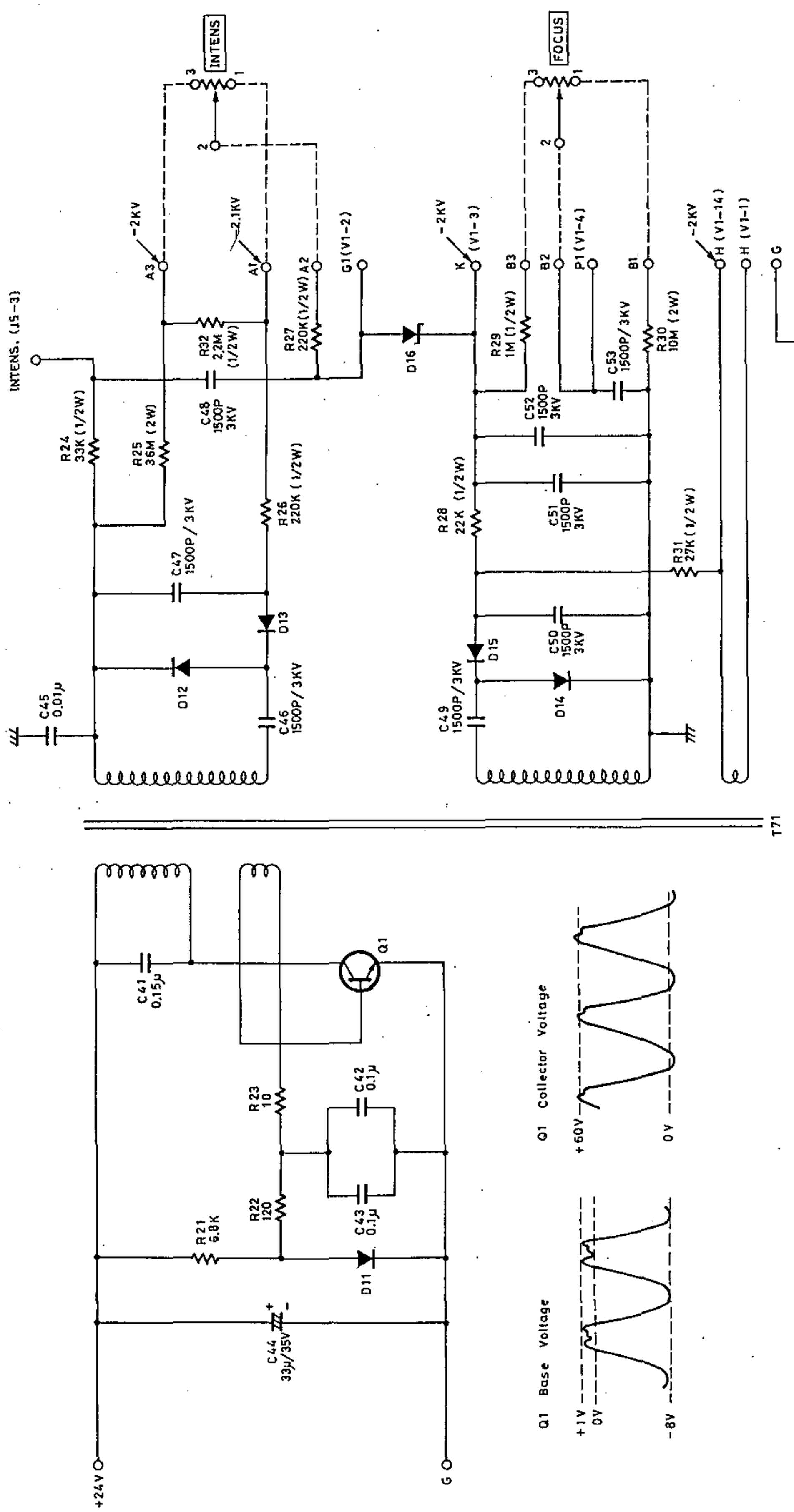


Fig. A-15 Locations & Diagrams, MEP265 (H.V. POWER SUPPLY Assy)



TR4132/4132N
HIGH VOLTAGE SECTION
MEP-265 (SE175)

0395506-014-C

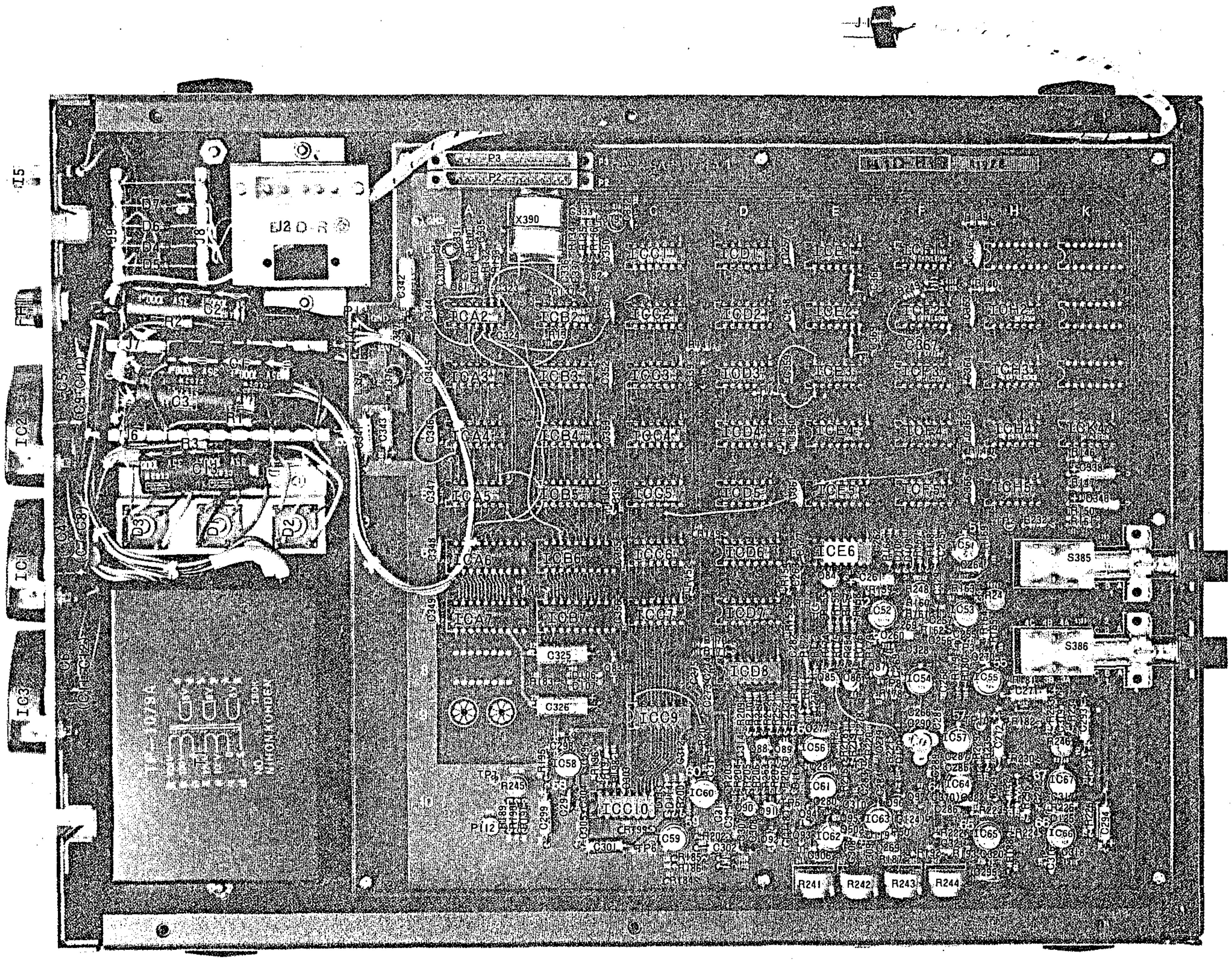
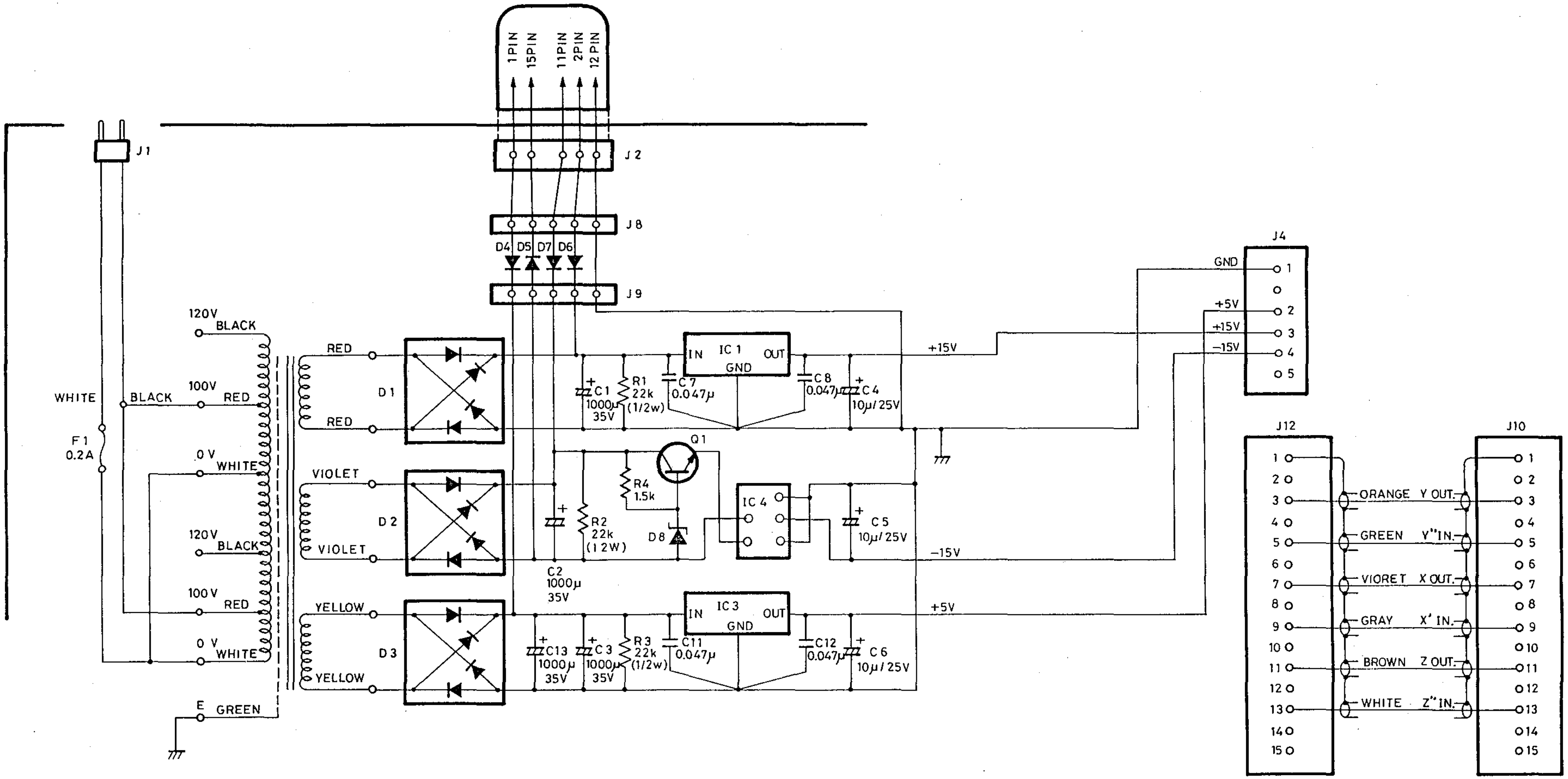
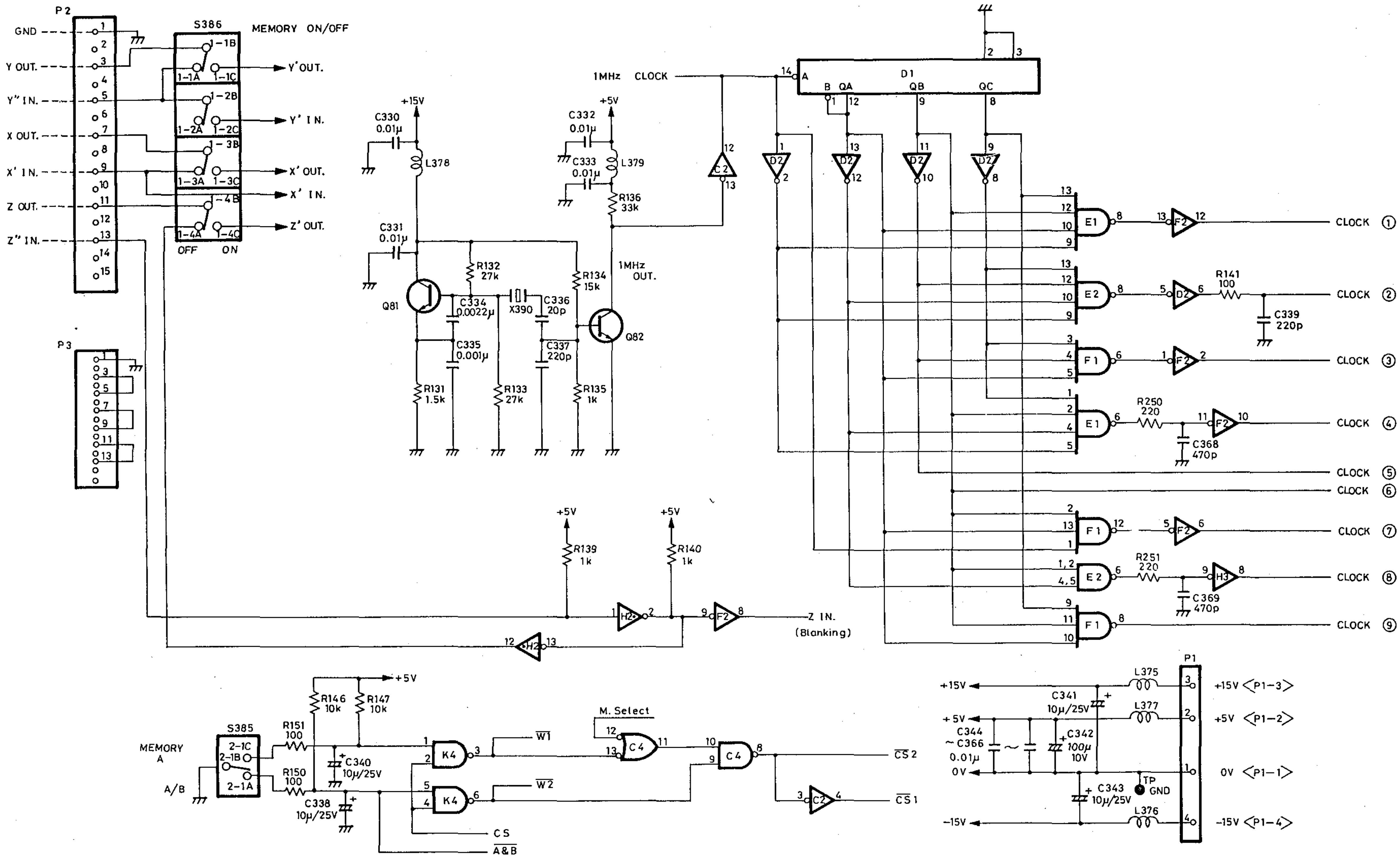


