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HITACHI

MODELS VC-6025/6045
DIGITAL STORAGE OSCILLOSCOPES

SERVICE MANUAL

Hitachi Denshi,Ltd.

MODELS VC-6025/6045

DIGITAL STORAGE OSCILLOSCOPES

SERVICE MANUAL

Hitachi Denshi, Ltd.

WARNING

The service manual is prepared for qualified service personnel only. Do not perform any servicing if you are not qualified service personnel to avoid possible personnel injury, electrical shock, exposure to X-radiation, fire and other hazard.

Take X-radiation protective measures for personnel during servicing to reduce the risk of possible exposure to X-radiation.

Replace with a CRT and other critical components of the same type number and the same rating for continued safety.

SERVICING PRECAUTIONS

Read all instructions in the service manual and safety markings on the product thoroughly before servicing.

Disconnect power cord from power source before opening the enclosure.

NOTICE

This Service Manual describes the most typical product of this model. If there are any specific differences between this Manual and the servicing unit, please contact Hitachi Denshi sales office in your area.

"WARNING - THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO."

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1. SPECIFICATIONS

The following specifications are applicable to the VC-6025, and VC-6045 oscilloscopes unless otherwise noted.

o CRT

Graticule:	6-inch, with internal graticule 0%, 10%, 90% and 100% markers 8 x 10 DIV (1 DIV = 1cm)
Phosphor:	P31
Accelerating potential:	17 kV approx. (12 kV approx. for the VC-6025)
External intensity modulation:	Coupling: DC coupling Voltage: 5 V or more Maximum input voltage: 30 V (DC+AC peak) or 30 Vp-p AC at 1 kHz or less Bandwidth: DC to 5 MHz

o VERTICAL DEFLECTION SYSTEM

Sensitivity:	2 mV/DIV to 5 V/DIV ±3% (switchable in 11 steps) Continuously variable
Bandwidth:	DC to 100 MHz -3dB (DC to 50 Hz -3dB for the VC-6025) 2 mV/DIV : DC to 20 MHz -3dB (DC to 10 MHz -3 dB for the VC-6025) AC low pass : 10 Hz -3 dB
Rise time:	3.5 ns approx. 2 mV/DIV : 17.5 ns approx. (35 ns approx. for the VC-6025)
Delay time:	Leading edge can be monitored

Maximum input voltage:	400 V (DC+AC peak) at 1 kHz or less
Input coupling:	AC, DC, GND
Input impedance:	1 MΩ ±1.5%, 23 pF ±3 pF
Display modes:	CH1, CH2, DUAL, CHOP (250 kHz approx.), ADD (DIFF mode can be established when the CH2 is in the INVERT mode.)
Bandwidth limiting function:	20 MHz (10 kHz for the VC-6025)
Polarity selection	+, - (CH2 only)
Common-mode rejection ratio:	20 dB minimum at 20 MHz
X-Y operation:	REAL TIME mode: X-axis, Y-axis selectable STORAGE mode: X-axis = CH1, Y-axis = CH2
Sensitivity:	X axis: CH1, CH2 2 mV to 5 V/DIV ±5% EXT 0.1 V/DIV ±5% EXT÷10 1 V/DIV ±5% Y axis: 2 mV to 5 V/DIV ±3%
Phase error:	3° or less from DC to 50 kHz
X bandwidth:	DC to 500 kHz (-3 dB)

o HORIZONTAL DEFLECTION SYSTEM

Sweep time	
* REAL TIME mode	
A(main) sweep:	50 ns/DIV to 0.5 s/DIV Continuously variable (UNCAL)
B(delay) sweep	50 ns/DIV to 50 ms/DIV
* STORAGE mode	
A(main) sweep:	50 ns/DIV to 50 s/DIV 50 ns/DIV to 2 µs/DIV available

only for a repetitive waveform
0.2 s/DIV to 50 s/DIV only for ROLL mode

B(delay) sweep: 2.5 µs/DIV to 50 ms/DIV
(5 µs/DIV to 50 ms/DIV for the VC-6025)

Accuracy: X1: ±3%, X10 MAG: ±4%
Holdoff time: Variable
Delay time: 1 µs to 5s
Delay jitter: 1/20,000 or less
Sweep magnification: X10
Maximum sweep rate: 5 ns/DIV
Alternate separation: Variable (REAL TIME only)
Trigger lock function: Provided
Auto range function: Provided

o TRIGGERING

Trigger mode: Trigger, auto trigger
Trigger source: CH1, CH2, EXT (AC,DC,DC÷10), LINE
TV trigger: Exclusive sync separator circuit provided
Sensitivity: SYNC signal
INT: 1 DIV or more
EXT: 200 mVp-p or more

Trigger sensitivity:

NORM mode:

Frequency	DC to 20 MHz	20 to 100 MHz (20 to 50 MHz for the VC-6025)
INT	0.35 DIV	1.5 DIV
EXT	50 mV	150 mV

AUTO mode:

Frequency	30 to 100 Hz	100 Hz to 20 MHz	20 to 100 MHz (20 to 50 MHz for the VC-6025)
INT	1.5 DIV	1 DIV	1.5 DIV
EXT	150 mV	100 mV	150 mV

Trigger level variable range:

AUTO: Automatically corresponds to the trigger signal

NORM:

INT: ±4 DIV or more

EXT: ±0.4 V or more

EXT÷10: ±4 V or more

Slope: +, -

External input: Impedance: 1 MΩ ±5%, 25pF ±6 pF

Voltage: 400 V (DC+AC peak) at 1 kHz

o READOUT FUNCTION

Panel setting display:

Vertical axis: V/DIV, UNCAL, probe conversion

Sweep speed: S/DIV, UNCAL, MAG (converted value)

Other: Delay time, X-Y, TRIGGER, No. of averaging

o CURSOR READOUT

Function:

Voltage difference ΔV : Δ-REF

Time difference ΔT : Δ-REF

Frequency 1/ΔT : Δ-REF

o EXTERNAL OUTPUT

Trigger signal out:	Output voltage : 25 mV/DIV approx. (Full scale on the CRT) 50-ohm termintation
	Frequency response: DC to 10 MHz (-3 dB)
	Output impedance : 50 ohms approx.

o CALIBRATOR

Waveform:	1 kHz ±20%, square wave
Voltage:	0.5 V ±1%

DIGITAL STORAGE FUNCTIONS

o WAVEFORM DATA STORAGE

Memory capacity

Display memory:	1000 words x 4	
Save memory:	1000 words x 2	
Acquisition memory:	Single trace	2.5 µs/DIV to 50 s/DIV --- 4000 words (5 µs/DIV to 50 s/DIV --- 2000 words for the VC-6025) 50 ns/DIV to 2 µs/DIV --- 1000 words
	Dual trace	2.5 µs/DIV to 50 s/DIV --- 2000 words/CH 5 µs/DIV to 50 s/DIV --- 2000 words/CH for the VC-6025

50 ns/DIV to 2 µs/DIV
--- 1000 words/CH

Vertical resolution: 8 bits/10 DIV

Horizontal resolution: 100 data/DIV

Maximum sampling rate:

VC-6045: 40 Msps, one-channel sampling
40 Msps, two-channel alternate sampling

VC-6025: 20 Msps, two-channel alternate sampling
Sampling rate depends on the time range.

Maximum storage frequency:
A single-shot signal
(Maximum amplitude error
30% or less): 5 MHz
A repetitive signal:
VC-6045: 100 MHz (20 MHz at 2 mV/DIV)
VC-6025: 50 MHz (10 MHz at 2 mV/DIV)

o DATA ACQUISITION

NORM storage mode: Updates a picture on the CRT at each triggering.

AVG mode: Averages input signals by the selected number of sweeps and displays the result after the averaging has reached the selected number.
(Number of average: 4 or 16)

ROLL mode: Shifts data from right to left continuously on the CRT. (The updating point is the right end.)

HOLD mode: Holds the waveform displayed on the CRT.

SINGLE sweep: Performs an operation of the NORM storage, or AVG mode once at each pressing the SINGLE RESET switch in the HOLD mode, and updates a picture.

o DATA SAVE: Up to two waveforms can be saved. Two stored waveforms forms can be displayed with the two sampling waveforms.

o PRETRIGGER: Variable (in 0.1 DIV steps)

o PLOTTER OUTPUT: Hard copy is available by the HP-GL through RS-232C.
6 colors are switchable.

o EXT INPUT: Provided with the RS-232C interface as standard.

o MAGNIFYING DISPLAY: A storage waveform can be magnified up to 10 times in the horizontal direction.

o MEMORY BACK-UP: Only a save memory can be backed up for approx. 48 hours.

o POWER SUPPLY

Voltage:	90 V to 250 V AC
Frequency:	48 to 440 Hz
Power consumption:	50 W approx.

o ENVIRONMENT

Operating temperature:	0 to 40 ^{o}C
Operating humidity:	45 to 85%
Specification guaranteed temperature:	10 to 35^{o}C
Safe storage temperature:	-20 to +70^{o}C
Safe storage humidity:	35 to 85% (70% or less in the ambient temperature of 50^{o}C)

o DIMENSIONS AND WEIGHT

Dimensions:	275(W) x 130(H) x 360(D) mm approx. (10.8(W) x 5.1(H) x 14.2(D) in. approx.)
Weight:	7 kg approx. (15.4 lb. approx.)

2. ACCESSORIES

The VC-6025/VC-6045 Digital Storage Oscilloscopes are shipped with the following standard accessories:

2 Probes (AT-10AP1.5)
1 AC Power Cord
1 Operation Manual
1 Fuse (2A)

3. PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of the oscilloscope. The severity of environment to which this instrument is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Disassembly

Remove the top cover and the bottom cover of the instrument. Most of the internal parts of the instrument are now accessible. If access to the front of the circuit boards are necessary, remove the knobs from the external control shafts on the board.

Cleaning

The instrument should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause component breakdown.

The covers provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush.

Dirt that remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used. Cleaning the interior should only be occasionally necessary. The best way to clean the interior is to blow off the dust with a dray, low-velocity stream of air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate components.

Visual Inspection

The instrument should be inspected occasionally for such defects as broken connections, improperly seated transistors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparent; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, correcting the cause of the overheating is important to prevent recurrence of the damage.

4. CALIBRATION

Hitachi Denshi provides complete instrument repair and calibration. Contact your local Hitachi Denshi office or representative.

4.1 Calibration interval

To maintain instrument accuracy, perform the calibration of the VC-6025/6045 at least every 1000 hours of operation or every six months if used infrequently.

4.2 Test equipment required

The test equipment and accessories listed in Table 4-1 or equivalent are required to perform the calibration of the VC-6025/6045. The minimum specifications required for accurate calibration are also listed. All the test equipment is assumed to be correctly calibrated and operate properly within the listed specifications. It is recommended to use the test equipment which exceeds the listed specifications. Operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment for more information.

4.3 Preliminary procedure

This instrument should be calibrated at an ambient temperature of +20°C (±5°C) for the best overall accuracy.

(1) Connect the instrument to AC line voltage, 50 Hz to 400 Hz line source.
(2) Set the instrument controls as given in the Preliminary Control Settings. Allow at least fifteen minutes of warmup before proceeding.
(3) See the Adjustment Locations in Section 6.

Table 4-1

TEST EQUIPMENT AND ACCESSORIES REQUIRED

	Description	Specifications	Applications	Examples of Applicable Test Equipment
1	Constant Amplitude Signal Generator	Reference frequency: 50 kHz, Maximum frequency: 150 MHz, Amplitude: variable	Check horizontal, vertical and trigger bandwidths.	TEKTRONIX R SG503
2	Standard amplitude Calibrator	Amplitude accuracy: 0.25%, Variable amplitude: 5 mV to 40 V, Frequency: 1 kHz square wave	Check horizontal and vertical gains.	TEKTRONIX PG506
3	Square-wave Generator	Variable frequency: 10 Hz to 1 MHz, Output amplitude: 10 mV to 100 V	Check probe and vertical compensation.	TEKTRONIX PG506
4	Digital Multimeter	Accuracy: 0.1%	Check power supply.	TEKTRONIX DM501A
5	Digital Frequency Counter	Accuracy: 0.1%	Check CAL frequency.	
6	Time Mark Generator	Accuracy: 0.1%	Check sweep time.	TEKTRONIX TG501
7	Cable	Impedance: 50 ohms, Type: RG-58/U, Length: 42 inches, Connectors: BNC	This cable is used for almost all adjustment.	Hitachi Part No. 4202
8	Termination	Impedance: 50 ohms, Connectors: BNC Feed through	Check vertical amplifier compensation.	
9	Attenuator	Ratio: 10X, Connectors: BNC, Impedance: 50 ohms	Check vertical amplifier bandwidth.	
10	T-Connector	Connectors: BNC	Check X-Y operation.	Hitachi Part No.1301

4.4 Preliminary control settings

Set the instrument controls as follows, when starting the calibration procedures.

Controls		Setting
POWER		OFF
FOCUS		Midrange
TRACE ROTATION		Any position
INTEN		CCW
READOUT INTEN		CCW
V. POSITION	CH1 CH2	Midrange Midrange
V. VAR	CH1 CH2	CW (CAL) CW (CAL)

Controls		Setting
AC-DC	CH1 CH2	Any position Any position
GND	CH1 CH2	GND GND
SELECTOR		Any position
VARIABLES		Any position
TIME/DIV		Any position
H MODE		A
V MODE		CH1

Note:

CW: Clockwise
CCW: Counterclockwise
H MODE: Horizontal mode
V MODE: Vertical mode

After completion of the above settings, turn the POWER control to ON, and set the INTEN and READOUT INTEN controls to any position.

4.5 Initial starting procedure

(1) Turn instrument POWER on.
(2) Allow a few seconds for the cathode ray tube (CRT) to warm up. A trace will appear on the display of the CRT.
(3) If trace does not appear, increase the intensity by the INTEN control clockwise rotation until the trace is easily observed.
(4) Adjust FOCUS control for optimum focus.
(5) Adjust POSITION controls to center the trace if necessary.

POWER SUPPLY

(1) +12 V ADJ RV1506 (PEF-784)

Measure the voltage on pin 3 of connector P1501 on the PEF-784 board with a digital voltmeter, and adjust RV1506 so that the voltage is +11.975 to +12.025 V.

(2) CRT BIAS RV1042 (PEF-784)

a. Set:

MODE:	CH1
SOURCE OR X :	CH2
GND (CH1, CH2):	ON (Push-in)
H MODE:	X-Y (Simultaneously push ALT and B.)
SELECTOR:	H POS
EXT INPUT (for X signal):	No signal

b. Position a spot at the center on the CRT screen by the CH1 POSITION (vertical position and the VARIABLES controls.)

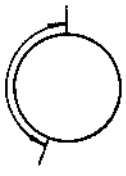
Note: When the SELECTOR selects H POS, the VARIABLES control is used as a horizontal position control.

c. Adjust the INTEN control so that the voltage on Z OUT CHECK on the PEF-784 board is +15 V.

d. Adjust CRT BIAS control RV1042 just before the spot starts to appear on the screen.

e. Adjust the INTEN control and verify that the spot starts to appear within the range (as illustrated below.)

INTEN



③ TRACE ROTATION RV1606 (Front Panel)

a. Set:

TIME/DIV:	A: 1 ms
H MODE:	A
V MODE:	CH1

b. Adjust the horizontal position until the left end of the trace is lined up with the center of the leftmost vertical graticule line on the screen.

c. Adjust the TRACE ROTATION control on the front panel so that the trace is parallel with the horizontal graticule line.

d. Repeat b and c alternately until the trace is aligned with the center horizontal graticule line.

④ ASTIG RV1281 (PEF-784)
FOCUS RV1607 (Front Panel)

a. Set:

CH1 GND:	ON (Push-in)
CH2 GND:	ON (Push-in)
H MODE:	X-Y (Simultaneously push ALT and B.)
SOURCE OR X:	CH1
BW LIMIT:	ON

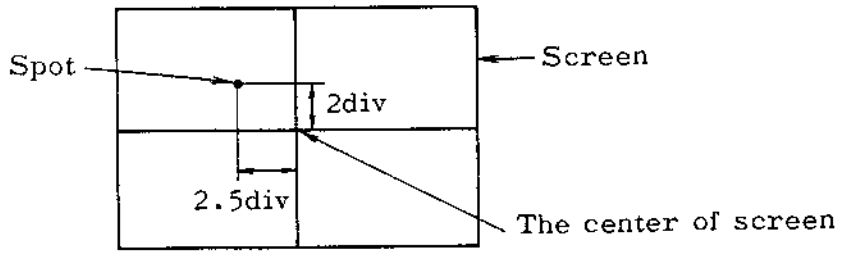
b. Locate a spot as illustrated in the following figure.

c. Adjust INTEN control RV1601 (Front Panel) just before halation starts to occur.

d. Rotate FOCUS control RV1607 (Front Panel) fully clockwise.

e. Adjust ASTIG control RV1281 (PEF-783) so that the spot is a circule as true as possible.

f. Adjust FOCUS control RV1607 (Front Panel) to obtain the smallest spot.



(5) FOCUS CENT RV1253 (PEF-784)

a. Perform adjustment (4) .

b. Set the FOCUS control to the mechanical mid-position.

c. Adjust FOCUS CENT control RV1253 (PEF-784) to obtain the samllest spot.

HORIZONTAL

Press AUTO of the TIME/DIV switch while holding the SELECTOR downward (▼) so that the sweep circuit operation is initialized. Then, proceed the following adjustment. (The adjustment in the X-Y mode is simultaneously performed.)

(6) H GAIN RV834 (PEF-782)

a. Set:

CH2 AC/DC:	AC
CH2 VOLTS/DIV:	10 mV (CAL)
H MODE:	X-Y
V MODE:	CH1
SOURCE OR X:	CH2
CH1 GND:	GND (Push-in)

b. Connect a 50 mV square wave to the CH2 INPUT connector.

c. Adjust H GAIN control RV834 (PEF-782) so that the distance between the spots on the CRT is 5 div.

(7) 1 ms/div ADJ RV801 (PEF-782)

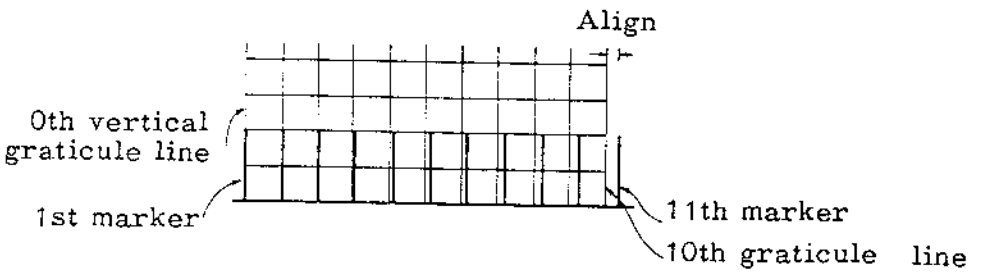
a. Set:

V MODE: CH1
CH1 AC/DC: DC
H MODE: A
A TIME/DIV: A = 1 ms
CH1 input: 1 ms time mark signal from a time mark generator
INTEN: As required
READOUT INTEN: As required
x10 MAG: OFF

b. Align the 1st time marker with the zeroth (leftmost) vertical graticule line.

Note: This adjustment is performed by moving the horizontal position by the VARIABLES control with H POS selected by the SELECTOR.

c. Adjust 1 ms/div ADJ control RV801 (PEF-782) so that the 11th time marker is aligned with the 10th (rightmost) vertical graticule line.



(8) x10 MAG GAIN RV844 (PEF-782)

a. Set:

V MODE: CH1
CH1 AC/DC: DC
H MODE: A
CH1 input: 1 ms from the time mark generator
INTEN: As required
REDOUT INTEN: As required
x10 MAG: ON
A TIME/DIV: A * 0.1 ms (since the x10 MAG control is ON)

b. Align the 1st time marker with the zeroth (leftmost) vertical graticule line.

c. Adjust MAG GAIN control RV844 (PEF-782) so that the 11th time marker is aligned with the 10th (rightmost) vertical graticule line.

(9) MAG CENT RV831 (PEF-782)

a. Set:

Same as adjustment (8) - a.

b. Adjust the horizontal position, and align the rising portion of the 2nd time marker with the center vertical graticule line (6th line from the left).

c. Adjust MAG CENT control RV831 (PEF-782) so that the above 2nd time marker is not displaced from the center vertical graticule line when the X10 MAG switch is set to off.

(10) H POS START RV807 (PEF-782)

a. Set the POWER switch to OFF first, and then turn it back to ON. At this time, leave the controls on the front panel as they are.

b. Adjust H POS START RV807 (PEF-782) so that the start point of the sweep is aligned with the leftmost graticule line.

(11) 5 ns CV859 (PEF-784)

a. Set: A TIME/DIV: A = 50 ns

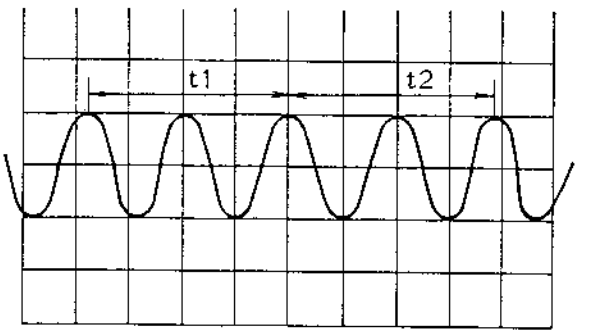
CH1 input: 10 ns (Fed from the time mark generator) (When the rate is 10 ns or more, a sinewave is supplied.)

H POS: Adjust so that the numbers of the peaks on either side of the center vertical graticule line are equal

x10 MAG: ON

b. Adjust the H POS control so that the numbers of the peaks on either side of the center vertical graticule line are equal with the peak of the center wave aligned with the center vertical graticule line.

c. Adjust 5 ns CV859 (PEF-784) so that the time (t_1 and t_2) from the center vertical graticule line to the 2nd peaks on either side of the center line is equal.



VERTICAL

(12) CH1 DC BAL RV37 (PEF-781)

a. Set:

V MODE:	CH1
CH1 GND:	ON (Push-in)
CH1 VOLTS/DIV:	2 mV
A TIME/DIV:	A = 1 ms
CH1 V POSITION:	Mid-position

b. Adjust CH1 DC BAL control RV37 (PEF-781) so that the displacement of the trace is within ±0.1 div when the CH1 VOLTS/DIV switch is switched between 2 mV and 10 mV.

(13) CH2 DC BAL RV137 (PEF-781)

a. Set:

V MODE:	CH2
CH2 GND:	ON (Push-in)

CH2 VOLTS/DIV: 2 mV
A TIME/DIV: A = 1 ms
CH2 V POSITION: Mid-position

b. Adjust CH2 DC BAL control RV137 (PEF-781) so that the displacement of the trace is within ±0.1 div when the CH2 VOLTS/DIV switch is switched between 2 mV and 10 mV.

(14) CH2 POS CENT RV162 (PEF-781)

a. Set:

V MODE: DUAL
V POSITION: Mid-position
(CH1, CH2)
GND (CH1, CH2): ON (Push-in)
A TIME/DIV: A = 0.1 ms

b. Adjust CH2 POS CENT control RV162 (PEF-781) so that the trace does not move when CH2 INV control S1611 (PEF-783) is turned on and off.

(15) CH1 POS CENT RV62 (PEF-781)

a. Set:

V MODE: DUAL
CH2 V POSITION: As set in (14) - a.
CH2 GND: ON (Push-in)

b. Adjust CH1 POS CENT control RV62 (PEF-781) so that the trace is aligned with the CH2 trace (See item (13)).

(16) CHR Y CENT RV574 (PEF-785)

a. Set:

Turn the POWER switch to OFF first, and then back to ON to initialize the microcomputer.
CHR INTEN: As appropriate
V MODE: CH1
CH1 VOLTS/DIV: 10 mV
(H MODE: A)

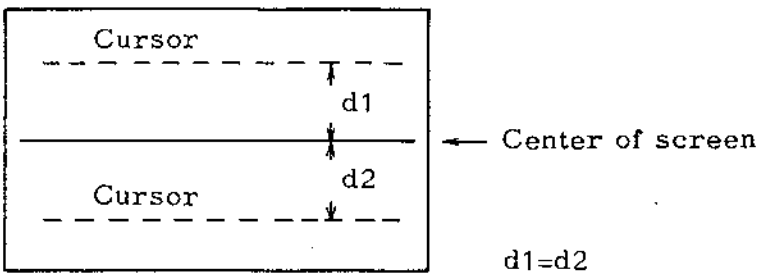
SELECTOR: ΔV of MEASURE

When power is turned on, H POS is automatically set. Consequently, when the SELECTOR switch is lowered one step further, MEASURE is selected (the LED lights) and $_{\Delta}V$ is displayed on the screen. (If the SELECTOR switch is lowered one more step, $_{\Delta}T$ is displayed on the screen with the MEASURE LED lit. If the switch is lowered one more step, $1/_{\Delta}T$ is displayed on the screen.)

VARIABLES: Do not touch to avoid a possible movement of the cursors.

b. Verify that the "ΔV=60.00 mV" is displayed at the top left of the screen.

c. Adjust CHR Y CENT RV574 (PEF-785) so that the cursors are at the same distance from the center of the screen.

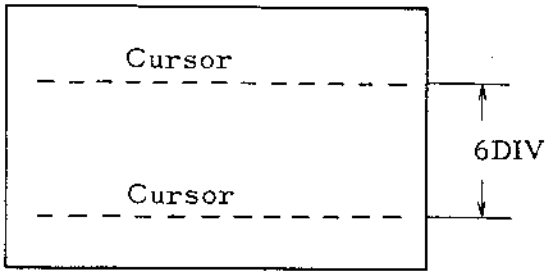


(17) CHR Y GAIN RV576 (PEF-785)

a. Set:

Same as (16) (1).

b. Adjust CHR Y GAIN RV576 (PEF-785) so that the distance between the two cursors is 6 div.



(18) CHR Y CENT RV574 (PEF-785)

Since the CHR Y GAIN adjustment is related to the CHR Y CENT adjustment, adjust the CHR Y CENT adjustment described in (16) again.

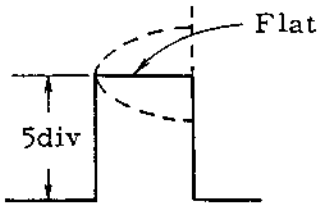
(19) CH1 DC GAIN RV30 (PEF-781)

a. Set:

VERT MODE: CH1
CH1 VOLTS/DIV: 10m V/DIV
TIME/DIV: A = 1 ms
CH1 AC-DC: DC
CH1 input: 1 kHz, 50 mVp-p square wave (from the Tektronix's pulse generator PG-506 or equivalent)
Set the PG-506 in the FAST RISE mode and connect the output (1 kHz square wave) in the 50-ohm termination.
(In the FAST RISE mode, a waveform with a flat top is ensured.)

b. Adjust the pulse generator so that the amplitude of the square wave is appprox. 5 div at the center on the screen. (50-ohm terminated)

c. Adjust CH1 DC GAIN control RV30 (PEF-781) so that the square wave is flat at top.



(20) CH2 DC GAIN RV130 (PEF-781)

a. Set:

VERT MODE: CH2
CH2 VOLTS/DIV: 10mV/DIV

A TIME/DIV: A = 2 ms

CH2 AC/DC: DC

CH2 input: Same as CH1 input (19) or equivalent

b. Adjust the pulse generator so that the amplitude of the square wave is approx. 5 div on the screen.

c. Adjust CH2 DC GAIN control RV130 (PEF-781) so that the square wave is flat at top.

(21) V GAIN RV505 (PEF-785).... Total gain control common to CH1 and CH2

a. Set:

MODE: CH1

SOURCE OR X: CH2

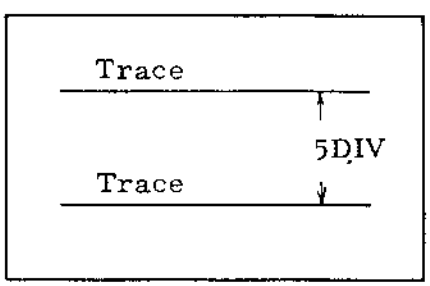
TRIG MODE: AUTO (Free-running scan)
Normally free-running scan is performed in the AUTO mode unless the trigger level is at the fringe of triggering. If the free-running scan is not performed, adjust the TRIG LEVEL control.

CH1 VOLTS/DIV: 10 mV

A TIME/DIV: A = 0.1ms

CH1 input: 1 kHz, 50 mVp-p square wave for calibration (from PG-506 on equivalent) (50-ohm termination open)

b. Adjust V GAIN control RV502 (PEF-785) so that the amplitude of the square wave is 5 div at the center on the screen.

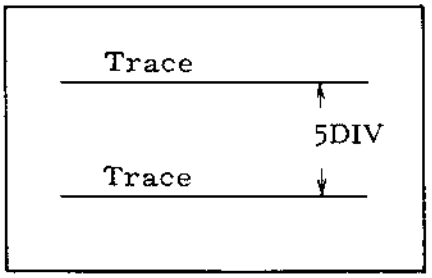


(22) CH2 GAIN control RV133 (PEF-781)

a. Set:

MODE:	CH2
SOURCE OR X:	CH1
TRIG MODE:	AUTO (Free-running trace)
CH2 VOLTS/DIV:	10 mV
A TIME/DIV:	A = 0.1ms
CH2 input:	Same as CH1 input (21)

b. Adjust CH2 GAIN control RV133 (PEF-781) so that the amplitude of the square wave is 5 div at the center on the screen.

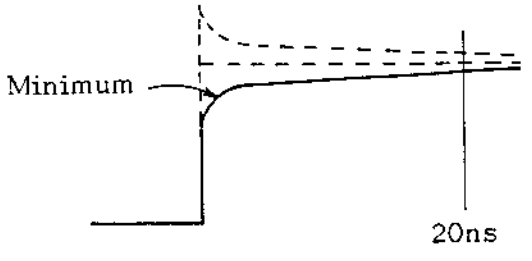


(23) CH1 HF COMP CV517, CV556, CV515 (PEF-785)

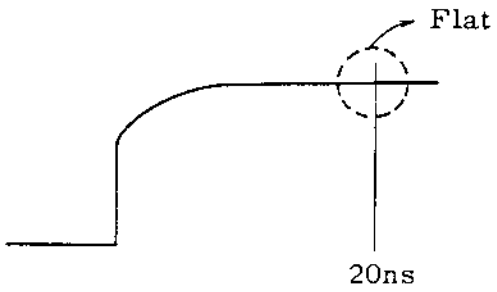
a. Set:

V MODE:	CH1
CH1 AC/DC:	DC
CH1 VOLTS/DIV:	10 mV/DIV
CH1 input:	Tektronix's pulse generator PG506 or equivalent when the PG506 is in the FAST RISE mode, a square wave (Tr≦1 ns) is obtained. Connect this signal to CH1 in 50-ohm termination.

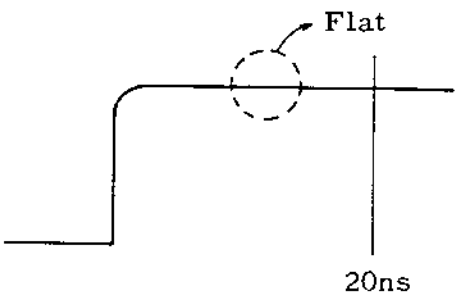
b. Adjust CV517 so that the amplitude around the rising edge is minimum.



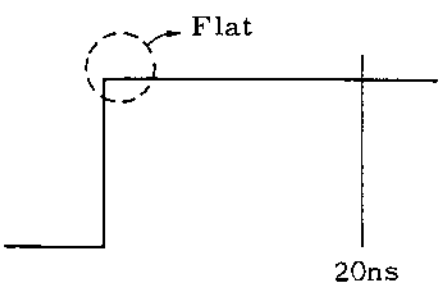
c. Adjust CV515 so that the portion near 20 ns is flat.



d. Adjust CV556 so that the midway point between the rising edge and 20 ns is flat.



e. Adjust CV517 so that the portion near the rising edge is flat.

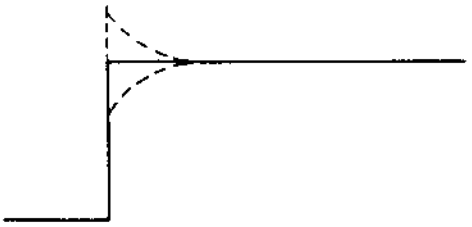


(24) CH2 HF COMP CV160 (PEF-781)

a. Set:

V MODE: CH2
CH2 AC/DC SW: DC
CH2 VOLTS/DIV: 10 mV
CH2 input: Same as CH1 input (23)

b. Adjust CV160 (PEF-781) so that the rising portion is flat.



(25) CH1 ATT CV4, CV5, CV14, CV15 (PEF-781)

(1) Attenuation characteristics

Connect the output of the PG-506 directly to CH1.

a. Set:

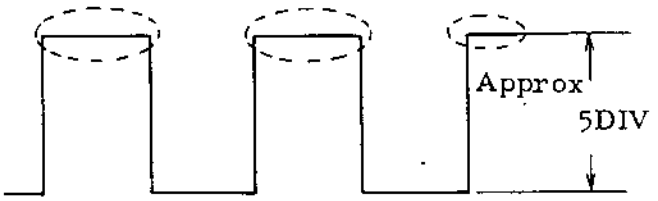
V MODE: CH1

CH1 input: Place the PG-506in the HIGH AMPLITUDE range and connect the output (10 kHz square wave) to CH1.

b. Set CH1 VOLTS/DIV to 0.1 V. (CH1 ATTN is set to ÷10.)

c. Adjust the output amplitude control of the PG-506 so that the amplitude of the waveform is approx. 5 DIV.

d. Adjust CV5 (PEF-781) so that the top of the waveform is as flat as possible.



e. Set CH1 VOLTS/DIV to 1 V. (CH1 ATTN is set to ÷100.)

f. Adjust the output amplitude control of the PG-506 so that the amplitude of the waveform is approx. 5 DIV.

g. Adjust CV15 (PEF-781) so that the top of the waveform is as flat as possible.

(2) Input capacitance

Connect the output of the PG-506 to CH1 by a 10:1 probe.

a. Set:

V MODE: CH1

CH1 input: Place the PG-506 in the HIGH AMPLITUDE range and connect the output (10 kHz square wave) to CH1 by the 10:1 probe.

b. Same as b of (1).

c. Same as c of (1).

d. Adjust CV4 (PEF-781) so that the top of the waveform is as flat as possible.

e. Same as e of (1).

f. Adjust the output amplitude adjustment of the PG-506 so that the amplitude of the waveform is 1 to 2 DIV on the screen.

g. Adjust CV14 (PEF-781) so that the top of the waveform is as flat as possible.

(26) CH2 ATT CV104, CV105, CV114, CV115 (PEF-781)

Same as (25) except that the V MODE input and the VOLTS/DIV settings are changed to CH2.

CV104 corresponds to CV4 of (25).

CV105 corresponds to CV5 of (25).

CV114 corresponds to CV14 of (25).

CV115 corresponds to CV15 of (25).

(27) TRIG SIG OUT DC LEVEL RV320 (PEF-781)

a. Set:

SOURCE OR X: CH1

CH1 GND: ON (Push in)

b. Connect the digital voltmeter or the oscilloscope to TRIG SIGNAL OUT J301.

c. Adjust RV320 (PEF-781) so that the output voltage is zero volts.

The following procedures ((28), (29) and (30)) are needed for the adjustment of the frequency response of the amplifier in the TRIG system.

(28) INT HF COMP CV305 (PEF-781)

a. Set:

H MODE: X-Y

SOURCE OR X: CH1 (The signal connected to CH1 enters the X-AMP.)

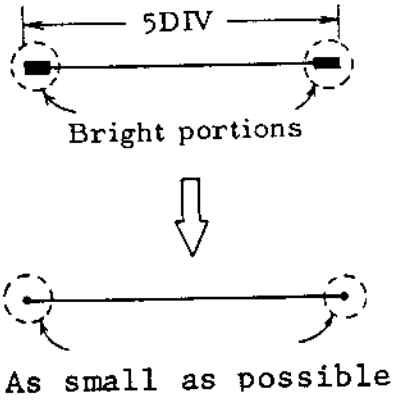
V MODE: CH2 (To prevent beam from deflecting in the vertical direction, the no-signal CH2, not CH1 with the signal connected, is selected.)

CH1 VOLTS/DIV: 10 mV

CH1 input: When the PG-506 is in the FAST RISE mode, a 10 kHz square wave (Tr≦1 ns) is obtained. Connect this signal to CH1 in 50-ohm termination.

b. Adjust the output control of the PG-506 so that the trace of approx. 5 DIV is displayed in the horizontal direction of the screen.

c. Adjust INT HF COMP CV305 (PEF-781) so that both ends of the trace is as small as possible.



(29) EXT 1/1 HF COMP CV306 (PEF-781)

a. Set:

SOURCE OR X: EXT DC

EXT INPUT input: Same as CH1 input of (28)

b. Same as b of (28)

c. Adjust EXT 1/1 HF COMP CV306 (PEF-781) so that both ends of the trace are as small as possible.

(30) EXT 1/10 HF COMP CV307 (PEF-781)

a. Set:

SOURCE OR X: EXT DC ÷ 10

Other settings are the same as (29).

b. Adjust the output control of the PG-506 so that the trace of approx. 1 DIV is displayed in the horizontal direction on the screen.

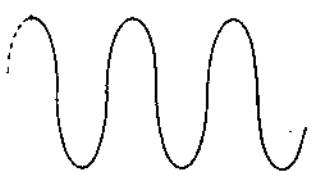
c. Adjust EXT 1/10 HF COMP CV307 (PEF-781) so that both ends of the trace are as small as possible.

(31) TRIG ⊕ PEAK RV685 (PEF-782)

a. Set:

SOURCE OR X:	CH1
V MODE:	CH1
TRIG MODE:	A = 20 μs
CH1 VOLTS/DIV:	10 mV or 20 mV
SLOPE:	⊕
TRIG LEVEL:	CW
CH1 input:	Square wave of approx. 50 kHz (4 DIV amplitude on screen)

b. The trigger point is changed as shown in dotted lines by the TRIG + PEAK control. Adjust TRIG + PEAK RV685 (PEF-782) so that the trace is triggered at as high a point as possible.



(32) TRIG ⊖ PEAK RV675 (PEF-782)

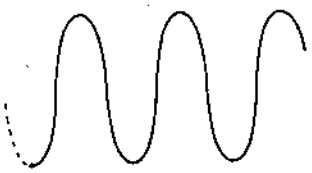
a. Set:

SLOPE: ⊖

TRIG LEVEL: CCW

Other settings are the same as (31).

b. Adjust TRIG - PEAK RV675 (PEF-782) so that the trace is triggered at as low a point as possible.



External output

(33) PROBE ADJ RV1303 (PEF-785)

Measure the PROBE COMP output at J502 by the digital voltmeter, and adjust PROBE ADJ RV1303 (PEF-785) for 0.250 V.

CHR X

(34) CHR X CENT RV876 (PEF-782)

a. Set:

Turn the POWER switch to off first, and then back to on to initialize the microcomputer.

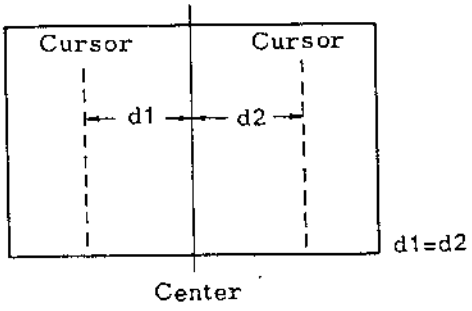
READOUT INTEN: As appropriate

SELECTOR: ΔT of MEASURE (Refer to SELECTOR of (16) a.)

VARIABLES: Do not move.

b. Verify that "8.00 ms" is displayed on the top left of the screen.

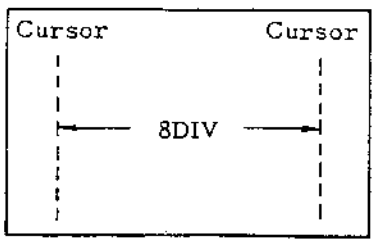
c. Adjust CHR X CENT RV876 (PEF-782) so that the distances between the center of the screen and the cursors are equal.



(35) CHR X GAIN RV884 (PEF-782)

a. Set: Same as (34) (1).

b. Adjust CHR X GAIN RV884 (PEF-782) so that the distance between cursors is 8 DIV.



NOTE:

When the power switch of this instrument is turned on, the time base calibration and the diagnosis of the sweep circuit operation are performed by the built-in micro-computer.

If the result is normal, "CALIBRATION-COMPLETED" is displayed on the CRT 20 seconds after the power has been turned on, and the instrument is placed in the standard state.

If the result is not normal, "CALIBRATION-FAILED AT SWEEP CKT (or CYCLE CKT)" is displayed. When the power switch is turned on after storage in a low temperature, allow several minutes until circuits become stable. Then turn off the power switch and turn on the switch again.

If "CALIBRATION-COMPLETED" is displayed, the operation is normal. If "CALIBRATION-FAILED AT SWEEP CKT" is displayed again, check the sweep circuit (PEF-782 or PEF-837.)

STORAGE

(36) V CENT (STORAGE Y CENT) RV5501 (PEF-880)

a. Set:

STORAGE: ON (LED blinks and the storage mode is established.)

MEASURE: ΔV cursor

b. Adjust RV5501 so that the two cursors are positioned symmetrically with respect to the horizontal center line on the CRT.

(37) V GAIN (STORAGE Y GAIN) RV5502 (PEF-800)

a. Set: Same as (36)

b. Adjust RV5502 so that the distance between the two cursors is 6 divisions.

c. Perform the adjustment mentioned under (36) again.

(38) H CENT (STORAGE X CENT) RV5503 (PEF-880)

a. Set:

STORAGE: ON (LED blinks and the storage mode is selected.)

MEASURE: ΔT cursor

b. Adjust RV5503 so that the two cursors are positioned symmetrically with respect to the vertical center line on the CRT.

(39) H GAIN (STORAGE X GAIN) RV5504 (PEF-800)

a. Set: Same as (38)

b. Adjust RV5504 so that the distance between the cursors is 8 divisions.

c. Perfrom the adjustment mentioned under (38) again.

(40) S/H ADJ (S/H BALANCE) RV8060 (PEF-880)

a. Set:

STORAGE:	OFF (LED goes off and the RTO mode is established.)
Input coupling:	GND (The GND switch is pushed in.)
V MODE:	CH1
CH1 V POSITION:	Align the trace with the center graticule on the CRT. (Fix this control.)
STORAGE:	ON (LED blinks and the storage mode is established.)

b. Measure the voltage difference between DC LEVEL 1 and DC LEVEL 2 on the PEF-883 through the two guide holes (DC LEVEL 1 and DC LEVEL 2 are silk-screened) on the PEF-880, using the digital voltmeter.

c. Adjust RV8060 so that the above voltage difference is less than 10 mV.

(41) EQS CENT (Equivalent sample start poiknt) RV5301 (PEF-880)

a. Set:

STORAGE:	ON (LED blinks and the storage mode is established.)
A TIME/DIV:	A = 50 ns
V MODE:	CH1
Input coupling:	GND (The GND switch is pushed in.)
TRIGGER MODE:	AUTO

b. Measure the voltage waveform on R5313 by the oscilloscope, and adjust RV5301 so that the sweep start voltage becomes 0.1 V.

(42) Not silk-screened (equivalent sample gain) RV5302 (PEF-880)

a. Set:

Input coupling: Dc (The AC/DC switch is pused in.)
Other settins are the same with (41) .

b. Connect the 50 ns marker to CH1 INPUT and trigger the signal by adjusting the TRIGGER LEVEL.
(The markers stop.)

c. Adjust RV5302 so that the distance between the first and last markers is 9 divisions.

(43) AD1 GAIN (CH1 A/D GAIN) RV5201 (PEF-800)

a. Set:

SOURCE OR X:	CH1 (The trigger source is CH1.)
V MODE:	CH1
CH1 VOLTS/DIV:	10 mV
A TIME/DIV:	A = 1ms
Input signal:	Calibration square wave (1 kHz, 50 mV)
SMOOTH:	OFF (Display "SMOOTH" by the MENU switch and "SMOOTH OFF" by the VARIABLES contrtol.)

b. Establish the RTO mode, and verify that the amplitude is 5 divisions in the RTO mode.

c. Establish the STORAGE mode, and adjust RV5201 so that the amplitude is 5 divisions on the CRT.

(44) AD1 NORM OFFSET (CH1 A/D OFFSET) RV5202 (PEWF-880)

a. Set:

TRIGGER MODE: AUTO

Other settings are the same with (43) .

b. Establish the RTO mode, and set the input coupling mode to GND.

c. Position the trace at the center of the CRT by CH1 V POSITION.

d. Establish the STORAGE mode and adjust RV5202 so that the trace is positioned at the center of the CRT.

e. Establish the RTO mode again, and verify that the trace is positioned at the center of the CRT.

(45) AD2 GAIN (CH1 A/D GAIN) RV5251 (PEF-880)

a. Set:

SOURCE OR X:	CH2 (The trigger source is CH2.)
V MODE:	DUAL
CH1 input coupling:	GND (The GND switch is pushed in.)
CH2 VOLTS/DIV:	10 mV
A TIME/DIV:	A = 1 ms
CH2 INPUT:	Calibration square wave (1 kHz, 50 mV)
SMOOTH:	OFF (Display "SMOOTH" by the MENU switch and "SMOOTH OFF" by the VARIABLES control.)

b. Establish the RTO mode, and verify that the amplitude is 5 divisions on the CRT.

c. Establish the STORAGE mode, and adjust RV5251 so that the amplitude is 5 divisions on the CRT.

(46) AD2 OFFSET (CH2 A/D OFFSET) RV5252 (PEF-880)

a. Set: Same as (44)

b. Establish the RTO mode, and set the CH2 input coupling mode to GNd.

c. Establish the STORAGE mode, and adjust RV5252 so that the trace is positioned at the center of the CRT.

d. Establish the RTO mode again, and verify that the trace is positioned at the center of the CRT.

(47) AD1 EQ OFFSET (equivalent sample OFFSET) RV5203 (PEF-880)

a. Set: Set to the state that the adjustment of 46 has finished.

b. Set the A TIME/DIV to 2 µs/DIV.

c. Adjust RV5203 so that the trace is positioned at the center of the CRT.

(48) Check of the frequency characteristics in the equivalent sampling mode (no controls)

(1) Overshoot

a. Set:

V MODE:	CH1
CH1 VOLTS/DIV:	10 mV
CH1 input coupling:	DC (The AC/DC switch is pushed in.)
A TIME/DIV:	A = 0.1 μs
SOURCE OR X:	CH1
TRIGGER SLOPE:	⊖
CH1 INPUT:	Connect the 1 MHz square wave (Tr≤1 ns) from the Tektronix PG-506 or equivalent to the instrument and adjust the PULSE AMPLITUDE control on the PG-506 so that the amplitude is 5 divisions on the CRT.
STORAGE:	ON (LED blinks, and the storage mode is established.)
x10 MAG:	ON

b. Adjust the TRIGGER LEVEL control so that the square wave is displayed on the CRT.

c. Verify that the overshoot is within ±4% (±0.2 divisions).

(2) Rise time

a. Set:

CH1 VOLTS/DIV:	10 mV
A TIME/DIV:	A = 2ns
CH1 INPUT:	Connect the 50 kHz sine wave from Tektronix SG-503 or equivalent to the instrument, and adjust the OUTPUT AMPLITUDE on the SG-503 so that the amplitude is 6 divisions on the CRT.

b. Set the A TIME/DIV switch to 50 ns/DIV.

c. VC-6025: Set the output frequency of the SG-503 to 50 MHz, and verify that the amplitude is more than 4.2 divisions.

VC-6045: Set the output frequency of the SG-503 to 100 MHz, and verify that the amplitude is more than 4.2 divisions.