Fig.A-16 Locations & Diagrams,TR1604 DIGITAL MEMORY



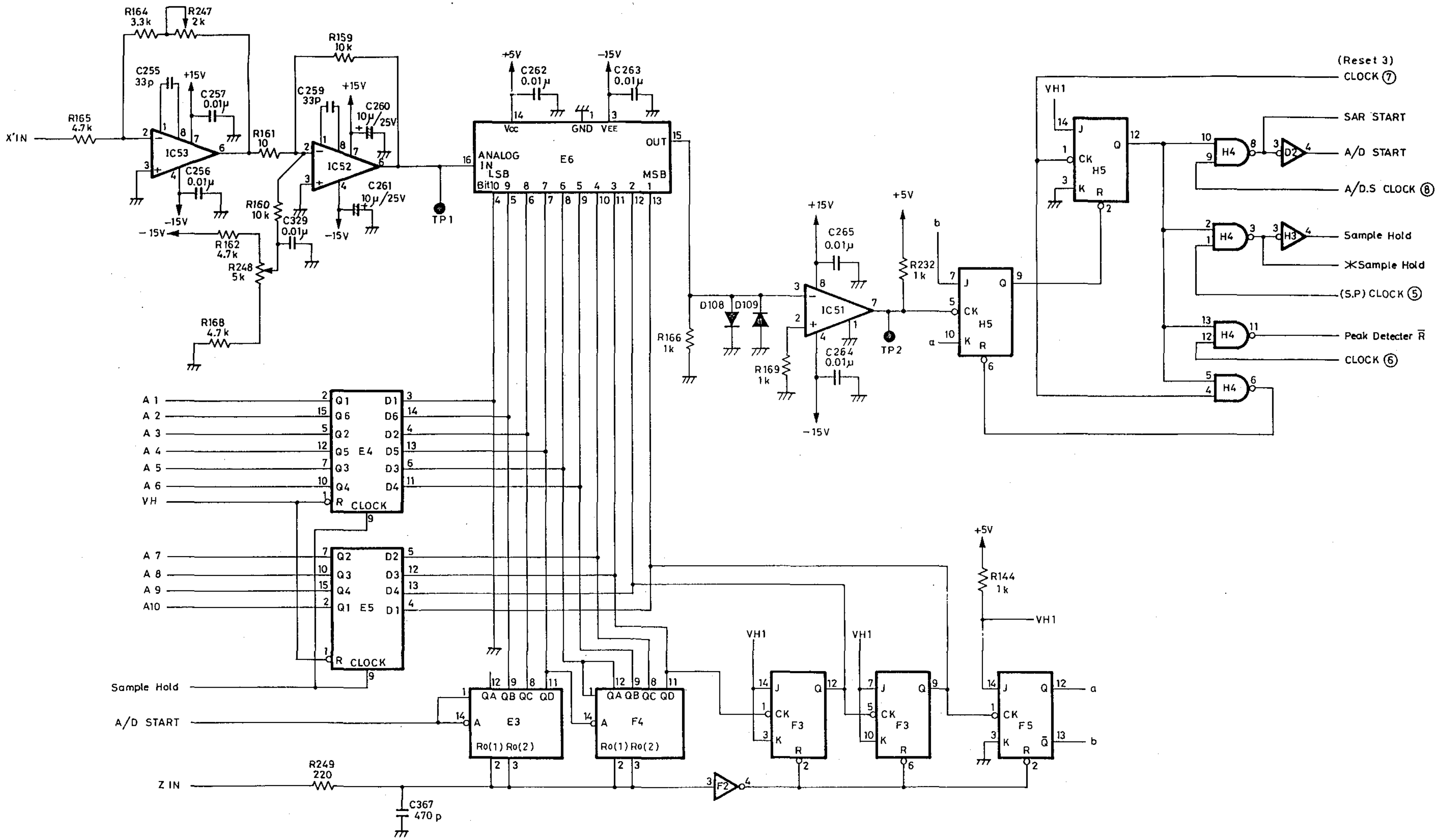
1993210-001-B

TR1604
SCHEMATIC SECTION



1993412-002-B

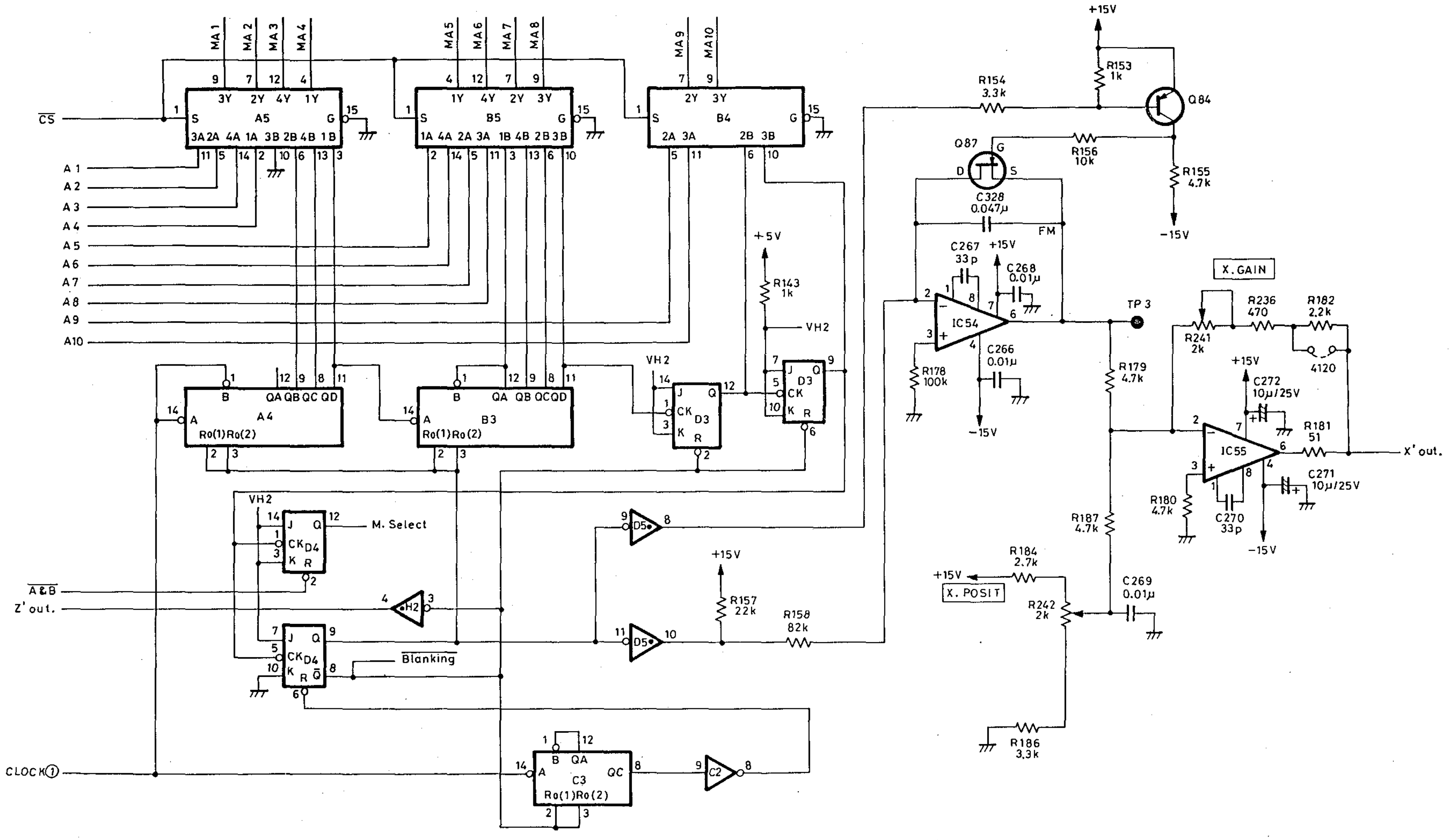
TR1604
DIGITAL MEMORY
(TIMING GENERATOR 1MHz
CLOCK & SWITCH)
PM074 1/6



TR1604
DIGITAL MEMORY
(X' INPUT AMP & A/D)
PM074 2/6

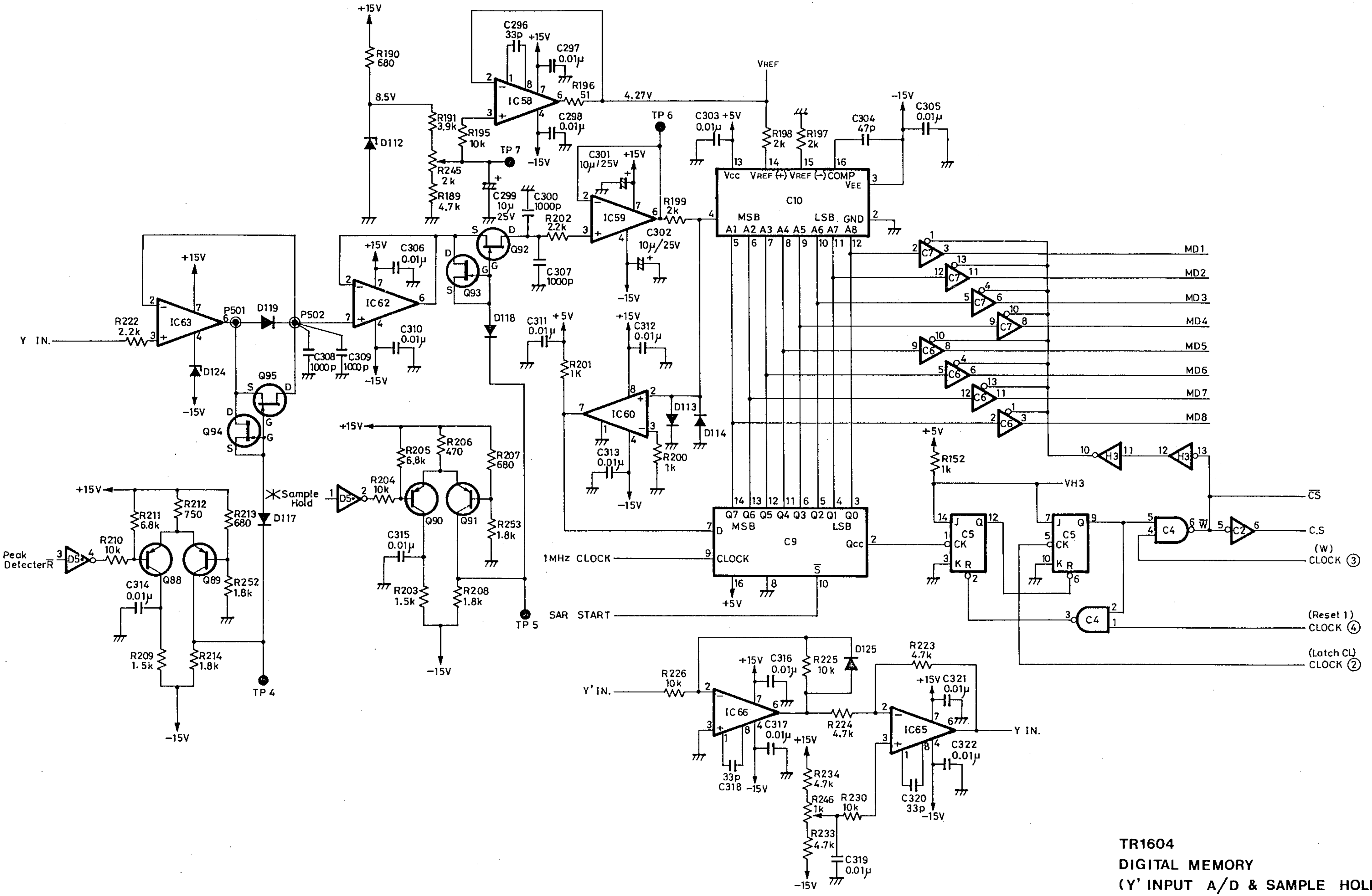
1993412 -003- 8

26



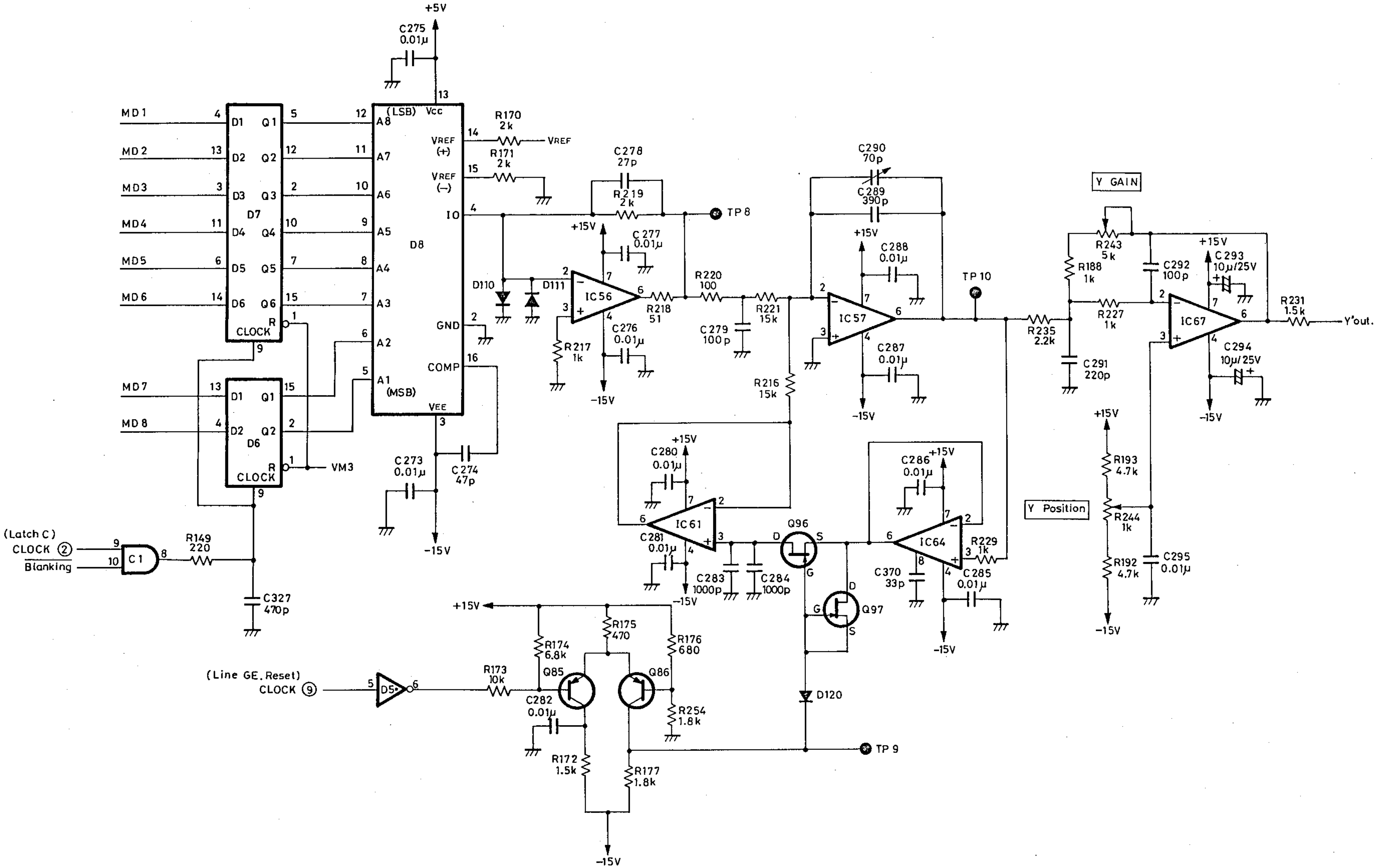
TR1604
DIGITAL MEMORY
(RAMP GENERATOR & ADDRESS COUNTER)
PM074 3/6

1993412-004-B



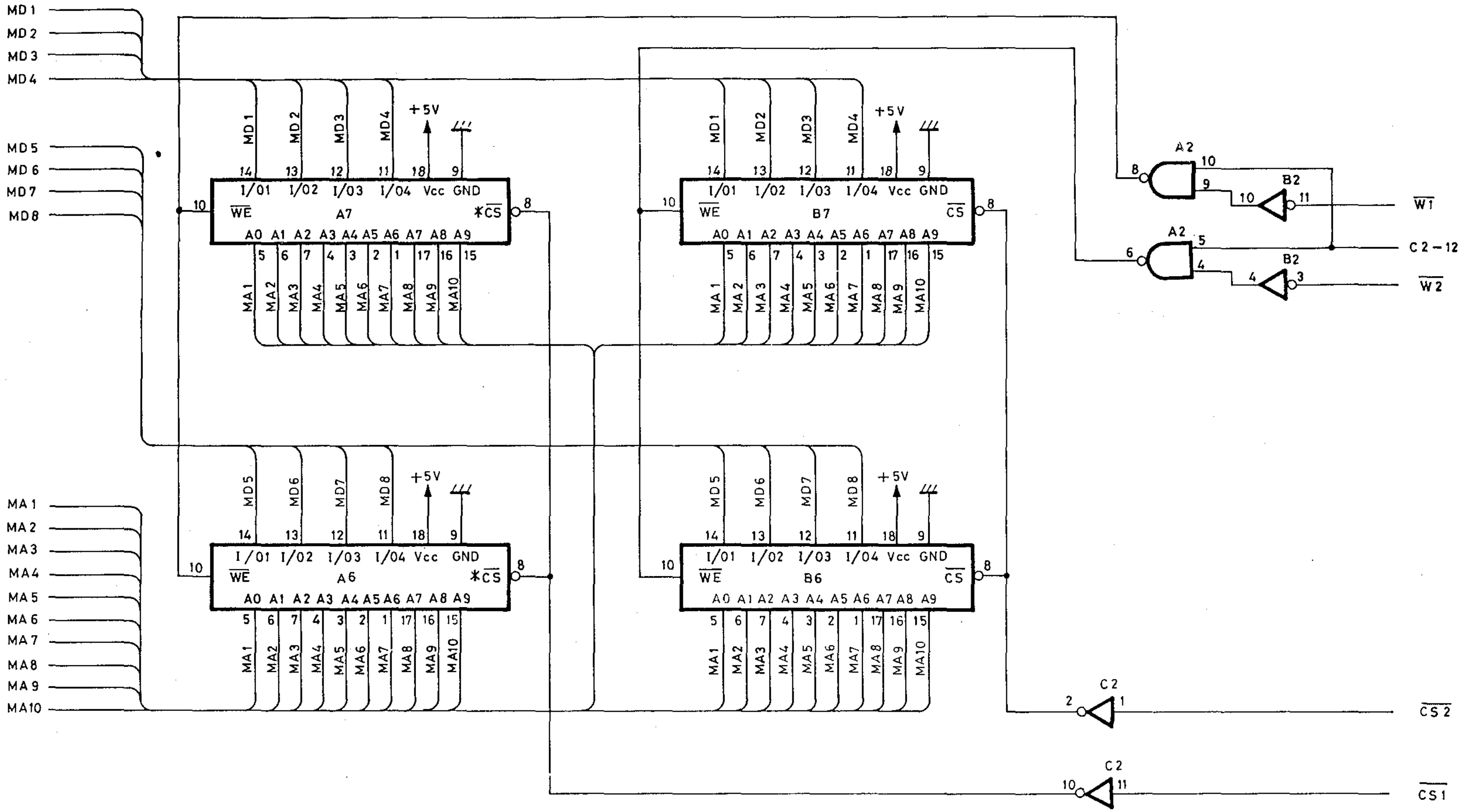
1993106-005-B

TR1604
DIGITAL MEMORY
(Y' INPUT A/D & SAMPLE HOLD)
PM074 4/6



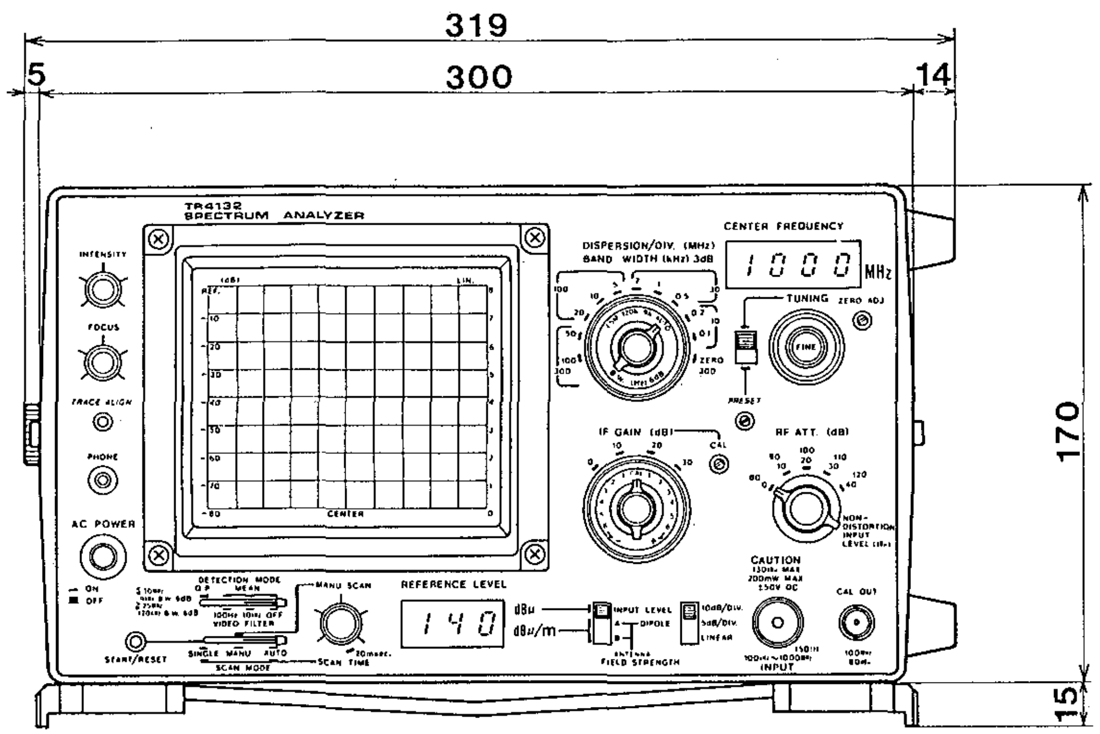
1993106−006−B

TR1604
DIGITAL MEMORY
(Y' OUTPUT D/A & LINE GENERATOR)
PM074 5/6

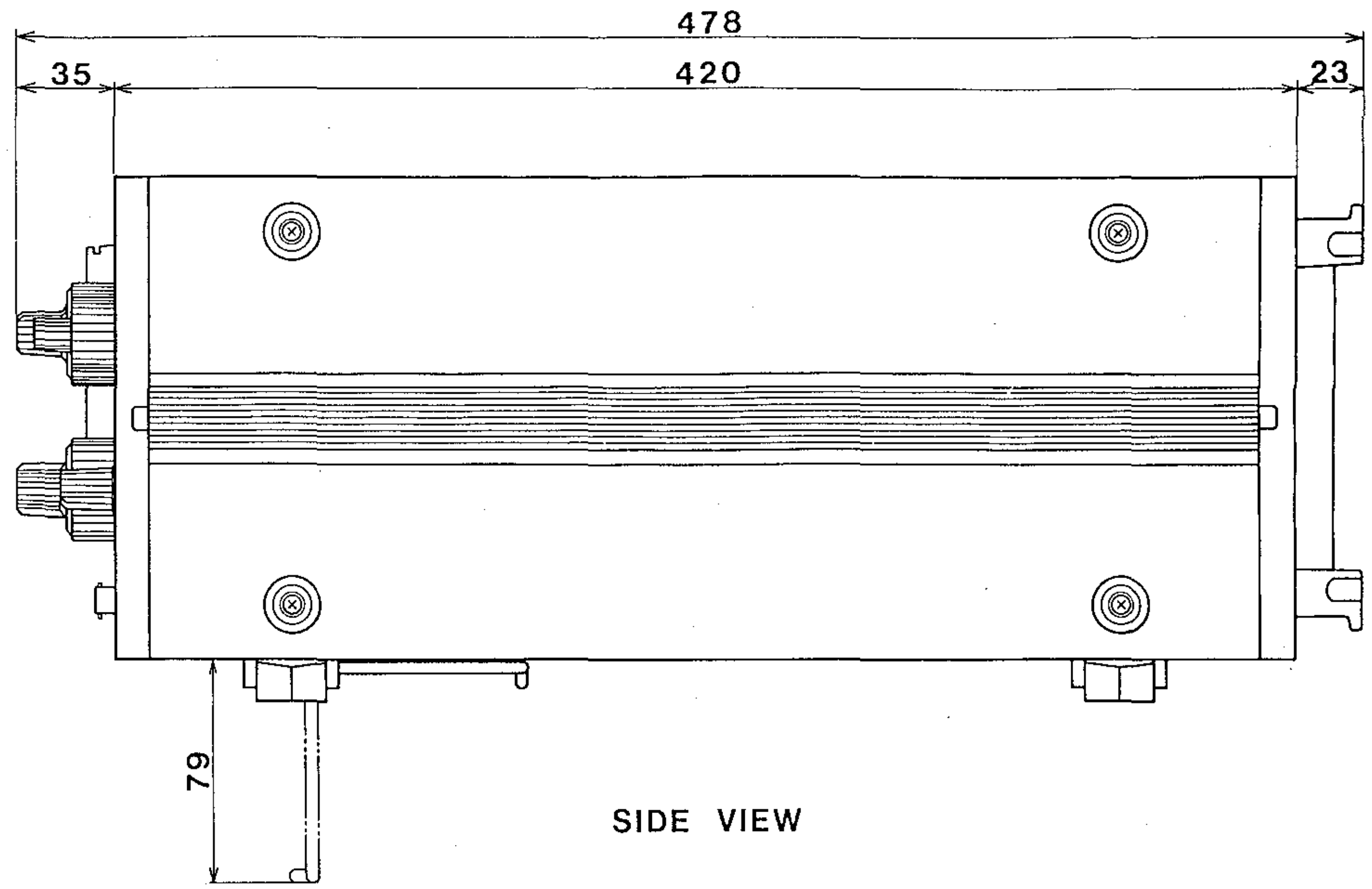


1993412 – 007 – B

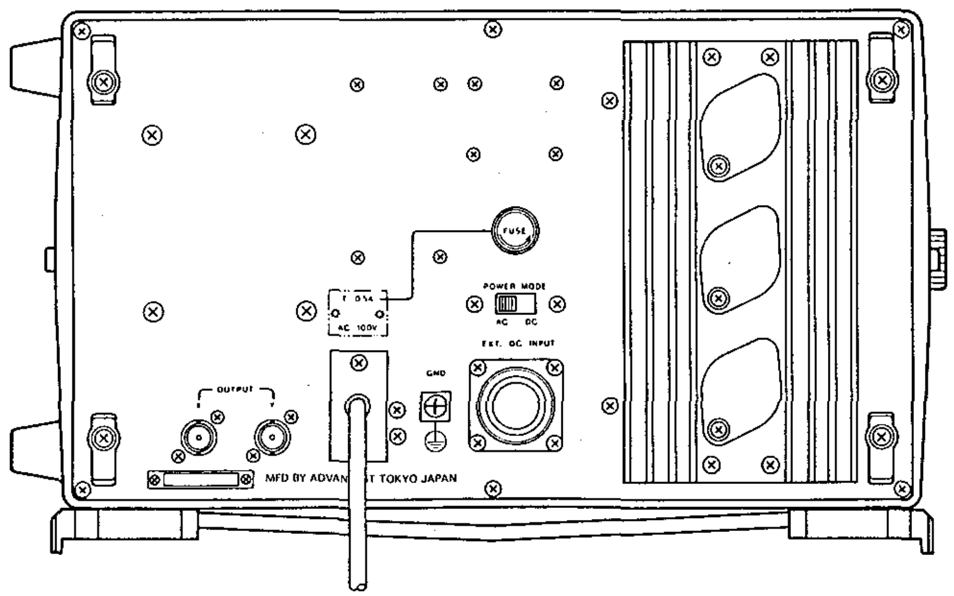
TR1604
DIGITAL MEMORY
PM074 6/6



FRONT VIEW

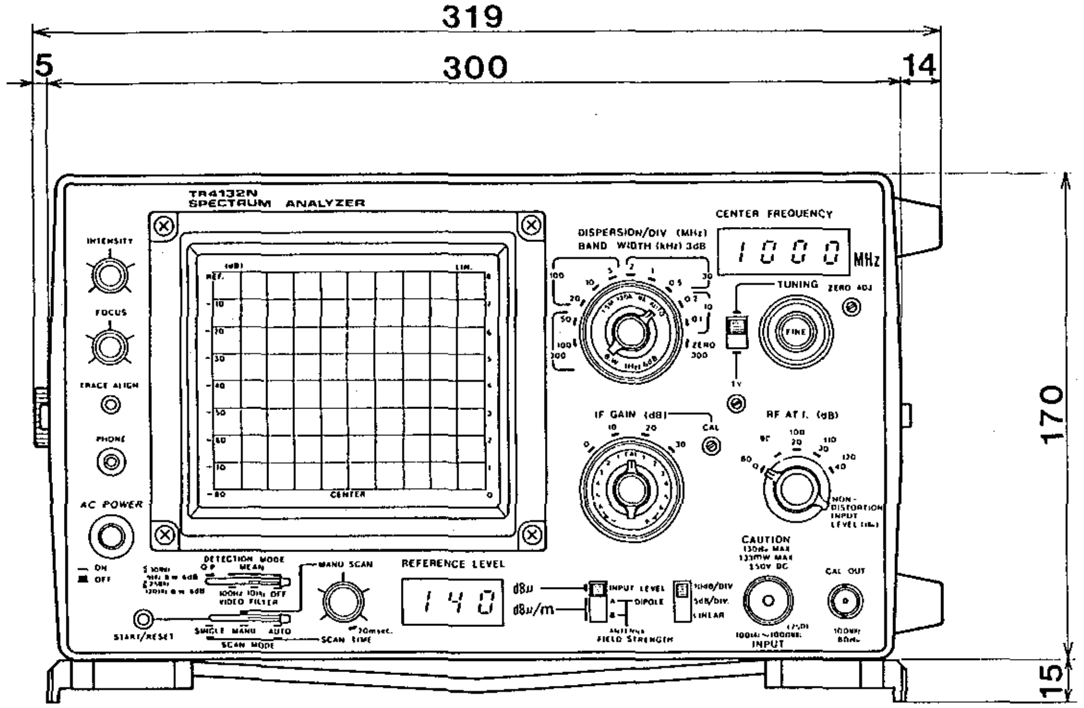


SIDE VIEW

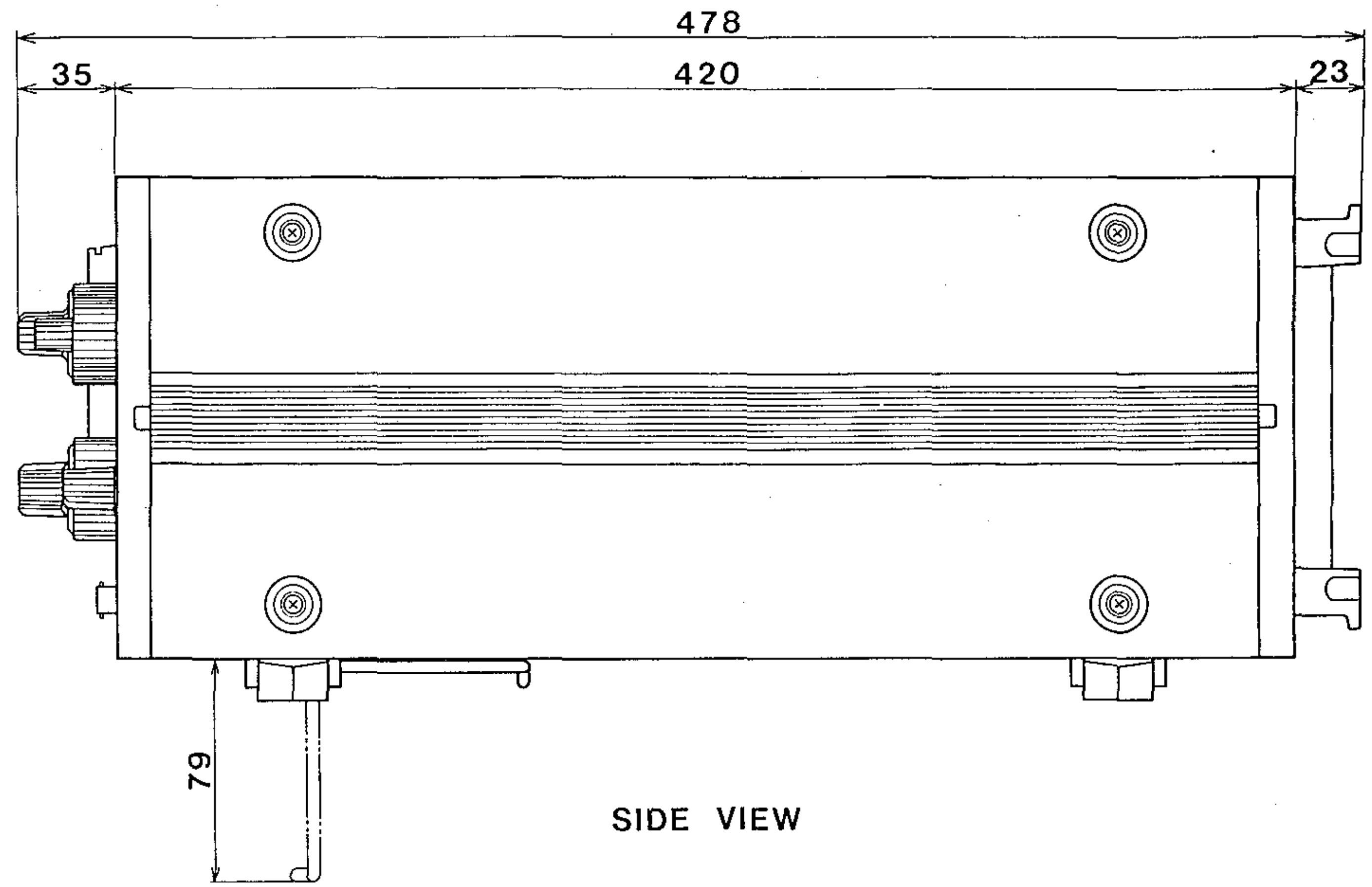


REAR VIEW

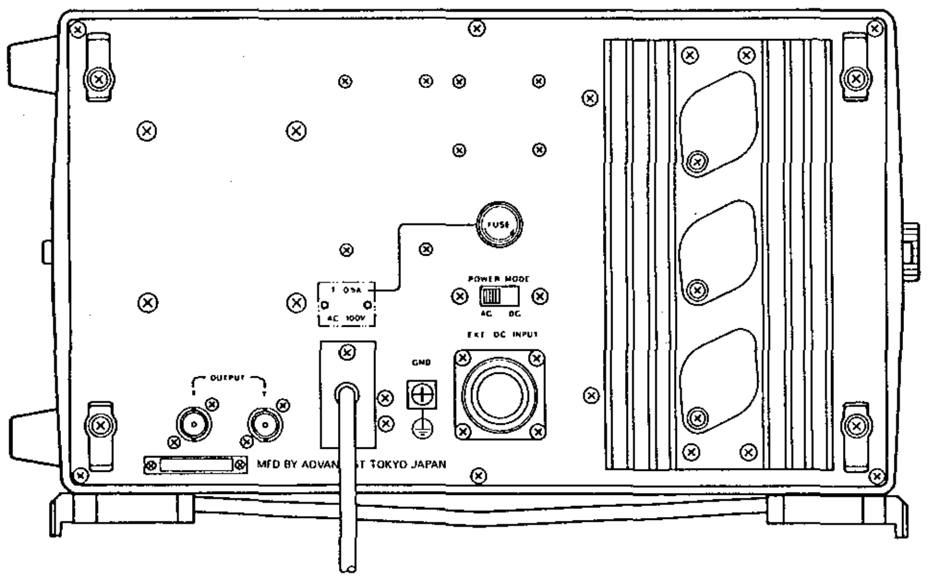
TR4132
EXTERNAL VIEW



FRONT VIEW

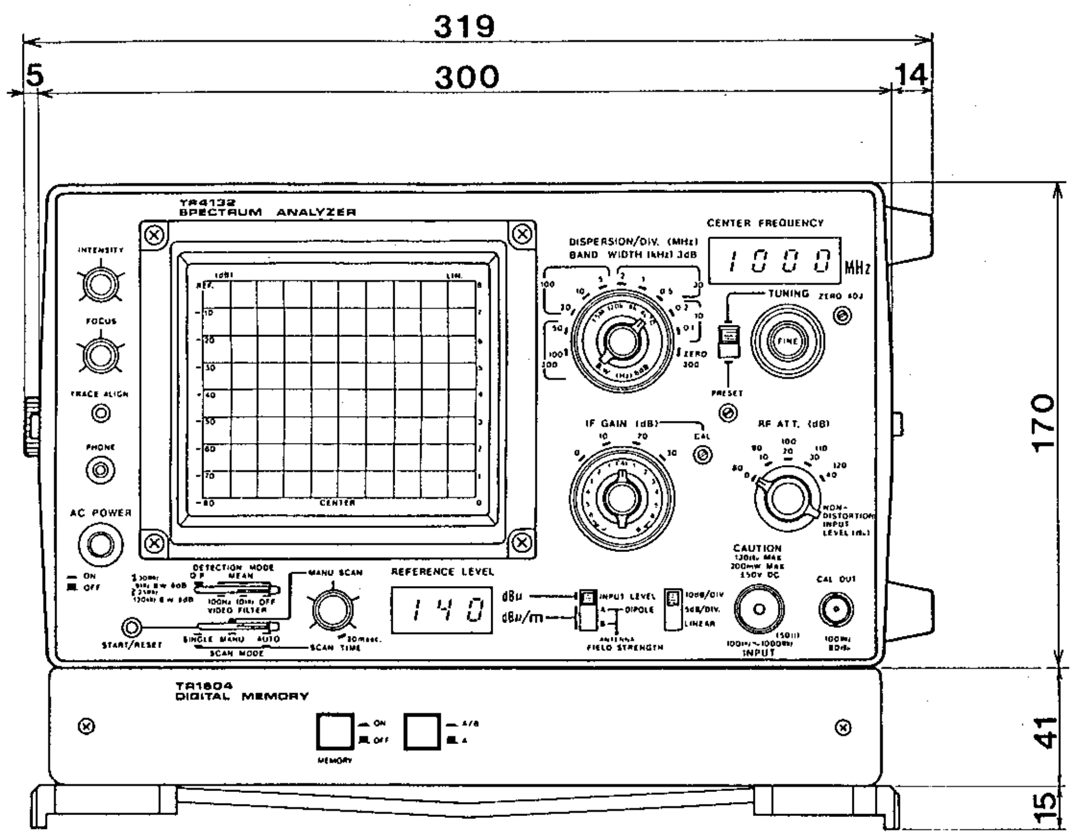


SIDE VIEW

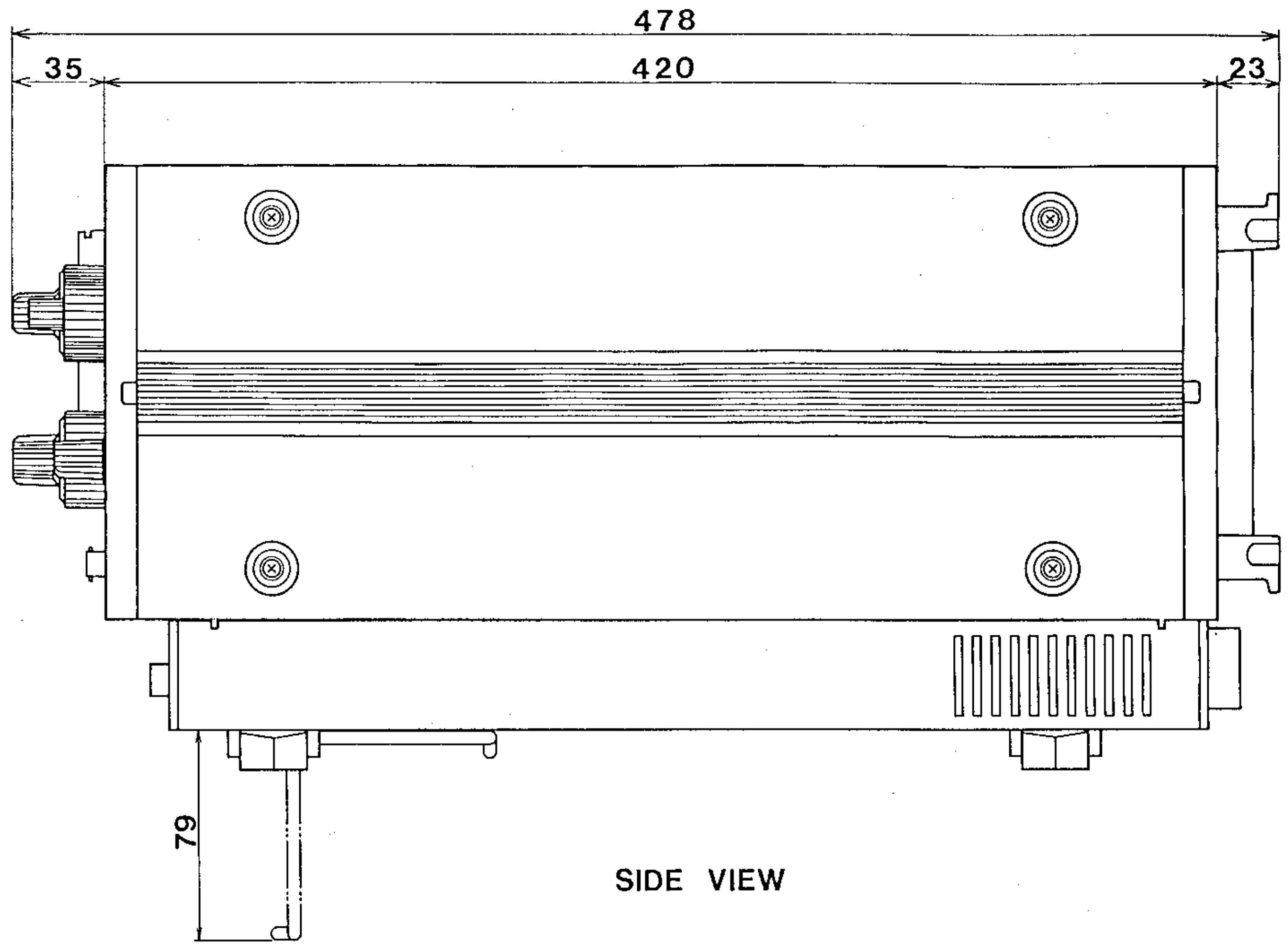


REAR VIEW

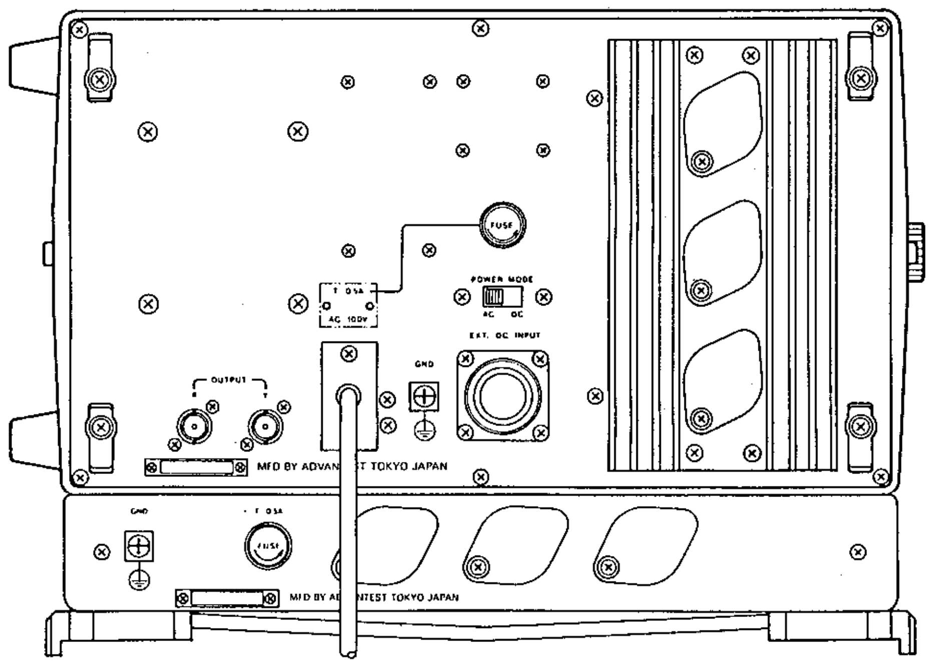
TR4132N
EXTERNAL VIEW



FRONT VIEW

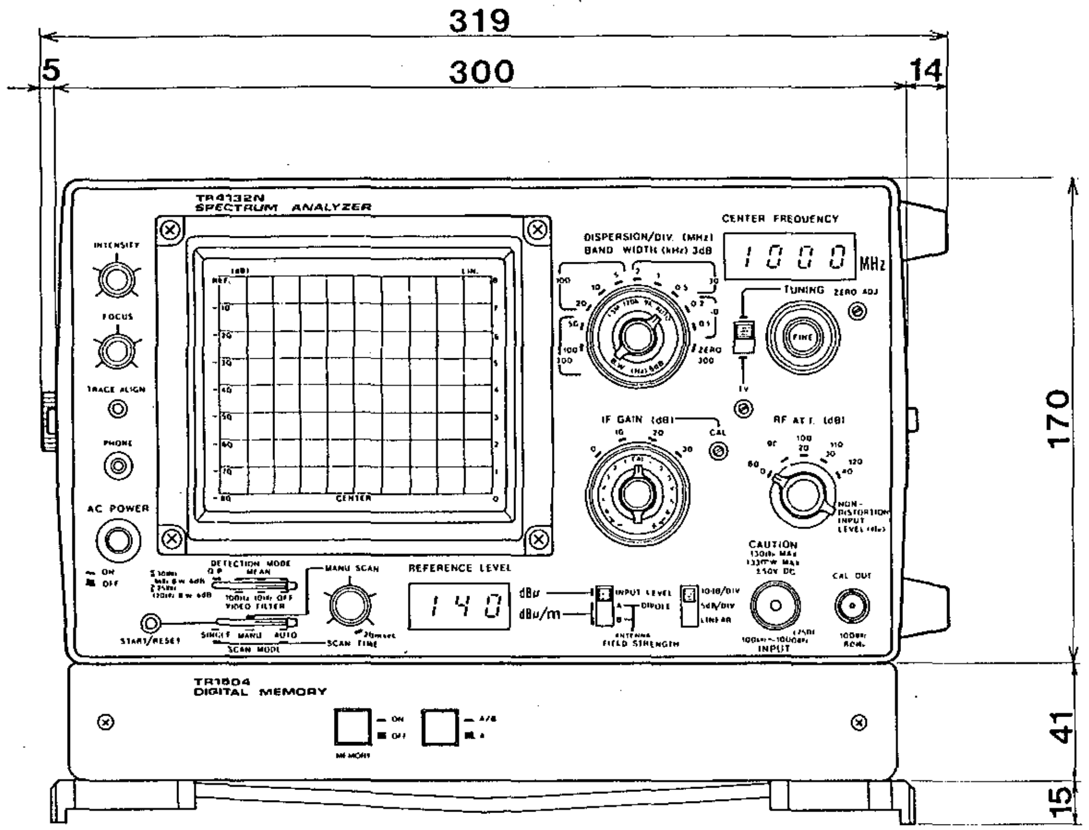


SIDE VIEW

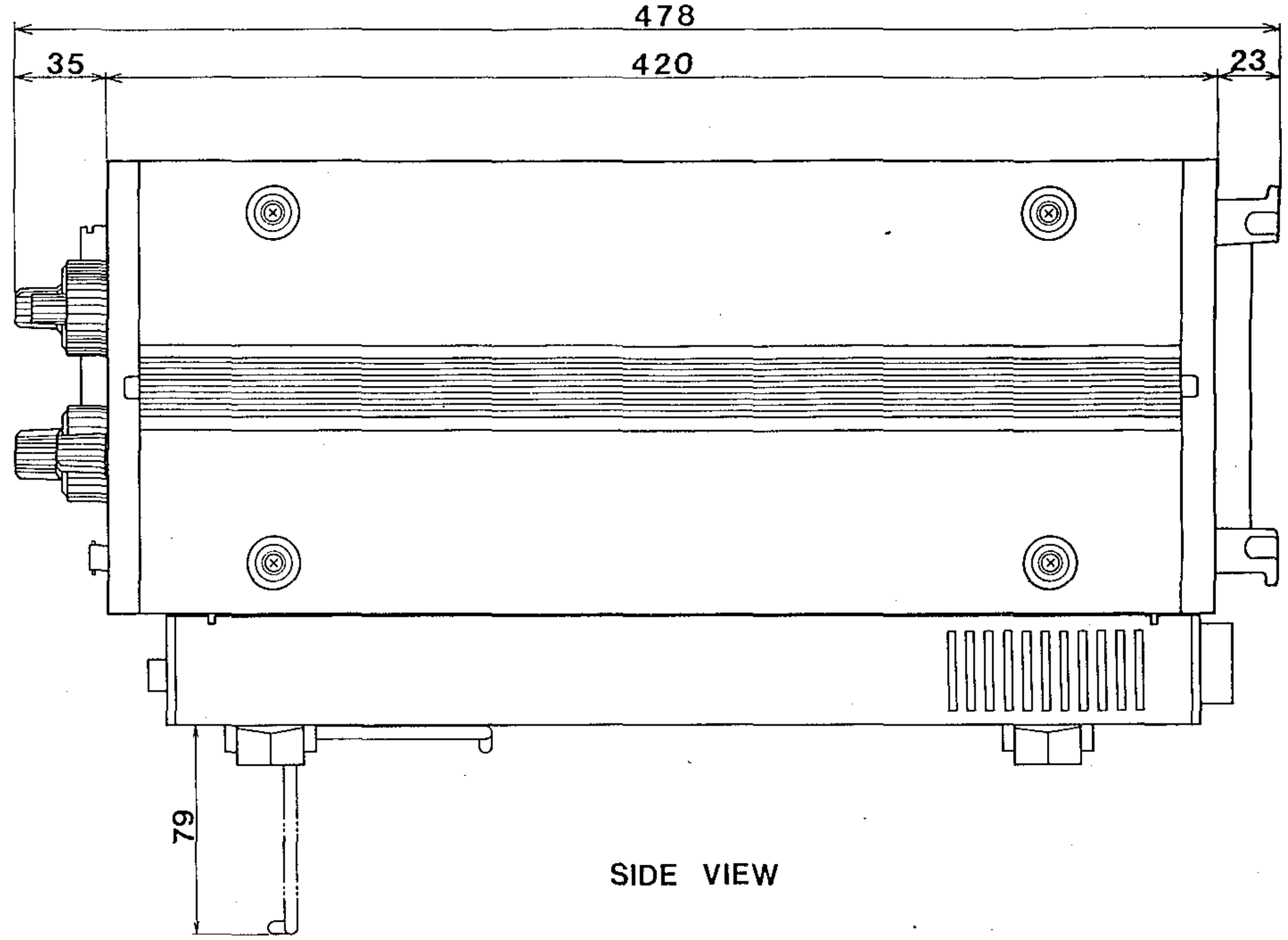


REAR VIEW

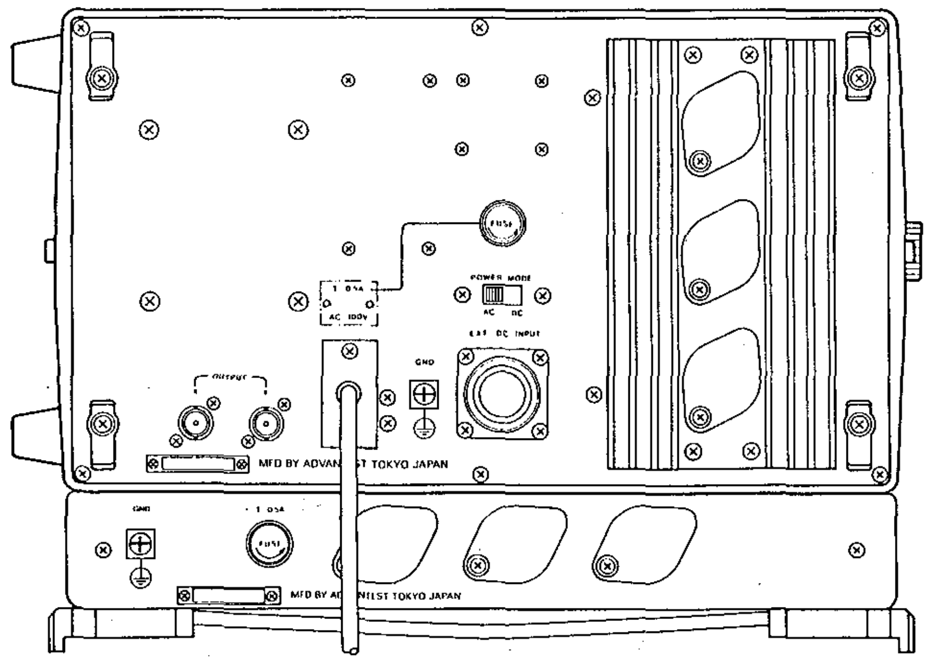
TR4132/1604
EXTERNAL VIEW



FRONT VIEW



SIDE VIEW



REAR VIEW

TR4132N/1604
EXTERNAL VIEW

IF Bandwidth

A Spectrum Analyzer uses Band Pass Filter (B.P.F.) in analyzing individual frequency components which are composed in an input signal. 3dB bandwidth of a B.P.F. is called an IF Bandwidth. [Fig. a] The characteristic of a B.P.F. must be considered in appropriate from depending on the sweep width and sweep speed. **TR4132/4132N** is designed so that settings are automatically selected to the best. Spectrum resolution is improved as the bandwidth is set narrower in general so that sometimes the resolution of a Spectrum Analyzer is expressed with the narrowest IF Bandwidth. [Fig. b]

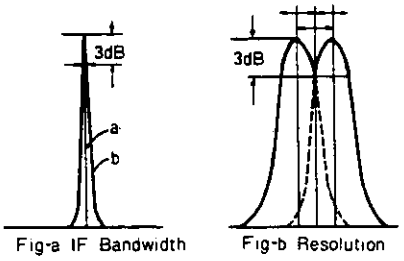


Fig. A-18 IF B.W. Reference Diagram

Gain Compression