5. DETAILED CIRCUIT DESCRIPTION

5.1 VERTICAL CIRCUIT (◇1, ◇2, ◇3 1/2, ◇7 1/3, ◇9 1/5, ◇15 1/2)

The detailed block diagram of this circuit is shown in Fig.5-1. The circuit description is made, based on the block diagram and the schematic diagrams ◇1, ◇2 and ◇3. This circuit consists of the CH1 vertical circuit and the CH2 vertical circuit. These circuit configurations are almost identical.

COUPLING

The CH1 SIG fed to J1 is routed to the CH1 INPUT COUPLING circuit, and the input-coupling modes are selected by switches S1 and S11 to AC, GND, or DC.

1st ATTENUATOR

The CH1 SIG is then fed to the CH1 1ST ATTN (attenuator), and its signal level is attenuated to 1/1, 1/10 or 1/100.

INPUT AMP

The attenuated CH1 SIG is fed to the CH1 INPUT AMP, and its impedance is converted (high input impedance and low output impedance).

The AC component of the CH1 SIG flows from C20 to TR25 to TR40 to TR41 to TR42, while the DC component flows from R21 to IC26 to TR28 to TR40 to TR41 to TR42.

IC26 is a DC amplifier. TR28 is a common-base transistor, and separates the AC component from the DC component to prevent them from being loaded to each other. Further, TR28 makes the load impedance of TR25 (FET) high and makes the gain of the FET 1.

When an input is zero volts, an output should also be zero volts. However, even if an input is zero volts, some offset voltage appears at the output of an actual DC amplifier.

CH1 DC BAL RV37 compensates for an offset voltage of IC26. CH1 DC GAIN RV30 changes the amount of the DC feedback, controls the DC gain, and matches the DC gain to the AC gain.
Diodes D23, D25, and D26 protect the INPUT AMP against an excessive input voltage.
The voltage gain of the INPUT AMP is 2.5 times, but it is switched to 6.25 times by switch S2-3 at the 2 mV/div range.

2nd ATTENUATOR

The output of the CH1 INPUT AMP is fed to the CH1 2ND ATTN, its signal level is attenuated to 1/1, 1/2, 1/4 or 1/10 by the setting position of the VOLTS/DIV switch. The output impedance is always 150 Ω.

PANEL STATUS

The PANEL STATUS (1) converts the settings of the VOLTS/DIV switch S2-1, the 1st ATTN switch S2-2 and the 2nd ATTN switch S2-4/S2-3 into the voltage values, and provides the MPU for the real time oscilloscope (RTO) with the setting of each switch via [2].
The relationship between the overall gain from J1 to CH1 2ND ATTN and the setting position of the VOLTS/DIV switch is shown in Table 5-1.

Table 5-1

VOLTS/ DIV	1ST ATTN	INPUT AMP Gain	2ND ATTN	Overall Gain	VOLTS/DIV x Overall Gain
2 mV	1	6.25(x2.5)	1	6.25	12.5 mV/div
5 mV	1	2.5	1	2.5	12.5 mV/div
10 mV	1	2.5	0.5(÷2)	1.25	12.5 mV/div
20 mV	1	2.5	0.25(÷4)	0.625	12.5 mV/div
50 mV	1	2.5	0.1(÷10)	0.25	12.5 mV/div
0.1 V	0.1(÷10)	2.5	0.5(÷2)	0.125	12.5 mV/div
0.2 V	0.1(÷10)	2.5	0.25(÷4)	0.0625	12.5 mV/div
0.5 V	0.1(÷10)	2.5	0.1(÷10)	0.025	12.5 mV/div
1 V	0.01(÷100)	2.5	0.5(÷2)	0.0125	12.5 mV/div
2 V	0.01(÷100)	2.5	0.25(÷4)	0.00625	12.5 mV/div
5 V	0.01(÷100)	2.5	0.1(÷10)	0.0025	12.5 mV/div

At the CAL position of the CH1 VAR control, R52 is shorted. At the fully CCW position, the output of the CH1 INPUT AMP becomes less than 1/2.5 times the output at the CAL mode.
The information on the CAL or UNCAL status is also sent to the MPU for RTO. (For details, refer to Figs. 5-14 and 5-15.)

V PREAMP

The CH1 SIG from the CH1 2ND ATTN is fed to the CH1 V.PREAMP, where the signal is converted from the single-ended signal to the paraphase signal, and then fed to the DIODE GATE 1 at the next stage.

The DC voltage at the TR58 base is changed by CH1 POS RV1604 in the circuit ◇9◇, and the vertical position of the CH1 SIG is changed.

TRIGGER PICKOFF

A part of the CH1 SIG from the CH1 2ND ATTENUATOR is fed to the TRIGGER PICKOFF(1), and becomes the CH1 TRIG SIG. The time constant of the output impedance of the TRIGGER PICKOFF(1) is equal to that of the feedback impedance of the TRIGGER AMP in the next stage (Fig. 5-3). Therefore, the impedance ratio of the two circuits is always constant independent of frequency.

DIODE GATE

The DIODE GATE 1 is controlled by the $\overline{\text{CH1 DSP}}$ signal from [7]. When the $\overline{\text{CH1 DSP}}$ signal is L, the CH1 SIG passes the DIODE GATE 1, and it is supplied to the DELAY LINE DRIVER at the next stage.

TR401 is a drive circuit of the DIODE GATE 1, and detects the operating state of CH1 (whether the CH1 SIG is in the state to be displayed or not).

TR407 is a stabilization circuit to prevent a shift of the DC level caused by the control switch.

In other words, TR407 changes the current flowing in TR407 according to the operating states of CH1 and CH2 to maintain the DC voltages at points ⓐ and ⓑ constant.

The CH2 SIG is fed to the DIODE GATE 2 via TR SW(1) or TR SW(2). The polarities of the input and output of TR SW(2) are opposite to those of TR SW(1).

When CH2 INVERT switch S1611 of ◇9◇ is switched to the INV side, the $\overline{\text{CH2 INV}}$ signal is pulled down by the resistor in invertor IC172, and turned to low. Then, each base of TR175 and TR176 goes high, and TR SW(2) (TR175 and TR176) turns to on. On the other hand, the TR SW(1) turns to off because the bases of TR171 and TR172 are low. Thus, the CH2 signalis fed to the DIODE GATE 2 via TR SW(2), and the display polarity is inverted.

DELAY LINE DRIVER

The signal is then supplied to the DELAY LINE DRIVER. Because this driver circuit is a common-emitter voltage feedback circuit, the impedance of the input and the output is low.

Flow of V SIG in RTO and DSO modes

The DELAY LINE output signal is routed to the RTO/DSO (digital storage oscilloscope) switch of ◇12◇ via [64] and [65] . When RTO is selected, the DELAY LINE output is sent back to [67] and [68] , and amplified by the V.AMP(1) consisting of TR501 and TR502. GAIN RV505 adjusts the V. OUTPUT AMP so that its output is displayed corresponding to the deflection factor set by the VOLTS/DIV switch.

When DSO is selected, the DELAY LINE output is fed to the sample-and-hold circuit, the A/D circuit and the D/A circuit. Then the signal is routed to the V.AMP (2) as the waveform signal (Y component) or character signal (Y component) for DSO from [11] (◇9◇) via the DIFF AMP.

The DIFF AMP(◇3◇) is a circuit for converting the single-ended signal into the paraphase signal. Because the V.AMP(2) is a parallel feedback amplifier, the input impedance is small.

CHR-Y(CHST-Y) and A/B SEP BIAS signals

(1) RTO mode

When the horizontal display mode is other than the ALT sweep, approximately +1 volt is supplied. In the ALT sweep mode, the +1 volt (for A sweep) and the voltage (for B sweep) obtained by adding a certain voltage to the +1 volt are supplied alternately. The A/B SEP operations are displayed simultaneously for CH1 and CH2.

At the timing to display characters on the CRT, the CHR Y signal (voltage in the Y direction for each dot consisting characters or cursors) is supplied.

(2) DSO mode

The voltage in the Y direction (CHST-Y) for each dot of waveforms or characters (including cursors) in the DSO mode.

BWL (Band Width Limiter)

As the BWL circuit is provided between the V.AMP(2) and the V.OUTPUT AMP, more than 10 MHz for the VC-6025 and more than 20 MHz for the VC-6045 are attenuated under some conditions.

In the RTO mode, whether the signal is routed to the BWL circuit or not is determined by switch S1612.

The switch is marked "BW LIMIT 10 MHz" for the VC-6025 and "BW LIMIT 20 MHz" for the VC-6045. When this switch is pressed in the RTO mode, the BWL(1) for display and the BWL(2) for trigger become on simultaneously.

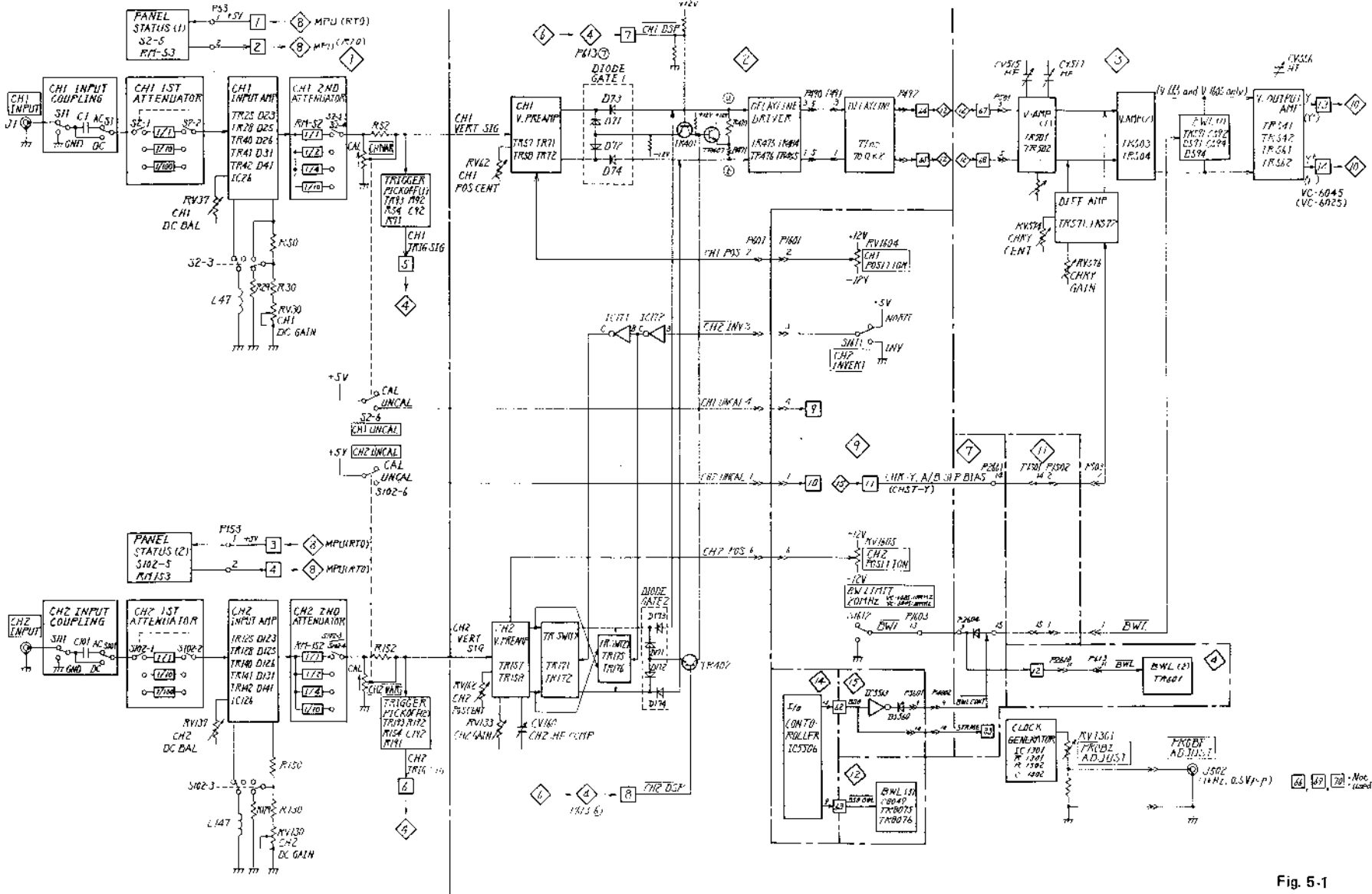
In the DSO mode, the DSO signal on pin 13 of IC5506 of 14 goes high, and the BWL(1) for display becomes on automatically. When the BWL(2) for trigger becomes on or not is determined by switch S1612. In the DSO mode, the output DSO BWL on pin 9 of IC5506 of 14 goes low only at 2 mV/DIV, and the BWL(3) of the sample-and-hold circuit becomes on.

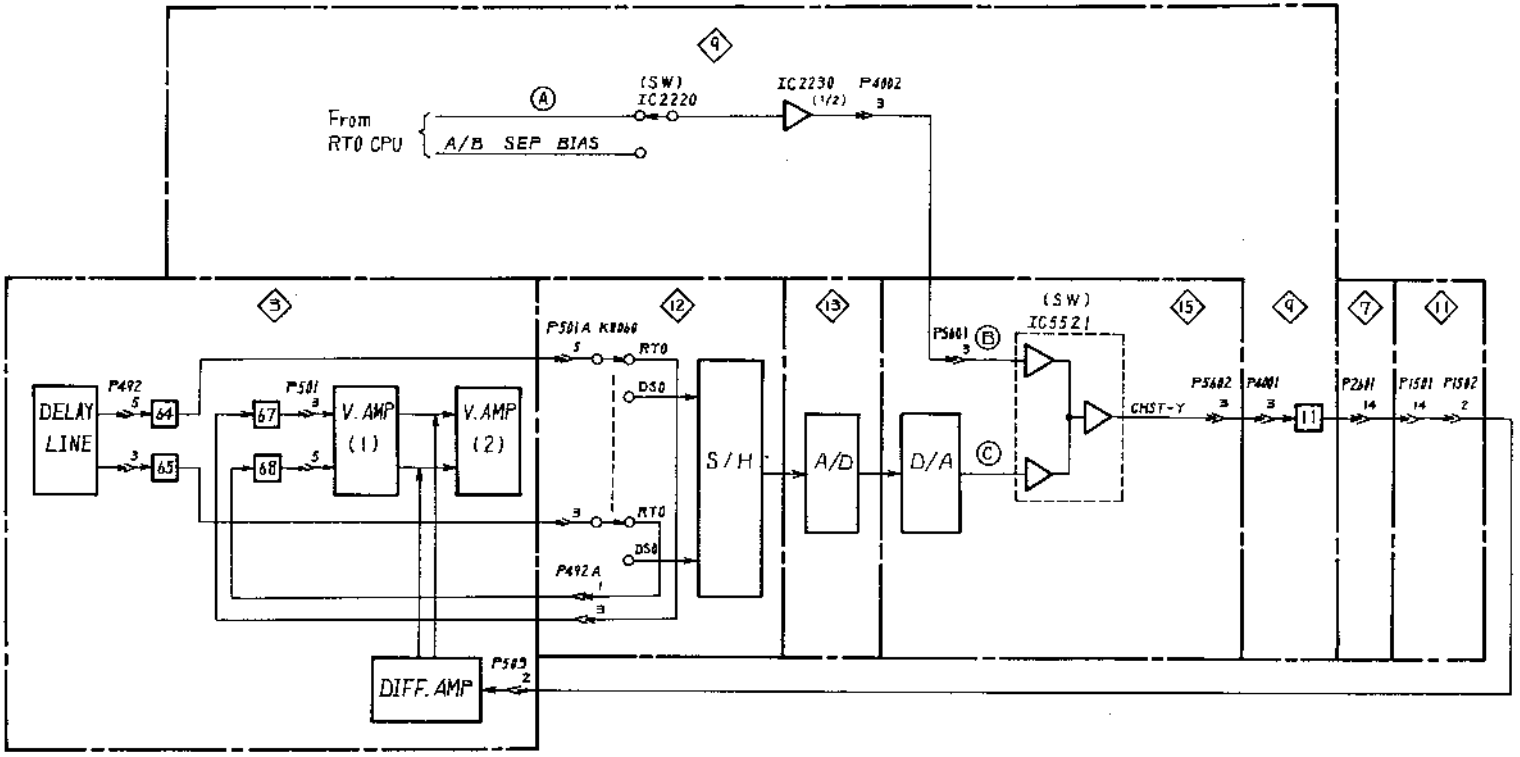
The BWL(3) attenuates more than 10 MHz for the VC-6025 and more than 20 MHz for the VC-6045.

The signal from the V.AMP (2) is fed to the cascode-V.OUTPUT AMP, and amplified up to the voltage required for the vertical deflection.

5.2 CALIBRATOR (◇3◇ 2/2)

For this circuit, refer to Fig.5-1.
IC1301 is a clock generator, and its oscillation frequency is determined by R1301, R1302, and C1302. The 2 kHz frequency oscillated by R1301, R1302 and C1302 is counted down to 2:1 by IC1301, and a symmetrical 1 kHz square waveform is fed out from pin 4 of IC1301. The output level of IC1301 is adjusted by RV1303 so that the output from PROBE ADJUST J502 becomes 0.5 Vp-p.


CH1 INPUT COUPLING
CH1 1ST ATTENUATOR
CH1 INPUT AMP
CH1 2ND ATTENUATOR
CH1 V. PREAMP
DELAY LINE DRIVER
V. AMP (1)
V. AMP (2)
V. OUTPUT AMP
CH1 VERT SIG
CH1 DC BAL
CH1 DC GAIN
CH1 POS CENT
CH1 POSITION
CH1 INVERT
CH1 GAIN
CH1 TRIG SIG
CH1 DSP
CH1 UNCAL
CH1 POS
CH1 INV
CH1 INVERT
CH1 GAIN
CH1 POSITION
CH1 DC BAL
CH1 DC GAIN
CH1 POS CENT
CH1 GAIN
CH1 POSITION
CH2 INPUT COUPLING
CH2 1ST ATTENUATOR
CH2 INPUT AMP
CH2 2ND ATTENUATOR
CH2 V. PREAMP
TR SW (1)
TR SW (2)
CH2 VERT SIG
CH2 DC BAL
CH2 DC GAIN
CH2 POS CENT
CH2 GAIN
CH2 HF COMP
CH2 DSP
CH2 UNCAL
CH2 POS
CH2 INV
CH2 INVERT
CH2 GAIN
CH2 POSITION
CH2 DC BAL
CH2 DC GAIN
PANEL STATUS (1) S2-5 RM-53
PANEL STATUS (2) S102-5 RM153
MPU (RT0)
MPU (AT0)
DIODE GATE 1
DIODE GATE 2
TRIGGER PICKOFF (1)
TRIGGER PICKOFF (2)
CH1-Y, A/B SW P BIAS (CH1ST-Y)
CH2-Y, A/B SW P BIAS (CH2ST-Y)
CONTROLLER IC5506
CLOCK GENERATOR
PROBE ADJUST
J502 (1kHz, 0.5V(p-p))
BWL (1)
BWL (2)
BWL CONT
STROBE
(V LEG and V HOG only)
VC-6045 (VC-6025)
Fig. 5-1



Ⓐ Y component of characters (including cursors) in RT0 mode

Ⓑ Y component of characters (including cursors) in RT0 mode or A/B SEP BIAS

Ⓒ Y component of waveform or characters (including cursors) in RT0 mode

Fig. 5-2

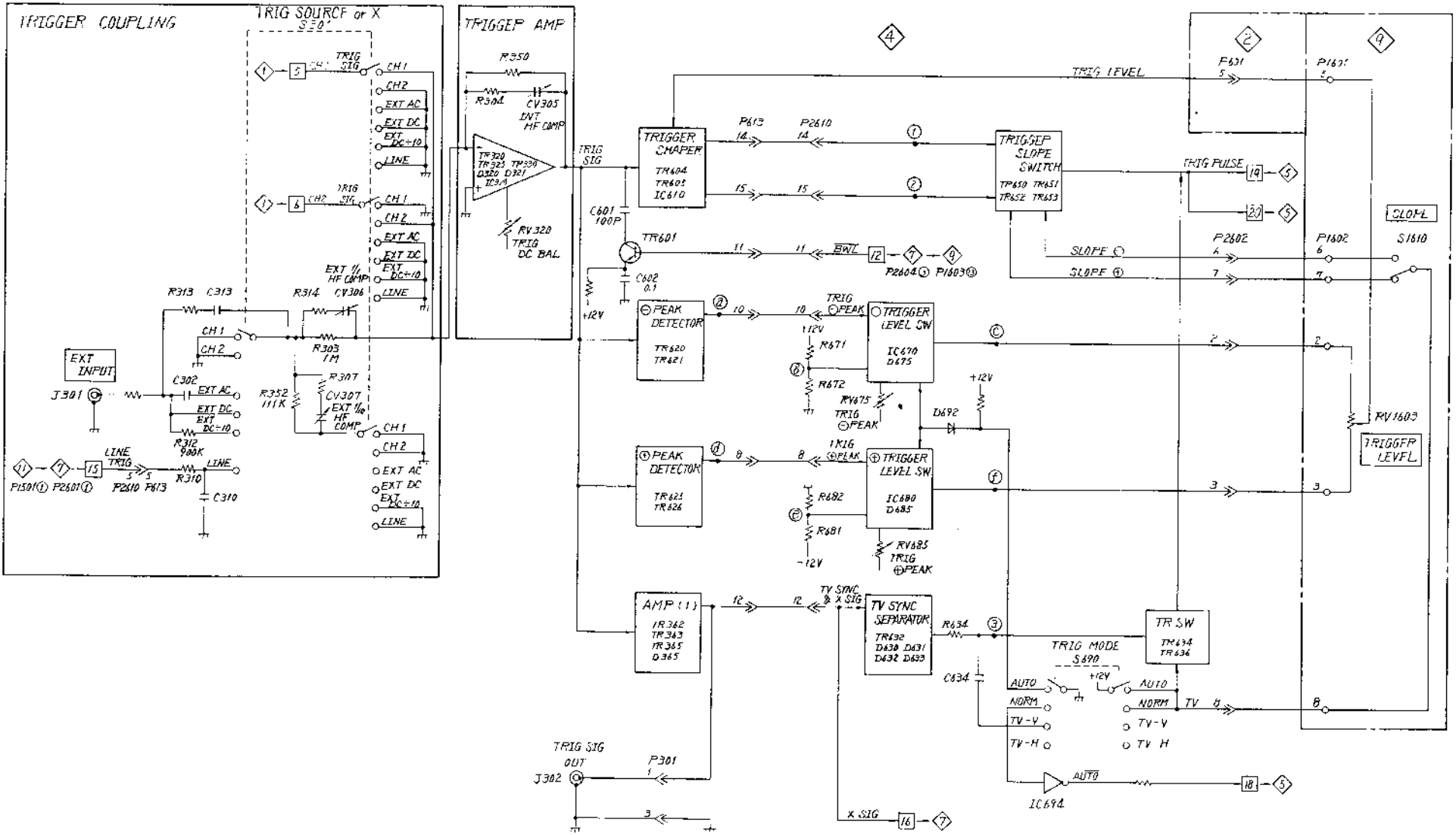

TRIGGER COUPLING
TRIG SOURCE or X
S601
TRIGGER AMP
R350
R304
CV305
INT HF COMP
TR320 TR325 TR330
D320 D321
IC301
RV320
TRIG DC BAL
TRIG SIG
CH1
CH2
EXT AC
EXT DC
EXT DC÷10
LINE
EXT // HF COMP
R313 C313
R314 CV306
R303 1M
EXT INPUT
J301
C302
R312 900K
R352 111K
R307
CV307
EXT // HF COMP
R310
C310
LINE TRIG
P1501 P2601
P2610 P613
TRIG SIG
C601 100P
TR601
C602 0.1
+12V
TRIGGER SHAPER
TR604 TR605
IC610
P613 P2610
TRIGGER SLOPE SWITCH
TP650 TR651
TP652 TR653
TRIG LEVEL
TRIG PULSE
SLOPE
P2602 P1602
S1610
EWL
P2604 P1603
PEAK DETECTOR
TR620 TR621
TRIGGER LEVEL SW
IC670 D675
R671
R672
RV675
TRIG ⊖PEAK
D672
RV1603
TRIGGER LEVEL
PEAK DETECTOR
TR625 TR626
1K16
TRIGGER LEVEL SW
IC680 D685
R682
R681
-12V
RV685
TRIG ⊕PEAK
AMP (1)
IR362 TR363
TR365 D365
TV SYNC & X SIG
TV SYNC SEPARATOR
TR632 D630 D631
D632 D633
R634
C634
TR SW
TR634 TR636
TRIG MODE
S690
AUTO
NORM
TV-V
TV-H
TV
TRIG SIG OUT
J302
P301
X SIG
AUTO
IC694

Fig. 5-3

5.3 TRIGGER CIRCUIT (◇4◇ , ◇9◇ 2/5)

The detailed block diagram of this circuit is shown in Fig. 5-3.

TRIGGER SOURCE

The trigger-coupling modes selected by TRIG OR X SOURCE are CH1, CH2, AC, DC, DC÷10, or LINE. The TRIG SIG is supplied from [5] in the CH1 mode, from [6] in the CH2 mode, from [15] in the LINE mode, and from EXT INPUT J301 in the other modes.

TRIGGER AMP

The TRIG SIG from the TRIGGER COUPLING is fed to the TRIG AMP and is amplified to the fixed signal level. The polarities at the input and output of TRIGGER AMP are opposite. The AC component of the TRIG SIG flows from TR320 to TR325 to TR330, while the DC component flows from R320 to IC320 to TR325 to TR330. TRIG DC BAL RV320 adjusts the offset voltage of IC320, and the feedback impedance of the TRIGGER AMP consists of R350, R304, and CV305. For the TRIGGER AMP, refer to TRIGGER PICKOFF in 5.1 VERTICAL CIRCUIT. The TRIG SIG from the TRIGGER AMP is supplied to the TRIGGER SHAPER, (+) PEAK DETECTOR, (-) PEAK DETECTOR, and AMP(1).

The bandwidth of the TRIG SIG can be limited as appropriate. When the BW LIMIT switch S1612 (◇9◇) on the front panel is pressed, the BWL signal from [12] goes low, and switching transistor TR601 is turned on. Then the high frequency component of the TRIG SIG is bypassed to GND via C601 and C602, resulting in limiting the bandwidth. For the BWL, refer to 5.1 VERTICAL CIRCUIT.

TRIGGER SHAPER, PEAK DETECTOR and TRIG MODE

The TRIGGER SHAPER is a comparator with a hysteresis characteristics, and feeds out the trigger pulses to ① and ② by comparing the TRIG LEVEL set by TRIG LEVEL RV1603 in ◇9◇ with the TRIG SIG. The polarities of the trigger pulses are opposite each other.

The (+) PEAK voltage of the TRIG SIG is fed to ⓐ by the (+) PEAK DETECTOR, and the (-) PEAK voltage is fed to ⓓ by the (-) PEAK DETECTOR. Therefore, the voltages at ⓐ and ⓓ are changed by the minimum and maximum voltages of the TRIG SIG. On the other hand, the positive fixed voltage is generated at ⓑ, and the negative fixed voltage is generated at ⓔ.
The voltage at ⓐ or ⓑ is fed to ⓒ, and the voltage at ⓓ or ⓔ is fed to ⓕ. The supplied voltages are determined by TRIG MODE S690 in ◇3◇. When the TRIG MODE is at AUTO, the voltage at ⓐ (the positive peak voltage of the TRIG SIG) is fed to ⓒ, and the voltage at ⓓ (the negative peak voltage of the TRIG SIG) is fed to ⓕ. Therefore, it is possible to correspond the variable range of TRIG LEVEL RV1603 in ◇9◇ with the amplitude of the trigger signal, and it is easy to set the trigger level.
When the TRIG MODE is at NORM, TV-V, or TV-H, the voltage at ⓑ (the positive fixed voltage not affected by the minimum and maximum voltages of the TRIG SIG) is fed to ⓒ, and the voltage at ⓔ (the negative fixed voltage) is fed to ⓕ. Therefore, the variable range of TRIG LEVEL RV1603 in ◇9◇ is constant independent of the amplitude of the trigger signal.
Information on the TRIG MODE selection is transmitted to the circuit ◇5◇ from [18] via INVERTOR TR694.
AMP(1) is a negative feedback amplifier. The polarity of the TRIG SIG is inverted here. The inverted TRIG SIG is sent to the TV SYNC SEPARATOR, ◇7◇, and TRIG SIG OUT J302.

SYNC SEPARATOR and TRIG MODE

In the SYNC SEPARATOR, the SYNC component of the TRIG SIG is separated regardless of the horizontal and vertical sync signals.
When the TRIG MODE is at AUTO or NORM, TR636 of TR SW(1) is on, the base of TR634 is grounded, and the TR SW(2) turns off.

Therefore, the output of the TV SYNC SEPARATOR can not pass through the TR SW(2).

When the TRIG MODE is at TV-V or TV-H, the TR SW(1) is off, and the TR SW(2) turns on. Therefore, the output of the TV SYNC SEPARATOR can pass through the TR SW(2).

When the TRIG MODE is at TV-V, one side of C634 is grounded, and R634 and C634 compose an integrating circuit. As a result, the H SYNC is interrupted, and only the V.SYNC passes through the TR SW(2).

TRIG SLOPE SWITCH

The TRIGGER SLOPE SWITCH consists of the two current switch circuits. One consists ofTR650 and TR651, and the other consists of TR652 and TR653.

When TRIG MODE S690 is at AUTO or NORM, +12 V is supplied to SLOPE S1610. When SLOPE S1610 is switched to the ⊕ SLOPE side, +12 V is supplied to the current switch circuit consisting of TR650 and TR651, and the voltage at ① is fed out from the TRIGGER SLOPE SWITCH.

When the TRIG MODE is at AUTO or NORM and SLOPE S1610 is switched to ⊖ SLOPE side, +12 V is supplied to the current switch circuit consisting of TR652 and TR653, and the voltage at ② is fed out from the TRIGGER SLOPE SWITCH. When the TRIG MODE is switched to TV-V or TV-H, +12 V is not supplied to any current switch circuit, and the voltage at neither ① nor ② is fed out from the TRIGGER SLOPE SWITCH.

In this case, as stated above, the voltage at ③ (H.SYNC or V.SYNC) is fed out from [19] via the TR SW(2). Thus, one of the signals ①, ②, and ③ is fed out from [19] as a TRIG PULSE by the combination of TRIG MODE S690 and SLOPE S1610.

5.4 SWEEP CYCLE (◇5◇)

This circuit is provided to perform a cycle sweep, which is one of the major features of this oscilloscope. Since the sweep circuit and the hold-off circuit are operated independently, the cycle time (= sweep time + hold-off time) can be fixed. In other words, when the TRIGGER LOCK control on the front panel is pressed (the cycle lock on mode), the cycle time is fixed by the MPU for the RTO and a stable trigger is obtained regardless of the sweep time (TIME/DIV range).

The main operation of this circuit is described below, referring to the simplified circuit diagram shown in Fig. 5-4.

(1) The sweep state (the trigger sweep or the free-running sweep) is determined by the state of the signal on pin 2 of IC661 (3/4). In the trigger sweep mode, pin 3 goes high and D665 turns to off because pin 2 is low.

(2) When the hold-off voltage $\overline{\text{HOLD OFF}}$ goes low, DELAY GATE (CYCLE GATE) IC660 (2/2) is reset, and $\overline{Q2}$ goes high.

(3) When $\overline{Q2}$ goes high, D664 is off, and the DLY GATE signal goes high.

(4) Thus, switching transistor TR2010 turns on, and the gate voltage of BUFFER TR2060 is set to the starting level of the DELAY RAMP.

(5) When the hold-off period finishes, the $\overline{\text{HOLD OFF}}$ changes from low to high. In other words, IC660 (2/2) is released from the reset state and is in the wait state.

(6) When the TRIG PULSE is fed to T2 from [20], $\overline{Q2}$ changes from high to low during the rising edge of the TRIG PULSE.

(7) When $\overline{Q2}$ goes low, D664 is on, and the $\overline{\text{DLY GATE}}$ signal is low.

(8) Then TR2010 turns to off, delay capacitor C_{DLY} (C2012 // C2013) starts to be charged, and the gate voltage of BUFFER TR2060 starts to increase.
The charging current is supplied from the delay current source, and the current value is changeable by the TIME/DIV setting. When the TIME/DIV setting value is set, the constant charging current flows in C_{DLY}. As a result, the gate voltage of TR2060 increases linearly.
The delay current signal from 26 is an analog voltage to determine the delay current. The voltage is held by C2017, and is applied to pin 10 of IC2040 (3/4) through the filter consisting of R2015 and C2015.

(9) Portion of the output of BUFFER TR2060 is sent to COMPARATOR IC2050 (2/2) as a DELAY RAMP signal. In this comparator, the output levels of ACTIVE FILTER IC2040 (1/4) and the DELAY RAMP signal are compared. When the DELAY RAMP signal level exceeds the output level of the ACTIVE FILTER, the output of the COMPARATOR goes high. Accordingly, the $\overline{\text{DLY TRIG}}$ signal goes low. In the B sweep mode, the sweep starts after the predetermined delay time from the trigger point. Either the DLY REF signal from 37 or the DLY PRESET signal from 38 is fed to the ACTIVE FILTER. The DLY REF signal is fed to the ACTIVE FILTER in the normal delay mode, and the DLY PRESET signal is fed to the ACTIVE FILTER in the automatic calibration mode.
The DLY REF signal is the voltage corresponding to the delay time set by the controls on the front panel.
The other portion of the output of BUFFER TR2060 is fed to COMPARATOR TR2063, and used to detect the maximum voltage

of the DELAY RAMP signal. Normally, the output of COMPARATOR TR2063 is high, the output ($\overline{Q}$) of RS LATCH IC2052 3/3 is low, and the output ($\overline{\text{HOLD OFF}}$) of IC2052 2/3 is high. When the DELAY RAMP signal reaches the maximum value, the output of COMPARATOR TR2063 goes low (because TR2063 turns to on). Therefore, the RS LATCH is reset, $\overline{Q}$ goes high, and the $\overline{\text{HOLD OFF}}$ signal goes low.

(10) As a result, DELAY GATE (CYCLE GATE) IC660 2/2 is reset, $\overline{Q2}$ signal goes high. This state is the same as that of step (3). Then D664 turns to off, TR2010 turns to on, and the gate voltage of BUFFER TR2060 is set to the start level of the DELAY RAMP. Moreover, the output of COMPARATOR TR2063 returns to high.

(11) Next, the circuit related to the HOLD OFF RAMP signal is described below.
When the $\overline{\text{DLY GATE}}$ is low, TR2040 is on, and the collector voltage of TR2045 remains at the start level of the HOLD OFF RAMP signal.

(12) The integration of the DELAY RAMP signal finishes before the output of TR2063 described in step (10) goes high, and TR2040 changes from on to off. At this time, the integration of the HOLD OFF RAMP starts.

(13) TR2040 turns to off, HOLD OFF CAPACITOR C_{HO} (C2042 // C2043) begins to be charged, and the collector voltage of TR2045 begins to increase. The charging current is supplied from the HOLD OFF CURRENT SOURCE. This current value is changeable by the TIME/DIV setting value.
When the TIME/DIV setting value is set, the constant charging current begins to flow, and the collector voltage of TR2045 increases linearly.

(14) The collector voltage of TR2045 and the VAR H/O voltage fed via VOLTAGE FOLLOWER IC2040 (4/4) are compared by COMPARATOR IC2050 (1/2) in the next stage. The VAR H/O voltage corresponds to the setting value of the VARIABLES and HOLD OFF controls on the front panel.

(15) When the HOLD OFF RAMP voltage (the collector voltage of TR2045) exceeds the VAR H/O voltage, the output of COMPARATOR IC2050 (1/2) goes low.

(16) Thus, RS LATCH IC2052 (3/3) is in the set state, and $\overline{Q}$ goes low.

(17) As a result, $\overline{\text{HOLD OFF}}$ (the output of IC2052 2/3) goes high and the period of the holdoff finishes.

In case of a single sweep

(a) The maximum VAR H/O voltage is fed to 36 .

(b) The upper limit value of the HOLD OFF RAMP voltage is clamped to the voltage lower than the VAR H/O voltage by CLAMP TR2080.

Thus, "L" is not output from COMPARATOR IC2050(1/2), and the hold-off state continues after swept once.

When the reset switch is pressed, the VAR H/O voltage lower than the upper limit of the HOLD OFF RAMP voltage is fed from 36 . As a result, the COMPARATOR output goes low, resulting in releasing the hold-off state.

When the single switch is pressed thereafter, the above (a) and (b) state is regained.

Circuits related to the sweep

(i) A SWEEP

(a) Since the $\overline{A}$ signal from 25 is low, the output from pin 11 of IC661 (1/4) is high, and TR661 is on. Therefore, the $\overline{\text{DLY TRIG}}$ signal cannot pass the differentiation circuit consisting of C669 and R669A in the next stage and S1 of SWP GATE IC660 (1/2) remains high. This is because only the rapid changing component of the signal can pass the differentiation circuit. In other words, in the A SWEEP the route of the $\overline{\text{DLY TRIG}}$ signal is not used.

(b) Moreover, since the output from pin 11 of IC661 (1/4) is high, D660 turns to off, and pin 9 of IC659 goes high. In case of the trigger sweep, pin 3 of IC661 (3/4) is also high, and D661 is off.

(c) When $\overline{Q2}$ changes from high to low under the above state, the output from pin 8 of IC659 changes from low to high. That is, when T1 of SWEEP GATE IC660(1/2) changes from low to high, Q1 changes from low to high, and the $\overline{\text{SWP GATE}}$ signal from $\overline{Q1}$ changes from high to low. Thus, the sweep begins.

(ii) B SWEEP

(a) Since the $\overline{A}$ signal from 25 is high, the output from pin 11 of IC661 (1/4) goes low.

(b) Therefore, D660 is on, and pin 9 of IC659 goes low. The output of pin 8 remains high independent of the state of pin 10 of IC659. In case of the B SWEEP the route of S1 is not used.

(c) On the other hand, the output from pin 11 of IC661 (1/4) is low, and TR661 becomes off.

(d) Therefore, when the $\overline{\text{DLY TRIG}}$ signal changes from high to low, the change is applied to terminal S of SWEEP GATE IC660 (1/2) through the differentiation circuit.

(e) As a result, IC660 (1/2) turns to the set state, Q1 changes from low to high , and $\overline{Q1}$ changes from high to low. Thus, the B SWEEP begins.

The DLY ADJUST signal from [21] is the signal for the automatic calibration of the delay time. Though the delay time is controlled by a screwdriver adjustment in conventional oscilloscopes, in this oscilloscope, the delay time is calibrated automatically by the built-in MPU for the RTO when the power switch is turned on.

(iii) Relation with STORAGE

In the STORAGE mode, the $\overline{\text{RTO/STR}}$ from [74] goes high, and the $\overline{\text{SWP GATE}}$ on pin 13 of IC659 passes through IC659, resulting in the GATE signal. In the RTO mode, the output signal from IC659 is always high, and the $\overline{\text{SWP GATE}}$ can not pass through IC659. The sweep output of ◇6◇ is supplied to [71] . The SWEEP signal from [72] and the GATE signal from [73] are supplied to the circuit ◇13◇ , and controls the sampling operation in the storage mode.

AUTO GATE circuit

(A) NORM mode (trigger sweep)

The $\overline{\text{AUTO}}$ signal from [18] is high, and TR660 is on. Pin 2 of IC661 (3/4) goes low, and pin 3 goes high. Therefore, D665 turns to off, the AUTO GATE circuit does not function in the NORM mode.

(B) Auto mode (including TV-V and TV-H)

The $\overline{\text{AUTO}}$ signal from [18] goes low. There are two kinds of sweep in the AUTO mode: the trigger sweep and the free-running sweep.

(a) Trigger sweep in AUTO (including TV-V and TV-H)

① When the TRIG PULSE is supplied to T2, Q2 changes from low to high during the rising edge of the pulse.

② When Q2 goes high, TR660 turns to on, C664 is shorted, and pin 2 of IC661 (3/4) remains low.

③ When the DELAY RAMP signal voltage reaches the maximum, the $\overline{\text{HOLD OFF}}$ signal is low, and the holdoff period begins.

④ When the $\overline{\text{HOLD OFF}}$ signal goes low, Q2 changes from high to low, and TR660 turns to off. On the other hand, D663 turns to on, the anode side of D662 goes low, and D662 becomes off. Therefore, C664 is not charged. Pin 2 of IC661 (3/4) remains low.

⑤ When the hold-off period finishes, the $\overline{\text{HOLD OFF}}$ changes from low to high, D663 turns to off. As the anode side of D663 goes high, D662 turns to on, and C664 begins to be charged.

⑥ As a result, the voltage on pin 2 of IC661 (3/4) increases gradually. However, the trigger pulse is repeatedly fed to pin 2 of IC661 (3/4) before the voltage reaches the threshold level, and the low level, namely the trigger sweep state, is maintained.

(b) Free-running sweep in AUTO (including TV-V and TV-H)

If TRIG PULSE is not fed when the voltage on pin 2 of IC661 (3/4) reaches the threshold level in the above description (a) ⑥ (even when pin 2 changes from low to high), the free-running sweep begins.

In other words, when pin 2 goes high, pin 3 goes low, and D661 and D665 turn to on. When D661 is on, pin 9 of IC659 goes low, pin 8 goes high, and the sweep begins. When D665 turns to on, the $\overline{\text{DLY GATE}}$ signal goes low, and the DELAY RAMP signal is generated.

COUNTER circuit IC2170 (1/2, 2/2)

When the TRIG PULSE is fed to T3, the divided-by-two pulse is fed out from Q3, and the divided-by-four pulse is fed out from Q4. These pulse are sent to the MPU for the RTO and used to count the frequency of the trigger pulse.
The waveform of 1.6 to 4 cycles is displayed on the CRT in the AUTO range mode.
There are two reasons for using the divider circuits. One reason is to avoid routing the signal at a high frequency. (It must be noted that the pulse of max. 10 MHz is fed to T3). The other reason is why the clock frequency of the counter built in the MPU for the TRO is limited.
(The clock frequency of the counter is 1 MHz.)
The number of trigger is counted by using the pulse from 24 for a slow waveform and the pulse from 23 for a fast waveform.

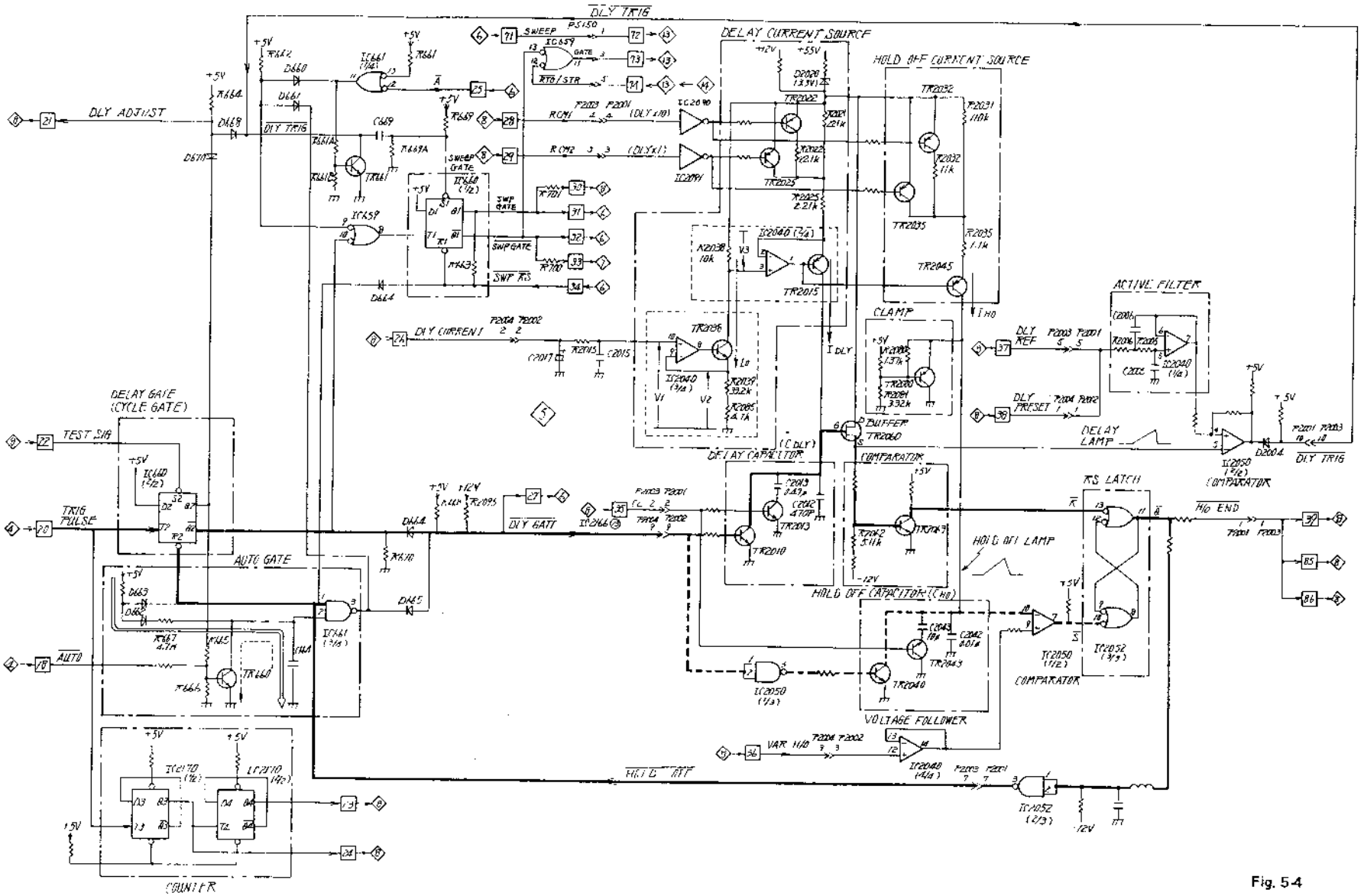

DLY TRIG
DELAY CURRENT SOURCE
HOLD OFF CURRENT SOURCE
DLY ADJUST
SWEEP
DLY TRIG
SWP GATE
SWP RS
DLY CURRENT
ACTIVE FILTER
CLAMP
DLY REF
DLY PRESET
DELAY LAMP
BUFFER
DELAY CAPACITOR (C DLY)
COMPARATOR
RS LATCH
HO END
DELAY GATE (CYCLE GATE)
TEST SIG
TRIG PULSE
AUTO GATE
AUTO
DLY GATE
HOLD OFF LAMP
HOLD OFF CAPACITOR (C HO)
VOLTAGE FOLLOWER
VAR HO
HOLD OFF
COUNTER

Fig. 5-4

5.5 SWEEP (◇6◇ 1/2)

The detailed block diagram of this circuit is shown in Fig. 5-5. When the sweep begins, the $\overline{\text{SWP GATE}}$ signal entered at [32] changes from high to low, and the SWP GATE signal entered at [31] changes from low to high. Accordingly, diodes D710, D711, and D712 turn to off. The TIMING CAPACITOR (C_T) is provided between the input and the output of the INVERTING AMP consisting of TR710, TR712, and TR714 to form an miller integrator. C_T is determined by C710 // C711 or C710 // C711 // C715. The integration current I_T is determined by the input voltage of IC730 (1/2) and the timing resistors (R_T), which are determined by the TIME/DIV setting. The value of C_T is determined by C710 // C711 or C710 // C711 // C715. The value of R_T is determined by R740, R740 // R741, R740 // R743 or R740 // R745. When diodes D710, D711, and D712 turn to off, the integration current I_T begins to flow to the TIMING CAPACITOR C_T, and the voltage of C_T begins to increase linearly corresponding to I_T.