If an input signal is applied in excess of a level, CRT display does not indicate correct level but shows as if increase of the input signal level were compressed. This phenomenon is called Gain Compression and defines linearity of the input signal range of the Spectrum Analyzer. Practically used is the range up to the compression of 1dB.

Input Sensitivity

Input Sensitivity is an ability of a Spectrum Analyzer to detect the smallest signal. It is directly related with the noise generated in the Spectrum Analyzer itself and depends on the IF Bandwidth being used. Input Sensitivity normally means the Average Noise Level at the least IF Bandwidth of the Spectrum Analyzer.

Maximum Input Level

It is the maximum permissible level at RF. input of the Spectrum Analyzer. Permissible level can be changed in accordance with provision of input attenuator.

Residual FM

Residual FM is used to mean short time stability of the local oscillator group built in a Spectrum Analyzer, and the drifting frequency bandwidth for a unit time is mentioned in peak to peak. It also indicated the measurement limit in measuring residual FM for the object under measurement.

Residual Response

It is to define the degree of level to which the spurious signal generated in the Spectrum Analyzer is restrained. It is due to a leakage signal like local oscillator output of the Spectrum Analyzer, and care is required in the case of analyzing extremely small input signal.

Quasi Peak Value Measurement

Reception interference noise in radio communications normally appears in a form of impulse. Such an inter ference energy is objectively evaluated with a value proportional to the quasi peak value. Since it is necessary to conclude the measurement range and detection time constant, etc. in measurement evaluation. quasi peak value is decided to indicate the measurement value. In accordance with the conclusion, there are JRTC Specifications in Japan and C.I.S.P.R. Specifications in U.S.A. ADVANTEST **TR4132/4132N** Spectrum Analyzer is the first to have adapted C.I.S.P.R. Specifications.

Frequency Response

This term is generally used to express an amplitude (frequency) characteristic of a frequency. With a Spectrum Analyzer, it means the frequency characteristic (flatness) of input attenuator and mixer, etc. for respective input frequency and is indicated in $\pm \Delta$ dB.

Scan Width