The output voltage of the INVERTING AMP is fed out from [50] as the SWP OUT signal via ANALOG SW2 IC717. Part of the output voltage of the INVERTING AMP is fed to voltage comparator TR723 via ANALOG SW2 IC717, and the maximum voltage of the SWP OUT signal is determined by comparing the output voltage of the INVERTING AMP with the base voltage of TR723. When TR723 detects the maximum voltage, its collector voltage turns to low, and the $\overline{\text{SWP RS}}$ signals fed from [34] and [49] also turn to low. The $\overline{\text{SWP RS}}$ signal is applied to FF IC660(1/2) (13) shown in ◇5◇, and turns the output of the $\overline{\text{SWP GATE}}$ to high. When the $\overline{\text{SWP GATE}}$ goes high and the $\overline{\text{SWP GATE}}$ goes low, diodes D710, D711, and D712 turn to on. The input and the output of the INVERTING AMP are thus shorted, and the TIMING CAPACITOR C_T discharges rapidly. As a result, the output voltage of the INVERTING AMP

falls down to the voltage at the beginning of the sweep, voltage comparator TR723 turns to off, and the collector voltage of TR723 is reset to high.

The CS A DATA signal entered at 44 is a DC voltage (analog value) corresponding to the A sweep, and the CS B DATA signal entered at 45 is a DC voltage (analog value) corresponding to the B sweep. The CS A and CS B DATA signals are changed by the TIME/DIV setting, and accordingly, the voltage V_T of the V_T/I_O CONVERTER is changed. The TIME/DIV setting is changed to 1:2:5 by changing the voltage V_T. The figures of the TIME/DIV setting value are determined by changing the value of the timing resistor R_T to 1:10:100:1000.

The Q_E output ($\overline{A}$) of SHIFT REGISTER IC2165 controls ANALOG SW1 IC717 via IC738. The CS A DATA signal and the CS B DATA signal are supplied to the V_T/I_O CONVERTER in the A sweep mode and in the B sweep mode, respectively. V_T is a voltage corresponding to the CS A DATA signal or the CS B DATA signal, and the current I_O corresponding to V_T flows across R732. The resulting voltage V_O is fed to the V_O/I_T CONVERTER and the output current I_T corresponding to V_O flows to the TIMING RESISTOR R_T. The V_T/I_T CONVERTER consists of the V_T/I_O CONVERTER and the V_O/I_T CONVERTER, and the current I_T corresponding to the CS A DATA signal or the CS B DATA signal is obtained. Since I_T is fed to the miller integrator, the SWP OUT signal corresponding to the CS A DATA signal or the CS B DATA signal is obtained.

R_{T1}, R_{T2}, and R_{T3} fed from Q_B, Q_C, and Q_D of SHIFT REGISTER IC2165 are control signals to switch the timing resistor R_T. R_{T1}, R_{T2}, and R_{T3} are supplied to switching transistors TR745, TR743 and TR741 via LEVEL SHIFT TR750, TR751, and TR752, respectively, and the value of R_T is determined. Only the A sweep is provided with the SWP VAR function, and the voltage value of the CS A DATA signal is changed continuously by the MPU for the RTO.

IC2165 is an 8-bit shift register having serial inputs and parallel outputs. The 8-bit shift register and the latch are packed onto a single chip. The S DATA signal fed to the SER is shifted to the register bit by bit during every rising edge of the shift register clock S CLK2 signal fed to the SRCK.
The 8-bit data in the register is transferred simultaneously to the latch circuit during the rising edge of the register clock pulse entered at RCK and the latch data is updated. (While the S DATA signal is being acquired, Q_A to Q_H are being held in the previous state and the data on Q_A to Q_H is updated during the rising edge of RCK.) The shift register and the latch circuit (storage register) have the individual clear signals (shift register clear $\overline{\text{SRCLR}}$ signal and register clear $\overline{\text{RCLR}}$ signal).
The clear signals are synchronized with the clock pulse when they are high.
The S DATA signal from [42] switches the TIME/DIV setting and the vertical channel. The clock pulse S CLK2 is fed from [43] only when the content of the S DATA is changed.
The S CLK2 pulse is generated by PC2 and PC6 pulses fed out from IC3101 of the MPU for the RTO shown in ◇8◇. PC2 is a clock pulse being fed out continuously. PC6 is a clock enable signal and controls the clock pulse P2. The passage of the clock pulse through the gate circuit (IC2107 of ◇8◇) is controlled by the PC6 signal. The clock pulse passing the gate circuit (IC2107 shown in ◇8◇) is an S CLK2 pulse.
The route of a register clock pulse fed to the RCK terminal (pin 12) of SHIFT REGISTER IC2165 is different in the normal sweep mode and in the non-sweep mode (mainly in the X-Y mode).

(1) When the sweep is performed
When the $\overline{\text{DLY GATE}}$ signal from [27] changes from low to high, the register clock pulse fed to the RCK terminal changes from low to high, and the 8-bit data in the register is transferred simultaneously to the latch circuit during the

rising edge of the register clock pulse. Strictly speaking, since the $\overline{\text{DLY GATE}}$ signal passes through the differentiation circuit consisting of C2167 and R2167, and gate circuit IC2162 (2/4), the register clock pulse changes from low to high after the $\overline{\text{DLY GATE}}$ signal has changed from low high. This is because the latch data is updated when the hold-off period begins completely.

The PC6 signal from [40] changes the state of pin 5 of IC2162 (2/4), and controls the transmission of the change of the DLY GATE signal to the RCK terminal. When the updating of the latch data is prohibited, namely when a new S DATA is being sent, PC6 from [40] is high. Therefore, pin 5 of IC2164 (2/4) goes low, and the change of the $\overline{\text{DLY GATE}}$ signal cannot pass through the gate circuit IC2162 (2/4). When all the data of 8-bit S DATA is shifted to the shift register, and the sweep is finished, data is transferred from the shift register to the latch circuit.

(2) When the sweep is not performed (mainly in the X-Y mode)

The MPU for the RTO controls the transmission of the latch data directly. When the data is updated, a negative pulse is fed from [41] .

The output of Q_H is sent to the MPU for the RTO (IC3101) in ◇8◇ via [47] , and informs the microcomputer of the latch state. The S DATA fed to $Q_{H'}$ is fed to the front panel board via [48] . The LED's (D1601, D1602, and D1605 to D1611 in ◇9◇) on the panel are blinked by this output of $Q_{H'}$.

TR708 and TR709 are switching transistors. When the TIME/DIV switch is set to 0.5 ms or 0.2 ms, the Q_A and Q_B outputs of SHIFT REGISTER IC2165 are low and high respectively, and TR708 and TR709 become on. Thus, R703 is shorted, and the current flowing across R703A increases.

As a result, the reset duration of the sweep waveform can be made short resulting in increasing the display ratio, and a brighter waveform can be observed.

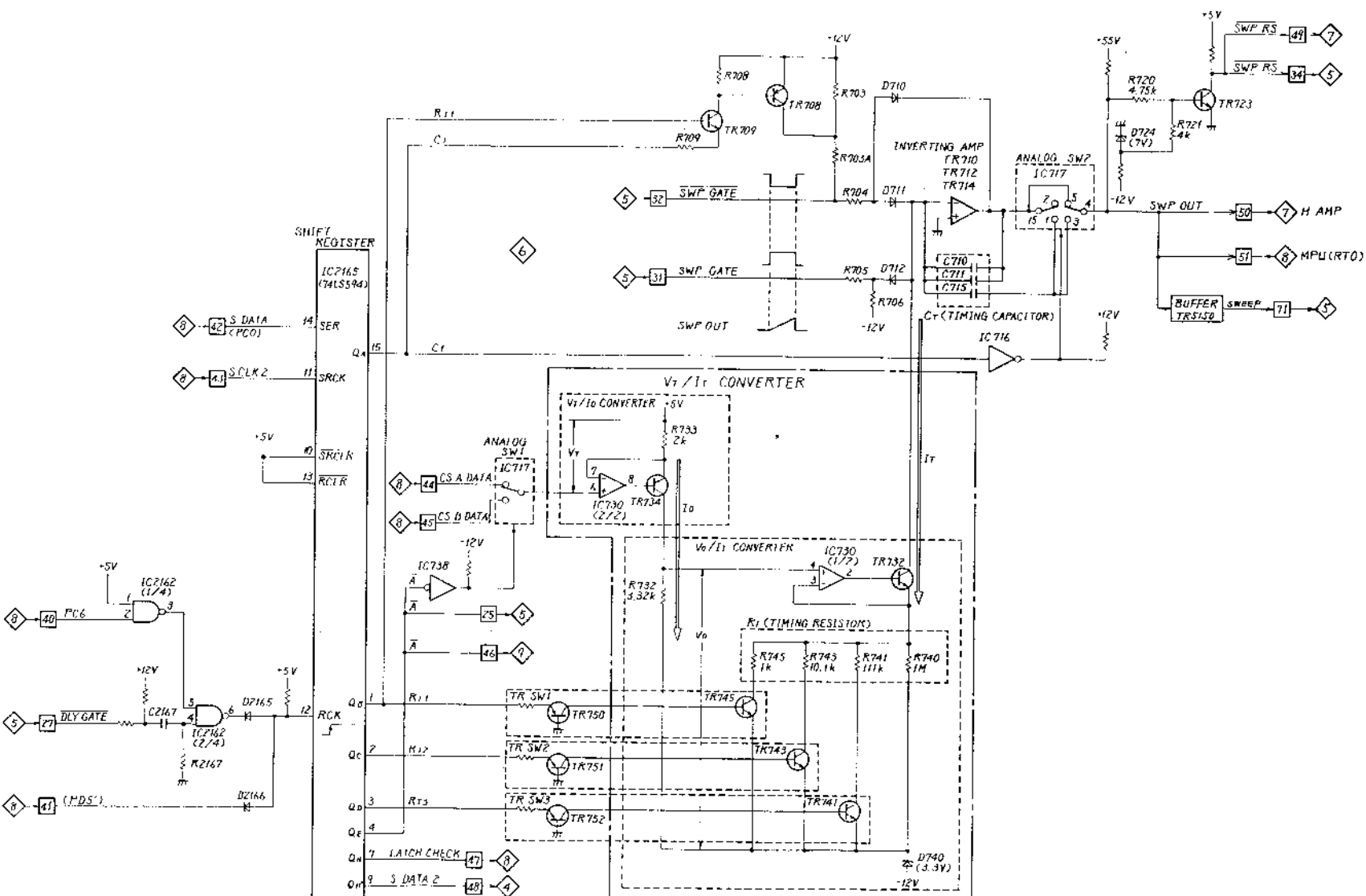

SHIFT REGISTER
IC2165 (74LS594)
S DATA (PCO)
SCLK 2
SRCK
SRCLR
RCLR
PC6
IC2162 (1/4)
IC2162 (2/4)
DLY GATE
C2167
R2167
D2165
D2166
(MDS')
LATCH CHECK
S DATA 2
R11
R12
R13
C1
R708
TR708
TR709
R709
R703
R703A
D710
INVERTING AMP
TR710
TR712
TR714
R704
D711
SWP GATE
R705
D712
R706
SWP OUT
ANALOG SW2
IC717
R720 4.75k
TR723
R721 4k
D724 (7V)
SWP RS
H AMP
MPU (RTO)
BUFFER TR5150
SWEEP
C710
C711
C715
Cr (TIMING CAPACITOR)
IC716
Vr / Ir CONVERTER
Vr / Io CONVERTER
R733 2k
Vr
IC730 (2/2)
TR734
Io
ANALOG SW1
IC717
CS A DATA
CS B DATA
IC738
Vo / Ei CONVERTER
IC730 (1/2)
TR732
R732 3.32k
Vo
Ir
Ri (TIMING RESISTOR)
R745 1k
R743 10.1k
R741 111k
R740 1M
TR SW1
TR750
TR745
TR SW2
TR751
TR743
TR SW3
TR752
TR741
D740 (3.3V)
+5V
+12V
-12V
-5V

Fig. 5-5

5.6 H AMP (◇7 2/3, ◇9 3/5)

Fig. 5-6 is the detailed block diagram of this circuit. Normally the TR SW (1) circuit is not activated, and the SWP OUT signal from [50] is applied to the DIFF AMP(1) circuit via the AMP (1) circuit. In the X-Y mode, the $\overline{\text{X-Y}}$ signal from [52] goes L, so that TR811 turns off and TR812 turns on. Therefore, the TR SW (1) circuit is activated, and the X-SIG from [16] is applied to the DIFF AMP(1) circuit via the AMP(1) circuit. On the other hand, the H POS signal from [53] is set to the optimum DC voltage by H POS START RV807, and is applied to the DIFF AMP(1) circuit via the AMP(2) circuit.

The DIFF AMP(1) circuit is activated in the waveform display mode, and the DIFF AMP(2) circuit is activated in the dot display mode. When I_1 or I_2 flows, the DIFF AMP(1) circuit is activated. When I_3 flows, the DIFF AMP(2) circuit is activated. Either of I_1, I_2 or I_3 is always flowing. I_1 flows in the x1 mode, I_2 in the x10 mode, and I_3 in the dot display mode.

The selection of I_1, I_2 or I_3 is controlled by the $\overline{\text{X1}}$ signal from [54] and the DOT EN signal from [56].

The state of the $\overline{\text{X1}}$ signal is determined by DPDT switch (x10 MAG) S1605 in ◇9. One switching circuit (pins 4, 5, and 6) of S1605 controls the CURRENT SW(1) directly. The other switching circuit (pins 1, 2, and 3) informs the setting state (x1 or x10) of the MPU for the RTO by changing the output voltage AN0 of D/A(2) RM1601. Pressing the [ALT] and [B] switches simultane ously results in the X-Y mode, and pin 4 of S1605 is grounded. Therefore, in the X-Y mode, even if the x10 MAG switch is set to the x10 side, the switch is forced to return to the x1 mode. The states of the [ALT] and [B] switches are informed of the MPU for the RTO by the output voltage AN2 of D/A(1) RM1603.

For the following description, refer to the schematic diagram ⟨7⟩.

D841 and D842 are switching diodes, and change the current flow in the DIFF AMP(1) circuit according to the x1 or x10 mode. Both diodes turn off in the x1 mode, and on in the x10 mode.

In the waveform display mode, the output of the DIFF AMP(1) circuit is applied to the DIFF AMP(3) circuit.

In the dot display mode, the output of the DIFF AMP(2) circuit is applied to the DIFF AMP(3) circuit.

The DIFF AMP(3) circuit employs a common-base circuit, and the low impedance input and the high impedance output are realized.

The output of the DIF AMP(3) circuit is sent to the CURRENT LIMITER circuit consisting of the common-base DIFF AMP circuit (TR851 and TR852) and the diodes (D873 and D874). This CURRENT LIMITER prevents the H OUTPUT AMP circuit from being driven up to a saturation field.

The output signal current of TR851 is amplified by emitter follower stage TR881 and common-emitter stage TR885. The amplified output is fed back to the input through R857, R855, C857, and C855. The feedback amount at high frequency is adjusted by CV859 to optimize the linearity at the 5 ns/div sweep.

TR871 is an active load of TR885. The AC component is applied to the base of TR871 through C883 so that the supply current increases when the output voltage changes to the positive at a high speed.

The operation of the circuits following TR852 is identical with the above operation except for signal polarities.

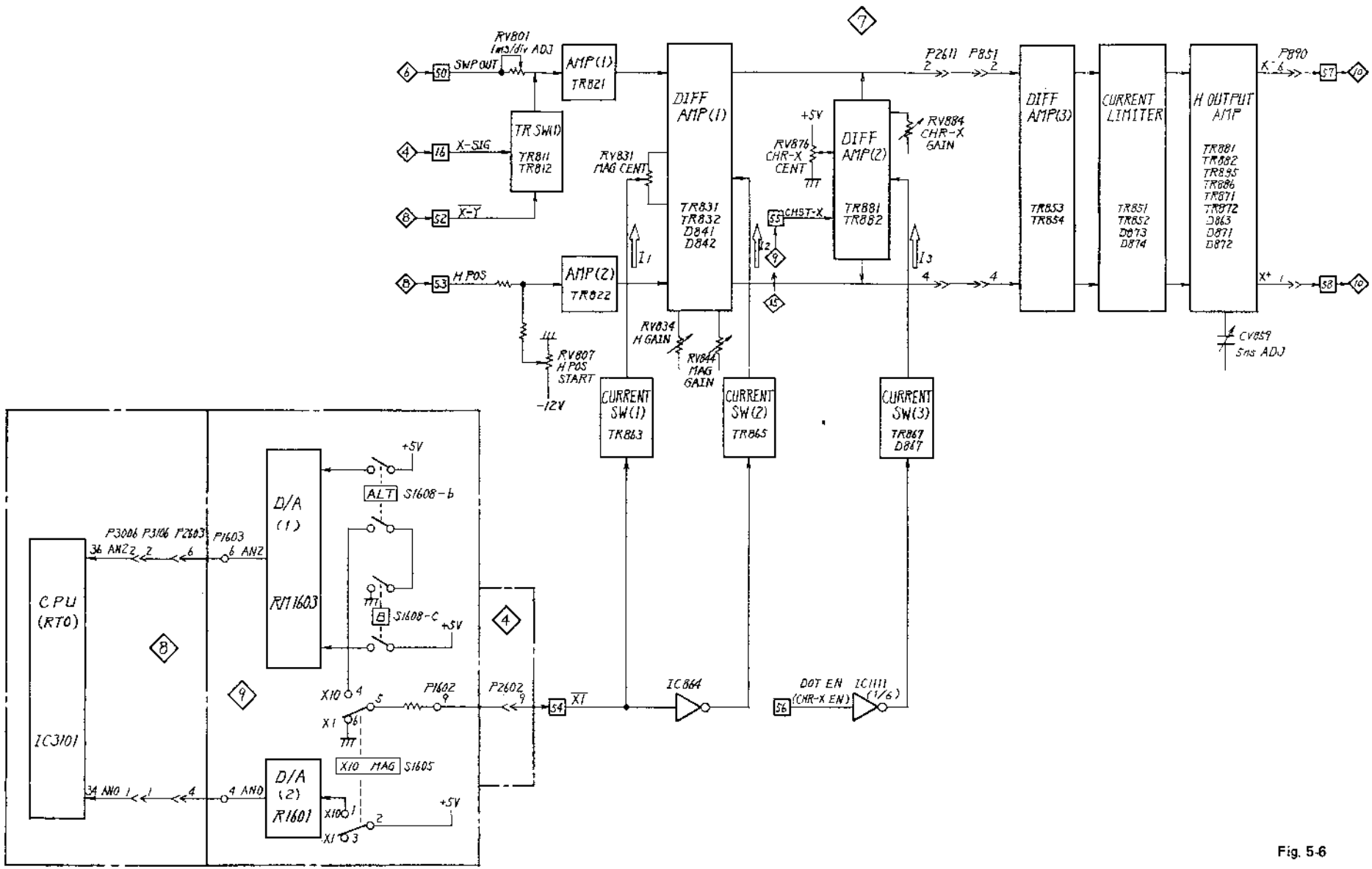

RV801
1ms/div ADJ
SWP OUT
AMP(1)
TR821
TR SW(1)
TR811
TR812
X-SIG
X-Y
RV831
MAG CENT
DIFF
AMP(1)
TR831
TR832
D841
D842
+5V
RV876
CHR-X
CENT
DIFF
AMP(2)
TR881
TR882
RV884
CHR-X
GAIN
CHST-X
I1
I2
I3
H POS
AMP(2)
TR822
RV807
H POS
START
-12V
RV834
H GAIN
RV844
MAG
GAIN
CURRENT
SW(1)
TR863
CURRENT
SW(2)
TR865
CURRENT
SW(3)
TR867
D867
P2611
P851
DIFF
AMP(3)
TR853
TR854
CURRENT
LIMITER
TR851
TR852
D873
D874
H OUTPUT
AMP
TR881
TR882
TR895
TR886
TR871
TR872
D863
D871
D872
P890
CV859
5ns ADJ
CPU
(RTO)
IC3101
P3006 P3106 P2603
36 ANZ
P1603
6 ANZ
D/A
(1)
R/M1603
+5V
ALT S1608-b
S1608-C
X10
X1
P1602
P2602
XT
IC864
DOT EN
(CHR-X EN)
IC1111
(1/6)
34 ANO
4 ANO
D/A
(2)
R1601
X10 MAG S1605

Fig. 5-6

5.7 UNBLANKING & Z-AXIS AMP (◇7◇ 3/3, ◇9◇ 4/5, ◇10◇ 1/2)

Description on the UNBLANKING circuit and the Z-AXIS AMP circuit follows. Refer to Figs. 5-7 and 5-8.

UNBLANKING circuit

The UNBLANKING circuit consists of two functional blocks. One consists of IC1101 1/3, IC1101 3/3 and D1113 and controls a waveform display, and the other consists of IC1121 3/4 and D1114 and controls the readout character display. The intensity of the displayed waveform is controlled by the INTEN control and that of the readout (characters or cursors) by the READOUT INTEN control.

The waveform display and the readout display (characters or cursors) are performed by the time division.

Like the X-axis circuit and the Y-axis circuit, the UNBLANKING circuit in the Z-axis circuit is switched according to the time division. In other words, either of the two functional blocks (the $\overline{\text{UNBL}}$ and $\overline{\text{CHR Z}}$ signals) of the UNBLANKING circuit is selected by the DOT EN signal or the $\overline{\text{DOT EN}}$ signal according to the kind of the requested display, the waveform or the dots (characters of cursors).

To effect or not blanking of the waveform and the dots (characters or cursors) is controlled by the $\overline{\text{UNBL}}$ signal and the $\overline{\text{CHR Z}}$ signal, respectively. When the waveform is displayed, the $\overline{\text{UNBL}}$ signal is low, and the $\overline{\text{CHR Z}}$ signal is high.

Since the emitter voltage of TR901 is always zero volts, D1113 is on, and D1114 is off. When the dots (characters or cursors) are displayed, the $\overline{\text{UNBL}}$ signal is high, and the $\overline{\text{CHR Z}}$ is low. Therefore, D1113 is off, and D1114 is on.

When the sweep begins and the $\overline{\text{SWP GATE}}$ signal from [33] goes low or the $\overline{\text{X-Y}}$ signal from [60] goes low in the X-Y mode, the

$\overline{\text{UNBL}}$ signal fed out from pin 8 of IC1101 (3/3) goes low, resulting in the waveform display state.
When the CHR EN from [76] goes high to display characters, or the $\overline{\text{CUR EN}}$ signal low from [59] goes low to display cursors, the DOT EN signal is fed out from pin 11 of IC1121 (4/4), and resulting in the dot display state.
The waveform becomes the blanking state ($\overline{\text{UNBL}}$=H)in the following cases (1) to (4).

(1) When the sweep finishes, and the $\overline{\text{SWP RS}}$ signal from [49] goes low.
(2) While the MPU for the RTO are operating
In this case, D1101 or D1105 turns on.
(3) When the switching part needs to be blanked
In this case, D1102 turns on.
(4) Dot display
In this case, D1103 and D1104 turn on.

The H AMP is changed by the DOT EN signal (corresponding to the the CHR-X EN signal) fed out from [56] , and the V AMP is changed by the $\overline{\text{DOT EN}}$ signal (corresponding to the $\overline{\text{CHR-Y EN}}$ signal) fed out from [61] .

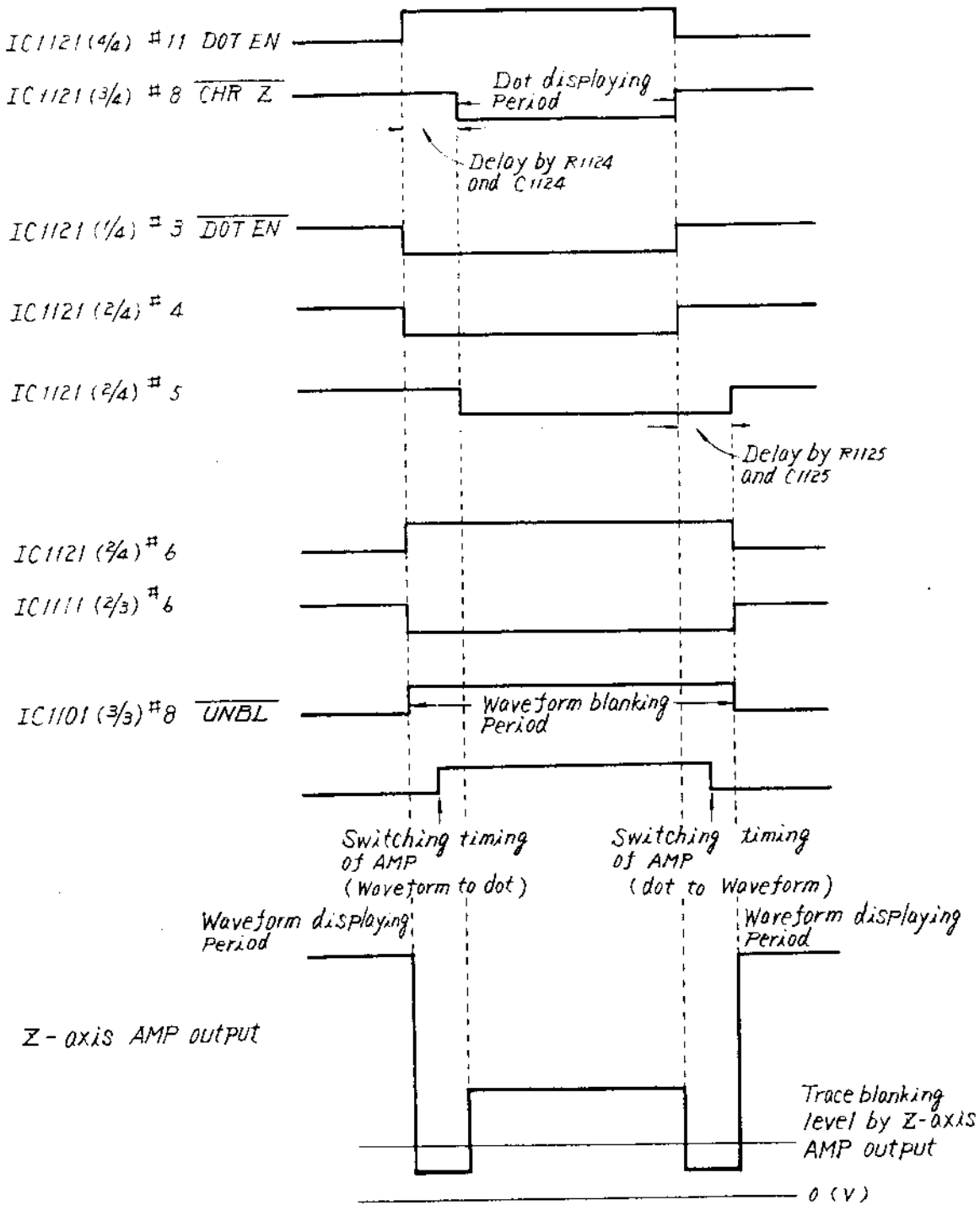
In the DSO mode, the STORAGE signal fed from [83] goes high and each switch of SELECTOR IC 4001 is switched to the B side. As a result, the $\overline{\text{STR-Z}}$ signal is fed out from 1Y, and 2Y becomes in the high state.
The 2Y output enters CURRENT SW(3) of ◇7◇ via [56] , and allows I3 to flow, resulting in operating DIFF AMP (2). (Fig. 5-6) I1 and I2 do not flow, and DIFF AMP (1) does not work, Thus, in any case of waveforms, characters and cursors the X-direction signal is fed out via DIFF AMP (2) in the DSO mode.
The DOT EN signal from [61] controls the switching of ANALOG SWITCH IC2220 of ◇9◇ . (Fig. 5-13) In the RTO mode, two kinds of blanking, waveforms and dots (characters or cursors), are

controlled. In the DSO mode, the blanking of dots (waveforms, characters and cursors) is controlled by the $\overline{\text{STR Z}}$ signal from 82 . In this case, the caracter generator circuit in the RTO mode is stopped by the MPU for the RTO. (The $\overline{\text{CHR Z}}$ signal is high.)

Z-AXIS AMP

This circuit consists of the current limiter (TR901 and D901) and the feedback AMP (TR906, TR910, and TR912). There are two input channels to this AMP. One is the waveform display channel of D1113, and the other is the dot display channel of D1114.
These channels are selected by the DOT EN signal fed out from pin 11 of IC1121 (4/4).
In either case, the current from TR901 emitter increases, the intensity of the CRT increases.
The change of the input current applied to TR901 emitter is not transmitted to the collector, but the change is not transmitted to TR906 by D901. Therefore, the output voltage of the Z.AXIS AMP is controlled so that it is not lower than approx. 5 V.

When the current of TR901 (from the emitter) increases, the current across D901 increases. Therefore, the base voltage of TR906 decreases. As a result, the base voltage of TR912 decreases, and the output voltage of the Z-AXIS AMP becomes more positive. This output is connected with the electrode G1 for the beam control of the CRT. So when the output voltage of the Z.
AXIS AMP becomes further positive, the intensity increases accordingly.



Note 1 : The above waveforms are synchronous each other.

Note 2 ; The unblanking waveform in each sweep and the above waveforms are asynchronous.

Fig. 5-7

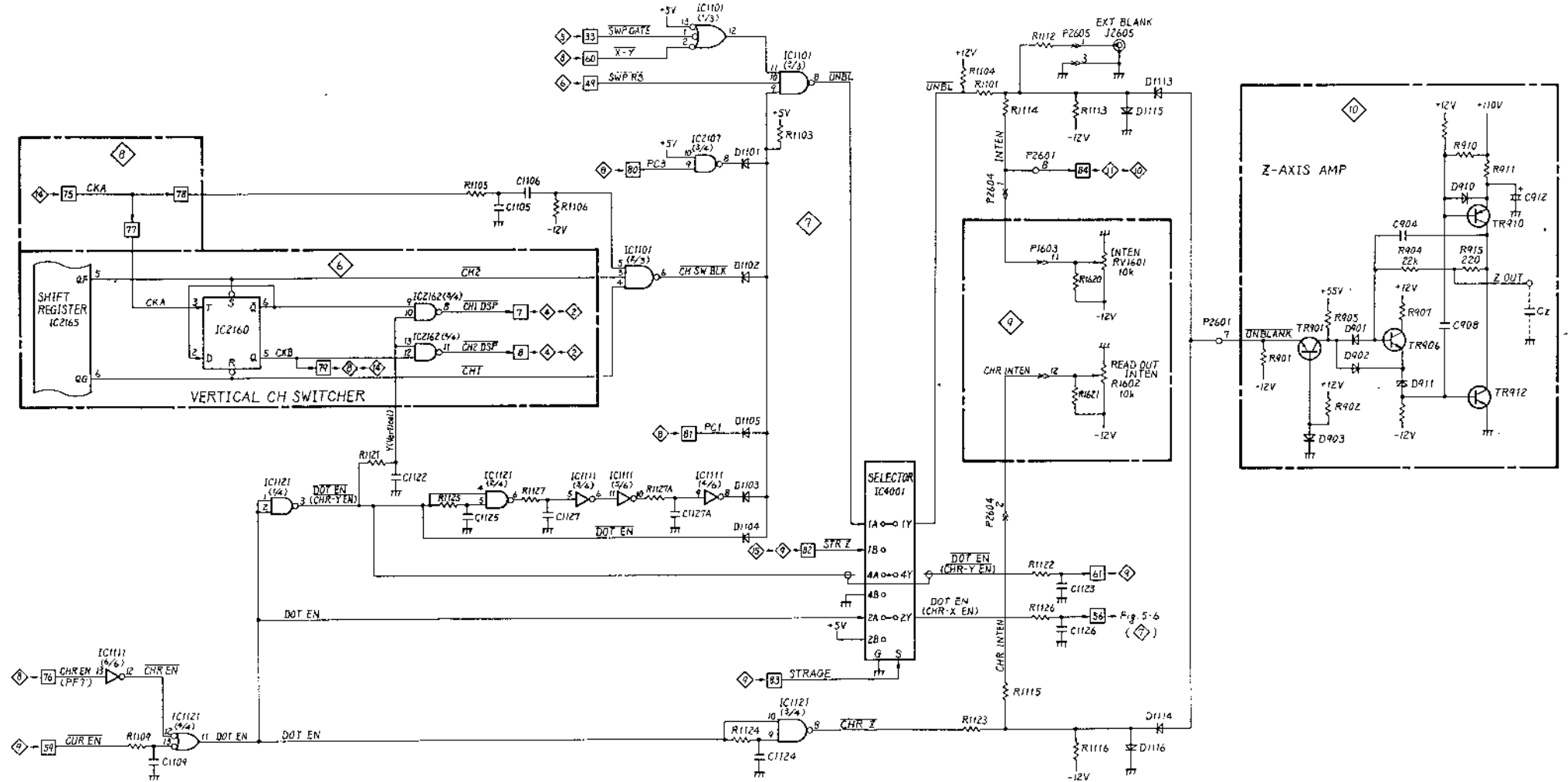

SHIFT REGISTER IC2165
IC2160
VERTICAL CH SWITCHER
SELECTOR IC4001
Z-AXIS AMP
EXT BLANK J2605
SWP GATE
X-Y
SWP RS
PC3
PC1
STRAGE
DOT EN
DOT EN (CHR-Y EN)
DOT EN (CHR-X EN)
CHR EN
CUR EN
CHR Z
CHR INTEN
UNBL
INTEN
CH1 DSP
CH2 DSP
CH SW BLK
READ OUT INTEN RV1602 10k
INTEN RV1601 10k
UNBLANK
Z OUT
Fig. 5-6

Fig. 5-8

5.8 VERTICAL CH SWITCHER (⟨6⟩ 2/2)

Refer to Fig. 5-6 and Table 5-2.
The displayed channel is determined by the output signals $\overline{\text{CH1 DSP}}$ and $\overline{\text{CH2 DSP}}$. The state of these output signals are determined by the $\overline{\text{CH1}}$, the $\overline{\text{CH2}}$, and the $\overline{\text{DOT EN}}$ signals. The $\overline{\text{CH SW BLK}}$ signal for blanking the switching portion of the channel is generated from the $\overline{\text{CH1}}$ and the $\overline{\text{CH2}}$ signals. The 500 kHz clock pulse is constantly fed to terminal T of toggle flip-flop IC2160 in the RTO mode. The CKA pulse is fed out from COUTNTER/TIMER IC5310 of ⟨13⟩ (Fig. 5-19) by the control of the MPU for the DSO.
The state of the $\overline{\text{CH1}}$ and the $\overline{\text{CH2}}$ signals fed out from Q_G and Q_F of SHIFT REGISTER IC2165 are determined by the V.MODE and the TIME/DIV switches.

Table 5-2 shows the relationship between "The Setting positions of the V MODE switch and the setting values of the TIME/DIV switch" and "The state of the $\overline{\text{CH1}}$, the $\overline{\text{CH2}}$, the $\overline{\text{CH1 DSP}}$, and the $\overline{\text{CH2 DSP}}$." Further, the supplemental explanation follows.

(1) When the V. MODE switch is set to CH1, the CH1 signal is displayed. Since the $\overline{\text{CH1}}$ signal is low, and the $\overline{\text{CH2}}$ signal is high, IC2160 is in the reset state, and high and low are fed out from $\overline{Q}$ and Q, respectively. (In this case, a clock pulse from T is not valid.) On the other hand, when characters are not displayed, the $\overline{\text{DOT EN}}$ signal fed to pins 10 and 13 of logic circuit IC2162 (3/4, 4/4) is high. Therefore, the $\overline{\text{CH1 DSP}}$ signal is low, the $\overline{\text{CH2 DSP}}$ is high, and the CH1 signal is displayed.

(2) When the V. MODE switch is set to CH2, the CH2 signal is displayed.
Since the $\overline{\text{CH1}}$ signal is high, and the $\overline{\text{CH2}}$ signal is low, IC 2160 is in the reset state.

(3) When the V. MODE switch is set to CHOP, the CH1 and the CH2 signals are displayed alternately at a 250 kHz cycle. In this case, the $\overline{CH1}$ and the $\overline{CH2}$ signals are high, and IC2160 operates as a toggle flip-flop.
Therefore, the outputs of $\overline{Q}$ and Q are inverted during the rising edge of a 500 kHz clock pulse fed to T.

(4) When the V.MODE switch is set to DUAL,
a. When the TIME/DIV switch is set to 2 ms/DIV or slower, the circuit operation is the same as that of item (3).
b. When the TIME/DIV switch is set to 1 ms/DIV or faster, the polarities of the $\overline{CH1}$ and the $\overline{CH2}$ signals are opposite, and they are inverted every approx. 20 ms by the MPU for the RTO. Therefore, the CH1 or the CH2 signals are displayed alternately every approximately 20 ms.

For the channel selection in the DSO mode, refer to 5.13 (7).

Table 5-2

V MODE	TIME/DIV	$\overline{CH1}$	$\overline{CH2}$	Q	$\overline{Q}$	$\overline{CH1\ DSP}$	$\overline{CH2\ DSP}$	Displayed CH
CH1	----	L	H	H	L	L	H	CH1
CH2	----	H	L	L	H	H	L	CH2
CHOP	----	H	H	H↔L	L↔H	L↔H	H↔L	CH1--CH2 (250 kHz)
DUAL	≥2 ms	H	H	H↔L	L↔H	L↔H	H↔L	CH1--CH2 (250 kHz)
	≤1 ms	H↔L	L↔H	H↔L	L↔H	L↔H	H↔L	CH1--CH2 (20 ms)

5.9 MPU(RTO), CHR GEN & FRONT PANEL (◇8◇ , ◇9◇ 5/5)

Outline

The description on the MPU for the RTO, its peripheral circuits, the control circuit of information on characters and cursors, and the circuit which inputs information on the panel switch setting into the MPU for the RTO follows. Refer to schematic diagrams ◇8◇ and ◇9◇, detailed block diagram Fig. 5-15, block diagrams Figs. 5-9, 5-12 and 5-13, waveform charts Figs. 5-10 and 5-11 and simplified schematic diagram Fig. 5-14.

Most of information on the switches at the right half side of the panel is acquired, in the RTO mode, by the MPU for the RTO, which controls the waveform display and the readout to obtain the optimum state. The switches of the storage mode under the screen, left half side of the front panel, are controlled by the MPU for the DSO.
Information on the panel switch setting is acquired as an analog signal from ports AN0 to AN7. The analog signal is converted into a digital signal by the A/D converter built in the MPU for the RTO. The processing programs are stored in ROM IC3006. The 10 bits digital data among the control signals fed out from the MPU for the RTO is converted into analog data by DA1 RM2120. The converted analog data is output from ANALOG SWITCH IC2130 as a continuously variable signal.
A digital control signal is fed out from port PC0 as an S-DATA (serial data), sent to the four shift registers* in Fig. 5-12, and fed out as bit information.

* IC2165 of ◇6◇, IC2166 of ◇8◇, and IC1601 and IC1602 of ◇9◇

The frequency of the measured signal (max. 100 MHz) is measured by measuring the frequency of the trigger signal developed from the measured signal.

The counter built in the MPU for the RTO counts up to 1 MHz. Therefore, the trigger signal is counted down to 4:1 by the counter of ◇5◇ (Fig. 5-4). The resultant signal is further counted down to 32:1 by the COUNTER 1 of ◇8◇ (Fig. 5-15). Thus the trigger signal is counted down to 128:1 by the external counters. The resultant signal is fed to PC5, entrance to the counter of the MPU.
The MPU reads the frequency of the measured signal by counting the counted-down signal, and determines the sweep time automatically.

While the change of the setting state is being fed out from the MPU, the waveform display is blanked so as not to appear the disturbance of the waveform. For this purpose, the control signal is sent to the Z-CONT circuit from the output port PC3 via [80] . The H signal is fed out from PC3 in case of blanking.
The character display data is fed out from LATCH 2 IC3005 and LATCH 3 IC3004, converted into analog data by RM2232 (◇9◇) and RM2231 (◇9◇), and then fed out as analog voltages CHR-X and CHR-Y from ANALOG SWITCH IC2220 (◇9◇). The A/B ALT SEP BIAS voltage is fed out from the same terminal as that of CHR-Y.
The switching of characters, vertical and horizontal cursor patterns, and A/B ALT SEP BIAS outputs is performed by ANALOG SWITCH IC2220 (◇9◇).

The machine clock of this MPU is 12 MHz, and oscillated by ceramic oscillator X3101.
While the power is on, terminal $\overline{\text{RESET}}$ is maintained to be low by the RESET circuit until the voltage for the digital circuit power supply becomes stable.

Read of status information

Information concerning the setting state of switches on the panel is fed to ports AN0 to AN7 of the MPU as an analog signal. When one of the variable control items such as DELAY, HOLDOFF, TIME, H POS related to the X axis and the cursors (ΔV, ΔT and 1/ΔT) is selected by the SELECTOR switch, the MPU recognizes the DC output voltage of the endless variable resistor (VARIABLES) as the signal that controls the selected item, and processes the output voltage. When SINGL or SEP is selected by the SELECTOR switch, the VARIABLES is not valid. The MPU converts an analog signal into a digital signal by the built-in A/D converter, and performs various processes using the signal. Terminals AV_{DD} and VA_{REF} are input terminals of the supply voltage and the reference voltage of the A/D converter, respectively.

Read of programs and transmission of data

As many pins of MPU IC3101 are allotted to inputs and outputs, the number of pins for bus is limited. Therefore, the same bus is used on the time division basis. LATCH 1 IC3003 is the circuit which functions to separate only the address information among the common bus. The liest significant 8 bits of the memory address are output form PD7-PD0, and the most significant 8 bits are output from PF7-PF0.
The parallel data output from PD7-PD0 and PF7-PF0 are retained in IC3005 and IC3004, respectively.
The decoder to which $\overline{RD}$, $\overline{WR}$, and ALE signals are input determines the IC to be selected from ROM, RAM and latch circuits.
Fig. 5-9 illustrates the above description.

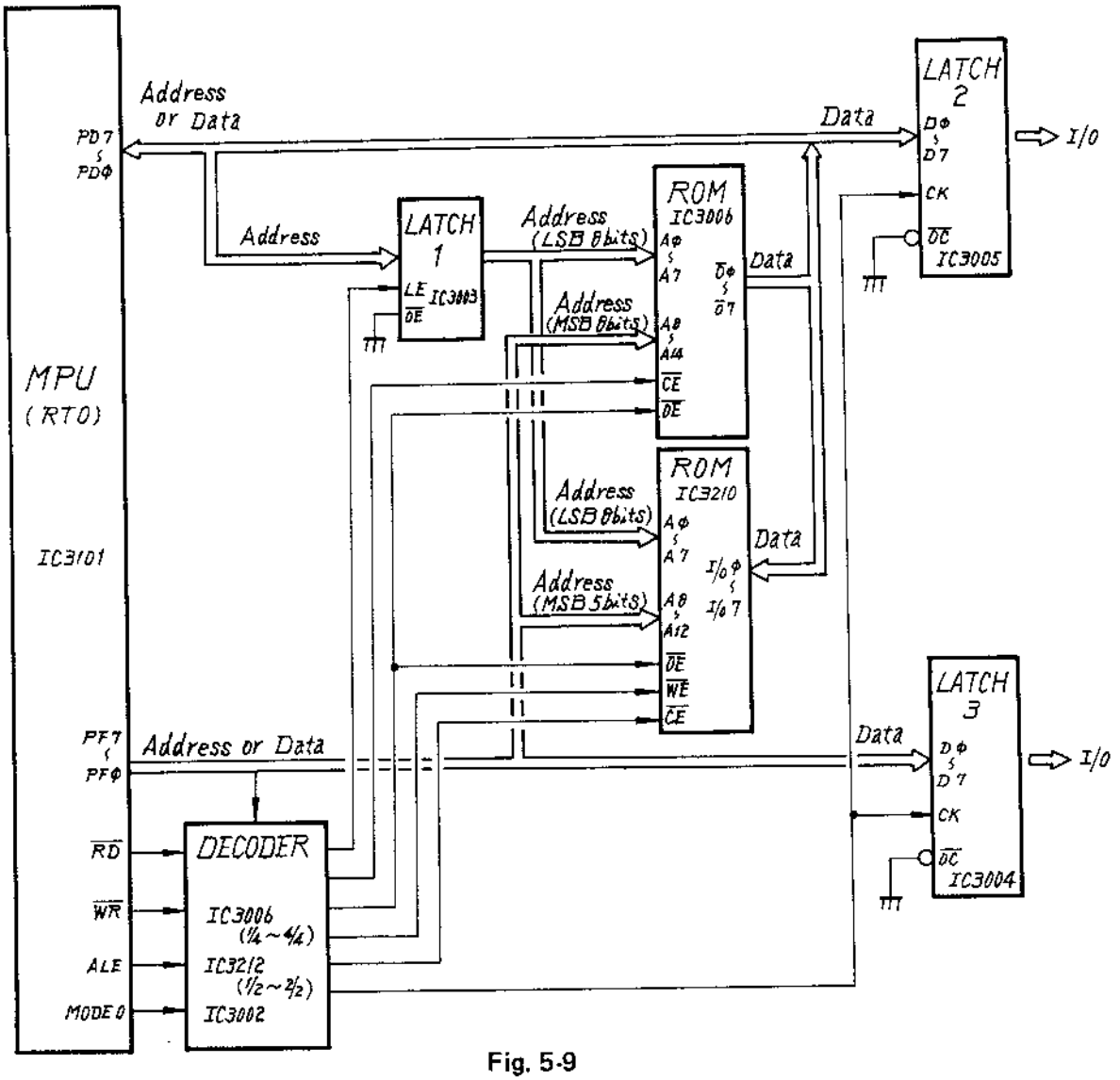


Fig. 5-9

Address information is sent to LATCH IC3003 from ports PD7 to PD0 of the MPU. At this time, terminal LE of IC3003 is high (latch enable), so that IC3003 latches this address information. Since terminal $\overline{OE}$ of IC3003 is always low, information on the latched address is transferred to ROM IC3006 immediately.

The high-order bits of address information is sent to ROM IC3006 from ports PF6 to PF0 of the MPU. At this time, $\overline{CE}$ (chip enable terminal) is low by the signals at PF7 and PF6.

(1) READ of ROM (Figs. 5-10 and 5-15)

The ALE of the MPU is the signal which determines the timing that the bus is used for address or data. Assume that the ALE goes high, the LE of LATCH 1 IC3003 goes high accordingly, and LATCH 1 is in the latch enable state. In this case, if the high-order address and the low-order address are output to PF7-0 and PD7-0, respectively, the $\overline{OE}$ (output enable) of LATCH 1 remains low. Therefore, the low-order address information of PD7-0 is output to DA7-0. Further, when PF6 low and PF7 low passes through IC3004 (4/4), the $\overline{CE}$ of ROM IC3006 goes low, and the ROM is in the chip enable state.

The polarity of the ALE is inverted by IC3212 (2/2), and the resultant signal is fed to the CK of IC3002. IC3002 latches the state of the MODE O supplied to D by the rising edge of CK (ie. rising edge of the ALE). The MODE O goes high when the ROM is in the READ mode, and low is output from $\overline{Q}$ of IC3002. When the $\overline{RD}$ goes low in this state, the $\overline{OE}$ of the ROM goes low by the operation of IC3006 (2/4). As a result, the MPU reads the data (program) of the ROM through bus PD7-0. When processing is executed in accordance with the program read by the MPU, the data on the results of processing is fed out from each port.

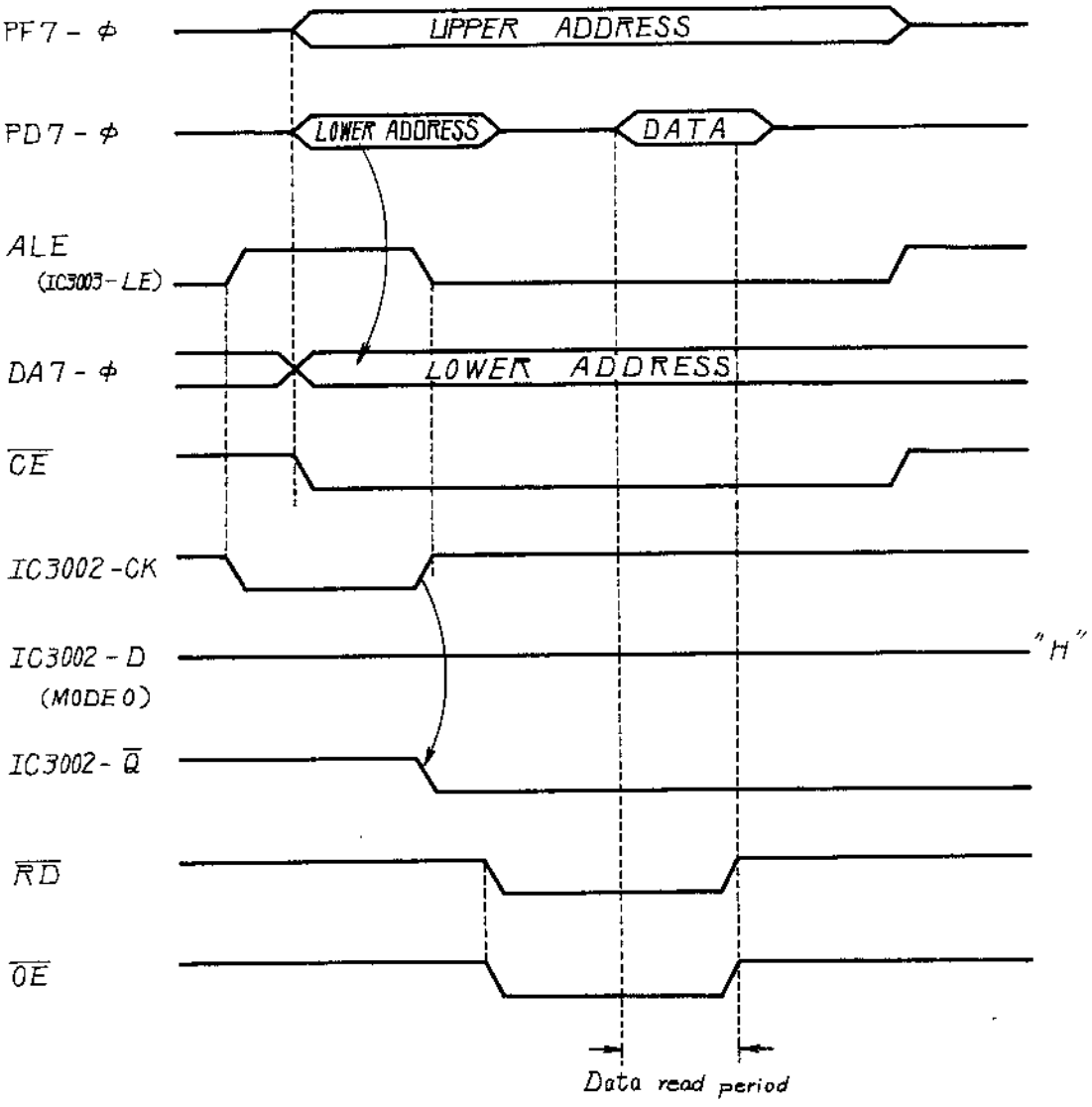


Fig. 5-10 READ OF ROM

(2) READ of RAM

When PF6 high and PF7 high passes through RAM IC3210, the output of IC3212 goes low, and the $\overline{CE}$ of IC3210 goes low. The $\overline{WR}$ goes low when the RAM is in the READ mode.

The description of (1) READ of ROM is applied except for the above.

(3) WRITE of RAM

The process until the low-order address information of PD7-0 is output to DA7-0 and the OE goes low is the same as described in (1). The process until the $\overline{CE}$ goes low is the same as described in (2).

When the $\overline{WR}$ goes low with the $\overline{Q}$ of IC3002 low, the $\overline{WE}$ of RAM IC3210 goes low by the operation of IC3006 (1/4).

As a result, the MPU writes the data on the RAM through bus PD7-0.

While the RAM is in the WRITE mode, the $\overline{RD}$ of the MPU remains in the high state.

(4) WRITE of I/O (Figs. 5-11 and 5-15)

In this mode, the MODE O goes low from high at the timing that the ALE goes high. The MODE O remains in the high state even if the ALE goes back low.

Consequently, low is output from Q by the rising edge of the CK of IC3002. During this period, the data for LATCH 2 and for LATCH 3 are output from PD7-0 and PF7-0, respectively. As low is being output from Q of IC3002, the output of IC3006 (3/4) #8 goes high when the $\overline{WR}$ goes high.

As the output of IC3006 (3/4) #8 is in the CK of LATCH, the CK goes high accordingly. The I/O data of PD7-0 and PF7-0 are latched by LATCH 2 and LATCH 3, respectively, by the rising edge from low to high.

In this case, the OE signals of ROM IC3006 and RAM IC3210 go high, and O7-0 and I/O 7-I/O0 become the high impedance state. Therefore, the ROM and RAM have no relation with the I/O data transfer.

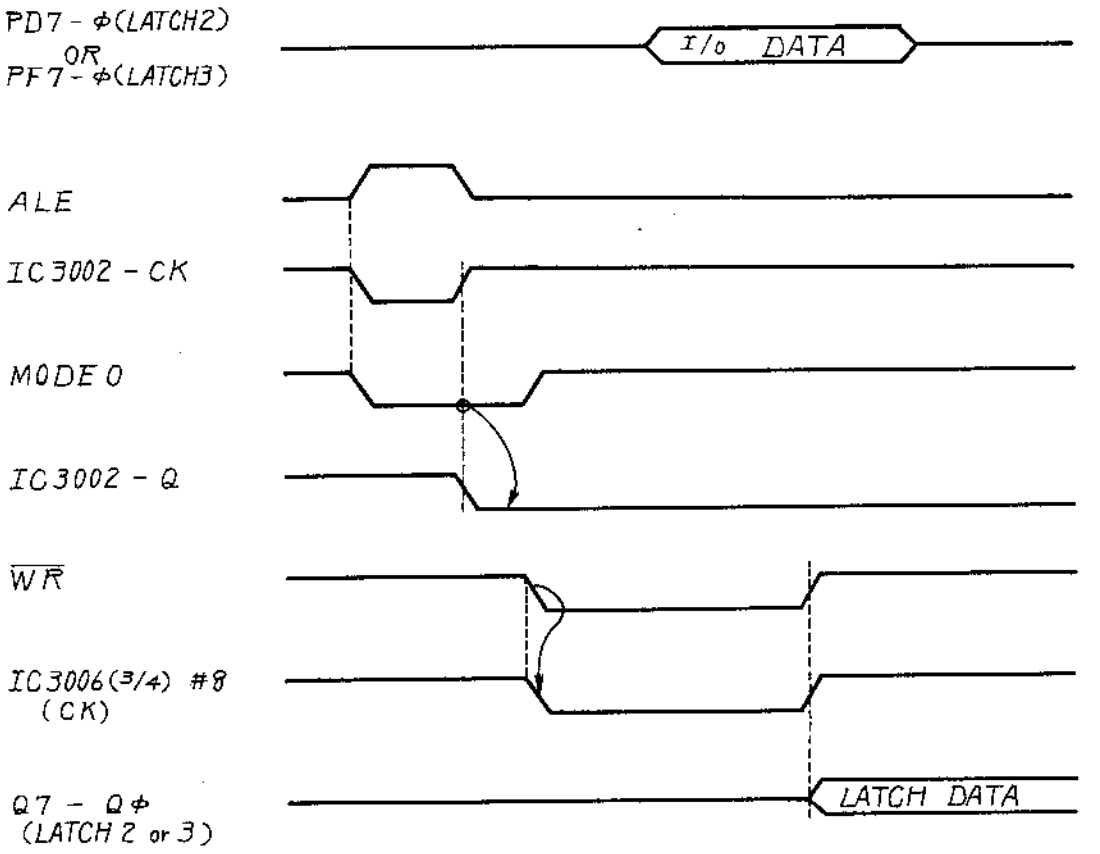


Fig. 5-11 WRITE OF I/o

Output of the analog control signal

The 8 bits output of PA7 to PA0 of the MPU for the RTO and the 2 bits output of Q7 and Q6 of IC3005 are added. The resultant 10 bits data is converted into the analog voltage by D/A 1 (RM2120), and fed to ANALOG SWITCH IC2130. D/A 1 has a resolving power of 1000, and feeds out the analog voltage between 0 and 5 V. ANALOG SWITCH IC2220 is constantly switched in the fixed order by a 3 bits control signal from PB2 to PB0.
The output voltage of the ANALOG SWITCH is maintained at the fixed voltage by a sample hold capacitor of each line. The INH signal in the high state is fed out from PB4 when the switch is changed to perform a "break before make" operation.

Transmission of serial data

The S DATA (serial data) is the digital control signal that is fed out from port PC0 of IC3101 of the MPU for the RTO. This signal is converted into the parallel signal by SHIFT REGISTER's IC2165(◇6◇), IC2166(◇8◇), IC1601(◇9◇) and IC1602(◇9◇) as the digital control signal.

There are three kinds of S DATA: A , B and C . A is the 16-bit parallel signal fed out from IC1602 and IC1601 which consist of the 9-bit signal to light the LED on the front panel and the SI SELA (1 bit) which is one of the control signals to switch an input signal to input import PC5 of the MPU. All of the 16 bits are not always used. B is the 8-bit parallel signal related to the switching of the TIME/DIV setting value of the waveform sweep and of the DISPLAY mode. This signal is fed from IC2165.

Shift registers IC2165, IC1601 and IC1602 are connected in series, and the 24 bits S DATA (A data + B data) is acquired from data input terminal SER of IC2165.

Then (A) data is allocated to IC1602 and (B) data to IC1602 and (B) data to IC2165. Data of each shift register is acquired by the clock pulse SCLK 2. To change the content of a digital control signal, a 24-bit S DATA is sent only once whatever the bit to be chanted is.

The SCLK 2 is the pulse obtained when the 500 kHz pulse that is fed out constantly from PC2 passes GATE1 (IC2107) of ◇8◇. This pulse is controlled by the output signal from PC6 and fed out only when the signal on PC6 goes high. PC6 is also used as a latch enable signal fed to the RCK terminal of IC2165 (◇6◇). Refer to ◇6◇ for the latch operation.

(C) data is the 8-bit parallel signal which consists of the information for determining the cycle period and of X-Y mode and the control signal (Ci SEL B, Ci SEL C) for the switching of IC2161(◇8◇). (C) data is fed to IC2166(◇8◇), and shifted by

the shift clock pulse SCLK1. This data is updated only when any bit of the digital control signal is needed to change, and an 8-bit S DATA is sent once. When all 8-bit data is shifted, the SCLK1 signal stops. The SCLK1 signal is also a 500 kHz pulse which passes GATE 1. In this case, GATE 1 is controlled by the PC3 output and the timing is determined by the output. IC2165 latches the 8 bits at a time. Therefore, when updating (B) data, the 8-bit shift data is latched at a time when new 8-bit serial signal is completely shifted in sequence and when the waveform display is within the blanking period. Therefore, the switching of (B) data does not effect the display on the CRT.

On the other hand, the switching of C data is performed by the shift of an 8-bit S DATA. Therefore, when the switching is performed during the sweep period, the normal display is not obtained. When the PC3 output is high, the PC3 signal (SCLK1) is sent to the Z circuit to blank the display.

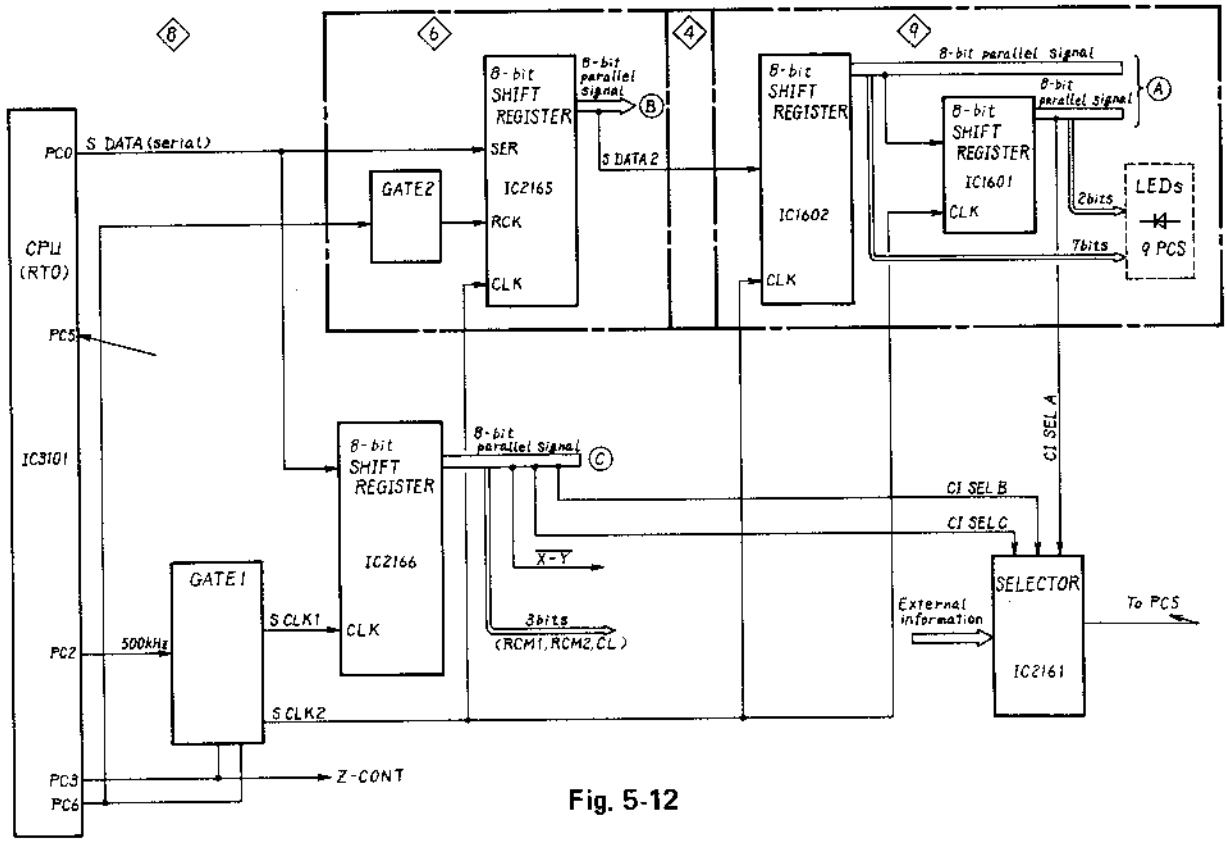


Fig. 5-12

Acquisition of a control signal

The MPU acquires external information from PC5 via SELECTOR IC2161(◇8◇). When the power switch is turned to on, the MPU reads the DC voltage of terminals D7 to D5 of IC2161, discriminates the type of this oscilloscope, and selects the applicable program memorized in the ROM. Then, the MPU reads the DLY ADJUST and SWP GATE signals from D3 and D4, and executes the automatic calibration of the delay time and the sweep time. The automatic delay time calibration is executed by converging the DLY RAMP signal by the TEST SIG fed from PC4 via [22] , the analog output DLY PRESET, from [38] and the loop circuit consisting of the feedback signals DLY ADJ and SWP GATE.

Normally the switching control signals Ci SEL B and Ci SEL C of IC2161 are low. When the Ci SEL A goes low or high, D_0 or D_1 of the analog switch is connected, and the trigger pulse of the measured pulse is counted to determine the cycle time.

Moreover, the $\overline{\text{H/O END}}$ signal from [39] , [85] and [86] and the LATCH CHECK signal from [47] are fed to the MPU to transmit the external status.

Transmission of information on characters and cursor patterns

Data of character information is output from LATCH 3 IC3004 and LATCH 2 IC3005. In other words, 3 bits data related to the Y component of information representing a character is output on PF2' to PF0', 3 bits data related to the X component of information representing a character is output on PF6' to PF4', and 5 bits data related to the X position of each character (number from first among 32 characters per line) is output on PD4' to PD0'.

After digital data related to the Y component of a character is converted to analog data by the D/A converter D/A 1 RM2232 (◇9◇), the DC voltage CUR-POS representing information about the vertical position (upper line or lower line) of a character or a cursor position is added to an analog data, and input to analog switch IC2220(◇9◇). The CUR-POS is fed out from ANALOG SW1 IC2130(◇8◇). Three bits data related to the X component of a character and 5 bits data related to the X position of each character are added, and the resultant 8 bits data is converted to the analog signal by D/A 2 RM2231(◇9◇).

Dots for cursors generated by the CURSOR DOT GENERATOR (◇9◇) are converted by D/A 3 RM2211(◇9◇), and fed to IC2220(◇9◇). Moreover, the 1 V DC voltage determining the center position of the horizontal axis of the A sweep waveform is applied to the terminal X2 of IC2220. The A/B ALT SEP BIAS voltage determining the center position of the horizontal axis of the B sweep waveform in the A/B ALT mode is applied to the terminal X3. The switching of IC2220 corresponding to these input signals is performed by the control signal $\overline{A}$ via SECTION LOGIC (◇9◇), the CUR SEL signal, and the $\overline{\text{DOT EN}}$ signal. Table 5-3 shows the detail. The horizontal or vertical position of cursors on the CRT is determined by IC2220. The vertical or horizontal movement of cursors is determined by the CUR-POS signal.

Next, the description on the cursor pattern generator circuit follows. When the MEASURE switch on the front panel is selected, the CUR RESET signal fed from the MPU goes low, the pin 10 of CURSOR DOT GENERATOR IC2248 goes high, and the oscillation starts. The oscillated clock pulse is fed to $\overline{\text{CLK}}$ of COUNTER IC2212. The output from COUNTER is converted into an analog signal by D/A 3 RM2211(◇9◇). The converted analog signal is fed out as a cursor pattern signal. Since the pin 4 of D/A 3 is grounded, cursor patterns are dotted lines.

When output D6 of counter IC2212 (◇9◇) goes high, pin 10 of CURSOR DOT GENERATOR IC2248 (◇9◇) goes low, and the oscillation stops. At the same time, the COUNTER sends the CUR END signal in the high state to the MPU from [92].

The MPU receives the CUR END signal and sends the CUR RESET signal in the high state to reset counter IC2212 via [96]. When the COUNTER is reset, D6 goes low, but pin 5 of IC2211 (2/4) is high. Consequently pin 10 of IC2248 (3/3) is low, and the CURSOR DOT GENERATOR continues to stop the oscillation. When the CUR RESET goes low and the reset is released, the oscillation starts and the above operation is repeated.

Table 5-3

Kinds of DISPLAY		Control signal			Control signal of switch IC2220		Connection of switch IC2220	Output signal of X terminal	Output signal of Y terminal
		$\overline{\text{DOT EN}}$	CUR SEL	$\overline{\text{A}}$	Terminal B	Terminal A			
Waveform display	A sweep	H	*	L	H	L	X_2 — X Y_2 — Y	1 V DC	No
	A/B ALT	H	*	H	H	H	X_3 — X X_3 — Y	A/B ALT SEP BIAS	No
Character display		L	L	*	L	L	X_0 — X Y_0 — Y	Y component of a character (added to the CUR POS)	X component of a character
Horizontal cursor display		L	L	*	L	L	X_0 — X Y_0 — Y	CUR POS	Cursor pattern
Vertical cursor display		L	H	*	L	H	X_1 — X Y_1 — Y	Cursor pattern	CUR POS

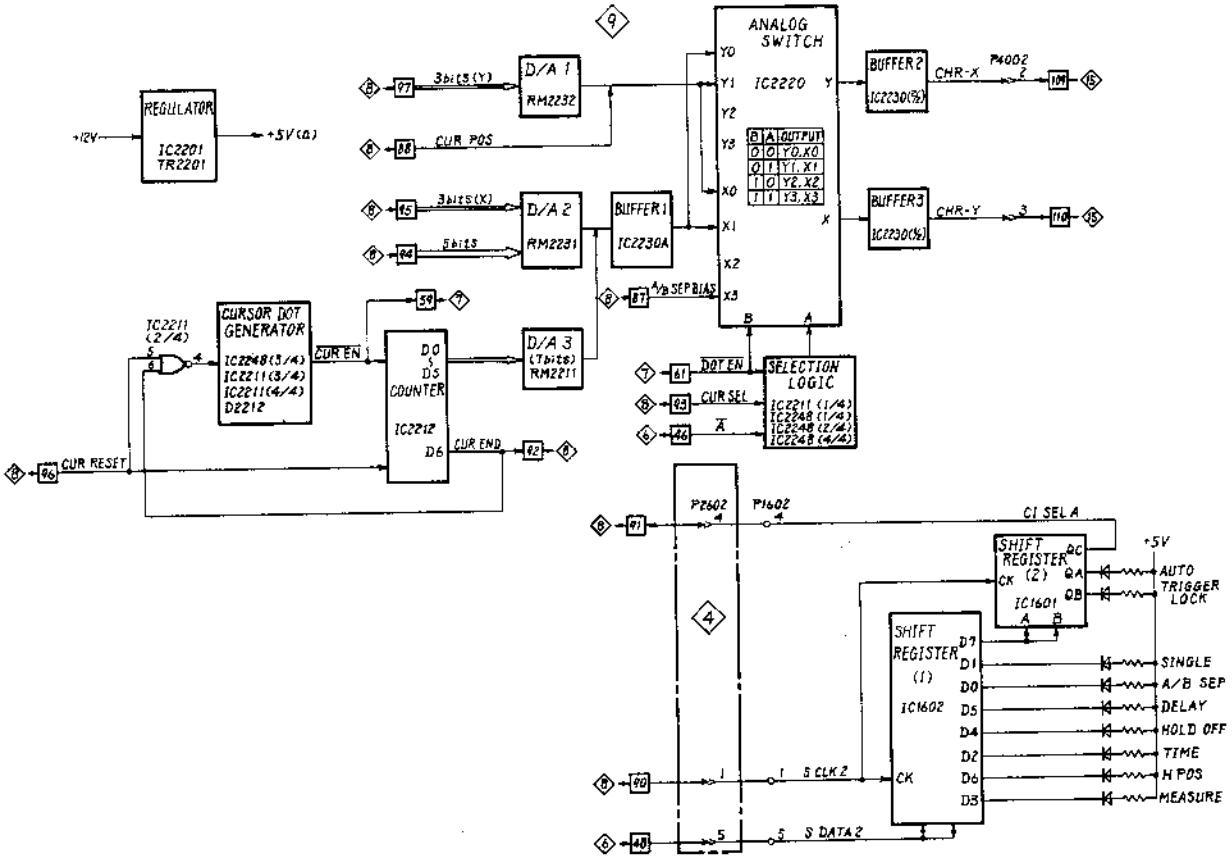


Fig. 5-13

Others

(1) The information on the settings of almost all the switches at the right half of the front panel is sent to the MPU for the RTO. The MPU judges the V MODE status by the voltage of the AN1 signal as shown in Fig. 5-14. In a similar fashion, H MODE, CH1 UNCAL, TRIGGER LOCK, etc. are judged by the AN2 signal, and CH2 UNCAL, X10 MAG, .5S, 50 ns, etc. are judged by the AN0 signal.

(2) The RXD and TXD signals are used, in the DSO mode, for the data transfer between the MPU for the RTO and the MPU for the DSO.

(3) POWER UP RESET CIRCUIT

POWER UP RESET CIRCUIT's (1) and (2) hold the $\overline{\text{RESET}}$ terminal of the MPU (RTO) to be low until +12 V and +5 V (d) reach the normal voltages after power up.

(4) MEMORY BACK UP

Under the normal operation, +5 V (d) is applied to V_{CC} of RAM IC3210 via D3062. At this time, back-up capaciter C3050 is charged. When +5 V (d) becomes lower than a specified value, +5 V is applied to V_{CC} from C3050. (Back-up duration is 48 hours.) At the same time, TR3201 becomes off and the CE signal of RAM goes high. As a result, RAM IC3210 is electrically separated, and the holding current becomes minumum.

The backup voltage +5 V BU supplied from C3050 is also routed to ◇14◇ via [101] to backup RAM IC5503 of the MPU for the DSO.

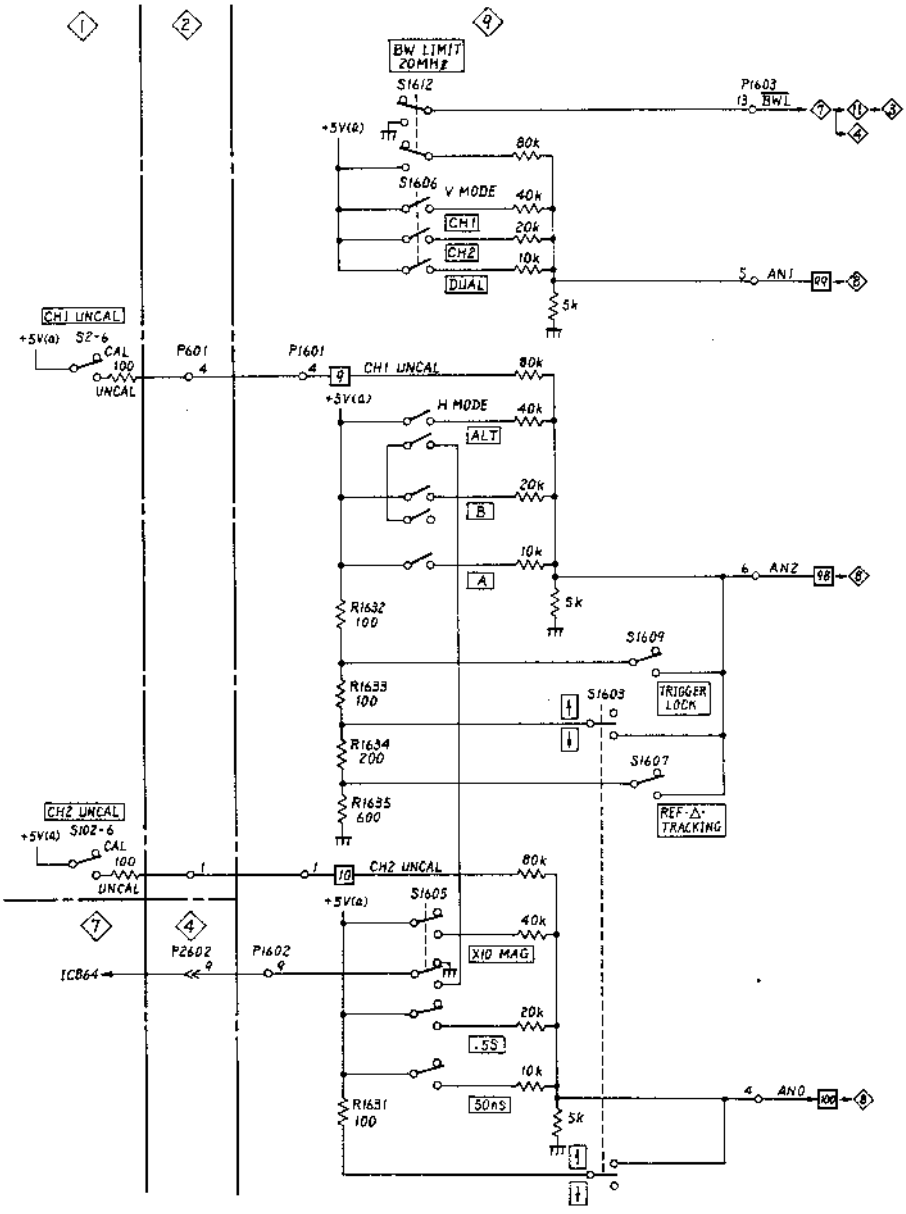

BW LIMIT 20MHz
S1612
P1603
13 BW1
+5V(a)
80k
S1606
V MODE
40k
CH1
20k
CH2
10k
DUAL
5k
5 ANJ
99
CH1 UNCAL
+5V(a) S2-6
CAL
100
UNCAL
P601
4
P1601
4
9
CH1 UNCAL
80k
+5V(a)
H MODE
40k
ALT
20k
B
10k
A
5k
6 ANZ
98
R1632
100
S1609
R1633
100
S1603
TRIGGER LOCK
R1634
200
S1607
R1635
600
REF-Δ-TRACKING
CH2 UNCAL
+5V(a) S102-6
CAL
100
UNCAL
1
1
10
CH2 UNCAL
80k
+5V(a)
S1605
40k
X10 MAG
P2602
9
P1602
9
ICB64
20k
.5S
10k
50nS
R1631
100
5k
4 AN0
100

Fig. 5-14

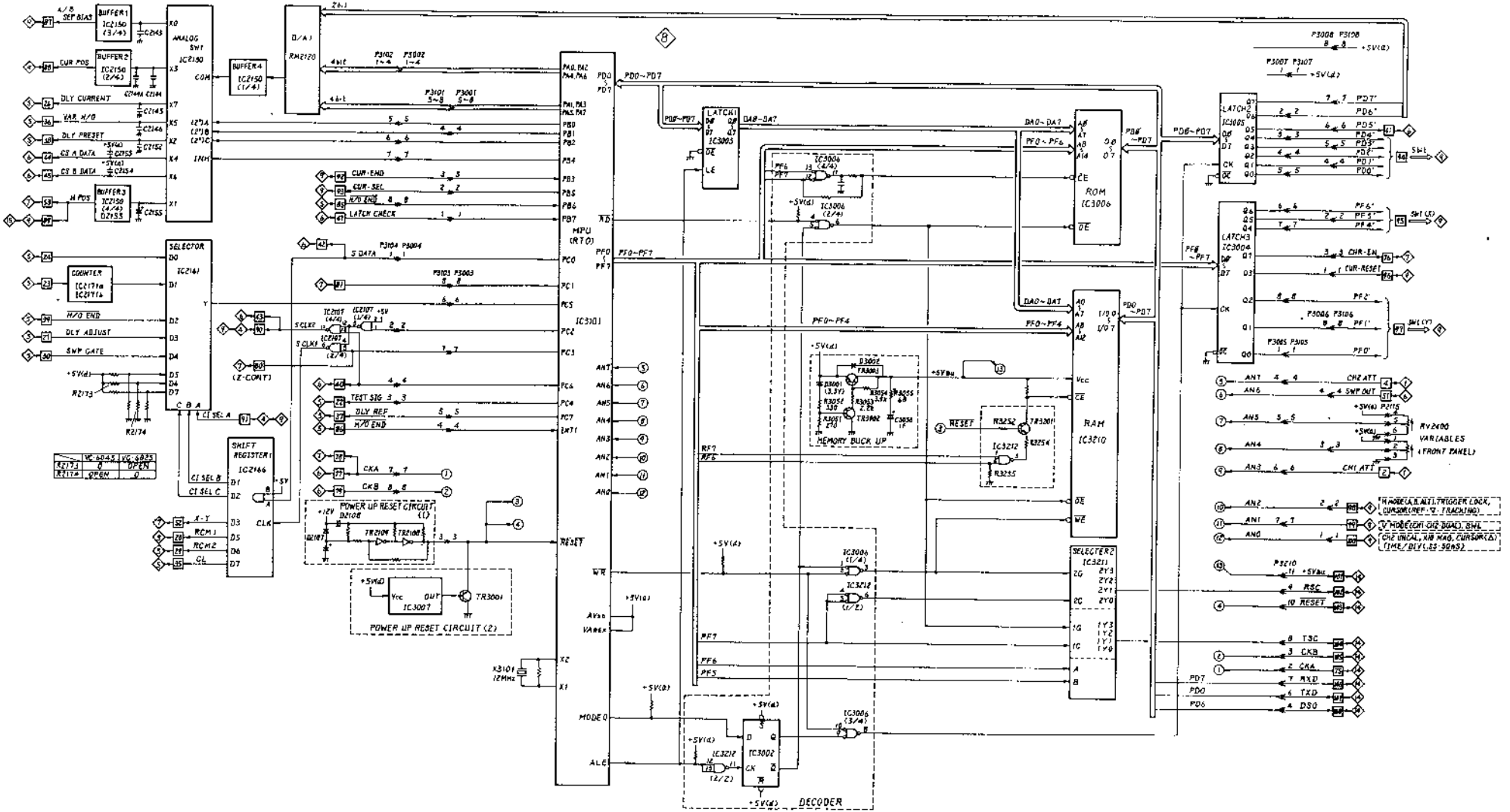

MPU (RTO)
IC3001
ROM IC3006
RAM IC3010
LATCH1 IC3003
LATCH2 IC3005
LATCH3 IC3004
SELECTOR IC2161
SHIFT REGISTER1 IC2166
ANALOG SW1 IC2150
BUFFER1 IC2150 (3/4)
BUFFER2 IC2150 (2/4)
BUFFER3 IC2150 (4/4) D2155
BUFFER4 IC2150 (1/4)
D/A1 RM2120
SELECTER2 IC3211
IC3212
IC3002
IC3007
POWER UP RESET CIRCUIT (1)
POWER UP RESET CIRCUIT (2)
MEMORY BUCK UP
DECODER
PDO~PD7
PF0~PF7
DA0~DA7
RESET
MODE0
ALE
WR
RF7
RF6
RF5
PF7
PF6
PF5
H POS
CUR POS
DLY CURRENT
VAR H/O
DLY PRESET
CS A DATA
CS B DATA
S DATA
H/O END
DLY ADJUST
SWP GATE
(Z-CONT)
TEST SIG
DLY REF
CUR-END
CUR-SEL
LATCH CHECK
CKA
CKB
RCM1
RCM2
CLK
CHZ ATT
CH1 ATT
SWP OUT
CUR-RESET
RV2400 VARIABLES (FRONT PANEL)
TSC
CKB
CKA
RXD
TXD
DSO
RSC
RESET
X3101 12MHz

Fig. 5-15

5.10 HV, CRT (⟨10⟩ 2/2)

The detailed block diagram of this circuit is shown in Fig. 5-16. This circuit consists of the following five blocks.

(1) High voltage generation circuit and the voltage regulator circuit
(VCO, PULSE AMP, SWITCH, FLYBACK TRANSFORMER & RECTIFIER, ERROR DETECTOR)

(2) Bias circuit for Grid No.1
(CHOPPER 1, DC RESTORER)

(3) Focus control circuit
(VOLTAGE DIVIDER, CHOPPER 2, DC RESTORER 2, focus and intensity control circuit)

(4) CRT

(5) Others
(TRACE ROTATION, ASTIG)

The circuit operations of the above blocks (1), (2), and (3) are described below. For details, refer to the schematic diagram HV, Z, CRT ⟨10⟩ .

(1) High voltage generation circuit and the voltage regulator circuit

(a) Voltage controlled oscillator (VCO)

The VCO supplies a positive pulse voltage from the collector of TR1002 by turning on and off TR1001 and TR1002 alternately. When the power switch is turned on, TR1001 becomes on, and C1004 starts to be charged through R1004. The charging voltage of C1004 rises the emitter voltage of TR1002 and then TR1002 becomes on. C1004 discharges immediately after TR1002 becomes on, the emitter voltage of TR1001 drops, and TR1001 becomes off. Then, C1004 is charged in the opposite direction through R1003, the emitter voltage of TR1001

rises, and TR1001 becomes on. These operations are repeated to continue generating the positive pulse.

The period of the pulse is determined by the on/off periods of TR1001 and TR1002. In other words, the period is determined by the time constants of R1003 and C1004, and R1004 and C1004 and the charging current. If the charging current is small, the pulse frequency becomes low, and the pulse width of the positive portion of the output pulse increases. Then, the energy in the primary coil of the FLYBACK TRANSFORMER (FBT) increases and the output voltage of the secondary coil increases.

(b) PULSE AMP

The positive pulse is amplified by PULSE AMP TR1010, and is supplied to the base of switching transistor TR1013 through pulse transformer T1013. The PULSE AMP amplifies the VCO output up to the level enough to drive the switching transistor and shapes the drive current waveform to minimize the cut-off loss of the switching transistor. The PULSE AMP also functions as a buffer to prevent the load variation at the output stage of the switching transistor from affecting the VCO.

(c) SWITCH

When the positive pulse is supplied to the base of switching transistor TR1013, TR1013 becomes on, the current which increases linearly flows into the primary coil of the FBT, and the energy is stored.

Even if the switching transistor becomes off, the current continues to flow in the same direction by the inductance inertia of the coil, and C1013 is charged.

The charging current decreases gradually, and the charging voltage becomes maximum when the charging current becomes zero. Then, a discharging current flows in the opposite direction through the coil.
When the voltage on C1013 becomes zero, the discharging current becomes maximum. D1013 becomes conductive by the counter electromotive force of the coil, and the current flows from the coil in the charging direction. The current decreases gradually, and becomes zero again. Later, TR1013 becomes on by the next positive pulse, and the same circuit operation is repeated. Thus, the alternate current flows into the coil and the voltage is generated at the secondary circuit.

(d) Voltage regulator circuit

This circuit detects a change in the cathode voltage of the CRT, and feeds back the change to the VCO to control the oscillation frequency so that the output voltage is regulated.
A small current flows from the base of TR1023 to the cathode line (-1650 V line in the schematic diagram) through R1035. The current is the sum of the base current of TR1023, the current through R1024, and the base current of TR1022.
For example, when the cathode voltage changes in the positive direction, the current flowing across R1035 decreases. Since the base current of TR1023 and the current across R1024 are constant, the base current of TR1022 decreases. Then, the emitter current of TR1022 decreases, and the charging current of C1004 in the VCO also decreases. Consequently, the oscillation frequency of the VCO becomes low as described in (a),

and the cathode voltage of the CRT changes in the negative direction. The secondary output voltage of the FBT is thus regulated by the feed-back loop.

(e) FBT

A half-wave rectified output of 15 kV is supplied from the secondary side of the FBT, and is applied to the electrode P3 of the CRT. A half-wave rectified signal of -1650 V is supplied to the cathode.

The heater voltage is connected to the cathode line and is the same electric potential with the cathode voltage. A -350 V pulse voltage is obtained to produce the G1 bias voltage and the focus bias voltage.

(2) Bias circuit for Grid No.1

(CHOPPER 1, DC RESTORER 1)

This circuit generates a voltage applied to G1 of the CRT. A pulse voltage is supplied from T1013 via C1040 and R1040. The positive peak voltage is limited to the CRT bias voltage (E_A) by D1040 and the negative peak voltage is limited to the output voltage (E_Z) of the Z-AXIS AMP. Then, the chopped waveform having the envelope of the difference between E_A and E_Z appears at point P (See the block diagram).

The chopped waveform is supplied to D1043 via C1041, and the positive peak voltage is clamped to the -1650 V cathode voltage. The negative peak voltage is rectified by D1042 and D1043 to produce a negative DC voltage. As a result, the signal whose DC level is shifted to the voltage lower than the cathode voltage is supplied to G1. (The waveform of the signal is the same as that of the Z-AXIS AMP output.) The high-frequency component of E_Z is directly supplied to G1 via C1043.

(3) Focus control circuit

This circuit produces a voltage applied to P1 (focus) of the CRT. The focus voltage is produced with the reference to E_{FR} (-1165 V) obtained by dividing the cathode voltage (-1650 V) and E_B at the FOCUS CENT control. Since an optimum focus voltage changes due to the variations in characteristics of the CRT, set E_B so that the optimum focus is obtained when the FOCUS and INTEN controls are set to their respective mid-positions. A pulse is supplied from T1013 via C1255 and R1260. The positive peak voltage is limited to E_B by D1282 and the negative peak voltage is limited to E_C set by the INTEN and FOCUS controls.

Then, a chopped waveform having the envelope of the difference between E_B and E_C appears at point Ⓠ (see the block diagram).

The chopped waveform is supplied to D1284 via C1256, and the negative peak voltage is clamped to E_{FR} (-1165 V).

The positive peak voltage is rectified by D1283 to generate a positive DC voltage. As a result, the voltage whose DC level is shifted to the level higher than E_{FR} is produced, and is applied to the P1 electrode as the focus voltage.

The relationship between the intensity of the CRT and the voltage for the optimum focus is not linear. Consequently, the change in E_C caused when the INTEN control is adjusted is approximated to the actual CRT characteristics using the polygonal line characteristics.

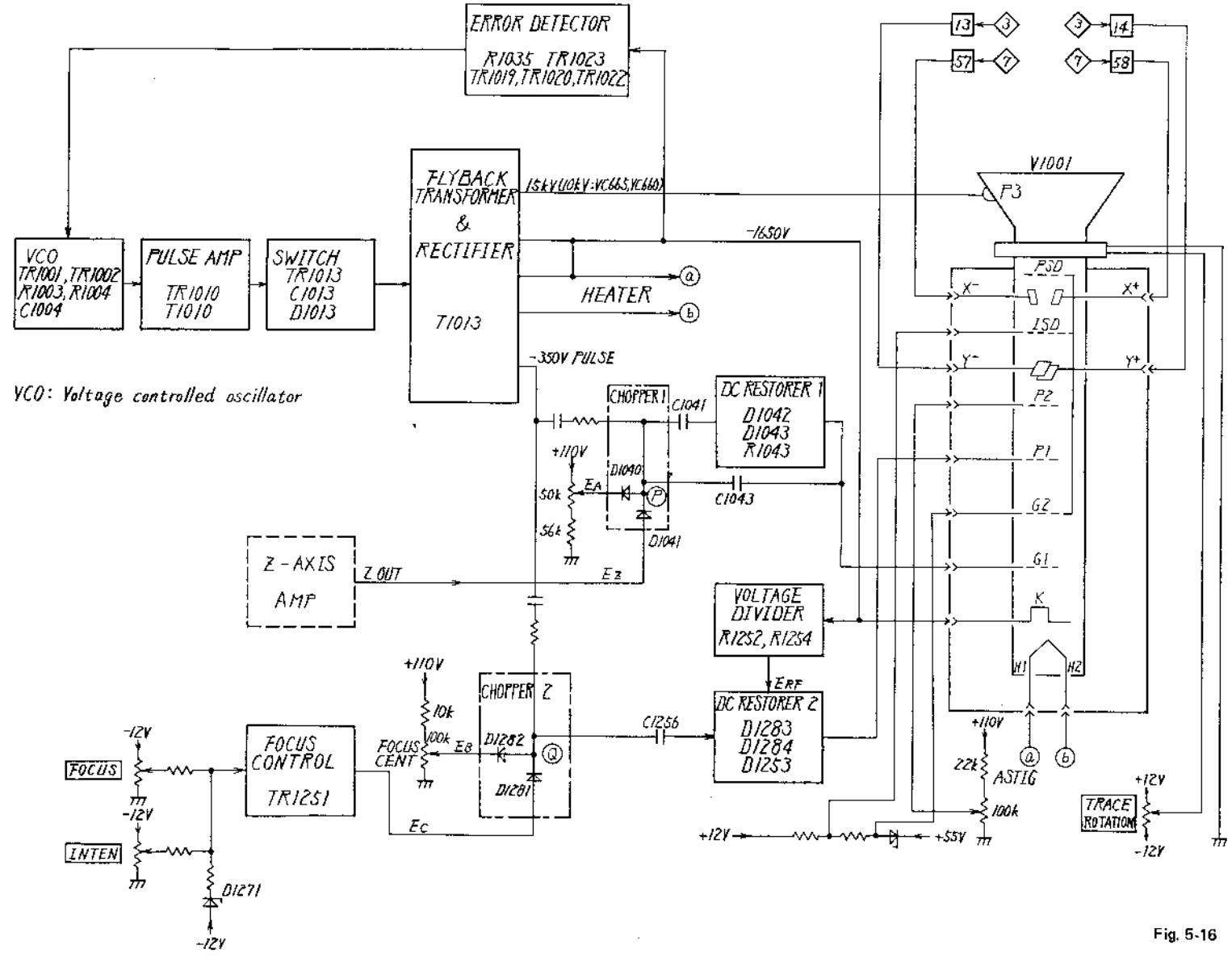

ERROR DETECTOR
R1035 TR1023
TR1019, TR1020, TR1022
VCO
TR1001, TR1002
R1003, R1004
C1004
PULSE AMP
TR1010
T1010
SWITCH
TR1013
C1013
D1013
FLYBACK
TRANSFORMER
&
RECTIFIER
T1013
15kV (10kV: VC665, VC660)
-1650V
HEATER
-350V PULSE
VCO: Voltage controlled oscillator
CHOPPER 1
C1041
DC RESTORER 1
D1042
D1043
R1043
+110V
D1040
50k
EA
56k
C1043
D1041
Z-AXIS
AMP
Z OUT
Ez
VOLTAGE
DIVIDER
R1252, R1254
ERF
+110V
10k
100k
FOCUS
CENT
Eb
CHOPPER 2
D1282
D1281
C1256
DC RESTORER 2
D1283
D1284
D1253
-12V
FOCUS
CONTROL
TR1251
FOCUS
-12V
INTEN
D1271
-12V
Ec
+110V
22k
ASTIG
100k
+12V
+55V
TRACE
ROTATION
+12V
-12V
V1001
P3
P5D
X-
X+
1SD
Y-
Y+
P2
P1
G2
G1
K
H1
H2
13
3
3
14
57
7
7
58

Fig. 5-16

5.11 POWER (⟨11⟩)

Outline

This circuit supplies the voltages to the circuit performing the NON STORE operation.
This circuit is a power supply circuit using a switching regulator, and uses hybrid IC IC1501 (STK7308) as a switching circuit. Figure 5-17 is the simplified circuit diagram of this circuit.
When switching transistor TR5 in IC1501 is on, the energy is stored in pulse transformer T1501 by the collector current. The stored energy is emitted to the secondary circuit while TR5 is off. The feedback loop circuit controls the duration of the on and off periods to control the transfer amount of energy, ie, to stabilize the output.
The description of the major functions follows.
(1) Switching operation
(2) Stabilizing operation of output
(3) Protection circuit of switching transistor

(1) Switching operation

The on and off operation is described.

(i) When the power switch is turned to on, the positive voltage is applied to the base of switching transistor TR5 in IC1501 via starting resistors R1503 and R1504, and TR5 is turned to on. Thus, the collector current Ic flows to the primary winding N1 of T1501.

(ii) The voltage induced between terminals 2 (positive) and 3 (negative) turns TR4 to on, increases the base current of TR5, and increases the collector current Ic.

(iii) When the collector current IC of TR5 reaches to saturation, the induced voltage of N2 turns to zero, and TR5 turns to off.

(iv) The energy stored in T1501 becomes a current and fed to the secondary wiring N4 (N5 through N8), and is emitted through D1513.

(v) The voltage induced at N2 (terminal 2 : positive) turns TR5 on again.

The above operations are repeated.

The collector current of TR4, ie, the base current of TR5, becomes the constant-current controlled by zener diode D1514 and resistor R9 in IC1501. (ZD3 is off because the zener voltage of zener diode D1514 is 2.4 V, and that of zener diode ZD3 in IC1501 is 5.1 V.)
When the positive feedback induced at N2 exceeds the fixed value, D1515 is conducted and then TR1514 is turned to on. Thus, the base current of TR4 is decreased, the collector current of TR4, ie, the base current of TR5 is also decreased, and the collector current of TR5 is decreased. These operations prevent the collector current of TR5 from flowing excessively.

(2) Stabilizing operation of output

The DC voltage (approx. -28V) is produced by rectifying the AC voltage fed back from winding N4 to windings N2 and N3 when TR5 is off. This DC voltage is divided, and added to the base of ERROR DETECTOR TR1 to stabilize the voltage of regulator output. In other words, the emitter potential of TR1 maintained constant by zener diode ZD1 is compared with the base potential of TR1 and the error signal is detected. This error signal is amplified by TR2, and supplied to the base of TR3, and the collector current of TR3 is thus controlled.