This is to express display range of horizontal axis (frequency domain) on CRT and includes the following display modes:

Full Scan: sweeps over the measurement range of the Spectrum Analyzer.

Dispersion/DIV.: is accurately calibrated frequency scale. Frequency axis is arbitrarily selected and sweep is effected from wide band to narrow band.

Zero Scan: does not perform frequency sweep but is tuned only to the frequency displayed at CRT display center. In this mode, the horizontal axis is not frequency but represents time axis as set by scan time.

Spurious

Spurious is undesired signal other than objective signal and is classified in accordance with characteristic of the signal as follows:

Harmonic Spurious: Specifies level of the harmonic which is generated in the Spectrum Analyzer (normally at mixer circuit) when ideal nondistorted signal is applied to the Analyzer. It also expresses the ability of harmonic distortion measurement.

Near-by Spurious: is the small spurious which appears in the neighbor of the Spectrum on the display when a pure single spectral signal is applied to a Spectrum Analyzer.

Nonharmonic Spurious: is called a residual spurious that is spurious of the frequency inherently generated in the Spectrum Analyzer.

Noise Sideband

Noise Sideband is an ability commonly used in expressing oscillation purity of an oscillator. With a Spectrum Analyzer, the noise generated in local oscillators and phase lock loops in particular appears in the neighbor of the spectrum under measurement and disturbs performance of the Spectrum Analyzer. It is therefore

necessary for such an instrument to specify the noise sideband of its own to mention the range where noise sideband of external signals can be analyzed. Typical specifications adapted to a Spectrum Analyzer are shown below.
The one specifies the Noise Sideband being −70dB below the signal peak, 20kHz away from the carrier, with 1kHz IF Bandwidth. Generally used is an expression of the energy existing in a 1Hz bandwidth. [Fig. b]
If the former is expressed in this way of the latter, the signal in 1Hz bandwidth is about 10 log 1Hz/1kHz that is about −30dB more lower, bearing in mind −70dB at 1kHz bandwidth. So, the former can be replaced to read −100dB/Hz, 20kHz away from the carrier with 1kHz Bandwidth.