When the output voltage of the regulator rises, the collector current of TR3 increases, and the base current of TR4 is decreased.
Consequently, the base current of TR5 is also decreased and the saturation point of the collector current of TR5 is decreased. In other words, the amount of energy transferred to the secondary circuits of T1501 is reduced by making the on-duration of TR5 short. The voltage across R1502 is supplied to the base of TR2 through R1507 to match the timing to turn TR5 to off, ie, the timing to control the collector current of TR3 with the timing of the peak of the collector current of TR5.

(3) Protection circuit of the switching transistor

Circuit protection after turning power to on

(i) Immediately after the power switch is turned to on, triac thyristor D1502 is off, and the charging current of C1508 (and C1509) flows to R1501. This prevents the rush current from doing damage to the circuits.
The voltage induced at N2 is supplied to D1502 as a negative trigger pulse. Then, D1502 turns to on, and this power circuit becomes a steady state.

(ii) Immediately after the power switch is turned to on, the base voltage of TR1 is much higher than the emitter voltage of TR1, compared with the steady operation state, because the charging speed of C1508 and C1507 is different. As a result, the collector current of TR3 increases, and the base current of TR4 decreases. The base current of TR5 decreases, and the collector current of TR5 is limited to a small amount. After C1508 and C1507 are charged, this power circuit becomes a steady state.

Circuit for protecting the excessive current

D1502 is a 3.0 V zener diode, and determines the upper limit of the base current of TR5 together with D1503 and R1502. This prevents the excessive current from flowing to TR5.

Others

The LINE TRIG signal for the line lock is taken out from the primary line. After the signal passes through photo coupler IC1519, the waveform is shaped and supplied to the TRIG circuit via 15 .

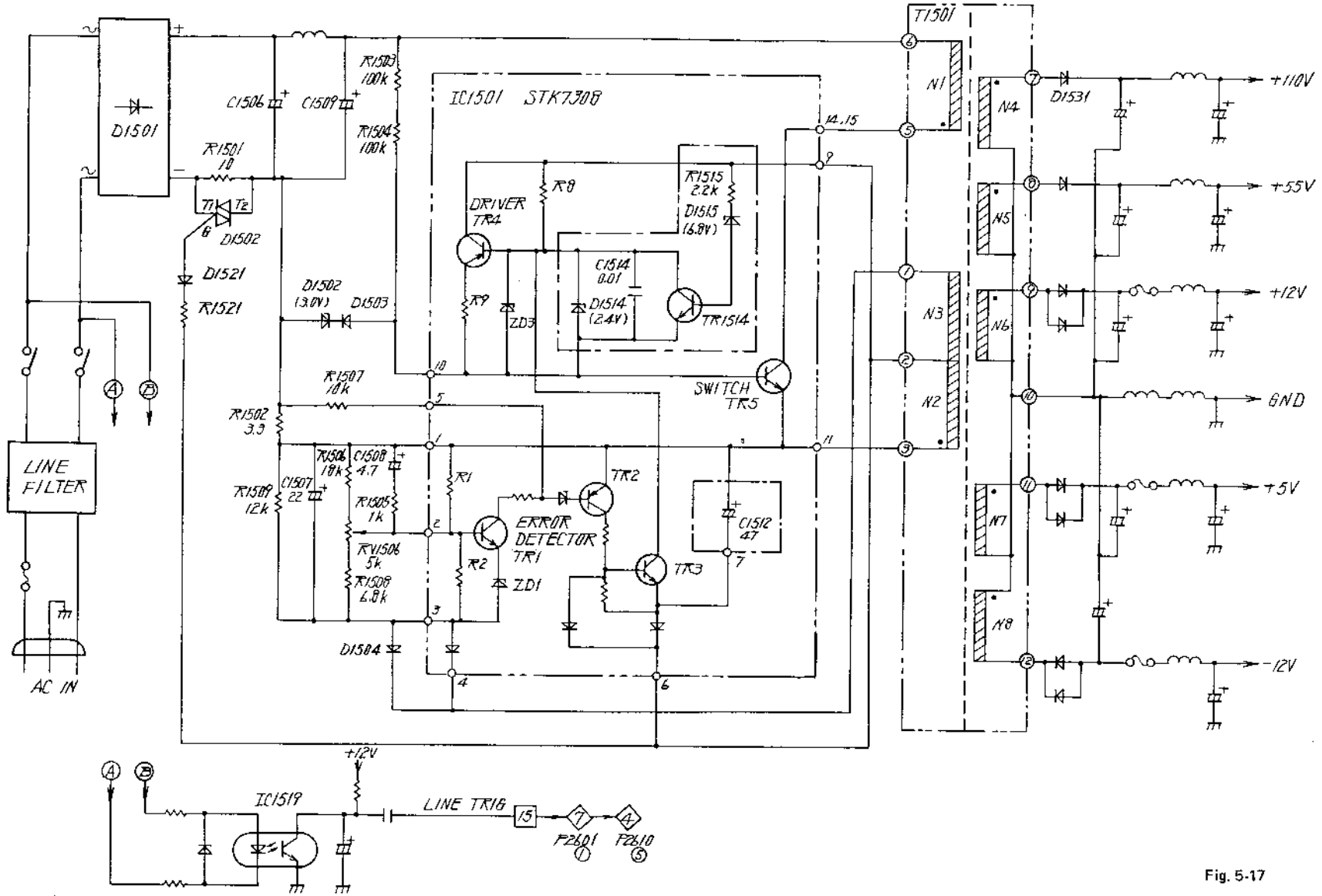

IC1501 STK7308
T1501
D1501
LINE FILTER
AC IN
DRIVER TR4
SWITCH TR5
ERROR DETECTOR TR1
TR2
TR3
TR1514
ZD1
ZD3
D1513 (6.8V)
D1514 (2.4V)
D1502 (3.0V)
D1504
D1521
D1531
+110V
+55V
+12V
GND
+5V
-12V
IC1519
LINE TRIG
+12V
P2601
P2610

Fig. 5-17

5.12 TRACK HOLDER (◇12◇)

Fig. 5-18 is a detailed block diagram of this circuit. Refer to the attached schematic diagram ◇12◇, too.

The AC signal (either of the CH1 V. SIG or CH2 V SIG signal) fed from ◇2◇ is routed to relay D8060a via [64] and [65]. The relay is controlled by the DSO signal fed from [113]. In the RTO mode, the AC signal passes through the relay, and fed out to ◇3◇ via [67] and [68].
In the DSO mode, the AC1 signal is applied to the STR V AMP, and the paraphase signal is converted into the single-ended signal. TR8062 is an emitter follower.
The output of the STR V AMP is applied to the SAMPLE HOLDER SW in the next stage. This is a high speed switch which can correspond to the sampling rate. The operation of this switch is controlled by the SW DRIVER. When (A) is high and (B) is low (Fig. 5-18), the switch is in the close state, and the signal passes through the switch. When (A) is low and (B) is high, the switch is in the open state, and the signal does not pass.
The signal which passes through the SAMPLE HOLDER SW is applied to the BUFFER. The BUFFER is of a high input impedance and a low output impedance, and the gain is designed to be 1 correctly. (The output is 1 with respect to the 1 input.)
TR8063 is a source follower and TR8066 is an emitter follower. S/H ADJ RV8060 controls an entire offset. A fine offset control for each mode is made in ◇14◇. The amplitude of the input of the A/D converter is limited (The maximum amplitude is determined), and the output of the BUFFER is designed to be 0 ±0.5 V. Namely, the voltage of -0.5 to +0.5 V at the output point of the BUFFER corresponds to 10 div on the CRT. (Correct A/D conversion is not ensured to the signal in excess of the

voltage range.) The SH CLK signal from [112] is converted into the differential signals (SH CLK and $\overline{\text{SH CLK}}$) by the CURRENT SW. The rising edge of the SH CLK is a sampling point.

REALTIME SAMPLING

In the real time sampling mode, the SH1 CLK is always low and $\overline{\text{SH CLK}}$ is high. Consequently, TR8068 is off and TR8069 is on. (A) goes high and (B) goes low. Thus, the SAMPLE HOLDER SW is in the close state, and the signal always passes.
In the equivalent time sampling mode, the SH1 CLK goes high and the $\overline{\text{SH CLK}}$ goes low at the sampling point. Consequently, TR8068 is on and TR8069 is off. A in Fig. 5-18 goes low and B goes high. Thus the SAMPLE HOLDER SW is in the open state, and HOLD CAPACITOR C8064 holds the voltage at the sampling point.
Before the $\overline{\text{SH CLK}}$ goes low and the $\overline{\text{SH CLK}}$ goes high at the end of a sweep, the voltage of the HOLD CAPACITOR is converted into the digital signal in the A/D converter (◇13◇) via the BUFFER and the AMP (◇13◇), because the operation speeds of the BUFFER, the 2X AMP and the A/D converter are slower than the switching speed of the SAMPLE HOLDER SW.

The CLAMPER (1) is provided to:
(1) limit the voltages at (A) and (B) in a given range when the SAMPLE HOLDER SW is off, and
(2) limit the output range of the BUFFER (1).

TR8065 is an emitter follower, and the clamp voltage tracks the output voltage. The tracking range is limited to ±0.7 by D8067.

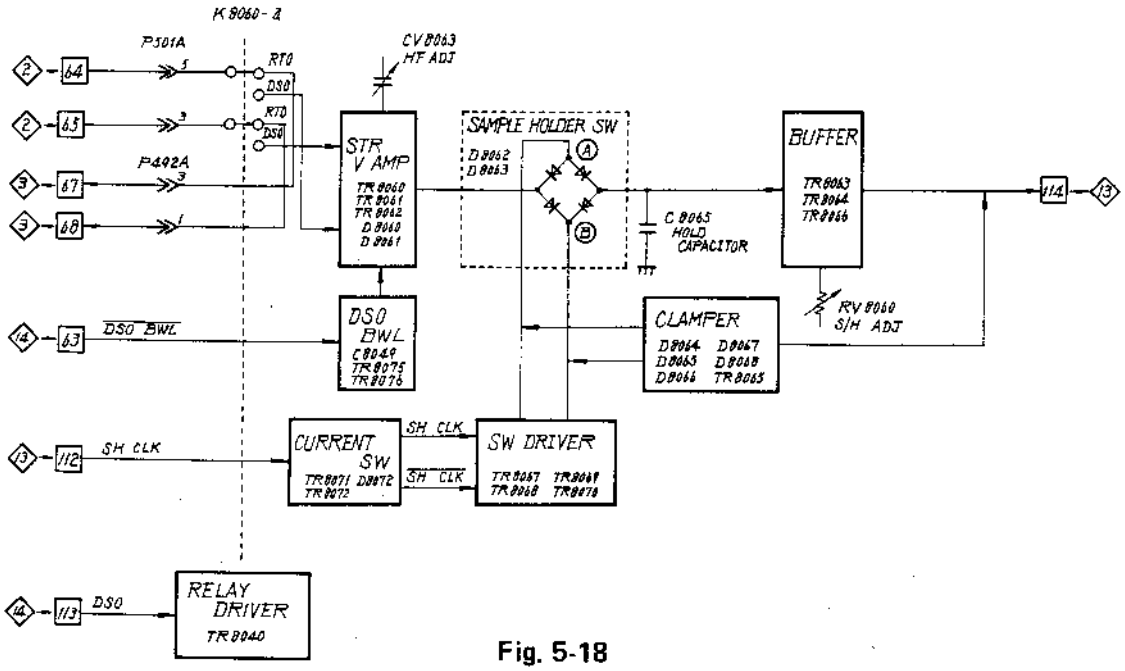


Fig. 5-18

5.13 AD DRIVER & ACQ MEMORY (13)

For this circuit, refer to the schematic diagram 13 , the detailed block diagram Fig. 5-19 and the timing chart Fig. 5-20.

STR V.AMP

The STR V AMP (1) consists of TR5201, TR5202, TR5203, etc. The S/H (sample holder) output of around zero volts is fed to the input (TR5201 base) of this amp via 114 . From this amp, the signal around +2.5 V (+2.5 V ±1 V) which is suitable to the A/D input in the following stage is fed out.

The gain of this amp is approximately 3 times, and controlled by AD1 GAIN RV5201. The CURRENT SOURCE (1) consisting of TR5202 and its peripheral circuits functions to offset the center of the output voltage of this amp to +2.5 V.

To make the center voltages in the normal sampling mode and the equivalent sampling mode equal, the offset voltages in both

modes are controlled by AD1 NORM OFFSET RV5202 and AD1 EQ OFFSET RV5203. These two controls are switched by the ANALOG SW(1) that is controlled by the EQ CK EN signal.
As the A/D (2) is not used in the equivalent sampling mode, the switch of this kind is not provided for the STR V AMP (2).
The upper and lower limits of the output voltage of this amp are controlled by TR5206 and TR5207, respectively. Normally, the voltage between the base and emitter of each limiter is biased reversely, and both transistors are in the off state.

A/D CONVERTER

The input range of the A/D (1) is from +1.5 to +3.5 V.
Consequently, the lower limit voltage is applied to the V_{RT} terminal from the VOLTAGE FOLLOWER (1), and the upper limit voltage is applied to the V_{RB} terminal from the VOLTAGE FOLLOWER (2). The A/D (1) is an 8-bit flash A/D converter, and the A/D conversion is performed at each rising edge of the clock signal.

ACQ MEMORY

The ACQ MEM (1) is a 2KB (2048 words x 8 bits) serial access memory (SAM). As this circuit incorporates the counter for address memory generation, the external address signal is not needed, and the address scan becomes the serial access.
The internal address counter increments the address one by one from the clock pulse and is resets to zero address by the reset pulse. After data is written in address zero to 2047, the internal counter is reset to zero, and data is written.

Equivalent sampling pulse generator circuit

For this circuit, refer to the EQV SPL section in Fig. 5-19, and the timing chart Fig. 5-20.
COUNTER IC5302 is a 12-stage binary counter. This counter is activated at the falling edge of the clock input (CK). When

the clear input (CLR) goes high, the counter is reset regardless of the clock input, and all the outputs go low.
The A SWEEP GATE signal form [73] is fed to CK. This gate signal is developed, based on the trigger signal in the RTO mode. Therefore, this counter is counted at each sweep.
The counter output is converted into the analog signal by D/A RM5301, and fed to the ⊕ input terminal of COMPARATOR IC5304 via AMP IC5303. This ⊕ input voltage increases every sweep. On the other hand, the SWEEP RAMP signal as shown in Fig. 5-20 is fed to the ⊖ input terminal.
When the SWEEP RAMP voltage exceeds the COMPARISON VOLTAGE fed to the ⊕ terminal, the "L" is output from the COMPARATOR.
The COMPARATOR output is fed to ◇12◇ as the SH CLK via IC5306 (2/2) and the BUFFER & LEVEL CONVERTER. The rising edge of the SH CLK becomes a sampling point. In the BUFFER & LEVEL CONVERTER, a TTL level is converted into an ECL level. Whether the SH CLK is fed out or not is determined in IC5306 (2/2) by the EQ CKEN signal, which goes high in the equivalent sampling mode.

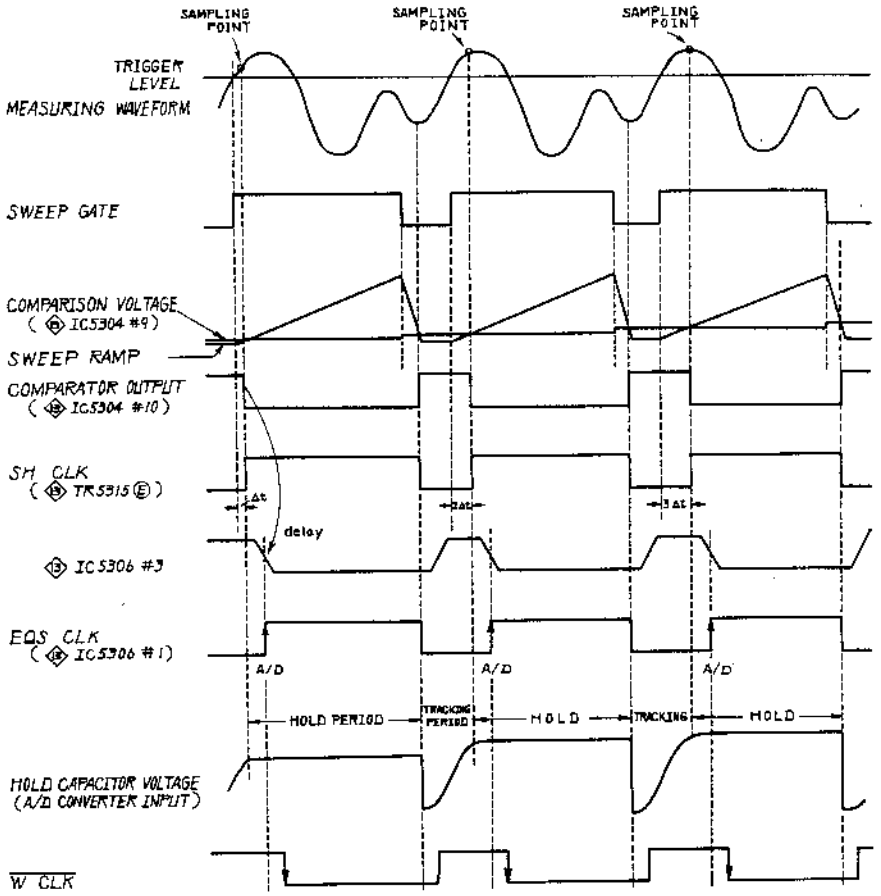


Fig. 5-20 *EQUIVALENT SAMPLING*

Part of the COMPARATOR output becomes the EQS CLK (equivalent sampling clock) via IC5314 (2/2) and IC5306 (1/2). In the equivalent sampling mode, the EQS CLK is fed to the CLK terminal of the A/D (1), and its rising edge performs the A/D conversion.

The A/D conversion is performed a little behind the sampling point by the delay circuit consisting of R5314 and C5409.

TBC and ACQ control circuit (Lower half of Fig. 5-19)

The operation of this circuit is classified into 6 as listed in Table 5-4.

(1) is the basic operation. Therefore, the differences from (1) are described in (2) to (6).

Table 5-4

Operation mode	Sampling	Sampling clock freq.	Item	TIME/DIV	Remark
Equivalent sample	Equivalent sampling	——	(6)	50 ns - 2 µs	
Realtime sample	Realtime sampling	40 MHz	(4)	2.5 µs	VC-6045 only
		20 MHz	(3)	5 µs	
		10 MHz	(2)	10 µs	
		5 MHz - 1 kHz	(1)	20 µs - 0.1 s	Basic operation
ROLL		500 Hz-2 Hz	(5)	0.2 s - 50 s	

(1) 20 µs/div - 0.1 s/DIV

The 20 MHz pulse is always fed out from the terminal F of OSC X5301. The pulse obtained by dividing this pulse is fed out from the terminal D. The output frequency from the terminal D is changed according to the TIME/DIV range setting, and controlled by OSC's A, B and C. (Table 5-5)

Table 5-5

TIME/DIV	OSC A	OSC B	OSC C	Terminal D output
50 ns - 2 µs	——	——	——	——
2.5 µs - 0.1 s	L	L	L	10 MHz
0.2 s - 5 s	H	H	L	1.25 MHz
10 s	L	L	H	625 kHz
20 s	H	L	H	312.5 kHz
50 s	H	H	H	78.125 kHz

COUNTER/TIMER IC5310 is a programmable counter/timer and has three 16-bit counters. The counter 0 (CLK 0, GATE 0 and OUT 0) is used as a divider, and the counter 1 (CLK 1, GATE 1 and OUT 1) is used as a pretrigger timer. The used counter is selected by A0 and A1.

Data is sent to D0 to D7 in three parts per processing.

1st ··· To which function data is used (counter or timer)

2nd ··· 8-bit data (including the dividing ratio per TIME/DIV setting) — 16 bits in total

3rd ··· 8-bit data

The maximum input frequency of COUNTER/TIMER IC5310 is 10 MHz, and its maximum output frequency is 5 MHz.

Consequently, the OSC output is fed to SELECTOR 2 IC5309 directly or via the counter 0 of the COUNTER/TIMER according to the TIME/DIV setting.

In case of the setting range from 20 µs/DIV to 0.1 s/DIV, a 10 MHz pulse is fed out from the terminal D. This pulse is fed to the CLK 0 terminal of the COUNTER/TIMER, and the pulse divided in accordance with the TIME/DIV setting is fed out from the terminal OUT 0.

The output frequency of the terminal OUT 0 may or may not coincide with the sampling clock frequency. This is determined by the model number, single trace operation or dual trace operation, TIME/DIV range settings, etc.

The output from the terminal OUT 0 is fed to the 1B terminal of SELECTOR 1 IC5550, and further fed to the terminals 1C2 and 1C2 of SELECTOR 2 IC5309 from the terminal Y1.

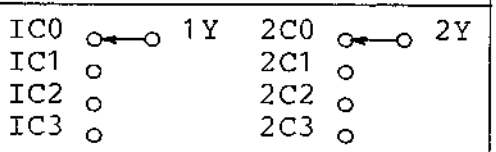
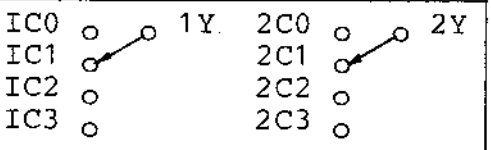
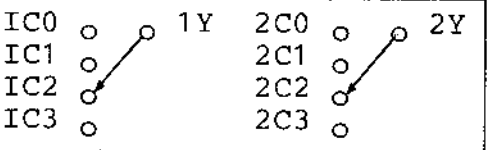
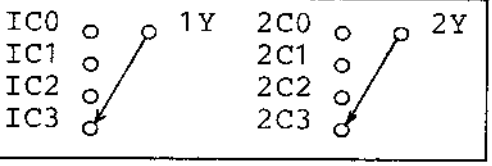
The pulse fed to the terminal 1C2 is fed out from the terminal 1Y, resulting in the A/D1 CLK and the $\overline{\text{W CLK1}}$.

The pulse fed to the terminal 2C2 is fed out from the terminal 2Y, resulting in the clock which counts the number of sample.

The SELECTOR 2 is the switch which selects the desired

clock. The two sets of switches are switched similarly by the control signals CK SEL A and CK SEL B at the same time.

Table 5-6

	CK SEL A	CK CEL B	Switch connection
20 MHz	L	L	
10 MHz	H	L	
Less than 5 MHz	L	H	
ES CLK (Equivalent sampling)	H	H	

IC5316 (4/4) and IC5316(3/4) form the gate circuit. When pin 13 goes low, the clock fed to pin 9 passes this gate. This gate enters exclusive OR circuit IC5314 (4/4) at pin 10, and exclusive OR circuit (2/4) at pin 5. As pin 9 is low, the clock fed to pin 10 is fed out from pin 8 as is, resulting in the W CLK1. When the 40M ADC signal fed to pin 4 goes low, the clock fed to pin 5 is fed out from pin 5 as is, resulting in the WCLK2.

In this case, the WCLK1 and the WCLK2 are quite identical. When the 40M ADC signal is high, the clock fed to pin 5 is reversed and fed out from pin 6, resulting in the WCLK2. In this case, the phase of the WCLK1 is opposite to that of the WCLK 2.

The relationship between the A/D CLK and the A/D2 CLK is the same with that between the W CLK1 and the WCLK2.

Pin 12 of IC5315 (3/4)is low except for the ROLL mode. Consequently, the WCLK1 fed to pin 13 is fed out from pin 11 as is, and fed to pin 2 of IC5312 (1/4) and pin 5 of IC5312 (2/4). During the write period, as the ACQ1RD, IORD and ACQ2RD are all high, the WCLK1 is fed out from IC5312 (1/4) and IC5312 (2/4) as is, resulting in the R CLK1 and the RCLK2, respectively. As described above, the write clock and the read clock are identical during the write period. During the read period, the ACQ1RD, IORD and ACQ2RD go low at the respective timings. Consequently, the RCLK1 and the RCLK2 are controlled by IC5313 (2/3) and IC5313 (1/3), respectively. OE1 connects the ACQ MEM(1) to the data bus during the read period.

Next, the counter 1 (GATE1, CLK1 and OUT1) of COUNTER/TIMER IC5310, FF1 and FF2 are discussed below.

Normally, the contents of the ACQ memory is updated one by one according to the realtime sampling. However, it happens to stop the data update in the course of processing. For example, this happens when memory is reset or when the setting of TIME/DIV is changed.

When it is needed to stop updating data of the ACQ memory, the TRIG EN signal fed to D1 and R1 of FF 1 goes high.

The rising edge of the GATE (A sweep gate) signal fed to CK1 latches the signal, and the latched output is fed out from Q1. The Q1 output is synchronized to the write clock by FF2 and fed out from Q2.

When 1024 clocks enter COUNTER/TIMER IC5310 at CLK1 after the GATE1 input changes from low to high according to the Q2 output, the OUT1 output changes low to high. The clock frequency to CLK1 changes according to the TIME/DIV setting. While the OUT1 is low, the 1Y output of SELECTOR2 passes through gate IC5316 (3/4 and 4/4), and the write clock is supplied to the ACQ memory.

When the OUT1 output goes high, pin 8 of IC5316 (3/4) is tied high, and the 1Y output of SELECTOR2 can not pass through gate IC5316 (3/4 and 4/4). Consequently, the write clock is not supplied to the ACQ memory, resulting in stopping the acquisition of data into the ACQ memory.

(2) 10 µs/DIV

In this case, the sampling frequency is 10 MHz and the 10 MHz pulse fed out from the terminal D of OSC X5301 is fed directly to SELECTOR2 IC5309. The other operations are the same with (1).

(3) 5µs/DIV

In this case, the sampling frequency is 20 MHz, and the 20 MHz pulse from the terminal F of OSC X5310 is fed directly to SELECTOR2.

FF3 and FF4 are the time measuring circuits, which are related to the 20M and 40M sampling. In case of the 20M sampling, the phase relation between the sampling clock and the ACQ trigger signal is checked according to the TRG 10M signal state, because the sampling capability and the count capability are different. Other operations are the same with (1).

(4) 2.5 µs/DIV (VC-6045 only)

In this case, the 40 MHz sampling frequency is required. However, the capability of the A/D converter is 20 MHz max. Consequently, two A/D converters are used, and the 40 MHz sampling is performed by reversing the phase of the A/D clock with respect to that of the other A/D clock.

Further, the relationship between the sampling clock and the ACQ trigger signal is checked from the status of the TRG 10 and the TRG 20M. The 40M ADC signal from OUTPUT PORT IC5307 is high.

(5) 0.2s/DIV - 50 s/DIV (ROLL mode)

When the TIME/DIV switch is set to this range, the ROLL

mode is automatically established. Each time when the ACQ memory acquires one data in the ROLL mode, the data is transferred to the buffer memory in the RAM. Thus, data is stored in the buffer memory during a specified duration. The number of the stored data changes in accordance with the TIME/DIV setting.

The data of the ROLL memory in the RAM is updated at a unit of the stored data amount. The ROLL memory facilitates the processing of waveforms in the ROLL mode. Later the display memory data in the same memory RAM is updated at a unit of the same data amount. When updating the ROLL memory and the display memory, data is shifted so that the oldest data is stored at the address 0.

Two display memories are provided for one channel. When the content of the first display memory is displayed on the CRT, the data of the second display memory is updated. During this time, the contents of the first display memory are displayed at a constant interval.

When the update of the second display memory finishes, the display memory changes from first to second, and the contents of the second display memory is displayed on the CRT. The same procedures are repeated between the two display memories.

The Write Enable Control (WECONT) signal goes high when acquiring data in the ACQ memory. When the WECTL signal goes high, the reset of FF5 and FF6 is released, and the Q6 output goes high. Pin 8 of IC5312 (3/4) is low even when the Q6 output goes high in the modes other than ROLL. Consequently, D7 of FF7 goes low, and $\overline{\text{INT}}\ \phi$ goes high.

The output of the set-reset FF consisting of IC5316 (1/4,2/4) and IC5305 (2/5) is also low.

When the ROLL mode is established and the ROLL signal fed to pin 10 of IC5312 (3/4) goes high, pin 8 of IC5312 (3/4)

goes high. Consequently, D7 of FF7 goes high.
When D7 goes high, the INT ϕ signal remains high, and changes from high to low at the rising edge of the clock fed to CK7.
The INT ϕ signal is an interrupt signal. When the MPU for the DSO detects that the INT ϕ goes low, the MPU issues the instruction "Read Data." According to this instruction, the ACQRD and IORD go low.
As a result, this output of pin 11 of IC5312 (4/4) goes low, FF7 is reset, and the INT ϕ changes from low to high. Thus, the reading of one piece of data in the ROLL mode finishes.

(6) 50 ns/DIV - 2 µs/DIV (Equivalent sampling mode)
In this case, the EQS CLK fed out from pin 1 of IC5306 (1/2) is fed out from terminals 1Y and 2Y of SELECTOR 2 IC5309.

(7) Channel selection in the storage mode (CKA and CKB signals)
Refer to Fig. 5-21.
The channel selection in the RTO mode is performed by the $\overline{CH1}$ and $\overline{CH2}$ signals. In the storage mode, the channel selection is performed by the CKA signal. The channel selection of the A/D converter is performed by the CKB signal.
Two operating modes are available for the dual trace operation in the storage mode, and they are switched as follows according to the TIME/DIV range settings. (VC-6025 and VC-6045)

50 ns/DIV - 0.5 ms/DIV --- ALT mode
(in dual trace operation)

1 ms/DIV - 50 s/DIV ------ CHOP mode
(in dual trace operation)

In the CHOP mode, the $\overline{CHOP}$ signal goes low, and 1Y and 2Y are connected to 1A and 2A, respectively, in SELECTOR 1

IC5500 (◇13◇). In the mode other than CHOP (including ALT), the $\overline{\text{CHOP}}$ signal goes high, and 1Y and 2Y are connected to 1B and 2B, respectively.

As known from Fig. 5-21, the CKA is divided by 2 by IC2160 (◇6◇), and the outputs Q and $\overline{\text{Q}}$ become the CH2 DSP and $\overline{\text{CH1}}$ DSP signals, respectively. In other words, the channel selection of the A/D input signal is performed by the CKA signal in the storage mode. The Q output also becomes the CKB signal, and becomes the AD clock in the CHOP mode.

Fig. 5-22 illustrates the relationship among the CKA, CKB, AD clock and AD input signals.

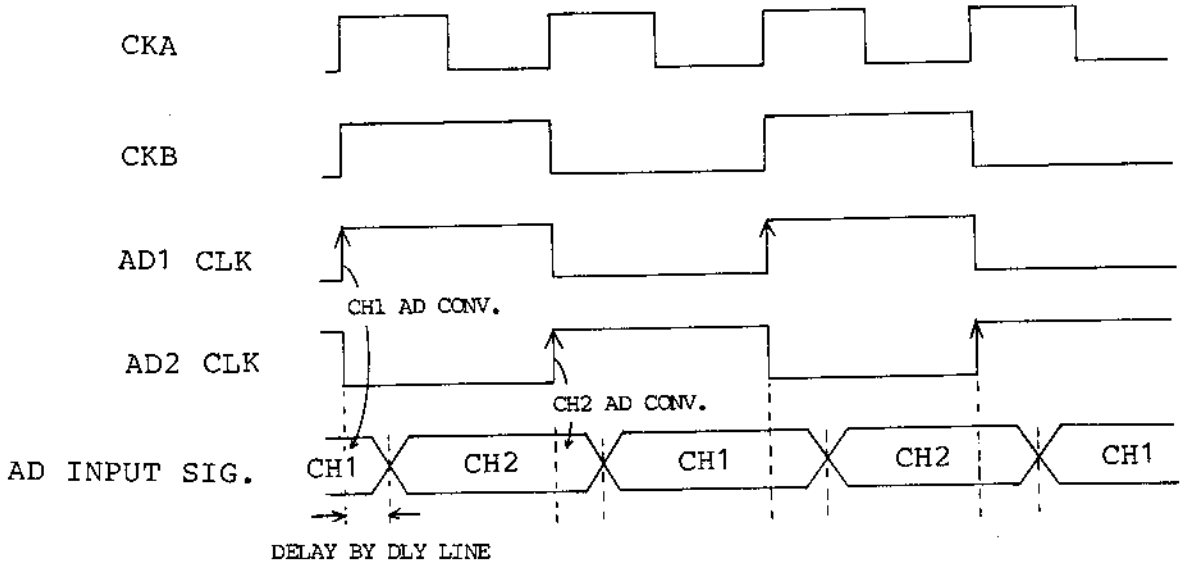


Fig. 5-22

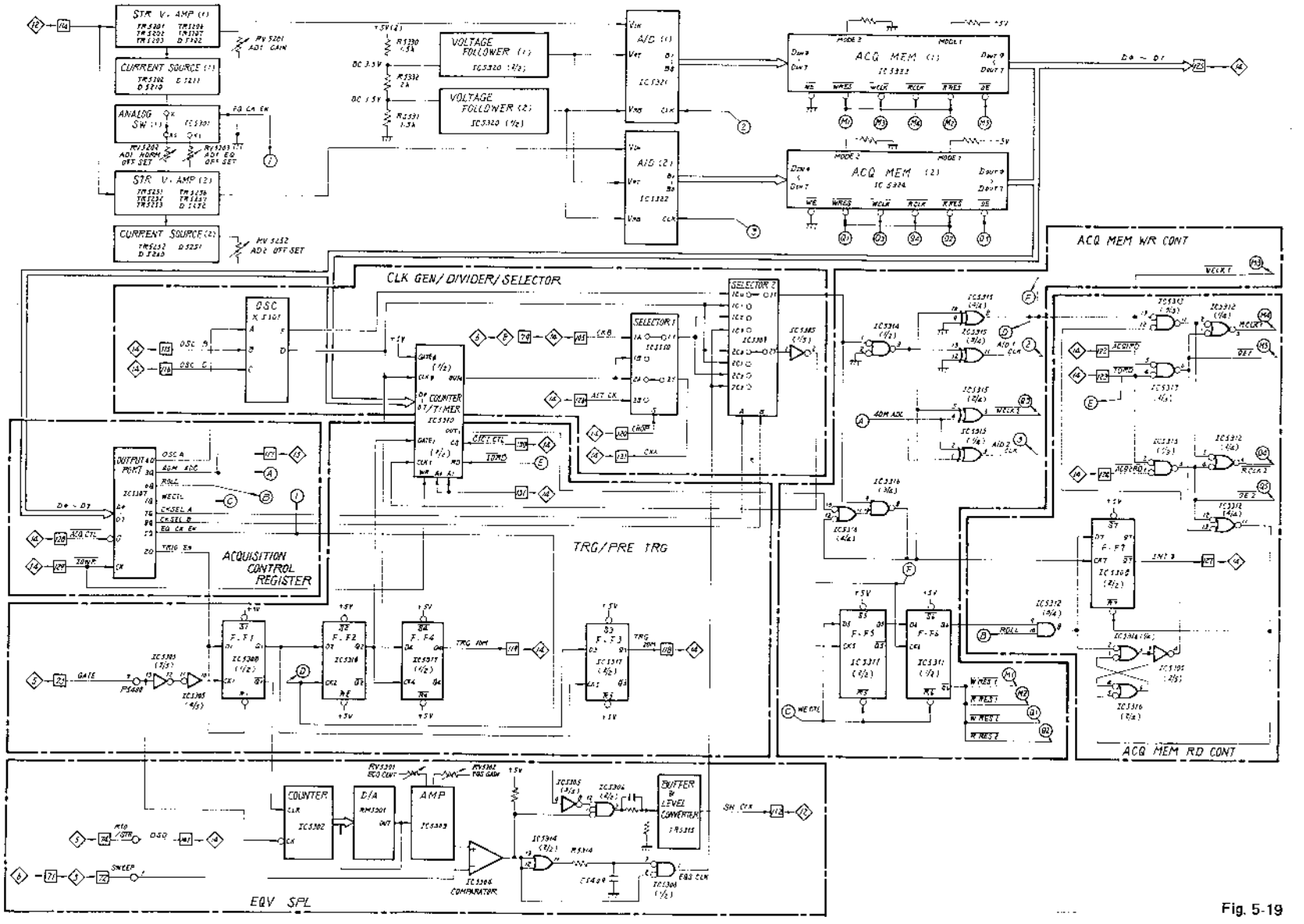

STR. V. AMP (1)
CURRENT SOURCE (1)
ANALOG SW (1)
STR. V. AMP (2)
CURRENT SOURCE (2)
VOLTAGE FOLLOWER (1)
VOLTAGE FOLLOWER (2)
A/D (1)
A/D (2)
ACQ MEM (1)
ACQ MEM (2)
ACQ MEM WR CONT
CLK GEN/DIVIDER/SELECTOR
OSC
COUNTER
SELECTOR 1
SELECTOR 2
OUTPUT PORT
ACQUISITION CONTROL REGISTER
TRG/PRE TRG
ACQ MEM RD CONT
COUNTER
D/A
AMP
BUFFER & LEVEL CONVERTER
COMPARATOR
EQV SPL

Fig. 5-19

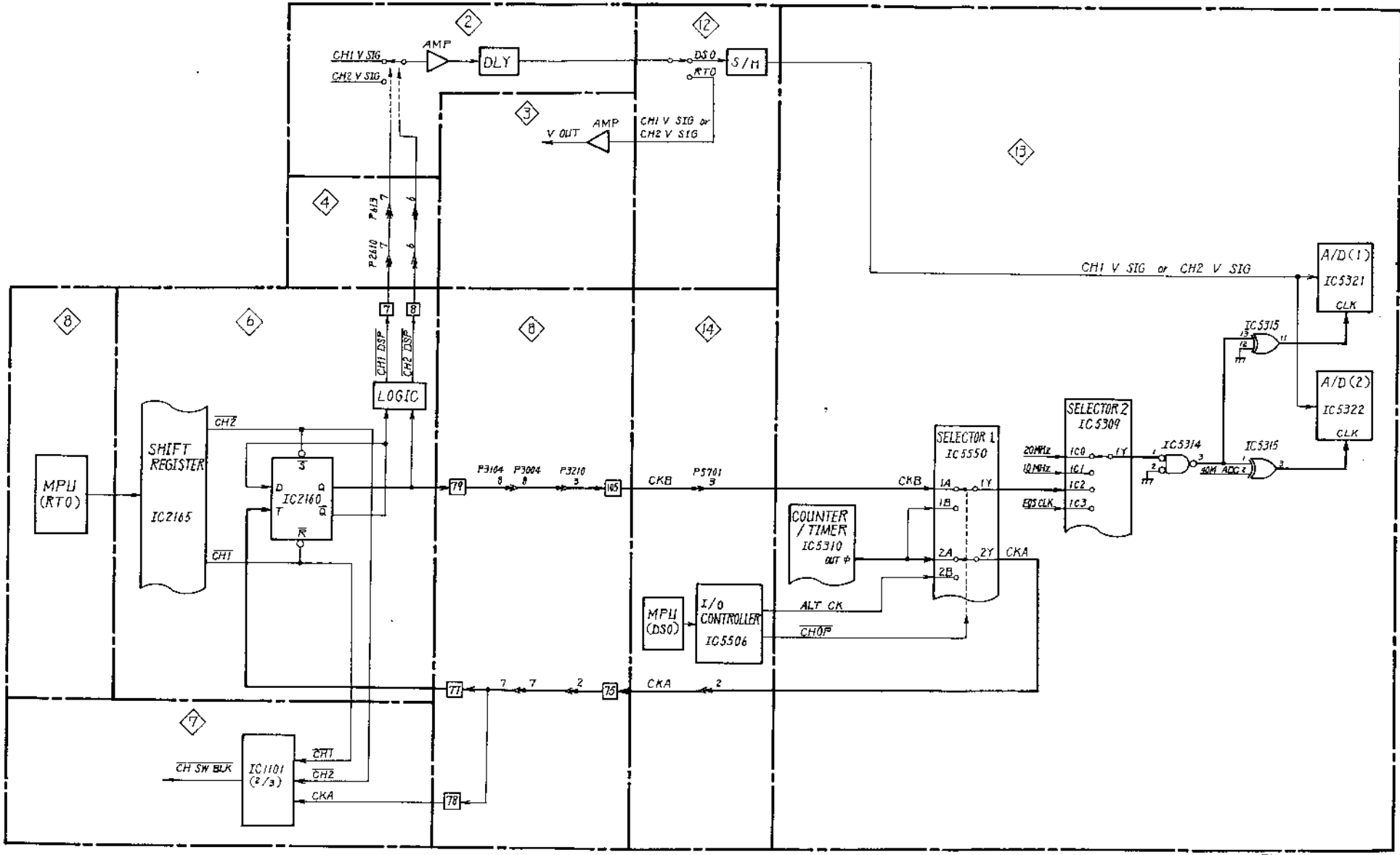

CH1 V SIG
CH2 V SIG
AMP
DLY
DS 0
RTO
S/H
V OUT
AMP
CH1 V SIG or CH2 V SIG
P2610
P2613
CH1 DSP
CH2 DSP
LOGIC
MPU (RTO)
SHIFT REGISTER
IC2165
IC2160
CH2
CH1
P3104
P3004
P3210
P5701
CKB
CKA
SELECTOR 1
IC5550
SELECTOR 2
IC5309
20MHz
10MHz
EQS CLK
IC5314
IC5315
40M ADC 2
A/D(1)
IC5321
CLK
A/D(2)
IC5322
CLK
CH1 V SIG or CH2 V SIG
COUNTER / TIMER
IC5310
OUT Φ
MPU (DSO)
I/O CONTROLLER
IC5506
ALT CK
CHOP
CH SW BLK
IC1101 (2/3)

Fig. 5-21

5.14 Digital MPU (◇14◇)
DISP CONT (◇15◇ 1/2)
FRONT PANEL (DSO) (◇16◇)

For this circuit, refer to the detailed block diagram Fig. 5-23 of ◇14◇ and ◇16◇, the detailed block diagram Fig. 5-24 of [15] and the schematic diagram (◇14◇, ◇15◇ and ◇16◇)
MPU IC5501 for the DSO of ◇14◇ is a CMOS 8-bit microprocessor, which has a high speed CPU, memory management unit (MMU), two direct memory access controllers (DMAC), timer, etc.
The major functions of the MPU for the DSO include:
(i) Display of data
(ii) Control of the digital section
(iii) Communications with the MPU for the RTO (transfer of data)
(vi) Interface with external equipment

Control of display
The area of the buffer memory, the display memory, the save waveform memory, etc. are allotted in RAM IC5503 of ◇14◇.
The waveform data (2KB) is transferred from the ACQ memory to the buffer memory. Then the range 1KB to display one waveform data from the 2KB data by the H POS. This 1KB waveform data is transferred to the display memory.
One frame is approximately 20 ms. One frame includes the data of waveforms, characters, cursors, etc. The number of waveforms whose data is included in one frame is determined by operating modes (one channel, multi-channel, save mode, etc.). The maximum number of waveforms is four.
The display of one waveform is described in (1) to (3).

(1) Display in the Y direction of one waveform

The waveform data in the display region of RAM IC5503 of ◇14◇ is fed out in sequence to OUTPUT CONTROLLER IC5518 of ◇15◇ by the DMAC. The DMAC has the start and stop addresses of the display region. The DMAC generates addresses and updates the addresses successively (outputs the next address). The DMAC built in this MPU can transfer one data at 7 clock (0.8 μs approx.).

The MPU and the DMAC have the common data bus and address bus. Therefore, they uses the buses at the time division basis. In the instrument, the MPU and the DMAC use the buses alternately at every data transfer.

The MPU detects that the DMAC is requested when the $\overline{\text{DREC}}$ signal (DMAC Request) goes low and admits the use of the buses to the DMAC. Then, the DMAC lets the address bus to generate the start address, read one waveform data in the RAM, and transfer it to OUTPUT CONTROLLER IC5518.

(The start address is previously established in the DMAC.)

The GATE 2 of TIMER IC5504 of ◇14◇ goes high every time when one waveform data is written in IC5518. When the GATE 2 goes high, the OUT 2 goes low. Consequently, the $\overline{\text{DREC}}$ goes high and the request to the DMAC is released.

When the specified number of clocks is fed to the CLK 2, the OUT 2 goes back high. Accordingly, the $\overline{\text{DREQ}}$ goes low, and the DMAC is requested again. Then, the DMA cycle for the next waveform data output starts again.

The address is incremented every cycle.

The time between the data points is the sum of the DMA cycle (7 clocks), the count time of the TIMER 2 (GATE 2, CLK 2, OUT 2), and the reception time of the $\overline{\text{DREC}}$. It is 3.2 μs approx.

One waveform data is displayed by repeating the above processes until the stop address. (The stop address is also established previously in the DMAC.)

(2) Display of one waveform in the X direction

The MPU for the DSO incorporates two DMAC's : DMAC 0 and DMAC 1. The display in the X direction is controlled by DMAC 0 and that in the Y direction is controlled by DMAC 1. The zero address of the display memory is selected to be such an address that all of the lower 10 bits is zero. Thus, the D/A (2) output becomes the stairstep waveform that starts from zero volts.

The above 10-bit address is latched by the address latches LATCH 2 and LATCH 3 of ◇15◇. IC 5514 controls all the address (upper and lower addresses), and IC5512 controls the lower address. In case of the waveform display, both LATCH 2 and LATCH 3 perform the latch operation. The PC port of the OUTPUT CONTROLLER is in the input state by means of the MPU, and the signal is not output from the PC port to D/A (4). As described above, in case of the waveform display, the Y-direction signal is fed to D/A (1) from the PA port of the OUTPUT CONTROLLER, and the X-direction signal is fed to D/A (2) from LATCH 2 and LATCH 3.

(3) Intensity control for the waveform display

IC5514 (◇15◇) controls the Z signal. In case of the waveform display, pins 10 and 11 of IC5514 are low. The DREQ signal fed to pin 9 continues to be low only for the time determined by the counter 1 (GATE 1, CLK 1, OUT 1) of TIMER IC 5504 (◇14◇). During this period, one piece of data is bright.

(4) X-Y operation

In this operation mode, the CH1 signal becomes the X signal, and the CH2 signal becomes the Y signal. Like the Y signal in the waveform display mode, the Y signal is fed to D/A (1) from the PA port of the OUTPUT CONTROLLER. The X signal is fed to D/A (4) from the DC port of the OUTPUT CONTROLLER. In this case, the outputs of LATCH 2 and LATCH

3 are in high impedance state and not connected electrically with D/A (4).

(5) Display of characters (Fig. 5-24)

One character consists of 3 bits each for the X and Y directions. The 3 bits in the X direction are output from terminals PB3 - PB5 of the OUTPUT CONTROLLER and converted into the analog signals by D/A (3). The 3 bits in the Y direction are output from terminals PB0 - PB1 and converted into the analog signals by D/A (2).

The number of the intensity bit which determines whether or not to brighten each for forming one character is one, which is output from terminal PB6.

As described above, 7 bits are used for one character. The character pattern for each character is stored in the ROM at the unit of 8 bits.

The characters of one upper row and two lower rows, 3 rows in total, are displayed on the CRT. The information on position in the Y direction which determines the position of one row is output from terminal PA0 to PA7 and converted into the analog signal by D/A (1).

The 32 positions (5 bits) are set to display characters for one row. The information on position in the X direction which determines the 32 positions is determined by the 5 bits of the upper address fed out from LATCH 3 to D/A (4). In this case, LATCH 2 is in the prohibit state. The D/A (1) output whose voltage changes one time per row (every 2.5 ms approx.) and the D/A (2) output whose voltage changes every one dot (every 2 μs approx.) are added, resulting in the position signal in the Y direction.

Though the X direction of one screen consists of 10 bits (1024 points), the distance between two characters is $2^{10}/2^5 = 2^5$ (5 bits), because 32 characters (5 bits) are positioned with equal distance. In other words, the 5-bit point from the start point of the first character is the

start point of the second point. Consequently, the voltage of the D/A (4) output changes every 32 x 2 µs = 64 µs approx. This D/A (4) output and the D/A (3) output whose voltage changes every one dot (every 2 µs approx.) and added, resulting in the position signal in the X direction.

(6) Cursor display (Fig. 5-24)

Like the character pattern, the cursor pattern is also stored in the ROM.

In case of the horizontal cursor, the position signal in the Y direction is constant and fed out from terminals PA0 - PA7. Then the output signal is converted into the analog signal by D/A (1). The position signal in the X direction changes and is fed to D/A (4) from terminals PC0 - PC7.

The horizontal cursor consists of the 8-bit X-direction signal.

In case of the vertical cursor, the Y-direction signal changes and is fed out to D/A (1) from terminal PA0 - PA7. The position signal in the X direction is constant, and 10 bits are required according to waveform. The 10 bits are output from LATCH 2 and LATCH 3 and converted into the analog signal by D/A (4). As described above, the instrument does not require a conventional cursor pattern generator. Consequently, the number of bits is reduced to a minimum, and an affective operation is ensured.

ANALOG SW, MULTIPLEXER (Fig. 5-24)

The switches X and Y of ANALOG SW are controlled by the $\overline{\text{DOTj}}$ signal, and the smooth on-off switching is made. The signal passes LPF at the time of the smooth on. "Smooth on" or "smooth off " is displayed on the screen by switching the MENU switch at the lower left of the front panel. The switch Z of ANALOG SW (2) is controlled by the 40M ADC signal and the gain of MULTIPLEXER (2) is switched.

MULTIPLEXER is controlled by the $\overline{\text{DSO}}$ signal, and the signal

flow is changed according to the RTO mode or the DSO mode.
In case of the RTO, the output of the operational amplifier A in each MULTIPLEXER becomes the CHST-Y and CHST-X signals.
In case of the DSO, the output of the operational amplifier B in each MULTIPLEXER becomes the CHST-Y and CHST-X signals.
The Y-direction signal of characters and cursors or the A/B SEP BIAS signal in the RTO mode is fed to the operational amplifier A of MULTIPLEXER (1). While, the Y-direction signal of waveforms, characters and cursors in the DSO mode is fed to the operational amplifier B.
The X-direction signal of characters and cursors in the RTO mode is fed to the operational amplifier A in MULTIPLEXER (2). The X-direction signal of waveforms, characters and cursors is fed to the operational amplifier B.

Control of the DSO switch and RS-232C CONTROL switch (Fig. 5-23)
The descriptions of the 6 DSO switches (S1601 - S1606) at the lower left of the front panel and the 8-circuit DIP switches on the rear follow.
As known from terminals PA0 - PA5 of I/O CONTROLLER IC5506, the status of the two switches can be judged by one line. In other words, the status of the DSO switch and the DIP switch is checked by the MPU for the DSO at some sequence.
When checking the status of the DSO switch, the MPU make the $\overline{\text{R PANEL}}$ signal high and PB6 low. Under this condition, all the switches of S5501 are the same as the off state when viewed from PA terminal side regardless of their actual setting positions.
Consequently, only the PA terminal corresponding to the on switch goes low. Thus, the MPU judges the switch that is on. Later, the MPU make the corresponding terminal among PB0 thru PB5 low, and the LED corresponding to the pressed switch.
When checking the DIP switches, the MPU makes the $\overline{\text{R PANEL}}$ signal low and PB6 high. The operation is identical with the DSO switch.

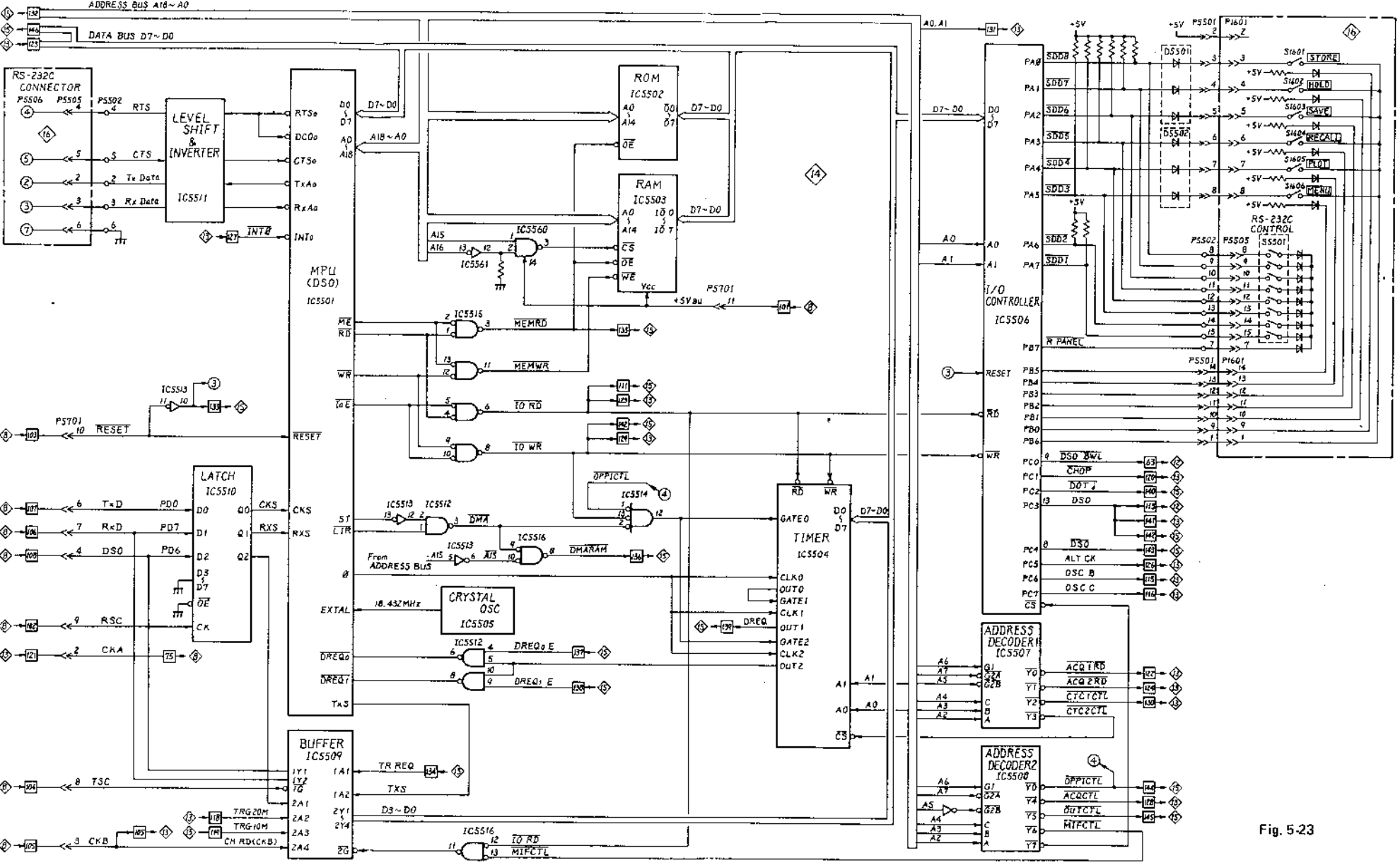

ADDRESS BUS A15~A0
DATA BUS D7~D0
RS-232C CONNECTOR
LEVEL SHIFT & INVERTER
IC5511
MPU (DSO)
IC5501
ROM
IC5502
RAM
IC5503
IC5560
IC5561
IC5515
MEMRD
MEMWR
IO RD
IO WR
IC5513
RESET
LATCH
IC5510
TxD
RxD
DSO
RSC
CKA
CKB
CRYSTAL OSC
IC5505
18.432MHz
IC5512
DMA
IC5516
DMARAM
OPPICTL
IC5514
TIMER
IC5504
DREQ0
DREQ1
BUFFER
IC5509
TSC
TRG20M
TRG10M
CH RD(CKB)
TR REQ
TXS
D3~D0
MIFCTL
I/O CONTROLLER
IC5506
ADDRESS DECODER1
IC5507
ADDRESS DECODER2
IC5508
ACQ1RD
ACQ2RD
CTC1CTL
CTC2CTL
ACQCTL
OUTCTL
RS-232C CONTROL
IC5501
STORE
HOLD
SAVE
RECALL
PLOT
MENU
R PANEL
DSO BWL
CHOP
DOT
DSO
ALT CK
OSC B
OSC C

Fig. 5-23

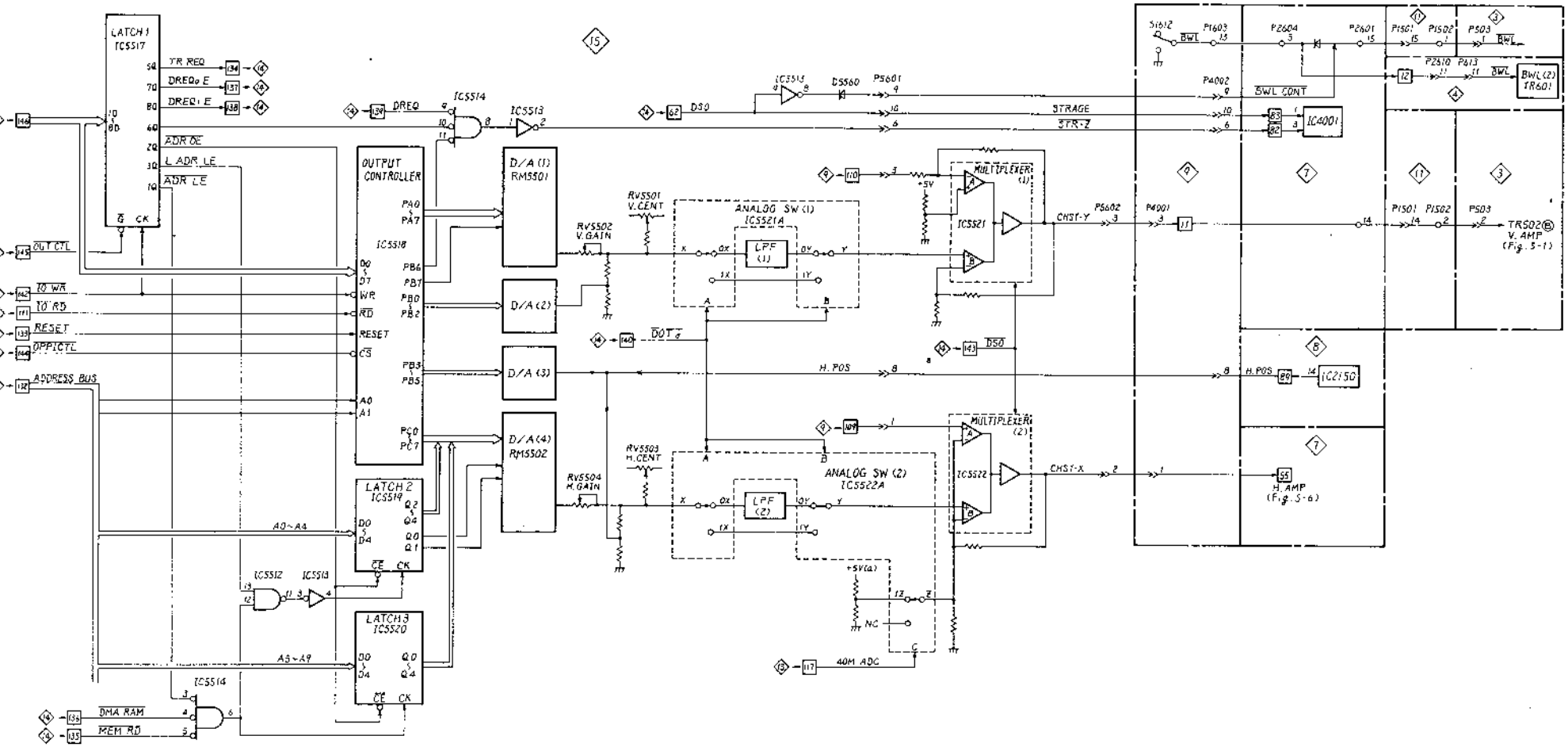
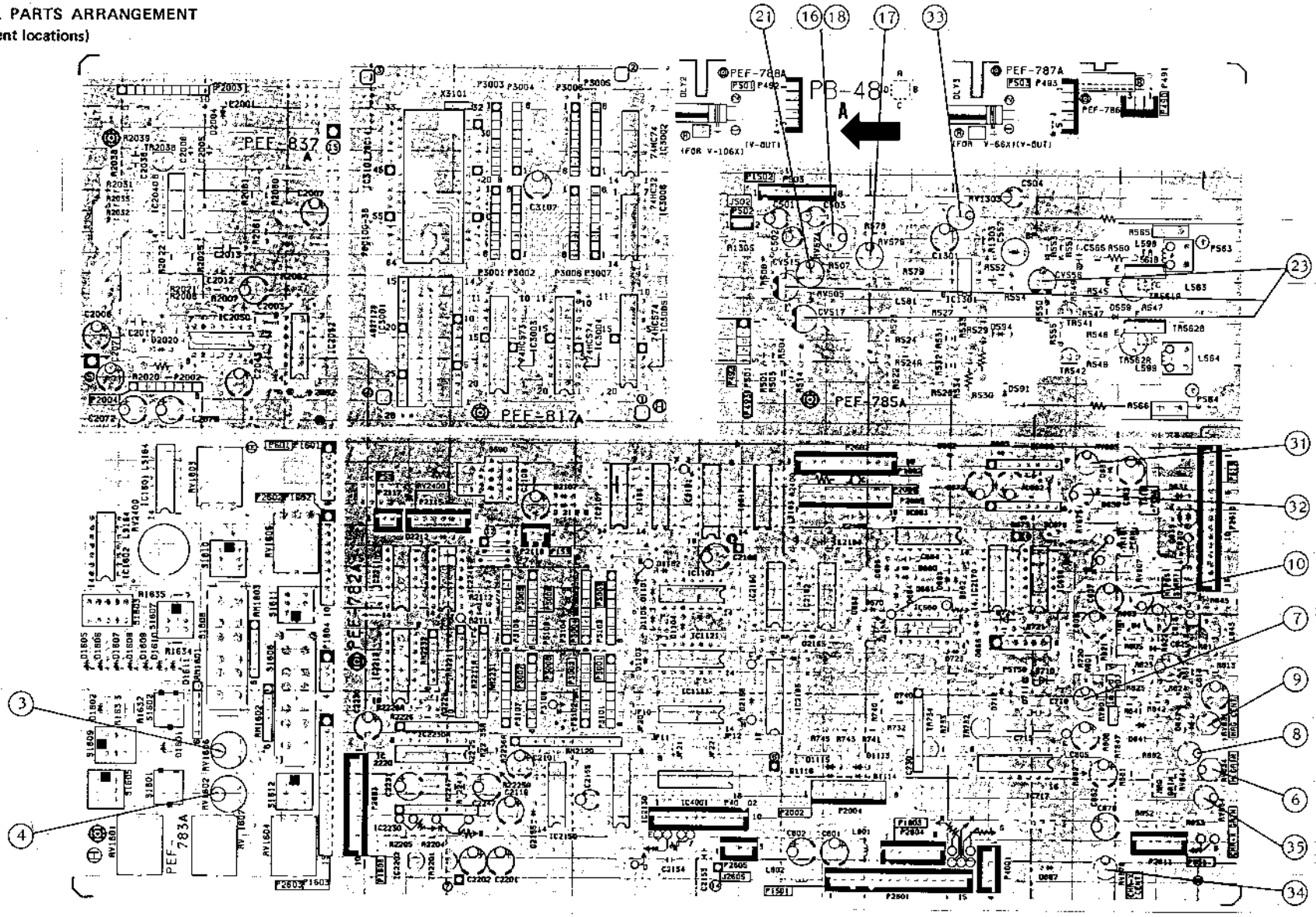

LATCH 1 IC5517
TR REQ
DREQ0 E
DREQ1 E
ADR OE
L ADR LE
ADR LE
OUT CTL
IO WR
IO RD
RESET
OPPICTL
ADDRESS BUS
OUTPUT CONTROLLER
IC5518
D/A (1) RM5501
D/A (2)
D/A (3)
D/A (4) RM5502
DREQ
IC5514
IC5513
DSO
STRAGE
STR-Z
IC4001
RV5501 V.CENT
RV5502 V.GAIN
ANALOG SW (1) IC5521A
LPF (1)
MULTIPLEXER (1) IC5521
CHST-Y
P5602
V. AMP (Fig. 5-1)
H. POS
IC2150
RV5503 H.CENT
RV5504 H.GAIN
ANALOG SW (2) IC5522A
LPF (2)
MULTIPLEXER (2) IC5522
CHST-X
H. AMP (Fig. 5-6)
+5V(a)
NC
40M ADC
LATCH 2 IC5519
LATCH 3 IC5520
A0~A4
A5~A9
IC5512
DMA RAM
MEM RD
BWL CONT
IC4001
BWL(2) TR601

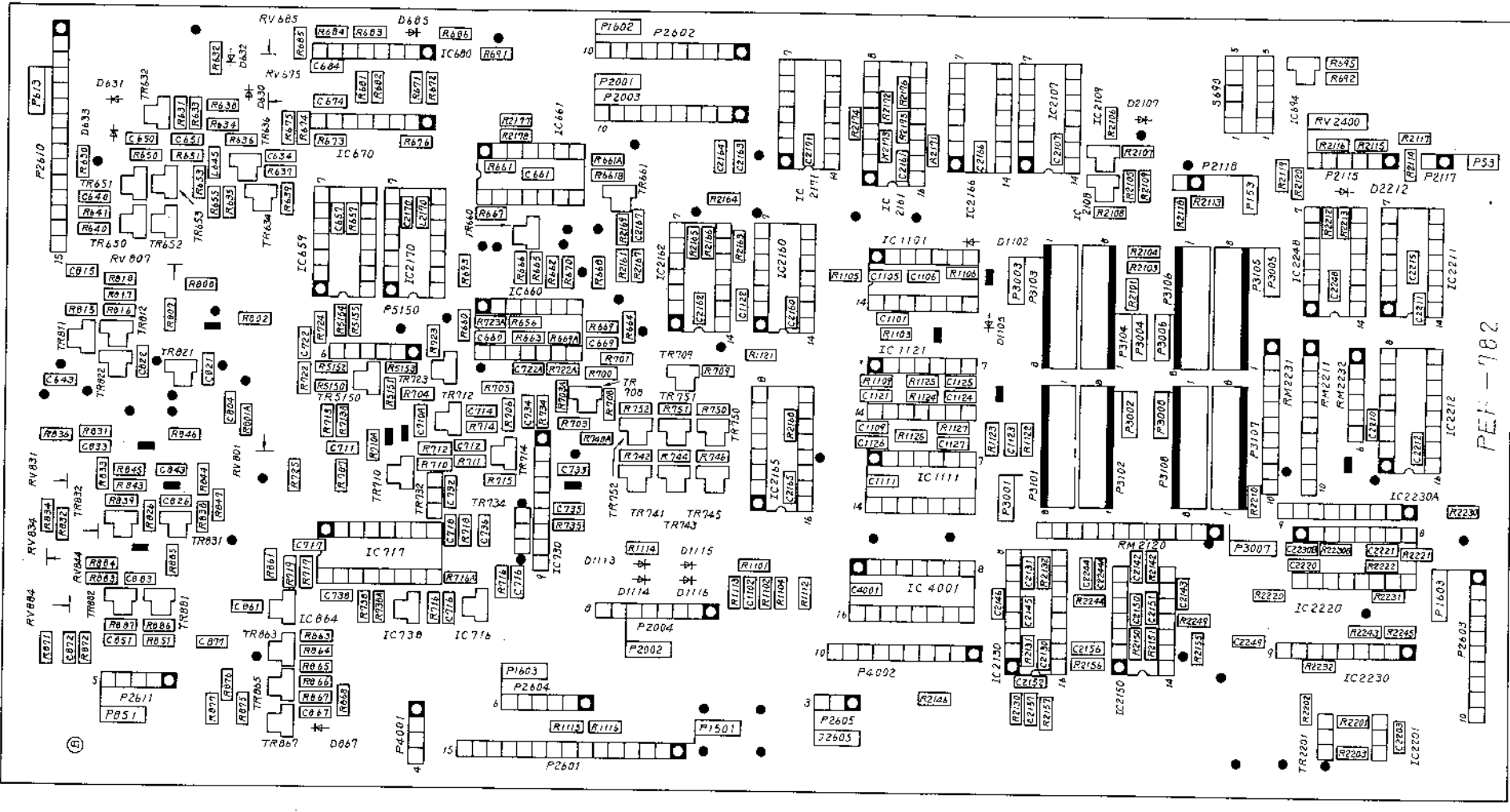
Fig. 5-24

6. ELECTRICAL PARTS ARRANGEMENT

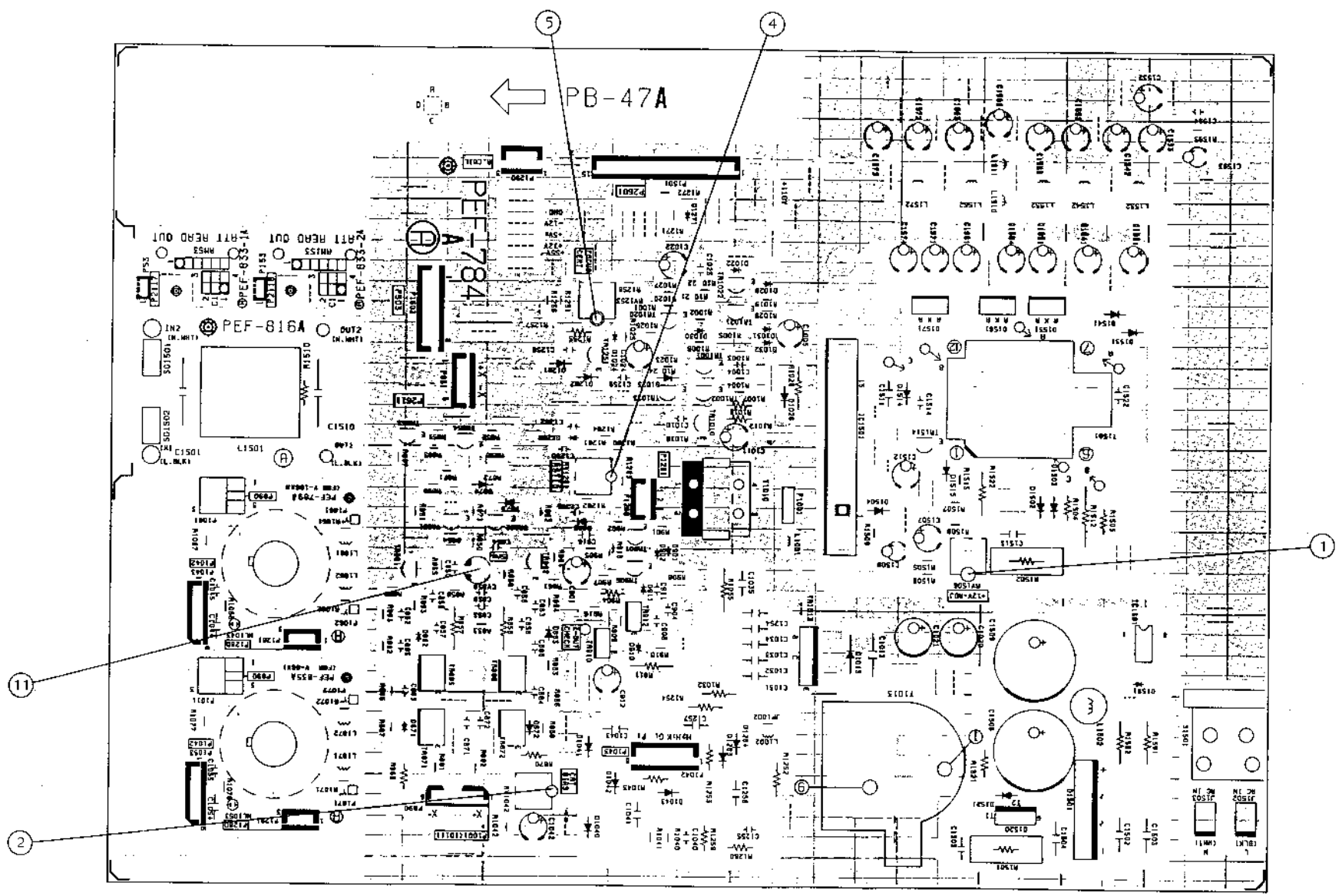
(With adjustment locations)



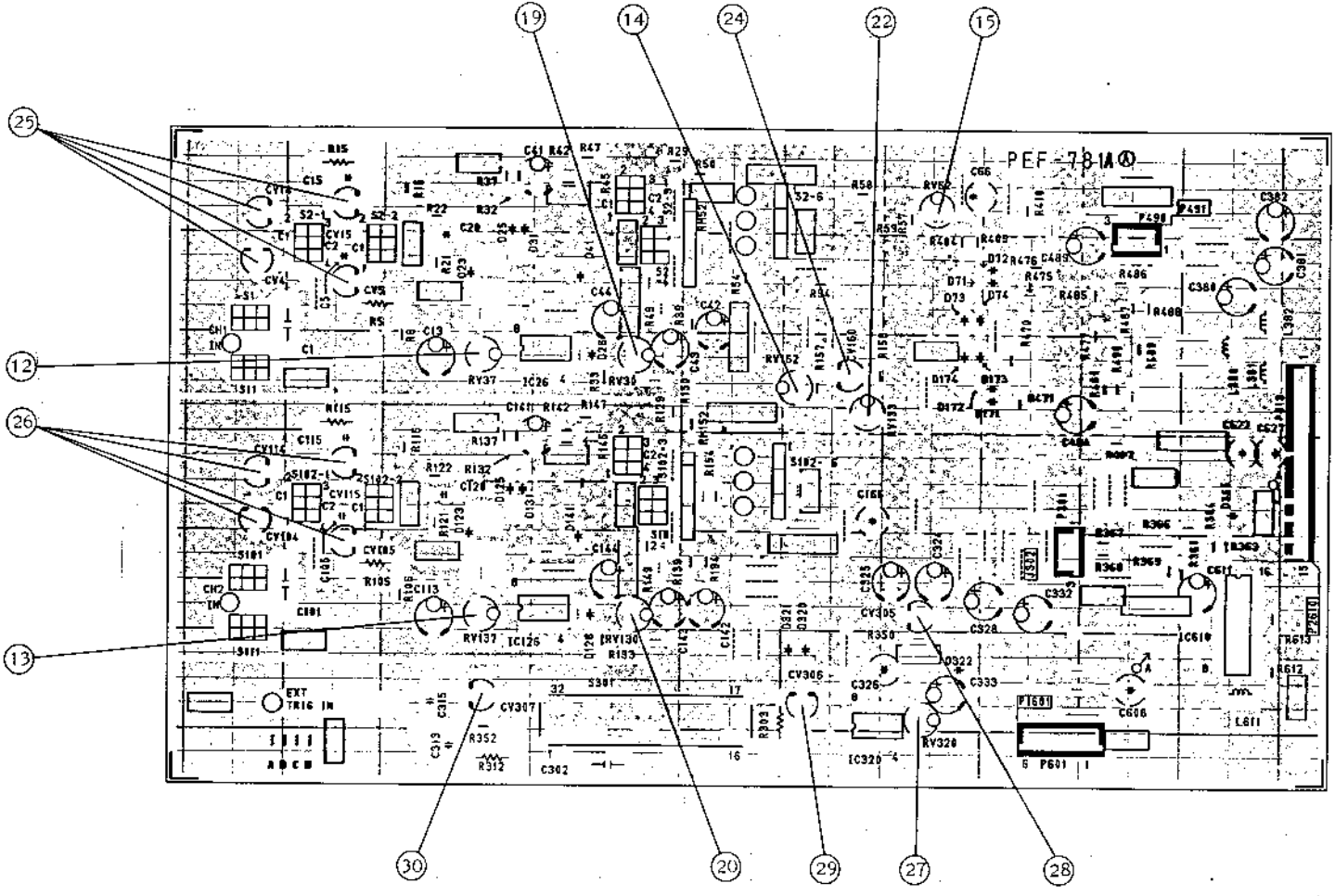
PEF-782, 783, 785, 786, 787, 788, 817, 837 (Parts side)



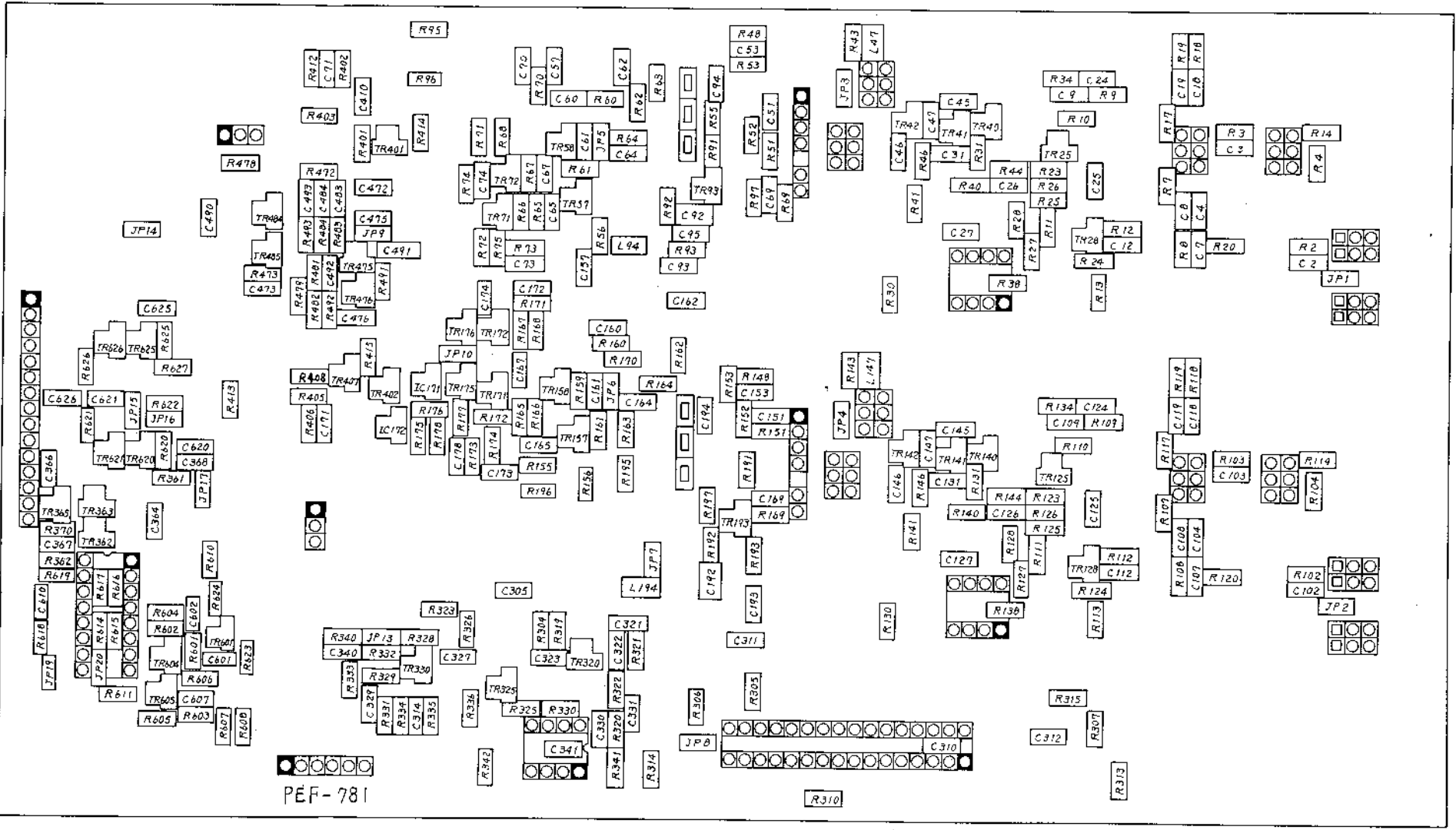
PEF-782 (Soldering side)



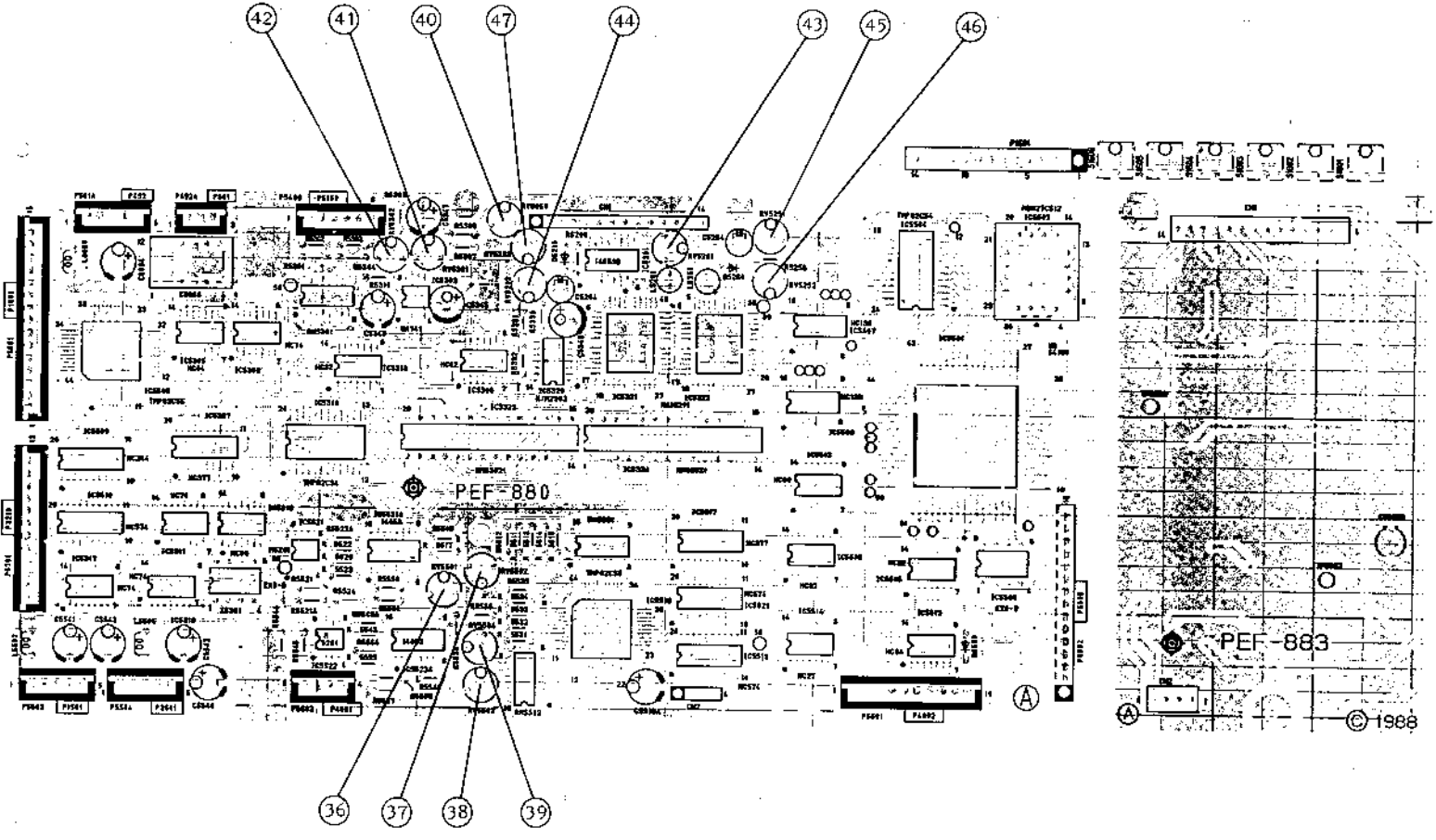
PEF-784, 789A, 816A, 833-1A, 833-2A, 835A (Parts side)



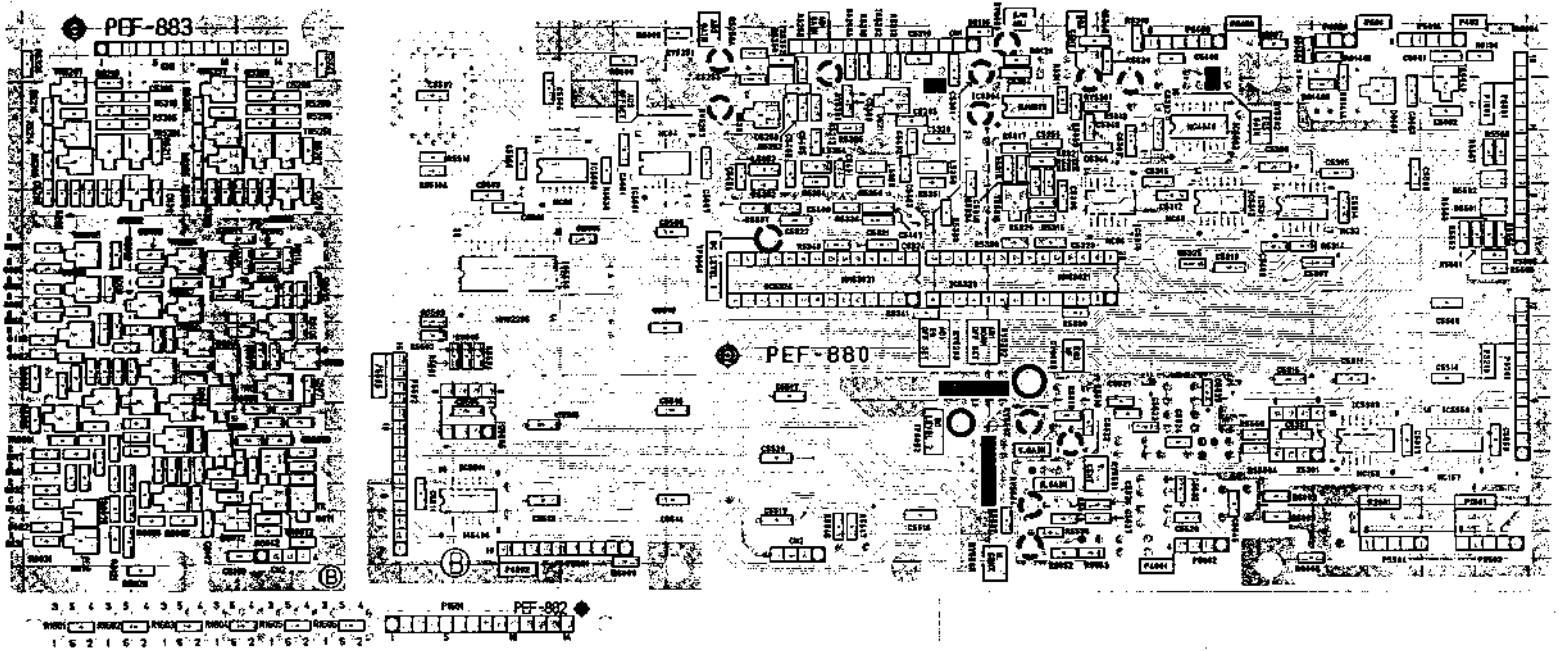
PEF-781 (Parts side)



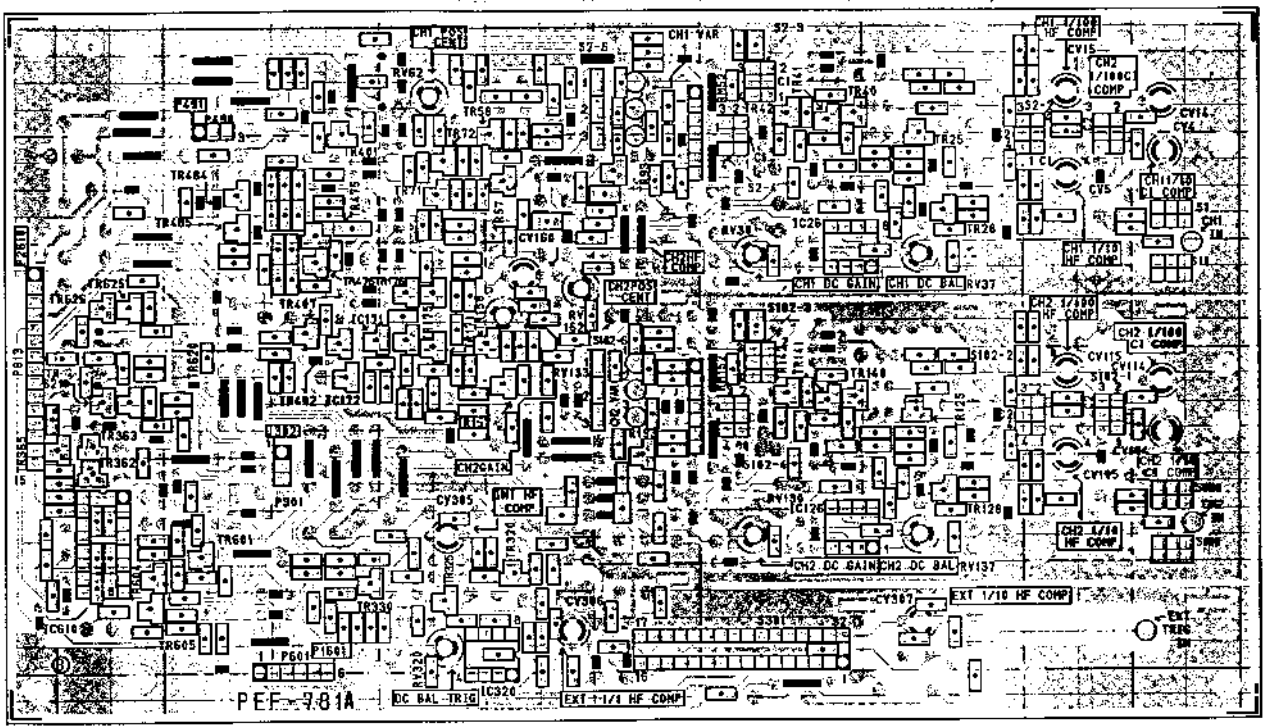
PEF-781 (Soldering side)



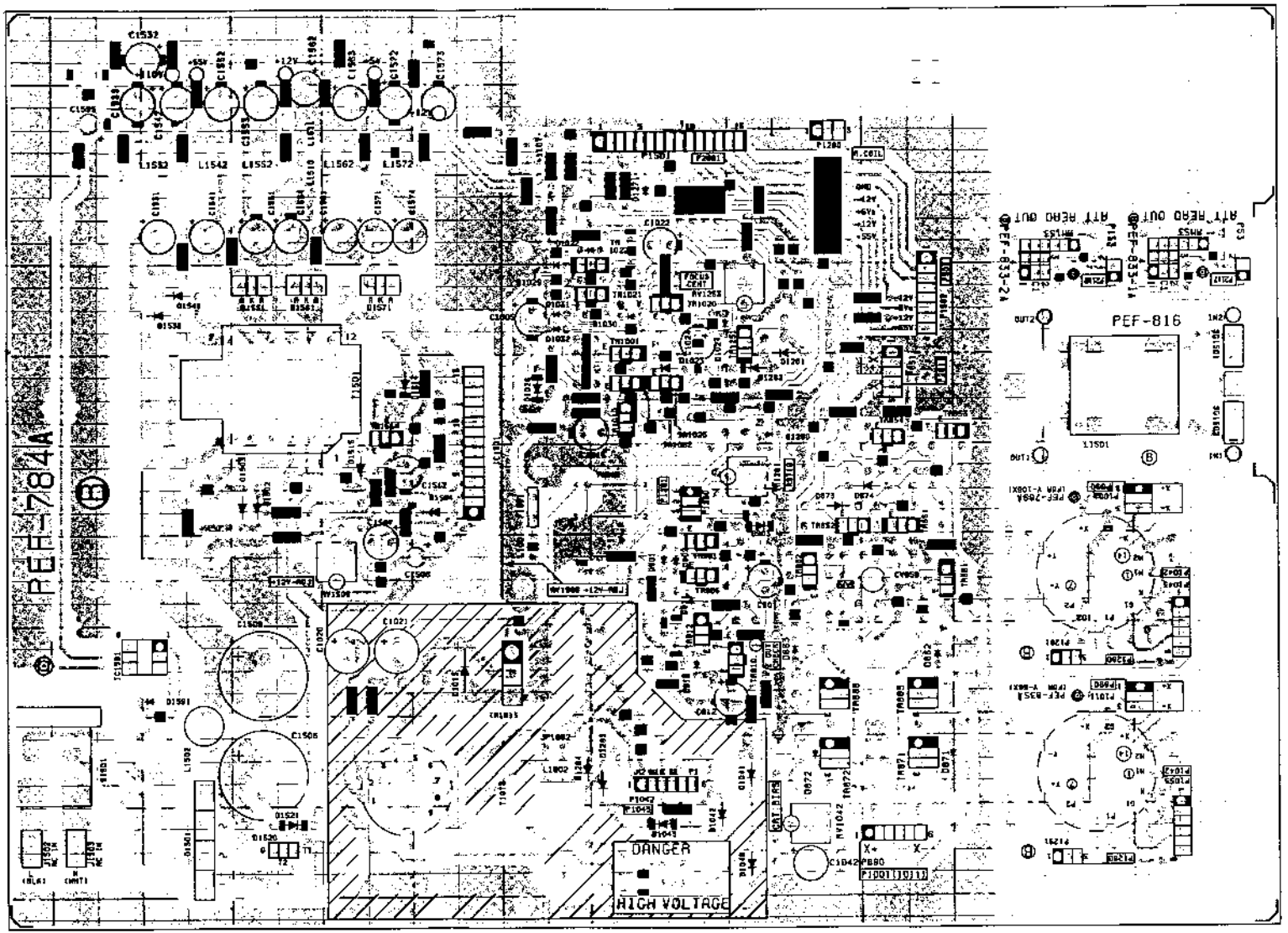
PEF-880, 882, 883 (Parts side)



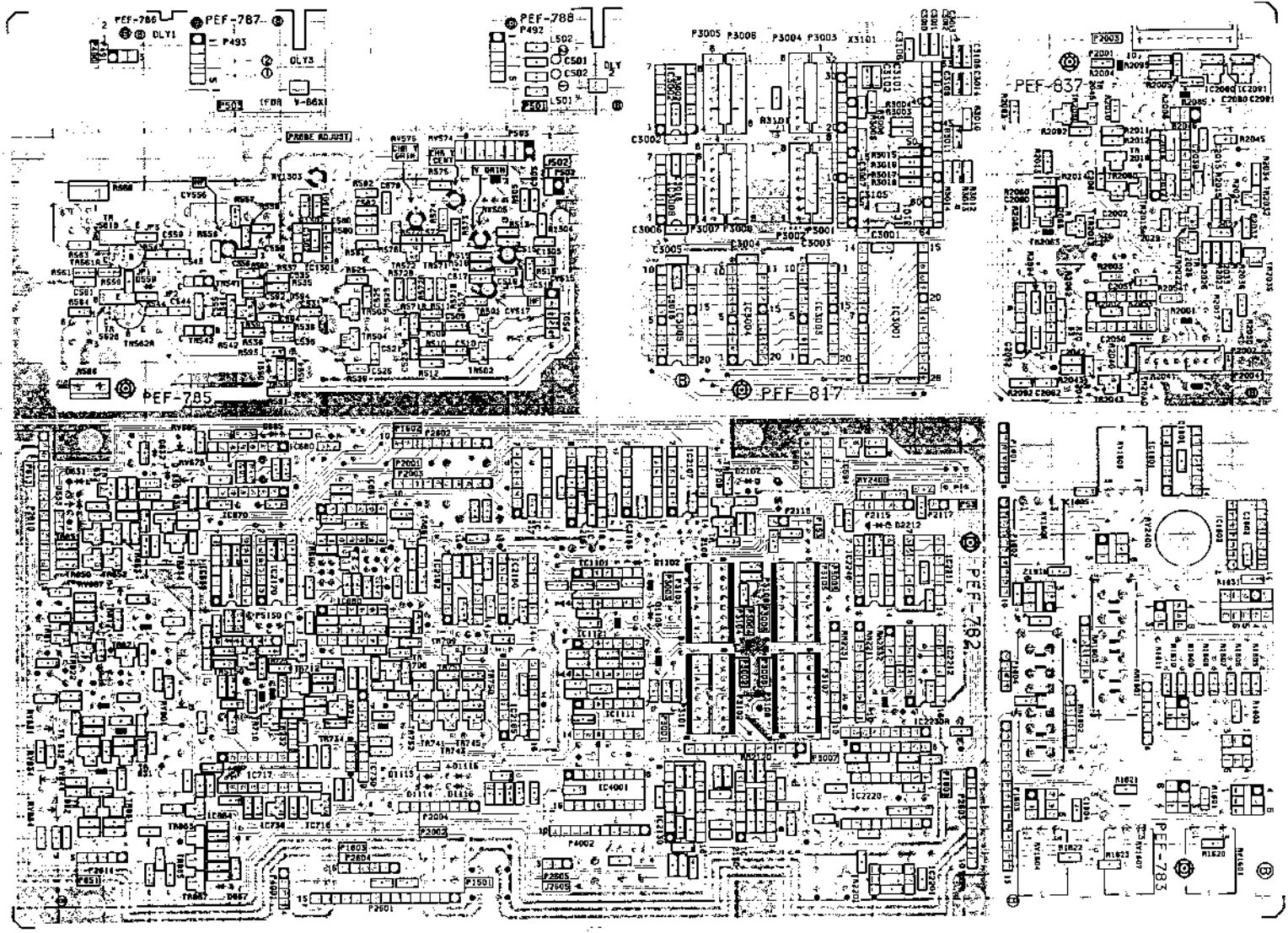
PEF-880, 882, 883 (Soldering side)