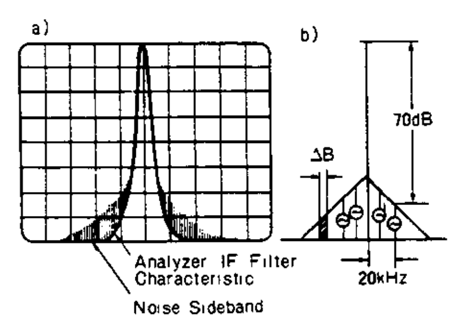


Fig. A-19 Noise Sideband Reference Diagram

Bandwidth Selectivity
The characteristic of Band Pass Filter is not of a normal rectangle but is given with an attenuation characteristic similar to that in a gauss distribution. Consequently, in the case there are two signals mixed in neighbor, the smaller signal is hidden in the skirt of the larger one as shown in Fig. (a) below. It is therefore necessary to specify the bandwidth at an appropriate area (60dB), and the ratio of the bandwidths at 3dB and 60dB points in expressed as Bandwidth Selectivity.

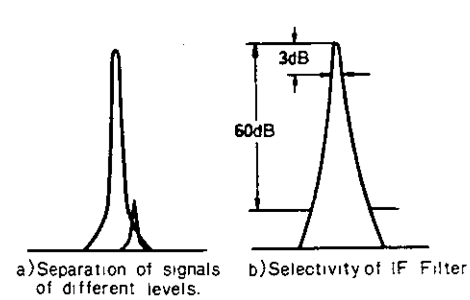


Fig. A-20 B.W.Selectivity Reference Diagram

Bandwidth Accuracy
It is the accuracy of bandwidth for IF Filter and is expressed with the deviation to the nominal value at the point 3dB below the peak. This ability is not necessarily considered in level measurements for normal continued signals but in level measurements for noise signals.

Bandwidth Switching Accuracy
Appropriate number if IF Filter is prepared and used by switching in analyzing a signal into spectrum so as to obtain best resolution for the scan width. The IF Filter retains inherent loss individually, and switching to the other causes an error corresponding to respective loss even in the case of measuring the same signal. This is defined as Bandwidth Switching Accuracy.

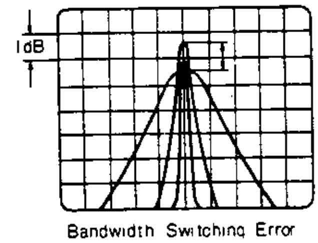


Fig. A-21 B.W. Switching Accuracy Reference Diagram

Reference Level Display Accuracy
Absolute level of the input signal is read with a Spectrum Analyzer display in reference to the horizontal top line of the graticule. The level set to the horizontal top line is called the reference level. The reference level can be selected in accordance with the settings of IF GAIN and Input Attenuator in the display of dBm or dBμ. The absolute accuracy of the display is the reference level accuracy.

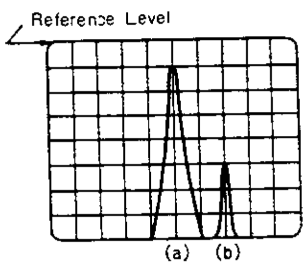


Fig. A-22 REFERENCE LEVEL Reference Diagram

V.S.W.R. (Voltage Standing Wave Ratio)
It is a constant to represent impedance matching condition and is expressed by a ratio of the maximum and minimum values among the standing waves which are composed by travelling waves and reflected waves at the condition the Spectrum Analyzer is acting as a load to an ideal nominal impedance source. This is another expression of reflection coefficient and reflection loss, which relation is described below.
In the case the signal Eo supplied from the transmitter

side is completely transmitted to the receiver (a Spectrum Analyzer) without any impedance loss, the signal E_I received must be identical to E_O. If the signal is not perfectly transmitted due to mismatching, etc. but there are reflected wave received again at the level E_R, the reflection coefficient is expressed as follows:
Reflection coefficient $m = E_R/E_O$
The ratio of reflected wave E_R to travelling wave E_O is reflection loss which is $20 \log E_R/E_O$ [dB]
V.S.W.R. $= (E_O + E_R) / (E_O - E_R)$.
The relationship with reflection coefficient is:
V.W.W.R. $= (1 + |m|) / (1 - |m|)$
V.S.W.R. is in a range from 1 to indefinite, and the matching is better as V.S.W.R. is close to 1.

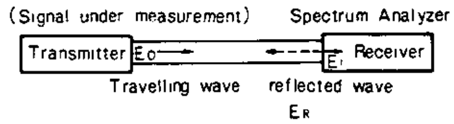


Fig. A-23 V.S.W.R. Reference Diagram

Spurious Response

It is the harmonic distortion generated in the input mixer circuit as the input level goes up, as shown in the figure below. The level range available in nondistortion depends on fundamental input level and an example shown in the figure is –70dB for the input level of –30dBm. In practice, the input attenuator is effectively used to decrease the signal level to get it appropriate.

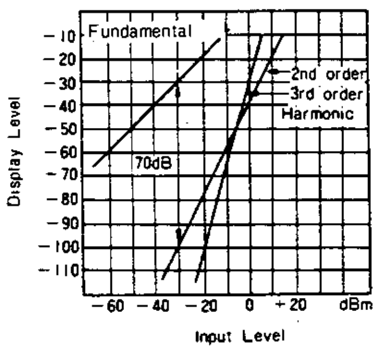


Fig. A-24 Spurious Response Reference Diagram

YIG-tuned Oscillator

YIG-turned Oscillator was reported by Griffiths in 1946 for the first time. Ferite in Garnet representing YIG (Yttrium Iron Garnet) single crystal has an extremely sharp electro-spin resonance in frequency has a linear proportional relationship with the impressed DC magnetic field over a wide frequency range. It enables wideband electronic tuning by varying excitation current of the magnet which causes a DC magnetic field.

ADVANTEST uses YIG Oscillator for the local oscillators of its Spectrum Analyzers and **TR5200** series Automatic Microwave Frequency Counters.

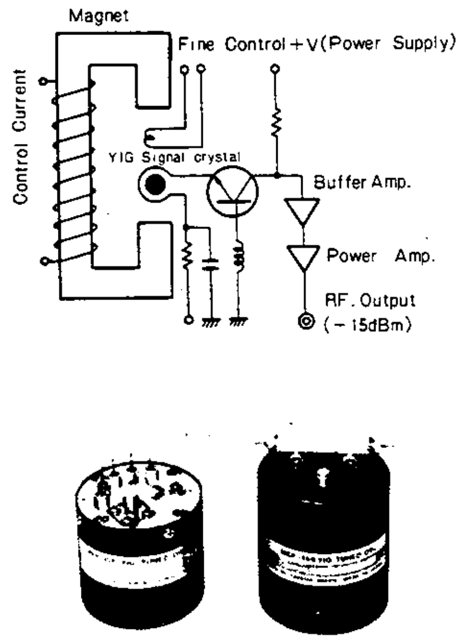


Fig. A-25 YIG-tuned OSC. Block Diagram & External View

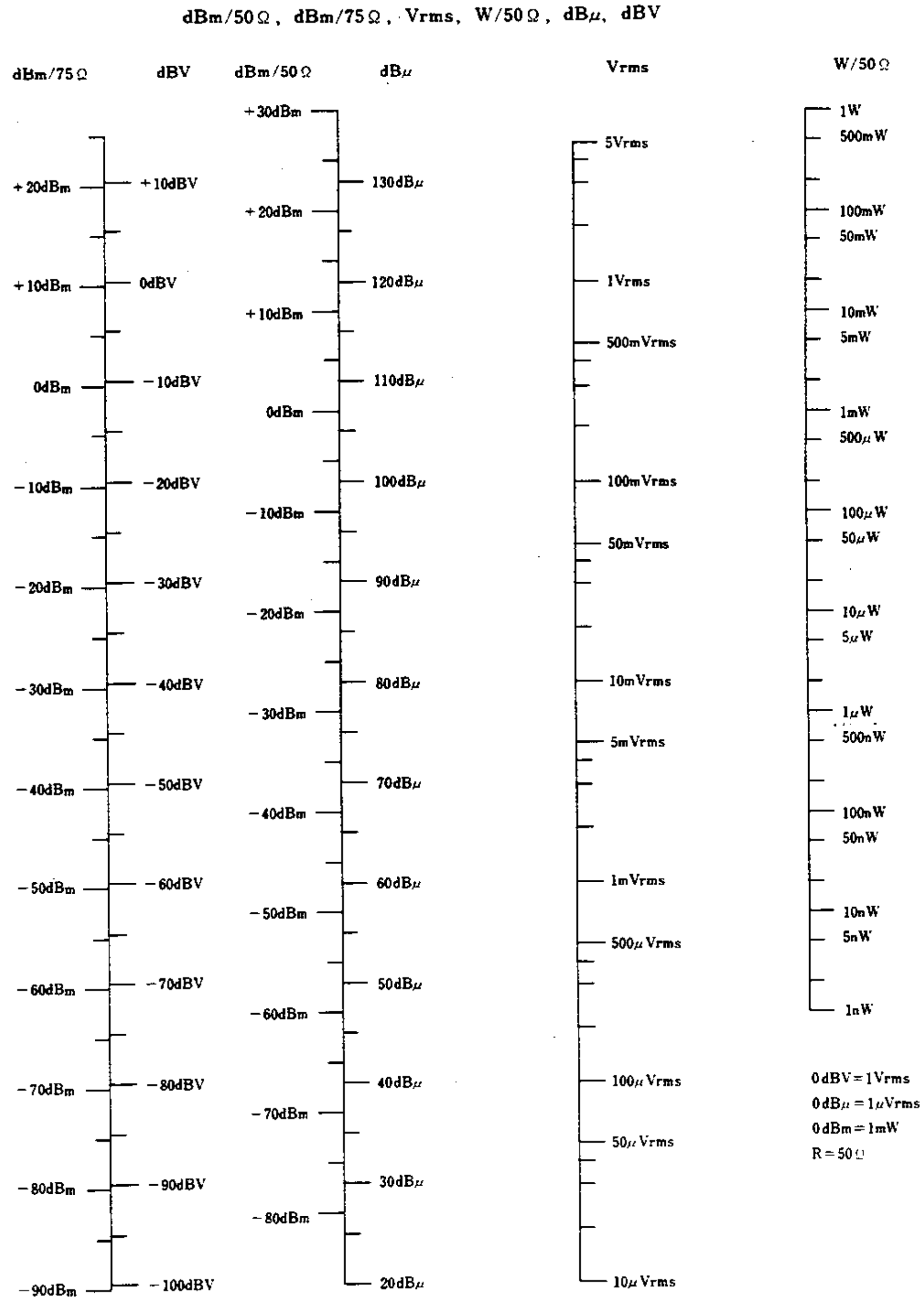


Fig. A-26 Level Conversion Table

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   (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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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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