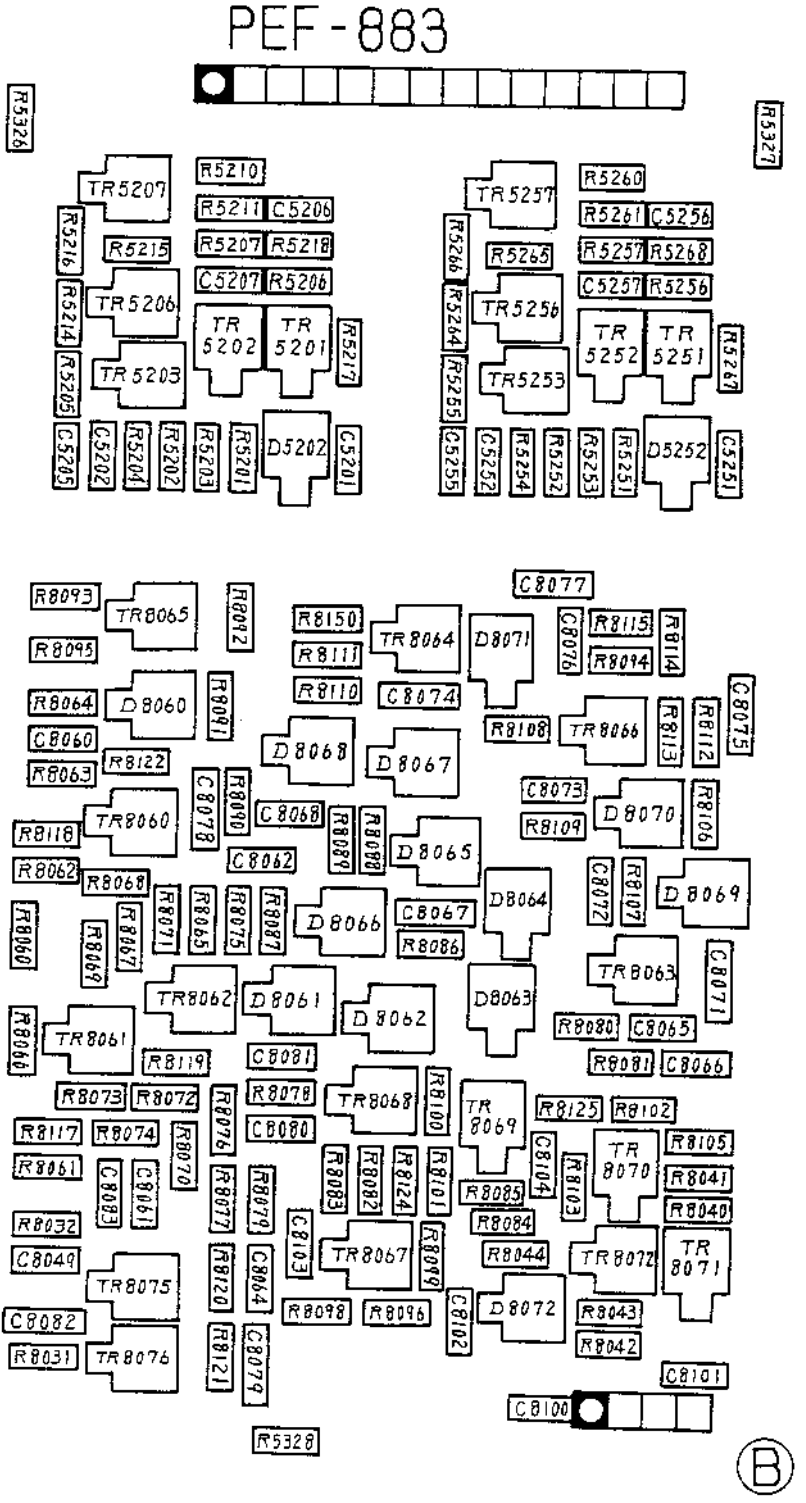
PEF-781 (Soldering side)



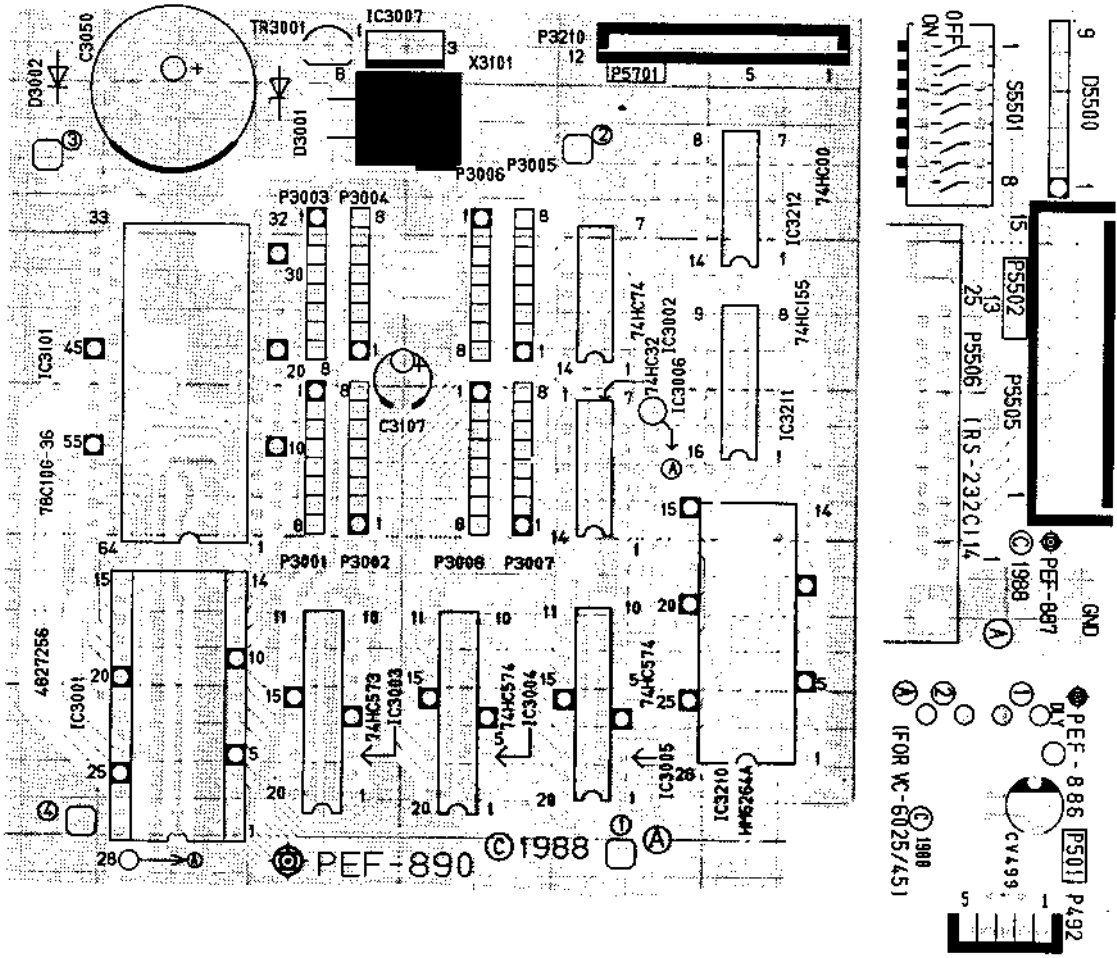
PEF-784, 789A, 816A, 833-1A, 833-2A, 835A (Soldering side)



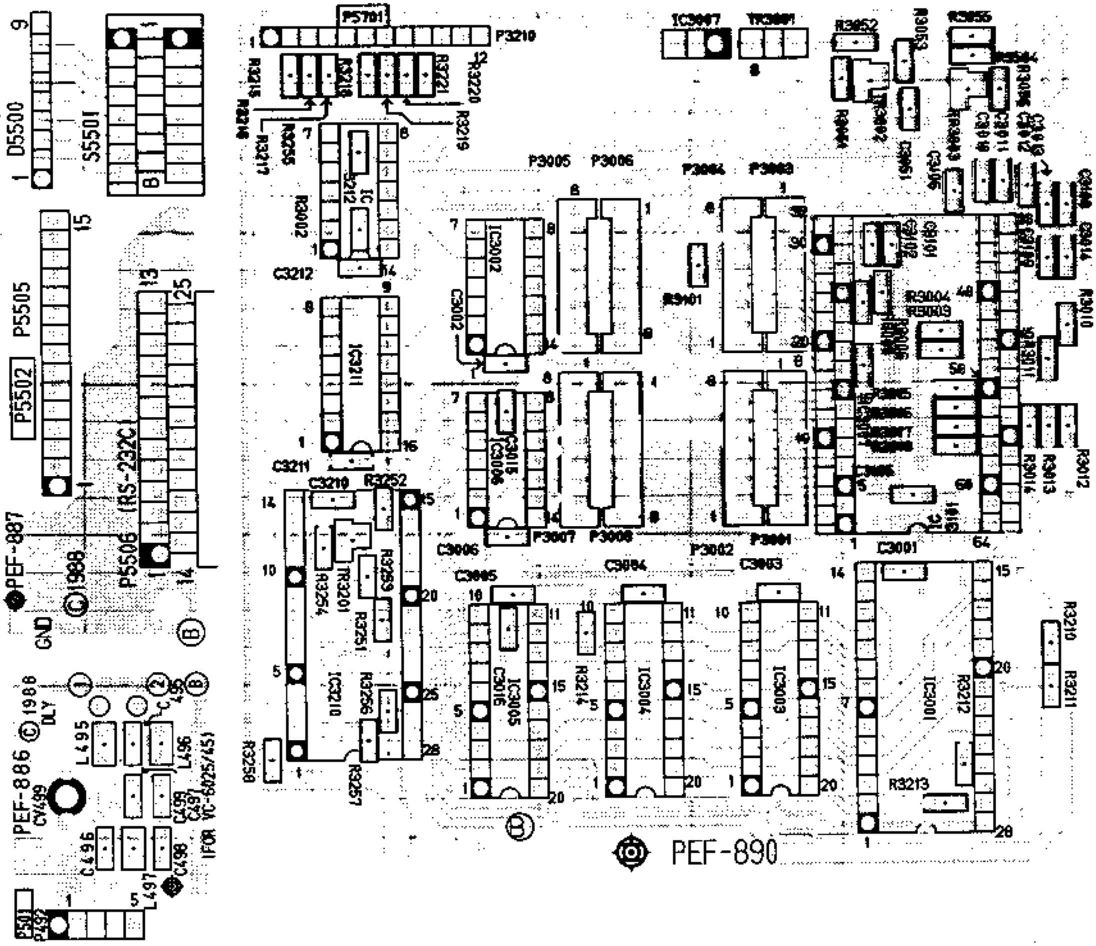
PEF-782, 783, 785, 786, 787, 788, 817, 837 (Soldering side)



PEF-883 (Soldering side)



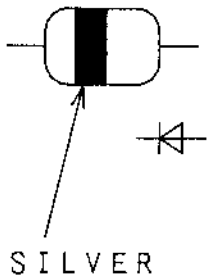
PEF-886, 887, 890 (Parts side)



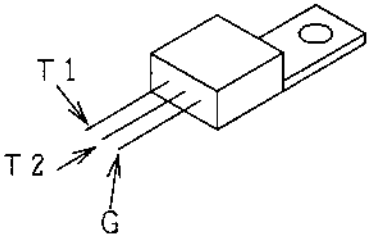
PEF-886, 887, 890 (Soldering side)

7. ELECTRICAL PARTS LEAD CONFIGURATIONS

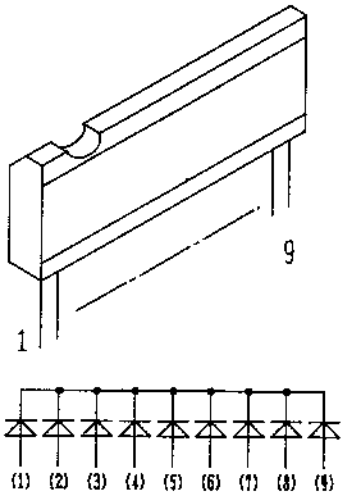
Diode



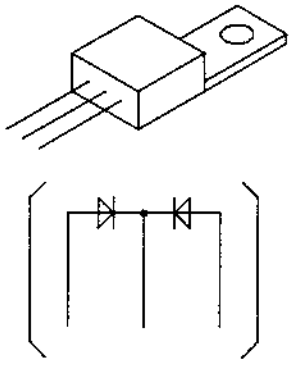
AU01
AU01A



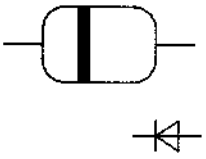
DTA10E



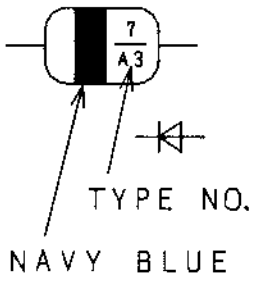
DAN803



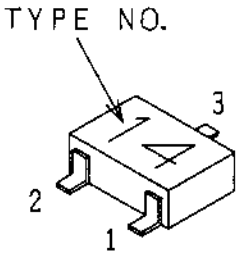
FMB-24
FMB-26



GZB 2.4B
GZB 3.0B
GZB 6.8B



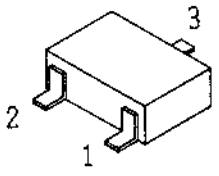
HZ7A1
HZ7A3



HZM SERIES

1. ANODE
2. ANODE
3. CATHODE

TYPE NO.14 HZM 4B
TYPE NO.17 HZM 5B
TYPE NO.24 HZM 7C

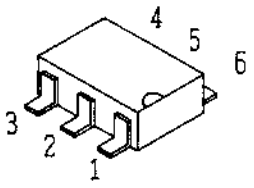


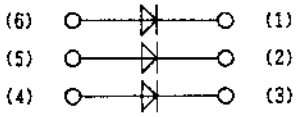
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2.ANODE2

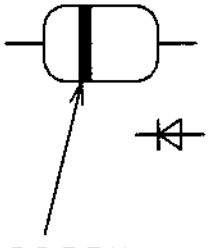
3.CATHODE2,
ANODE1

HSM88S



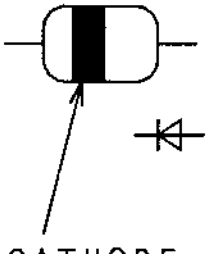


IMN10



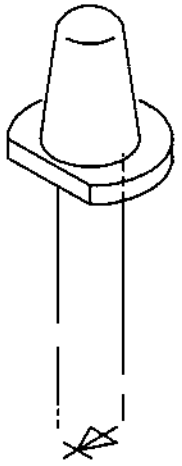
GREEN

MA161

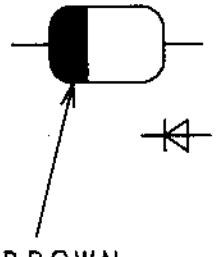


CATHODE BAND

1SS83
1SS110
1SS123
1SS133
1SS153
1SS165
1SS286
MTZ SERIES

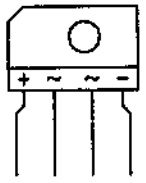


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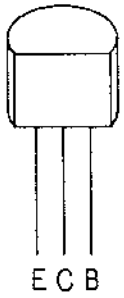
BROWN

RU3AMLF

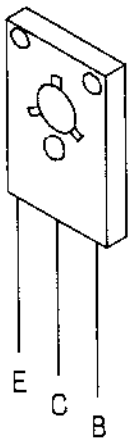


RBV-406

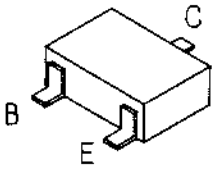
Transistor



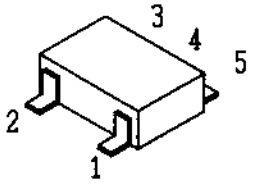
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2SA1029D
2SA1188E
2SC535C
2SC641K
2SC1213AC
2SC1906
2SC2853E
2SC3068
2SC458C



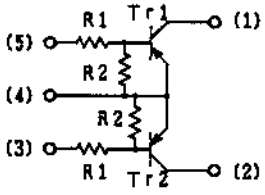
2SA1210S
2SC2912S



2SA1052
2SA1226E4
2SA1245
2SA1462
2SB624BV3
2SC1621B4
2SC2462LC
2SC2620QC
2SC2759-T2
2SC2735JC
2SC3772LY4
2SC3775OY-4
2SD596DV3

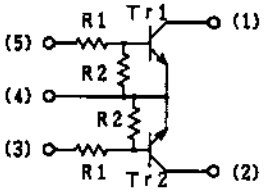


DTA124EK

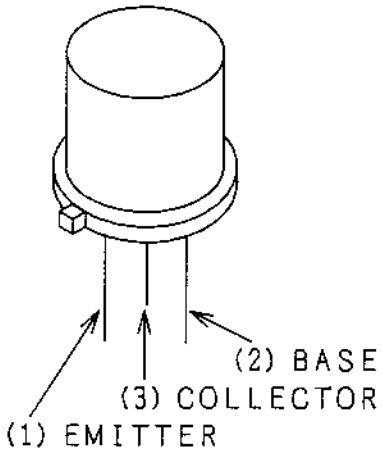


(1) Tr1 OUT
(2) Tr2 OUT
(3) Tr2 IN
(4) GND (+)
(5) Tr1 IN

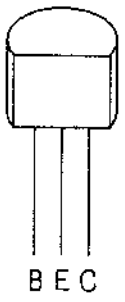
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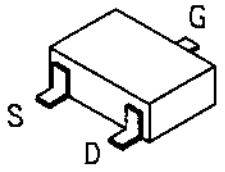
(1) Tr1 OUT
(2) Tr2 OUT
(3) Tr2 IN
(4) GND
(5) Tr1 IN



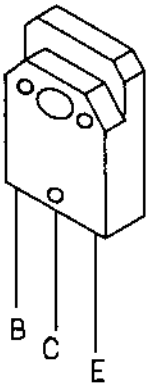
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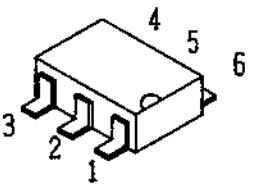
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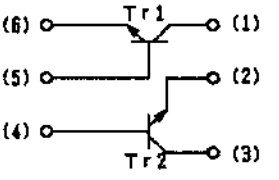
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2SK436A20
2SK508K52



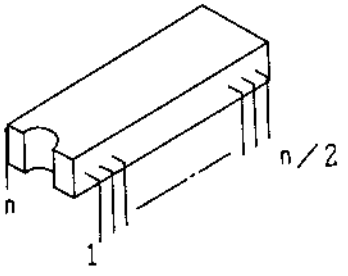
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IMX3



IC



8PINS

MN3102

14PINS

HD74LS00P
HD74LS04P
HD74LS10P
HD74LS74AP
HD74LS164P
HD74LS393P
HD74HC00P
HD74HC02P
HD74HC04P
HD74HC08P
HD74HC32P
HD74HC74P
TC40H000P
TC40H002P
TC40H164P
SN74AS00N
SN74AS74N
TL064CN
NJM319D

16PINS

HD14040BP
HD14051BP
HD14053BP
HD74HC138P
HD74HC155P
HD74HC4040P
HD74LS157P
MC10H116L
MC74HC4052N
MC74HC4053N
SN74LS594N
TC40H151P

20PINS

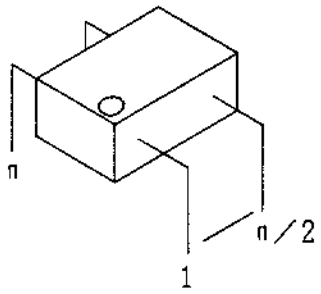
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28PINS

HN27256G-25
HM63021P

64PINS

μPD78C10G-36



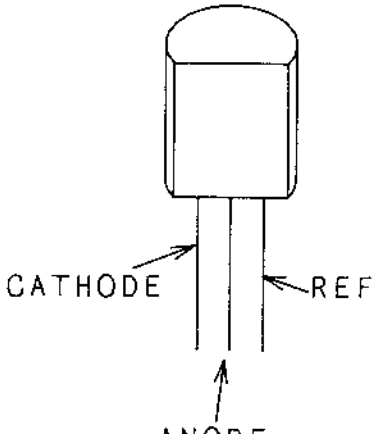
6PINS

PC714U

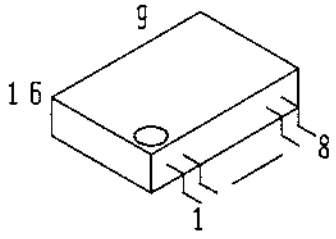


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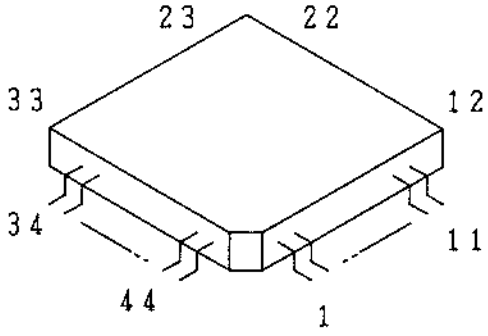
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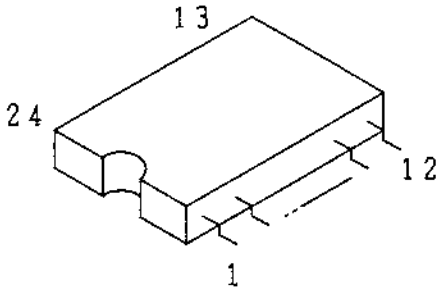
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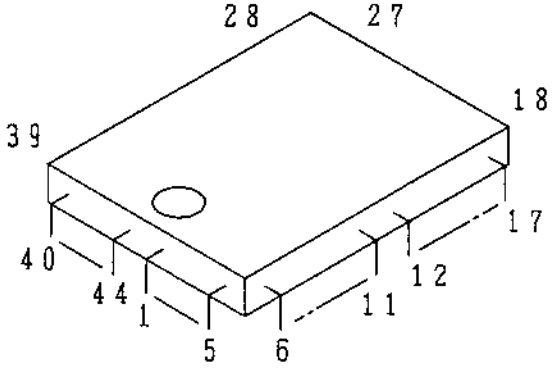
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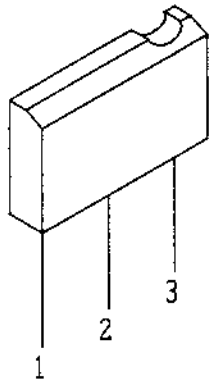
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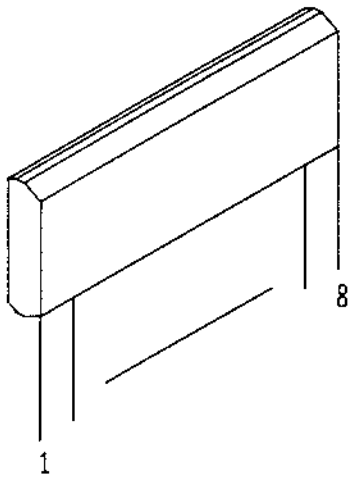


HA19211MP



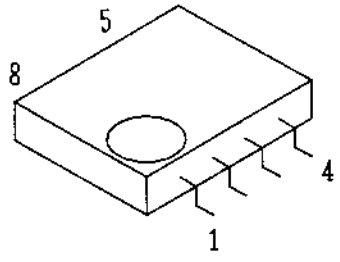
1. Vss
2. VDD
3. OUT

MN1280R

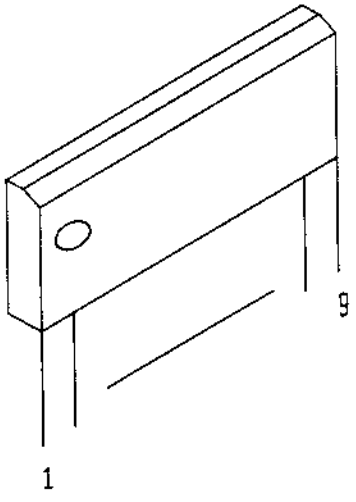


8PINS

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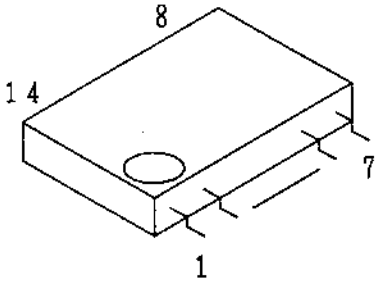


μA741PS
M5201FP

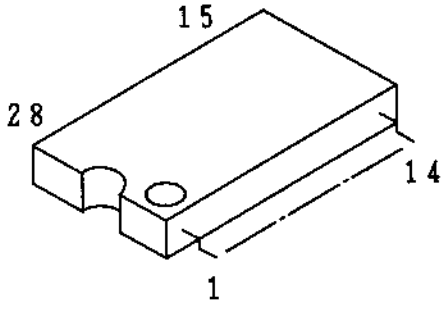


9PINS

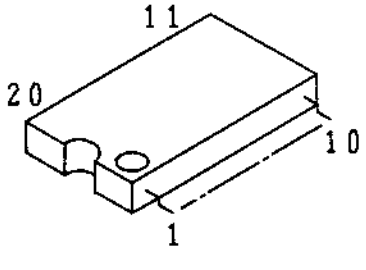
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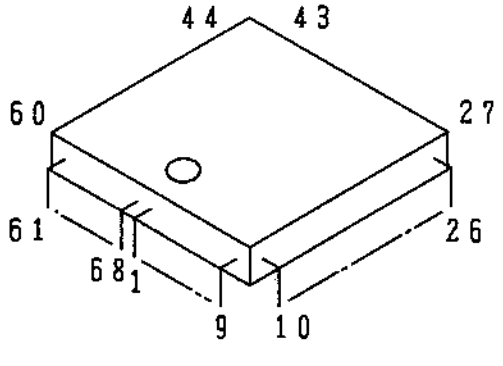
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NJM2902M
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HD74HC32FP
TC74HC00F
TC74HC86F



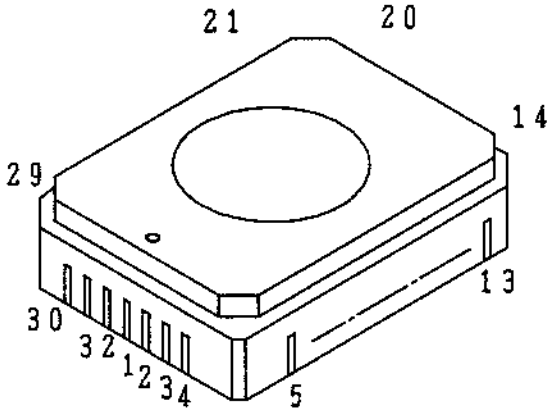
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HM6264ALP-15



HD74HC377FP
TC74HC244F
TC74HC574AF



HD64180R1CP10



MBM27C512-20 (LCC)

8. ELECTRICAL PARTS LIST
V-PRE & TRIG AMP (PEF-781)

A : VC-6025 B : VC-6045 PEF-781 V-PRE&TRIG AMP

SYMBOL	..PART CODE..	..... DESCRIPTION					Q'TY A	Q'TY B
C 1	CQM0451	C.PLASTIC	400	V	47000	PF+-10%	1	1
C 2	CCG0128	C.CERAMIC	50	V	15	PF+-5%	1	1
C 3	CCG0121	C.CERAMIC	50	V	15	PF+-5%	1	1
C 5	CCD0274	C.CERAMIC	500	V	3	PF+-0.25PF	1	1
C 8	CCG0136	C.CERAMIC	50	V	33	PF+-5%	1	1
C 9	CCG0116	C.CERAMIC	50	V	2	PF+-0.25PF	1	1
C 12	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 13	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 15	CCG0272	C.CERAMIC	500	V	1	PF+-0.25PF	1	1
C 18	CCG0144	C.CERAMIC	50	V	220	PF+-5%	1	1
C 19	CCG0142	C.CERAMIC	50	V	82	PF+-5%	1	1
C 20	CCD0266	C.CERAMIC	500	V	1000	PF+100-0%	1	1
C 24	CCG0124	C.CERAMIC	50	V	12	PF+-5%	1	1
C 25	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 26	CCG0128	C.CERAMIC	50	V	15	PF+-5%	1	1
C 27	CCG0209	C.CERAMIC	50	V	470	PF+-5%	1	1
C 31	CCG0116	C.CERAMIC	50	V	2	PF+-0.25PF	1	1
C 33	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 41	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 42	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 43	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 44	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 65	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 66	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 67	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 51	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 53	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	1
C 57	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 60	CCG0120	C.CERAMIC	50	V	6	PF+-0.5PF	1	1
C 61	CCG0136	C.CERAMIC	50	V	33	PF+-5%	1	1
C 62	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 65	CCG0203	C.CERAMIC	50	V	680	PF+-5%	1	1
C 66	CES0252	C.AL ELYC	16	V	10	UF+-20% BP	1	1
C 67	CCG0203	C.CERAMIC	50	V	680	PF+-5%	1	1
C 69	CCG0120	C.CERAMIC	50	V	6	PF+-0.5PF	1	1
C 70	CCG0157	C.CERAMIC	50	V	3	PF+-0.25PF	1	1
C 71	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	1
C 73	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 74	CCG0116	C.CERAMIC	50	V	2	PF+-0.25PF	1	1
D 92	CMU0047	C.MIC.CHIP	500	V	27	PF +-1%	1	1
D 93	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
D 94	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
D 95	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	1
C 101	CQM0431	C.PLASTIC	400	V	47000	PF+-10%	1	1
C 102	CCG0128	C.CERAMIC	50	V	15	PF+-5%	1	1
C 103	CCG0128	C.CERAMIC	50	V	15	PF+-5%	1	1
C 105	CCD0274	C.CERAMIC	500	V	3	PF+-0.25PF	1	1
C 106	CCG0136	C.CERAMIC	50	V	33	PF+-5%	1	1
C 109	CCG2116	C.CERAMIC	10	V	2	PF+-0.25PF	1	1
C 112	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 113	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 115	CCG0272	C.CERAMIC	500	V	1	PF+-0.25PF	1	1
C 118	CCG0144	C.CERAMIC	50	V	220	PF+-5%	1	1
C 119	CCG0142	C.CERAMIC	50	V	82	PF+-5%	1	1

A : VC-6025 B : VC-6045 PEF-781 V-PRE&TRIG AMP

SYMBOL	..PART CODE..	..... DESCRIPTION					Q'TY A	Q'TY B
C 381	CES0379	C.AL ELYC	10	V	470	UF +-20%	1	1
C 382	CES0378	C.AL ELYC	16	V	330	UF +-20%	1	1
C 404	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 410	CC60209	C.CERAMIC	50	V	1000	PF+-10%	1	1
C 472	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 472	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	1
C 473	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 473	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	1
C 475	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	1
C 476	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	1
C 483	CCG0193	C.CERAMIC	50	V	150	PF+-5%	1	1
C 486	CCG0186	C.CERAMIC	50	V	VZZ000	PF+-20%	1	1
C 489	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 490	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 491	CCG0122	C.CERAMIC	50	V	8	PF+-0.5PF	1	1
C 492	CCG0128	C.CERAMIC	50	V	15	PF+-5%	1	1
C 492	CCG0120	C.CERAMIC	50	V	6	PF+-0.5PF	1	1
C 493	CCG0134	C.CERAMIC	50	V	27	PF+-5%	1	1
C 601	CCG0143	C.CERAMIC	50	V	100	PF+-5%	1	1
C 602	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 607	CCG0217	C.CERAMIC	50	V	47000	PF+-10%	1	1
C 608	CES0252	C.AL ELYC	16	V	10	UF+-20% BP	1	1
C 610	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 611	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 620	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 621	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 622	CES0252	C.AL ELYC	16	V	10	UF+-20% BP	1	1
C 625	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 626	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 627	CES0252	C.AL ELYC	16	V	10	UF+-20% BP	1	1
CV 4	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)				1	1
CV 5	CVT0053	C.VARIABLE	TZ03Z2R3NR169 (~2.3P)				1	1
CV 14	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)				1	1
CV 19	CVT0053	C.VARIABLE	TZ03Z2R3NR169 (~2.3P)				1	1
CV 104	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)				1	1
CV 105	CVT0053	C.VARIABLE	TZ03Z2R3NR169 (~2.3P)				1	1
CV 114	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)				1	1
CV 115	CVT0053	C.VARIABLE	TZ03Z2R3NR169 (~2.3P)				1	1
CV 140	CVT0056	C.VARIABLE	TZ03Z100NR169 (~10P)				1	1
CV 305	CVT0053	C.VARIABLE	TZ03Z2R3NR169 (~2.3P)				1	1
CV 306	CVT0053	C.VARIABLE	TZ03Z2R3NR169 (~2.3P)				1	1
CV 307	CVT0057	C.VARIABLE	TZ03T200NR169 (~20P)				1	1
D 25	HDS0477	DIODE	1SS119				1	1
D 25	HDS0477	DIODE	1SS119				1	1
D 26	HDS0477	DIODE	1SS119				1	1
D 31	HDS0477	DIODE	1SS119				1	1
D 41	HDM0141	DIODE	MTZ 7.5JC				1	1
D 42	HDS0477	DIODE	1SS119				1	1
D 71	HDS0437	DIODE	1SS133				1	1
D 72	HDS0437	DIODE	1SS133				1	1
D 73	HDS0437	DIODE	1SS133				1	1
D 74	HDS0437	DIODE	1SS133				1	1
D 125	HDS0477	DIODE	1SS119				1	1
D 125	HDS0477	DIODE	1SS119				1	1

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SYMBOL	..PART CODE..	..... DESCRIPTION					Q'TY A	Q'TY B
C 120	CCD0236	C.CERAMIC	500	V	1000	PF+100-0%	1	1
C 124	CCG0126	C.CERAMIC	50	V	12	PF+-5%	1	1
C 125	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 126	CCG0128	C.CERAMIC	50	V	15	PF+-5%	1	1
C 127	CCG0201	C.CERAMIC	50	V	470	PF+-5%	1	1
C 131	CCG0116	C.CERAMIC	50	V	2	PF+-0.25PF	1	1
C 131	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 141	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 142	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 143	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 144	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 145	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 146	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 147	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 151	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 153	CCG0121	C.CERAMIC	50	V	7	PF+-0.5PF	1	1
C 157	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 161	CCG0136	C.CERAMIC	50	V	33	PF+-5%	1	1
C 162	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 165	CCG0203	C.CERAMIC	50	V	680	PF+-5%	1	1
C 166	CES0252	C.AL ELYC	16	V	10	UF+-20% BP	1	1
C 167	CCG0203	C.CERAMIC	50	V	680	PF+-5%	1	1
C 169	CCG0120	C.CERAMIC	50	V	6	PF+-0.5PF	1	1
C 171	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	1
C 172	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	1
C 173	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 174	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	1
C 178	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 192	CMU0047	C.MIC.CHIP	500	V	27	PF +-1%	1	1
C 193	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 194	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 302	CCG0131	C.AL ELYC	400	V	47000	PF+-10%	1	1
C 305	CCG0117	C.CERAMIC	50	V	3	PF+-0.25PF	1	1
C 310	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 311	CCG0119	C.CERAMIC	50	V	5	PF+-0.25PF	1	1
C 312	CCG0136	C.CERAMIC	50	V	33	PF+-5%	1	1
C 313	CCG0275	C.CERAMIC	500	V	5	PF+-0.25PF	1	1
C 315	CCD0277	C.CERAMIC	500	V	10	PF+-0.5PF	1	1
C 321	CCG0136	C.CERAMIC	50	V	33	PF+-5%	1	1
C 322	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 323	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 324	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 325	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 326	CES0252	C.AL ELYC	16	V	10	UF+-20% BP	1	1
C 327	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 328	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 329	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 331	CCG0176	C.CERAMIC	50	V	1	PF+-0.25PF	1	1
C 332	CCG0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 333	CES0133	C.AL ELYC	16	V	47	UF+-20%	1	1
C 341	CCG0201	C.CERAMIC	50	V	470	PF+-5%	1	1
C 344	CCG0116	C.CERAMIC	50	V	2	PF+-0.25PF	1	1
C 346	CCG0211	C.CERAMIC	50	V	10000	PF+-10%	1	1
C 347	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 348	CCG0213	C.CERAMIC	50	V	0.1	UF+80-20%	1	1
C 360	CES0378	C.AL ELYC	16	V	330	UF +-20%	1	1

A : VC-6025 B : VC-6045 PEF-781 V-PRE&TRIG AMP

SYMBOL	..PART CODE..	..... DESCRIPTION					Q'TY A	Q'TY B
D 126	HDS0477	DIODE	1SS119				1	1
D 131	HDS0477	DIODE	1SS119				1	1
D 141	HDM0141	DIODE	MTZ 7.5JC				1	1
D 142	HDS0477	DIODE	1SS119				1	1
D 171	HDS0437	DIODE	1SS133				1	1
D 172	HDS0437	DIODE	1SS133				1	1
D 173	HDS0437	DIODE	1SS133				1	1
D 174	HDS0437	DIODE	1SS133				1	1
D 320	HDS0437	DIODE	1SS133				1	1
D 321	HDS0437	DIODE	1SS133				1	1
D 322	HDM0139	DIODE	MTZ 3.3JA				1	1
D 345	HDS0437	DIODE	1SS133				1	1
IC 26	B397023 A	IC.ANALOG	LF411CN-S1				1	1
IC 126	B397023 A	IC.ANALOG	LF411CN-S1				1	1
IC 171	HTD0161	TRANSISTOR	DTC124EK				1	1
IC 172	HTD0161	TRANSISTOR	DTC124EK				1	1
IC 320	ILT0037	IC.ANALOG	TL061CP				1	1
IC 610	IDM0875	IC.DIGITAL	MC10H116L				1	1
IC 610	IDM0162	IC.DIGITAL	MC10116L				1	1
JP 1	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 2	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 3	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 4	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 5	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 6	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 7	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 8	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 9	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 10	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 13	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 14	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 15	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 16	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 17	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 19	RME0912	R.METAL	1/8W	0	OHM		1	1
JP 20	RME0912	R.METAL	1/8W	0	OHM		1	1
L 47	TLM0047	L.CHIP	MLF3216110R39M				1	1
L 96	TLM0045	L.CHIP	MLF3216114AR7M				1	1
L 147	TLM0047	L.CHIP	MLF3216110R39M				1	1
L 194	TLM0045	L.CHIP	MLF3216114AR7M				1	1
L 330	TLE0173	COIL	EL96075XI 101K (100UH)				1	1
L 331	TLE0173	COIL	EL96075XI 101K (100UH)				1	1
L 332	TLE0173	COIL	EL96075XI 101K (100UH)				1	1
P 501	JBS0021	CONNECTOR	83B-XH-A				1	1
P 490	JBB0021	CONNECTOR	B3B-XH-A				1	1
P 601	JBB0022	CONNECTOR	B6B-XH-A				1	1
P 613	JBB0024	CONNECTOR	B15B-XH-A				1	1
R 2	RNE0856	R.METAL	1/8W	22	OHM	+-5%	1	1
R 3	RNE0856	R.METAL	1/8W	33	OHM	+-5%	1	1
R 4	RNE0862	R.METAL	1/8W	68	OHM	+-5%	1	1
R 5	RNE0043	R.METAL	1/4W	900	KOHM	+-0.5%	1	1

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SYMBOL	PART CODE	DESCRIPTION	A	B
R 6	RME1163	R.METAL 1/4W 111 KOHM +-0.5%	1	1
R 7	RME0868	R.METAL 1/8W 120 OHM +-5%	1	1
R 8	RME0858	R.METAL 1/8W 33 OHM +-5%	1	1
R 9	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 10	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 11	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 12	RME0885	R.METAL 1/8W 9.0 KOHM +-5%	1	1
R 13	RME0891	R.METAL 1/8W 18 KOHM +-5%	1	1
R 14	RME0853	R.METAL 1/8W 12 OHM +-5%	1	1
R 15	RMS0044	R.METAL 1/4W 990 KOHM +-0.5%	1	1
R 16	RME1156	R.METAL 1/4W 10.1 KOHM +-0.5%	1	1
R 17	RME0866	R.METAL 1/8W 150 OHM +-5%	1	1
R 18	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 19	RME0851	R.METAL 1/8W 6.8 OHM +-10%	1	1
R 21	RME1168	R.METAL 1/4W 500 KOHM +-0.5%	1	1
R 22	RME1168	R.METAL 1/4W 500 KOHM +-0.5%	1	1
R 23	RME1597	R.METAL 1/8W 10 MOHM +-5%	1	1
R 24	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	1
R 25	RME0840	R.METAL 1/8W 47 OHM +-5%	1	1
R 26	RME0848	R.METAL 1/8W 220 OHM +-5%	1	1
R 27	RME0886	R.METAL 1/8W 6.8 KOHM +-5%	1	1
R 28	RME0877	R.METAL 1/8W 1.2 KOHM +-5%	1	1
R 29	RME1591	R.METAL 1/4W 26.7 KOHM +-0.5%	1	1
R 30	RME0868	R.METAL 1/8W 100 OHM +-5%	1	1
R 31	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 32	RME0856	R.METAL 1/8W 22 OHM +-5%	1	1
R 33	RME1081	R.METAL 1/4W 5.62KOHM +-1%	1	1
R 34	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 37	RME1662	R.METAL 1/4W 301 OHM +-0.5%	1	1
R 38	RME0897	R.METAL 1/8W 56 KOHM +-5%	1	1
R 39	RCE0798	R.CARBON 1/4W 820 OHM +-5%	1	1
R 40	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 41	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 42	RME1661	R.METAL 1/4W 100 OHM +-0.5%	1	1
R 43	RME0884	R.METAL 1/8W 100 OHM +-5%	1	1
R 44	RME0882	R.METAL 1/8W 68 OHM +-5%	1	1
R 45	RME1595	R.METAL 1/4W 475 OHM +-0.5%	1	1
R 46	RME0876	R.METAL 1/8W 1.5 KOHM +-5%	1	1
R 47	RME1643	R.METAL 1/4W 22.1 OHM +-0.5%	1	1
R 48	RME0868	R.METAL 1/8W 220 OHM +-5%	1	1
R 49	RME1157	R.METAL 1/4W 16.5 KOHM +-0.5%	1	1
R 50	RME1596	R.METAL 1/4W 24.0 KOHM +-0.5%	1	1
R 51	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 52	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 53	RME0865	R.METAL 1/8W 120 OHM +-5%	1	1
R 54	RME1195	R.METAL 1/4W 110 KOHM +-1%	1	1
R 55	RME09DD	R.METAL 1/8W 100 KOHM +-5%	1	1
R 56	RME0838	R.METAL 1/8W 10 KOHM +-5%	1	1
R 57	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 58	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 59	RME1057	R.METAL 1/4W 56.2 OHM +-1%	1	1
R 60	RME0866	R.METAL 1/8W 150 OHM +-5%	1	1
R 61	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	1
R 62	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 63	RME0883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 64	RME0862	R.METAL 1/8W 68 OHM +-5%	1	1

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SYMBOL	PART CODE	DESCRIPTION	A	B
R 144	RME0862	R.METAL 1/8W 68 OHM +-5%	1	1
R 145	RME1595	R.METAL 1/4W 475 OHM +-0.5%	1	1
R 146	RME0878	R.METAL 1/8W 1.5 KOHM +-5%	1	1
R 147	RME1663	R.METAL 1/4W 22.1 OHM +-0.5%	1	1
R 148	RME0868	R.METAL 1/8W 220 OHM +-5%	1	1
R 149	RME1157	R.METAL 1/4W 16.0 KOHM +-0.5%	1	1
R 150	RME1596	R.METAL 1/4W 24.0 KOHM +-0.5%	1	1
R 151	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 152	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 153	RME0865	R.METAL 1/8W 120 OHM +-5%	1	1
R 154	RME1195	R.METAL 1/4W 110 KOHM +-1%	1	1
R 155	RME09DD	R.METAL 1/8W 100 KOHM +-5%	1	1
R 156	RMED888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 157	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 158	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 159	RME0863	R.METAL 1/8W 82 OHM +-5%	1	1
R 160	RME0868	R.METAL 1/8W 220 OHM +-5%	1	1
R 161	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	1
R 162	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 163	RME0883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 164	RME0862	R.METAL 1/8W 68 OHM +-5%	1	1
R 165	RME0854	R.METAL 1/8W 15 OHM +-5%	1	1
R 166	RME0849	R.METAL 1/8W 270 OHM +-5%	1	1
R 167	RME0854	R.METAL 1/8W 15 OHM +-5%	1	1
R 168	RME0849	R.METAL 1/8W 270 OHM +-5%	1	1
R 169	RME0912	R.METAL 1/8W 0 OHM	1	1
R 170	RME0863	R.METAL 1/8W 82 OHM +-5%	1	1
R 171	RME0860	R.METAL 1/8W 47 OHM +-5%	1	1
R 172	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 173	RMED860	R.METAL 1/8W 47 OHM +-5%	1	1
R 174	RMED888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 175	RMED888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 176	RME0882	R.METAL 1/8W 3.3 KOHM +-5%	1	1
R 177	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 178	RME0860	R.METAL 1/8W 47 OHM +-5%	1	1
R 191	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 192	RME0863	R.METAL 1/8W 82 OHM +-5%	1	1
R 193	RME0866	R.METAL 1/8W 100 OHM +-5%	1	1
R 194	RCE0770	R.CARBON 1/4W 1.2 KOHM +-5%	1	1
R 195	RMED866	R.METAL 1/8W 100 OHM +-5%	1	1
R 196	RME0883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 303	RMS0049	R.METAL 1/2W 1 MOHM +-0.5%	1	1
R 304	RME0874	R.METAL 1/8W 680 OHM +-5%	1	1
R 305	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 306	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 307	RMED870	R.METAL 1/8W 330 OHM +-5%	1	1
R 312	RMED874	R.METAL 1/8W 1.0 KOHM +-5%	1	1
R 313	RMS0043	R.METAL 1/4W 900 KOHM +-0.5%	1	1
R 315	RME0872	R.METAL 1/8W 470 OHM +-5%	1	1
R 314	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 315	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 319	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 320	RME09D6	R.METAL 1/8W 1.0 MOHM +-5%	1	1
R 321	RMED867	R.METAL 1/8W 180 OHM +-5%	1	1
R 322	RMED860	R.METAL 1/8W 47 OHM +-5%	1	1
R 323	RMED876	R.METAL 1/8W 1.0 KOHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-781 V-PRESTRIG AMP

SYMBOL	PART CODE	DESCRIPTION	A	B
R 65	RME0854	R.METAL 1/8W 15 OHM +-5%	1	1
R 66	RME0869	R.METAL 1/8W 270 OHM +-5%	1	1
R 67	RME0854	R.METAL 1/8W 15 OHM +-5%	1	1
R 68	RME0869	R.METAL 1/8W 270 OHM +-5%	1	1
R 69	RME0912	R.METAL 1/8W 0 OHM	1	1
R 70	RMED86D	R.METAL 1/8W 47 OHM +-5%	1	1
R 71	RMED888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 72	RMED882	R.METAL 1/8W 3.3 KOHM +-5%	1	1
R 73	RME0860	R.METAL 1/8W 47 OHM +-5%	1	1
R 74	RME0856	R.METAL 1/8W 22 OHM +-5%	1	1
R 75	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 91	RME0861	R.METAL 1/8W 56 OHM +-5%	1	1
R 92	RME0863	R.METAL 1/8W 82 OHM +-5%	1	1
R 93	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 94	RCE0770	R.CARBON 1/4W 1.2 KOHM +-5%	1	1
R 95	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 96	RME0883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 102	RME0856	R.METAL 1/8W 22 OHM +-5%	1	1
R 103	RME0858	R.METAL 1/8W 33 OHM +-5%	1	1
R 104	RME0862	R.METAL 1/8W 68 OHM +-5%	1	1
R 105	RMS0043	R.METAL 1/4W 900 KOHM +-0.5%	1	1
R 106	RME1163	R.METAL 1/4W 111 KOHM +-0.5%	1	1
R 107	RME0865	R.METAL 1/8W 120 OHM +-5%	1	1
R 108	RME0858	R.METAL 1/8W 33 OHM +-5%	1	1
R 109	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 110	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 111	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 112	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 113	RME0891	R.METAL 1/8W 18 KOHM +-5%	1	1
R 114	RME0853	R.METAL 1/8W 12 OHM +-5%	1	1
R 115	RMS0044	R.METAL 1/4W 990 KOHM +-0.5%	1	1
R 116	RME1156	R.METAL 1/4W 10.1 KOHM +-0.5%	1	1
R 117	RME0866	R.METAL 1/8W 150 OHM +-5%	1	1
R 118	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 119	RME0851	R.METAL 1/8W 6.8 OHM +-10%	1	1
R 121	RME1168	R.METAL 1/4W 500 KOHM +-0.5%	1	1
R 122	RME1168	R.METAL 1/4W 500 KOHM +-0.5%	1	1
R 123	RME1597	R.METAL 1/8W 10 MOHM +-5%	1	1
R 124	RME0826	R.METAL 1/8W 1.0 KOHM +-5%	1	1
R 125	RME0860	R.METAL 1/8W 47 OHM +-5%	1	1
R 126	RMED868	R.METAL 1/8W 220 OHM +-5%	1	1
R 127	RME0884	R.METAL 1/8W 6.8 KOHM +-5%	1	1
R 128	RME0877	R.METAL 1/8W 1.2 KOHM +-5%	1	1
R 129	RME1591	R.METAL 1/4W 26.7 KOHM +-0.5%	1	1
R 130	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 131	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 131	RME0856	R.METAL 1/8W 22 OHM +-5%	1	1
R 133	RME1081	R.METAL 1/4W 5.62KOHM +-1%	1	1
R 134	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 137	RME1662	R.METAL 1/4W 301 OHM +-0.5%	1	1
R 138	RME0897	R.METAL 1/8W 56 KOHM +-5%	1	1
R 139	RCE0768	R.CARBON 1/4W 820 OHM +-5%	1	1
R 140	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 141	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 142	RME1661	R.METAL 1/4W 100 OHM +-0.5%	1	1
R 143	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-781 V-PRESTRIG AMP

SYMBOL	PART CODE	DESCRIPTION	A	B
R 325	RME0876	R.METAL 1/8W 1.0 KOHM +-5%	1	1
R 326	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 328	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 329	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 331	RME0856	R.METAL 1/8W 22 OHM +-5%	1	1
R 332	RME0877	R.METAL 1/8W 1.2 KOHM +-5%	1	1
R 333	RME0906	R.METAL 1/8W 1.0 MOHM +-5%	1	1
R 334	RME0886	R.METAL 1/8W 6.8 KOHM +-5%	1	1
R 335	RME0906	R.METAL 1/8W 1.0 MOHM +-5%	1	1
R 336	RME0860	R.METAL 1/8W 47 OHM +-5%	1	1
R 340	RME0912	R.METAL 1/8W 0 OHM	1	1
R 341	RME0891	R.METAL 1/8W 18 KOHM +-5%	1	1
R 342	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 350	RME1644	R.METAL 1/4W 600 KOHM +-0.5%	1	1
R 352	RME1143	R.METAL 1/4W 111 KOHM +-0.5%	1	1
R 360	RME1672	R.METAL 1/4W 1.00KOHM +-1%	1	1
R 361	RME0877	R.METAL 1/8W 1.2 KOHM +-5%	1	1
R 362	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 363	RME1594	R.METAL 1/4W 68.1 KOHM +-1%	1	1
R 364	RME1075	R.METAL 1/4W 1.82KOHM +-1%	1	1
R 366	RCE0769	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 367	RME1060	R.METAL 1/2W 100 OHM +-1%	1	1
R 368	RME1060	R.METAL 1/2W 100 OHM +-1%	1	1
R 369	RCE0757	R.CARBON 1/4W 100 OHM +-5%	1	1
R 370	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 401	RME0883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 402	RME0887	R.METAL 1/8W 8.2 KOHM +-5%	1	1
R 403	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 404	RME1065	R.METAL 1/4W 267 OHM +-1%	1	1
R 405	RME0883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 406	RME0887	R.METAL 1/8W 8.2 KOHM +-5%	1	1
R 407	RCE0775	R.CARBON 1/4W 2.2 KOHM +-5%	1	1
R 408	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 409	RME1193	R.METAL 1/4W 11.0KOHM +-1%	1	1
R 410	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 414	RME0896	R.METAL 1/8W 47 KOHM +-5%	1	1
R 415	RME0894	R.METAL 1/8W 42 KOHM +-5%	1	1
R 470	RME1068	R.METAL 1/4W 475 OHM +-1%	1	1
R 471	RME1068	R.METAL 1/4W 475 OHM +-1%	1	1
R 472	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 473	RME0852	R.METAL 1/8W 10 OHM +-5%	1	1
R 473	RME1064	R.METAL 1/4W 221 OHM +-1%	1	1
R 474	RME1223	R.METAL 1/4W 432 OHM +-1%	1	1
R 477	RME1064	R.METAL 1/4W 221 OHM +-1%	1	1
R 478	RME0881	R.METAL 1/8W 2.7 KOHM +-5%	1	1
R 479	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 480	RME1197	R.METAL 1/4W 750 OHM +-1%	1	1
R 481	RMED877	R.METAL 1/8W 1.2 KOHM +-5%	1	1
R 482	RMED877	R.METAL 1/8W 1.2 KOHM +-5%	1	1
R 483	RME0893	R.METAL 1/8W 27 KOHM +-5%	1	1
R 483	RME0894	R.METAL 1/8W 33 KOHM +-5%	1	1
R 484	RME0899	R.METAL 1/8W 82 KOHM +-5%	1	1
R 485	RCE0759	R.CARBON 1/4W 150 OHM +-5%	1	1
R 486	RME1071	R.METAL 1/4W 825 OHM +-1%	1	1
R 487	RME1071	R.METAL 1/4W 825 OHM +-1%	1	1
R 488	RME1060	R.METAL 1/4W 100 OHM +-1%	1	1

SWP LOGIC (PEF-782)

A : VC-6025 B : VC-6045 PEF-781 V-PRESTRIG AMP

SYMBOL	PART CODE	DESCRIPTION						A	B
R 489	RME0869	R.METAL	1/4W	100	OHM	+-1%		1	1
R 490	RME1072	R.METAL	1/4W	1.00K	OHM	+-1%		1	1
R 491	RME0862	R.METAL	1/8W	68	OHM	+-5%			1
R 492	RME0863	R.METAL	1/8W	82	OHM	+-5%			1
R 492	RME0860	R.METAL	1/8W	47	OHM	+-5%		1	
R 493	RNE0886	R.METAL	1/8W	4.6	KOHM	+-5%			1
R 493	RME0883	R.METAL	1/8W	3.9	KOHM	+-5%		1	
R 601	RME0864	R.METAL	1/8W	100	OHM	+-5%		1	1
R 602	RME0873	R.METAL	1/8W	560	OHM	+-5%		1	1
R 603	RME0873	R.METAL	1/8W	560	OHM	+-5%		1	1
R 604	RME0864	R.METAL	1/8W	100	OHM	+-5%		1	1
R 605	RMED864	R.METAL	1/8W	100	OHM	+-5%		1	1
R 606	RMED876	R.METAL	1/8W	1.5	KOHM	+-5%		1	1
R 607	RMED860	R.METAL	1/8W	47	OHM	+-5%		1	1
R 608	RME0903	R.METAL	1/8W	330	KOHM	+-5%		1	1
R 610	RME0852	R.METAL	1/8W	10	OHM	+-5%		1	1
R 611	RME0867	R.METAL	1/8W	180	OHM	+-5%		1	1
R 612	RME1072	R.METAL	1/4W	1.00K	OHM	+-1%		1	1
R 613	RME1072	R.METAL	1/4W	1.00K	OHM	+-1%		1	1
R 614	RME0872	R.METAL	1/8W	470	OHM	+-5%		1	1
R 615	RME0872	R.METAL	1/8W	470	OHM	+-5%		1	1
R 616	RME0874	R.METAL	1/8W	680	OHM	+-5%		1	1
R 617	RME0874	R.METAL	1/8W	680	OHM	+-5%		1	1
R 618	RMED863	R.METAL	1/8W	82	OHM	+-5%		1	1
R 619	RME0863	R.METAL	1/8W	82	OHM	+-5%		1	1
R 620	RME0891	R.METAL	1/8W	18	KOHM	+-5%		1	1
R 621	RME0852	R.METAL	1/8W	10	OHM	+-5%		1	1
R 622	RME0904	R.METAL	1/8W	470	KOHM	+-5%		1	1
R 623	RME0873	R.METAL	1/8W	560	OHM	+-5%		1	1
R 624	RME0873	R.METAL	1/8W	560	OHM	+-5%		1	1
R 625	RME0891	R.METAL	1/8W	18	KOHM	+-5%		1	1
R 626	RME0852	R.METAL	1/8W	10	OHM	+-5%		1	1
R 627	RME0904	R.METAL	1/8W	470	KOHM	+-5%		1	1
RM 52	3203299	R.NETWORK	EXB-D87059FNP					1	1
RM 152	3203299	R.NETWORK	EXB-D87059FNP					1	1
RV 30	RNE0042	VR.METAL	EVM-39C 00Y B14		10KOHM			1	1
RV 37	RNE0047	VR.METAL	EVM 39C00YB54(50K)					1	1
RV 62	RNE0047	VR.METAL	EVM 39C00YB54(50K)					1	1
RV 130	RNE0042	VR.METAL	EVM-39C 00Y B14		10KOHM			1	1
RV 133	RNE0046	VR.METAL	EVM 39C00YB22(20K)					1	1
RV 137	RME0047	VR.METAL	EVM 39C00YB54(50K)					1	1
RV 162	RNE0047	VR.METAL	EVM 39C00YB54(50K)					1	1
RV 320	RME0047	VR.METAL	EVM 39C00YB54(50K)					1	1
S 1	SSP0574	SW.ROTARY	SPUJ-1					1	1
S 2	8472813 D	SW.ROTARY	ADR25S81BR11PY02(W,SS,GHD					1	1
S 11	SSP0574	SW.ROTARY	SPUJ-1					1	1
S 101	SSP0574	SW.ROTARY	SPUJ-1					1	1
S 102	8472813 D	SW.ROTARY	ADR25S81BR11PY02(W,SS,GHD					1	1
S 111	SSP0574	SW.ROTARY	SPUJ-1					1	1
S 301	SSR0311	SW.ROTARY	SRR234					1	1
TR 25	MTK0127	TRANSISTOR	2SK508K52/2SK508K52NV					1	1
TR 26	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 40	HTA0334	TRANSISTOR	2SA1226E4					1	1
TR 49	HTA0318	TRANSISTOR	2SA1462Y34						1
TR 41	MTC0871	TRANSISTOR	2SC3772LY4					1	
TR 42	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 57	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 58	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 71	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 72	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 93	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 125	MTK0127	TRANSISTOR	2SK508K52/2SK508K52NV					1	1
TR 128	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 140	HTA0334	TRANSISTOR	2SA1226E4					1	
TR 140	HTA0318	TRANSISTOR	2SA1462Y34						1
TR 141	MTC0871	TRANSISTOR	2SC3772LY4					1	
TR 142	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 157	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 158	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 171	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 172	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 175	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 176	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 193	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 320	MTK0127	TRANSISTOR	2SK508K52/2SK508K52NV					1	1
TR 325	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 330	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 362	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 363	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 365	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 601	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 602	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 607	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 475	HTA0334	TRANSISTOR	2SA1226E4					1	
TR 475	HTA0344	TRANSISTOR	2SA1245						1
TR 476	HTA0334	TRANSISTOR	2SA1226E4					1	
TR 476	HTA0344	TRANSISTOR	2SA1245						1
TR 484	HTA0318	TRANSISTOR	2SA1462Y34					1	1
TR 485	HTA0318	TRANSISTOR	2SA1462Y34					1	1
TR 601	HTA0318	TRANSISTOR	2SA1462Y34					1	1
TR 604	MTC0872	TRANSISTOR	2SC2620C					1	1
TR 605	MTC0872	TRANSISTOR	2SC2620C					1	1
TR 620	MTC0872	TRANSISTOR	2SC2620C					1	1
TR 621	HTA0334	TRANSISTOR	2SA1226E4					1	1
TR 625	HTA0334	TRANSISTOR	2SA1226E4					1	1
TR 626	MTC0872	TRANSISTOR	2SC2620C					1	1

A : VC-6025 B : VC-6045 PEF-782 SWP LOGIC R : Not used

SYMBOL	PART CODE	DESCRIPTION					A	B
6	EIP0141	PIN	DP-2				1	1
7	ETP0141	PIN	DP-2				1	1
12	ETP0141	PIN	DP-2				1	1
14	ETP0141	PIN	DP-2				1	1
16	EIP0141	PIN	DP-2				1	1
17	EIP0141	PIN	DP-2				1	1
C 630	CES0252	C.AL ELYC	16 V	10	UF+-20% BP		1	1
C 632	CES0378	C.AL ELYC	16 V	330	UF +-20%		1	1
C 634	CCG0209	C.CERAMIC	50 V	4700	PF+-10%		1	1
C 640	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 643	CCG0163	C.CERAMIC	50 V	100	PF+-5%		1	1
C 650	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 651	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 657	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 660	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 661	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 664	CQA0129	C.PLASTIC	50 V	82000	PF+-10%		1	1
C 669	CCG0163	C.CERAMIC	50 V	68	PF+-5%		1	1
C 672	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 674	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 682	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 684	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 710	CMY0053	C.MICA	50 V	180	PF+-5%		1	1
C 710A	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 711	CCG0150	C.CERAMIC	50 V	18	PF+-5%		1	1
C 712	CCG0152	C.CERAMIC	50 V	22	PF+-5%		1	1
C 714	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 715	CQE0049	C.PLASTIC	ECQ-E1105JN(JNB) TYPE-1				1	1
C 716	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 717	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 718	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 722	CCG0152	C.CERAMIC	50 V	22	PF+-5%		1	1
C 722A	CCG0150	C.CERAMIC	50 V	18	PF+-5%		1	1
C 732	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 733	CCG0144	C.CERAMIC	50 V	220	PF+-5%		1	1
C 734	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 735	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 736	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 738	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 801	CES0378	C.AL ELYC	16 V	330	UF +-20%		1	1
C 802	CES0378	C.AL ELYC	16 V	330	UF +-20%		1	1
C 803	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 804	CCG0116	C.CERAMIC	50 V	2	PF+-0.25PF		1	1
C 805	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 807	CES0131	C.AL ELYC	16 V	10	UF+-20%		1	1
C 813	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 815	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 818	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 821	CCG0116	C.CERAMIC	50 V	2	PF+-0.25PF		1	1
C 822	CCG0116	C.CERAMIC	50 V	2	PF+-0.25PF		1	1
C 825	CET0033	C.AL ELYC	160 V	1UF			1	1
C 826	CCG0176	C.CERAMIC	50 V	5	PF+-0.25PF		1	1

A : VC-6025 B : VC-6045 PEF-781 V-PRESTRIG AMP

SYMBOL	PART CODE	DESCRIPTION						A	B
TR 40	HTA0334	TRANSISTOR	2SA1226E4					1	1
TR 49	HTA0318	TRANSISTOR	2SA1462Y34						1
TR 41	MTC0871	TRANSISTOR	2SC3772LY4					1	
TR 42	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 57	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 58	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 71	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 72	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 93	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 125	MTK0127	TRANSISTOR	2SK508K52/2SK508K52NV					1	1
TR 128	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 140	HTA0334	TRANSISTOR	2SA1226E4					1	
TR 140	HTA0318	TRANSISTOR	2SA1462Y34						1
TR 141	MTC0871	TRANSISTOR	2SC3772LY4					1	
TR 142	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 157	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 158	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 171	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 172	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 175	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 176	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 193	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 320	MTK0127	TRANSISTOR	2SK508K52/2SK508K52NV					1	1
TR 325	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 330	MTC0871	TRANSISTOR	2SC3772LY4					1	1
TR 362	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 363	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 365	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 601	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 602	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 607	MTC0686	TRANSISTOR	2SC2462C					1	1
TR 475	HTA0334	TRANSISTOR	2SA1226E4					1	
TR 475	HTA0344	TRANSISTOR	2SA1245						1
TR 476	HTA0334	TRANSISTOR	2SA1226E4					1	
TR 476	HTA0344	TRANSISTOR	2SA1245						1
TR 484	HTA0318	TRANSISTOR	2SA1462Y34					1	1
TR 485	HTA0318	TRANSISTOR	2SA1462Y34					1	1
TR 601	HTA0318	TRANSISTOR	2SA1462Y34					1	1
TR 604	MTC0872	TRANSISTOR	2SC2620C					1	1
TR 605	MTC0872	TRANSISTOR	2SC2620C					1	1
TR 620	MTC0872	TRANSISTOR	2SC2620C					1	1
TR 621	HTA0334	TRANSISTOR	2SA1226E4					1	1
TR 625	HTA0334	TRANSISTOR	2SA1226E4					1	1
TR 626	MTC0872	TRANSISTOR	2SC2620C					1	1

A : VC-6025 B : VC-6045 PEF-782 SWP LOGIC R : Not used

SYMBOL	PART CODE	DESCRIPTION					A	B
C 833	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 843	CCG0163	C.CERAMIC	50 V	100	PF+-5%		1	1
C 851	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 861	CCG0213	C.CERAMIC	50 V	0.1	UF+80-20%		1	1
C 862	CES0133	C.AL ELYC	160 V	1UF			1	1
C 867	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 872	CCG0199	C.CERAMIC	50 V	330	PF+-5%		1	1
C 883	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 1101	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 1102	CCG0126	C.CERAMIC	50 V	10	PF+-0.5PF		1	1
C 1105	CCG0139	C.CERAMIC	50 V	47	PF+-5%		1	1
C 1106	CCG0195	C.CERAMIC	50 V	150	PF+-5%		1	1
C 1109	CCG0199	C.CERAMIC	50 V	330	PF+-5%		1	1
C 1111	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 1121	CCB0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 1124	CCB0296	C.CERAMIC	50.0V	1000.	PF+-5%		1	1
C 1125	CCG0296	C.CERAMIC	50.0V	1000.	PF+-5%		1	1
C 1126	CCG0199	C.CERAMIC	50 V	330	PF+-5%		1	1
C 1127	CCG0296	C.CERAMIC	50.0V	1000.	PF+-5%		1	1
C 1127A	CCG0296	C.CERAMIC	50.0V	1000.	PF+-5%		1	1
C 2100	CQA0127	C.PLASTIC	50 V	330000	PF+-10%		1	1
C 2101	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 2107	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2108	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 2110	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 2130	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2131	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2142	CCG0205	C.CERAMIC	50 V	1000	PF+-10%		1	1
C 2143	CCG0213	C.CERAMIC	50 V	0.1	UF+80-20%		1	1
C 2144	CCG0205	C.CERAMIC	50 V	1000	PF+-10%		R	R
C 2144A	CCG0201	C.CERAMIC	50 V	470	PF+-5%		1	1
C 2145	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 2146	CCG0209	C.CERAMIC	50 V	4700	PF+-10%		1	1
C 2150	CCG0213	C.CERAMIC	50 V	0.1	UF+80-20%		1	1
C 2151	CCG0213	C.CERAMIC	50 V	0.1	UF+80-20%		1	1
C 2152	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		R	R
C 2153	CQE0062	C.PLASTIC	50V	1MF	+-5%		1	1
C 2154	CQE0062	C.PLASTIC	50V	1MF	+-5%		1	1
C 2155	CEK0186	C.AL ELYC	50 V	4.7	UF+-20%		1	1
C 2156	CCG0126	C.CERAMIC	50 V	10	PF+-0.5PF		1	1
C 2157	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2160	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2161	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2162	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2163	CCG0163	C.CERAMIC	50 V	100	PF+-5%		1	1
C 2164	CCG0163	C.CERAMIC	50 V	100	PF+-5%		1	1
C 2165	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2166	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2167	CCG0163	C.CERAMIC	50 V	100	PF+-5%		1	1
C 2168	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 2170	CCG0213	C.CERAMIC	50 V	0.1	UF+80-20%		1	1
C 2171	CCG0211	C.CERAMIC	50 V	10000	PF+-10%		1	1
C 2201	CES0033	C.AL ELYC	25 V	100	UF+-20%		1	1
C 2202	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1

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SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
C 2203	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
C 2210	CCG0206	C.CERAMIC	50 V 3300 PF+-10%	1	1
C 2211	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
C 2212	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
C 2215	CCG0296	C.CERAMIC	50,0V 1000. PF+-5%	1	1
C 2220	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
C 2221	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
C 2230	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	1
C 2231	CES0155	C.AL ELYC	16 V 47 UF+-20%	1	1
C 2247	CES0155	C.AL ELYC	16 V 47 UF+-20%	1	1
C 2266	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
C 2269	CQA0124	C.PLASTIC	50 V 0.1 UF+-10%	1	1
C 4001	CCG0211	C.CERAMIC	50 V10000 PF+-10%	1	1
D 630	HDN0140	DIODE	MTZ 4.7JB	1	1
D 631	HDX0055	DIODE	1SS165	1	1
D 632	HDS0437	DIODE	1SS133	1	1
D 635	HDS0437	DIODE	1SS133	1	1
D 660	HDS0437	DIODE	1SS133	1	1
D 661	HDS0437	DIODE	1SS133	1	1
D 662	HDS0437	DIODE	1SS133	1	1
D 663	HDS0437	DIODE	1SS133	1	1
D 664	HDS0437	DIODE	1SS133	1	1
D 665	HDS0437	DIODE	1SS133	1	1
D 666	HDS0437	DIODE	1SS133	1	1
D 668	HDS0437	DIODE	1SS133	1	1
D 670	HDS0437	DIODE	1SS133	1	1
D 675	HDS0437	DIODE	1SS133	1	1
D 685	HDS0437	DIODE	1SS133	1	1
D 692	HDS0437	DIODE	1SS133	1	1
D 710	HDM0051	DIODE	MA161	1	1
D 711	HDS0576	DIODE	1SS286	1	1
D 712	HDS0576	DIODE	1SS286	1	1
D 723	HDS0437	DIODE	1SS133	1	1
D 724	HDN0226	DIODE	MZ7AT	1	1
D 740	HDM0139	DIODE	MTZ 3.3JA	1	1
D 841	HDX0055	DIODE	1SS165	1	1
D 842	HDX0055	DIODE	1SS165	1	1
D 867	HDM0141	DIODE	MTZ 7.5JC	1	1
D 1101	HDS0437	DIODE	1SS133	1	1
D 1102	HDS0437	DIODE	1SS133	1	1
D 1103	HDS0437	DIODE	1SS133	1	1
D 1104	HDS0437	DIODE	1SS133	1	1
D 1105	HDS0437	DIODE	1SS133	1	1
D 1113	HDX0055	DIODE	1SS165	1	1
D 1114	HDS0437	DIODE	1SS133	1	1
D 1115	HDX0055	DIODE	1SS165	1	1
D 1116	HDS0437	DIODE	1SS133	1	1
D 2107	HDS0437	DIODE	1SS133	1	1
D 2108	HDK0176	DIODE	MT16.8JC	1	1
D 2135	HDS0437	DIODE	1SS133	1	1
D 2165	HDS0437	DIODE	1SS133	1	1
D 2166	HDS0437	DIODE	1SS133	1	1
D 2212	HDS0437	DIODE	1SS133	1	1
D 4002	HDS0437	DIODE	1SS133	1	1

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SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
P 3102	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 3103	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 3104	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 3105	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 3106	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 3107	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 3108	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 4001	JBB0026	CONNECTOR	B4B-XH-A	1	1
P 4002	JBB0026	CONNECTOR	B10B-XH-A	1	1
P 5150	JBB0022	CONNECTOR	B6B-XH-A	1	1
R 630	RME0869	R.METAL	1/8W 270 OHM +-5%	1	1
R 631	RME0894	R.METAL	1/8W 33 KOHM +-5%	1	1
R 632	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 635	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	1
R 654	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 655	RME0864	R.METAL	1/8W 100 OHM +-5%	1	1
R 656	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 657	RNE0845	R.METAL	1/8W 5.6 KOHM +-5%	1	1
R 658	RNE0895	R.METAL	1/8W 39 KOHM +-5%	1	1
R 659	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	1
R 640	RME0845	R.METAL	1/8W 120 OHM +-5%	1	1
R 641	RME0865	R.METAL	1/8W 120 OHM +-5%	1	1
R 643	RME1191	R.METAL	1/4W 432 OHM +-1%	1	1
R 650	RME0872	R.METAL	1/8W 470 OHM +-5%	1	1
R 651	RME0872	R.METAL	1/8W 470 OHM +-5%	1	1
R 653	RME0856	R.METAL	1/8W 22 OHM +-5%	1	1
R 653	RME0845	R.METAL	1/8W 120 OHM +-5%	1	1
R 656	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	1
R 657	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 660	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 661	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 661A	RME0864	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 661B	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 662	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 663	RME0896	R.METAL	1/8W 47 KOHM +-5%	1	1
R 664	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	1
R 665	RME0881	R.METAL	1/8W 2.7 KOHM +-5%	1	1
R 666	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	1
R 667	RME0908	R.METAL	1/8W 4.7 MOHM +-10%	1	1
R 668	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 669	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 669A	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 670	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 671	RME0874	R.METAL	1/8W 33 KOHM +-5%	1	1
R 672	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	1
R 673	RME0890	R.METAL	1/8W 15 KOHM +-5%	1	1
R 674	RME0901	R.METAL	1/8W 150 KOHM +-5%	1	1
R 675	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 676	RME0868	R.METAL	1/8W 220 OHM +-5%	1	1
R 681	RME0894	R.METAL	1/8W 33 KOHM +-5%	1	1
R 682	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	1
R 683	RME0890	R.METAL	1/8W 15 KOHM +-5%	1	1
R 684	RME0901	R.METAL	1/8W 150 KOHM +-5%	1	1
R 685	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 686	RME0868	R.METAL	1/8W 220 OHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-782 SWP LOGIC B : Not used

SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
IC 659	IDS0444	IC.DIGITAL	SN74S00N	1	1
IC 660	IDS0455	IC.DIGITAL	SN74S74N	1	1
IC 661	IDM0982	IC.DIGITAL	MD74HC00P/TC74HC00P	1	1
IC 670	ILM0431	IC.ANALOG	M5216L	1	1
IC 680	ILM0431	IC.ANALOG	M5216L	1	1
IC 694	HTD0160	TRANSISTOR	DTA124EK	1	1
IC 716	HTD0161	TRANSISTOR	DTC124EK	1	1
IC 717	IDM0766	IC.DIGITAL	MC74HC4053N	1	1
IC 730	ILH0042	IC.ANALOG	NJM 0725	1	1
IC 738	HTD0161	TRANSISTOR	DTC124EK	1	1
IC 864	HTD0161	TRANSISTOR	DTC124EK	1	1
IC 1101	IDM0475	IC.DIGITAL	MD74LS10P	1	1
IC 1111	IDM0471	IC.DIGITAL	MD74LS04P	1	1
IC 1121	IDM0467	IC.DIGITAL	MD74LS00P	1	1
IC 2107	IDM0467	IC.DIGITAL	MD74LS00P	1	1
IC 2130	IDM0800	IC.DIGITAL	MB14051BP/MC14051BCP	1	1
IC 2150	ILT0045	IC.ANALOG	TL064CN	1	1
IC 2160	IDM0456	IC.DIGITAL	MD74LS74AP	1	1
IC 2161	IDT0096	IC.DIGITAL	TC40H151P	1	1
IC 2162	IDM0467	IC.DIGITAL	MD74LS00P	1	1
IC 2165	IDS0479	IC.DIGITAL	SN74LS595N	1	1
IC 2166	IDT0069	IC.DIGITAL	TC40H164P	1	1
IC 2170	IDS0455	IC.DIGITAL	SN74S74N	1	1
IC 2171	IDM0454	IC.DIGITAL	MD74LS73P	1	1
IC 2201	ILT0091	IC.ANALOG	TL431CLP-B	1	1
IC 2211	IDT0047	IC.DIGITAL	TC40H002P	1	1
IC 2212	IDM0795	IC.DIGITAL	MD14040BP/MC14040BCP	1	1
IC 2220	IDM0704	IC.DIGITAL	MC74HC4052N	1	1
IC 2230	ILN0042	IC.ANALOG	NJM 0725	1	1
IC 2230A	ILN0042	IC.ANALOG	NJM 0725	1	1
IC 2248	IDT0039	IC.DIGITAL	TC40H000P	1	1
IC 4005	IDM0630	IC	MD74LS157P	1	1
L 663	TLE0084	COIL	ELG06D6SK1 1ROK	1	1
L 665	TLN0005	COIL	D.22UH 450 MA +-20%	1	1
L 801	TLE0172	COIL	ELG04D7SK1 470K (47UH)	1	1
L 802	TLE0172	COIL	ELG04D7SK1 470K (47UH)	1	1
L 2163	XCFD033			R	R
L 2163	TLE0058	COIL	ELG04D6SK1 10 UH+-10%	1	1
L 2164	TLE0058	COIL	ELG04D6SK1 10 UH+-10%	1	1
L 2170	TLN0006		4.7 UH 220 MA +-20%	1	1
P 2003	JBB0076	CONNECTOR	B10P-SHF-GB	1	1
P 2004	JBB0031	CONNECTOR	B8P-SHF-GB	1	1
P 2115	JBB0022	CONNECTOR	B6B-XH-A	1	1
P 2117	JBB0027	CONNECTOR	B2B-XH-A	1	1
P 2118	JBB0021	CONNECTOR	B3B-XH-A	1	1
P 2601	JBB0024	CONNECTOR	B15B-XH-A	1	1
P 2602	JBB0026	CONNECTOR	B10B-XH-A	1	1
P 2603	JBB0026	CONNECTOR	B10B-XH-A	1	1
P 2604	JBB0022	CONNECTOR	B6B-XH-A	1	1
P 2605	JBB0021	CONNECTOR	B3B-XH-A	1	1
P 2610	JBB0024	CONNECTOR	B15B-XH-A	1	1
P 2611	JBB0040	CONNECTOR	B5B-XH-A	1	1
P 3101	JBB0031	CONNECTOR	B8P-SHF-GB	1	1

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SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
R 691	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 692	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 693	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 700	RME0856	R.METAL	1/8W 22 OHM +-5%	1	1
R 701	RME0860	R.METAL	1/8W 47 OHM +-5%	1	1
R 703	RME0874	R.METAL	1/8W 680 OHM +-5%	1	1
R 703A	RME0872	R.METAL	1/8W 470 OHM +-5%	1	1
R 704	RME0869	R.METAL	1/8W 270 OHM +-5%	1	1
R 705	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 706	RME0890	R.METAL	1/8W 15 KOHM +-5%	1	1
R 707	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 708	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 709	RME0886	R.METAL	1/8W 6.8 KOHM +-5%	1	1
R 710	RME0824	R.METAL	1/8W 100 OHM +-5%	1	1
R 710A	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 711	RME0886	R.METAL	1/8W 6.8 KOHM +-5%	1	1
R 712	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 713	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 713A	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 714	RME0858	R.METAL	1/8W 33 OHM +-5%	1	1
R 715	ACE0704	R.CARBON	1/2W 820 OHM +-5%	1	1
R 716	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 716A	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 717	RME0876	R.METAL	1/8W 1.0 KOHM +-5%	1	1
R 718	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 719	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 720	RME1080	R.METAL	1/4W 4.75KOHM +-1%	1	1
R 721	RME1080	R.METAL	1/4W 4.75KOHM +-1%	1	1
R 722	RME0872	R.METAL	1/8W 470 OHM +-5%	1	1
R 722A	RME0884	R.METAL	1/8W 4.7 KOHM +-5%	1	1
R 723	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 723A	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 724	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	1
R 725	RME0896	R.METAL	1/8W 46 KOHM +-5%	1	1
R 732	RME1078	R.METAL	1/4W 3.32KOHM +-1%	1	1
R 733	RME1174	R.METAL	1/4W 2.00KOHM +-1%	1	1
R 734	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 735	RME0852	R.METAL	1/8W 10 OHM +-5%	1	1
R 736	RME0864	R.METAL	1/8W 100 OHM +-5%	1	1
R 737	RME0864	R.METAL	1/8W 100 OHM +-5%	1	1
R 738	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 738A	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 740	RME1710	R.METAL	1/4W 1.00 MOHM +-0.5%	1	1
R 740A	RME0882	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 741	RME1163	R.METAL	1/4W 111 KOHM +-0.5%	1	1
R 742	RME0867	R.METAL	1/8W 6.2 KOHM +-5%	1	1
R 743	RME1156	R.METAL	1/4W 10.1 KOHM +-0.5%	1	1
R 744	RME0867	R.METAL	1/8W 6.2 KOHM +-5%	1	1
R 745	RME1711	R.METAL	1/4W 1.00 KOHM +-0.5%	1	1
R 746	RME0867	R.METAL	1/8W 6.2 KOHM +-5%	1	1
R 750	RME0862	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 751	RME0862	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 752	RME0862	R.METAL	1/8W 3.3 KOHM +-5%	1	1
R 801	RCE0774	R.CARBON	1/4W 2.7 KOHM +-5%	1	1
R 801A	RME0865	R.METAL	1/8W 120 OHM +-5%	1	1
R 802	RME0863	R.METAL	1/8W 82 OHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-782 SMP LOGIC R : Not used

SYMBOL	PART CODE	DESCRIPTION			Q'TY A	Q'TY B
R 803	RME1412	R.METAL	1/4W	4.32KOHM +-1%	1	1
R 804	RME1412	R.METAL	1/4W	4.32KOHM +-1%	1	1
R 805	RNE1073	R.METAL	1/4W	1.21KOHM +-1%	1	1
R 806	RME1070	R.METAL	1/4W	681 OHM +-1%	1	1
R 807	RME0890	R.METAL	1/8W	15 KOHM +-5%	1	1
R 808	RME0889	R.METAL	1/8W	12 KOHM +-5%	1	1
R 811	RME1058	R.METAL	1/4W	68.1 OHM +-1%	1	1
R 812	RME1423	R.METAL	1/4W	2.43KOHM +-1%	1	1
R 813	RME1072	R.METAL	1/4W	1.00KOHM +-1%	1	1
R 815	RME0884	R.METAL	1/8W	4.7 KOHM +-5%	1	1
R 816	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 817	RME0883	R.METAL	1/8W	3.9 KOHM +-5%	1	1
R 819	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
A 821	RME1074	R.METAL	1/4W	1.50KOHM +-1%	1	1
R 822	RME1074	R.METAL	1/4W	1.50KOHM +-1%	1	1
R 823	RCE0779	R.CARBON	1/4W	6.8 KOHM +-5%	1	1
R 824	RCE0779	R.CARBON	1/4W	6.8 KOHM +-5%	1	1
R 825	RCE0772	R.CARBON	1/4W	1.8 KOHM +-5%	1	1
R 830	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 831	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
A 832	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 833	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	R	R
R 834	RME0885	R.METAL	1/8W	3.9 KOHM +-5%	1	1
R 836	RME0896	R.METAL	1/8W	47 KOHM +-5%	1	1
R 838	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 839	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
A 841	RME1071	R.METAL	1/4W	825 OHM +-1%	1	1
A 842	RME1071	R.METAL	1/4W	825 OHM +-1%	1	1
A 843	RME0860	R.METAL	1/8W	47 OHM +-5%	1	1
A 844	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
A 845	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	R	R
R 846	RME0894	R.METAL	1/8W	4.7 KOHM +-5%	1	1
A 847	RME0868	R.METAL	1/8W	220 OHM +-5%	1	1
A 852	RME1078	R.METAL	1/4W	3.32KOHM +-1%	1	1
R 853	RME1078	R.METAL	1/4W	3.32KOHM +-1%	1	1
R 861	RME0873	R.METAL	1/8W	560 OHM +-5%	1	1
A 862	RME1081	R.METAL	1/4W	5.62KOHM +-1%	1	1
R 863	RME0880	R.METAL	1/8W	2.2 KOHM +-5%	1	1
R 864	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 865	RME0880	R.METAL	1/8W	2.2 KOHM +-5%	1	1
R 866	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 867	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 868	RME0879	R.METAL	1/8W	1.8 KOHM +-5%	1	1
R 871	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
A 872	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	R	R
R 875	RME0884	R.METAL	1/8W	4.7 KOHM +-5%	1	1
R 876	RME0883	R.METAL	1/8W	3.6 KOHM +-5%	1	1
R 881	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 882	RME1070	R.METAL	1/4W	681 OHM +-1%	1	1
R 883	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	R	R
R 884	RME0881	R.METAL	1/8W	2.7 KOHM +-5%	1	1
R 885	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 886	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 887	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 1101	RME0875	R.METAL	1/8W	820 OHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-782 SMP LOGIC R : Not used

SYMBOL	PART CODE	DESCRIPTION			Q'TY A	Q'TY B
R 2175	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 2176	RME0912	R.METAL	1/8W	0 OHM	R	R
R 2177	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 2178	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 2201	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 2202	RME0912	R.METAL	1/8W	0 OHM	1	1
R 2203	RME0838	R.METAL	1/8W	33 OHM +-5%	1	1
R 2204	RME1084	R.METAL	1/4W	16.0 KOHM +-1%	1	1
M 2205	RME1084	R.METAL	1/4W	16.0 KOHM +-1%	1	1
R 2219	RME1200	R.METAL	1/4W	10.0 KOHM +-1%	1	1
R 2211A	RME1262	R.METAL	1/8W	1.5 MOHM +-5%	1	1
R 2212	RME0879	R.METAL	1/4W	90.9 K OHM +-1%	1	1
R 2213	RME0892	R.METAL	1/8W	1.8 KOHM +-5%	1	1
R 2220	RME0864	R.METAL	1/8W	22 KOHM +-5%	1	1
R 2221	RME0876	R.METAL	1/8W	100 OHM +-5%	1	1
A 2222	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
A 2225	RME1069	R.METAL	1/8W	680 OHM +-5%	1	1
R 2225A	RME1121	R.METAL	1/4W	562 OHM +-1%	1	1
R 2226	RME1123	R.METAL	1/4W	1.37KOHM +-1%	1	1
R 2226A	RME1371	R.METAL	1/4W	2.43KOHM +-1%	1	1
R 2229	RME1088	R.METAL	1/4W	1.65 KOHM +-1%	1	1
R 2230	RME0952	R.METAL	1/4W	22.1 KOHM +-1%	1	1
		R.METAL	1/8W	10 OHM +-5%	1	1
R 2231	RME0852	R.METAL	1/8W	10 OHM +-5%	1	1
A 2232	RME0866	R.METAL	1/8W	150 OHM +-5%	1	1
R 2235A	RCE0746	R.CARBON	1/4W	560 OHM +-5%	1	1
A 2236A	RCE0773	R.CARBON	1/4W	2.2 KOHM +-5%	1	1
A 2243	RME0880	R.METAL	1/8W	2.2 KOHM +-5%	1	1
R 2244	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 2245	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
R 2246	RME1155	R.METAL	1/4W	4.00KOHM +-0.5%	1	1
R 2247	RME1711	R.METAL	1/4W	1.00 KOHM +-0.5%	1	1
A 2249	RCE0757	R.CARBON	1/4W	100 OHM +-5%	1	1
R 5150	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 5151	RME0860	R.METAL	1/8W	47 OHM +-5%	1	1
R 5152	RME0877	R.METAL	1/8W	1.2 KOHM +-5%	1	1
R 5153	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 5154	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 5155	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
RM 2120	RZA0166	R.BLOCK		EXB-LB10-5036	1	1
RM 2211	RCE0652	R.BLOCK		EXB-LD8-5036	1	1
RM 2231	RCE0852	R.BLOCK		EXB-LD8-5036	1	1
RM 2232	RCE0854	R.BLOCK		EXB-LD4-5036	1	1
RT 847	MDD0086	THERMISTOR		32D27	1	1
RV 675	RME0047	VR.METAL		EVK 39C00Y854(50K)		
RV 685	RME0047	VR.METAL		EVK 39C00Y854(50K)	1	1
RV 801	RNE0058	VR.METAL		EVM 39C00Y813(1K)	1	1
RV 807	RNE0042	VR.METAL		EVM-39C 00Y 814 10KOHM	1	1
RV 831	RNE0068	VR.METAL		EVN 39C00Y822(200)	1	1
RV 834	RNE0070	VR.METAL		EVN 39C00Y853(5K)	1	1
RV 844	RNE0049	VR.METAL		EVN 39C00Y812(100)	1	1
RV 876	RNE0042	VR.METAL		EVN-39C 00Y 814 10KOHM	1	1
RV 884	RNE0070	VR.METAL		EVN 39C00Y853(5K)	1	1

A : VC-6025 B : VC-6045 PEF-782 SMP LOGIC R : Not used

SYMBOL	PART CODE	DESCRIPTION			Q'TY A	Q'TY B
R 1102	RME0895	R.METAL	1/8W	47 KOHM +-5%	1	1
R 1103	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 1104	RME0884	R.METAL	1/8W	4.7 KOHM +-5%	1	1
R 1105	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 1106	RME0890	R.METAL	1/8W	15 KOHM +-5%	1	1
R 1109	RME0879	R.METAL	1/8W	1.8 KOHM +-5%	1	1
R 1112	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 1113	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 1114	RME0883	R.METAL	1/8W	3.9 KOHM +-5%	1	1
R 1115	RME0886	R.METAL	1/8W	6.8 KOHM +-5%	1	1
R 1116	RME0890	R.METAL	1/8W	15 KOHM +-5%	1	1
A 1121	RME0912	R.METAL	1/8W	0 OHM	1	1
A 1122	RME0912	R.METAL	1/8W	0 OHM	1	1
R 1123	RME0878	R.METAL	1/8W	1.3 KOHM +-5%	1	1
R 1124	RME0885	R.METAL	1/8W	5.6 KOHM +-5%	1	1
R 1125	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 1126	RME0868	R.METAL	1/8W	220 OHM +-5%	1	1
R 1127	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 1127A	RME0870	R.METAL	1/8W	330 OHM +-5%	1	1
R 2100	RCE0738	R.CARBON	1/2W	2.2 MOHM +-5%	1	1
R 2105	RME0900	R.METAL	1/8W	100 KOHM +-5%	1	1
R 2106	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
R 2107	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
R 2108	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
R 2109	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
A 2111	RME1129	R.METAL	1/4W	3.11KOHM +-1%	1	1
A 2112	RME1052	R.METAL	1/4W	6.81KOHM +-1%	1	1
A 2115	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
A 2116	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
R 2117	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
A 2118	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 2119	RME0902	R.METAL	1/8W	220 KOHM +-5%	1	1
R 2120	RME0902	R.METAL	1/8W	220 KOHM +-5%	1	1
R 2130	RME0864	R.METAL	1/8W	100 OHM +-5%	1	1
R 2131	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 2132	RME0874	R.METAL	1/8W	680 OHM +-5%	1	1
R 2142	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 2146	RME0868	R.METAL	1/8W	220 OHM +-5%	1	1
R 2150	RME0852	R.METAL	1/8W	10 OHM +-5%	1	1
A 2151	RME0852	R.METAL	1/8W	10 OHM +-5%	1	1
R 2153	RME0888	R.METAL	1/8W	10 KOHM +-5%	1	1
R 2156	RME0860	R.METAL	1/8W	47 OHM +-5%	1	1
R 2157	RME0912	R.METAL	1/8W	0 OHM	1	1
R 2161	RME3882	R.METAL	1/8W	5.6 KOHM +-5%	1	1
R 2163	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 2164	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 2165	RME0882	R.METAL	1/8W	3.3 KOHM +-5%	1	1
R 2166	RME0882	R.METAL	1/8W	3.3 KOHM +-5%	1	1
R 2167	RME0876	R.METAL	1/8W	1.0 KOHM +-5%	1	1
R 2168	RME0892	R.METAL	1/8W	22 KOHM +-5%	1	1
R 2169	RME0872	R.METAL	1/8W	470 OHM +-5%	1	1
R 2171	RME0912	R.METAL	1/8W	0 OHM	1	1
A 2172	RME0874	R.METAL	1/8W	1.0 KOHM +-5%	R	R
R 2173	RME0912	R.METAL	1/8W	0 OHM	R	1
R 2174	RME0912	R.METAL	1/8W	0 OHM	1	R

A : VC-6025 B : VC-6045 PEF-782 SMP LOGIC

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
S 690	SSR0312	SW.ROTARY 5RBM 1024(M)	1	1
TR 632	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 634	HTC0684	TRANSISTOR 2SC2462C	1	1
TR 636	HTC0686	TRANSISTOR 2SC2462C	1	1
TR 650	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 651	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 652	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 653	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 660	HTC0590	TRANSISTOR 2SC162184	1	1
TR 661	HTC0590	TRANSISTOR 2SC162184	1	1
TR 708	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 709	HTC0684	TRANSISTOR 2SC2462C	1	1
TR 710	HTK0167	TRANSISTOR 2SK456A2G	1	1
TR 712	HTC0572	TRANSISTOR 2SC2620GC	1	1
TR 714	HTC0338	TRANSISTOR 2SC1906	1	1
TR 723	HTC0686	TRANSISTOR 2SC2462C	1	1
TR 732	HTC0813	TRANSISTOR 2SC2853E	1	1
TR 734	HTA0336	TRANSISTOR 2SA1138E	1	1
TR 741	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 743	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 745	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 750	HTA0261	TRANSISTOR 2SA1052D	1	1
TR 751	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 752	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 811	HTC0586	TRANSISTOR 2SC2462C	1	1
TR 812	HTA0334	TRANSISTOR 2SA1226E4	1	1
TR 821	HTC0691	TRANSISTOR 2SC2335JC/2SC2735J04	1	1
TR 822	HTC0691	TRANSISTOR 2SC2735JC/2SC2735J04	1	1
TR 831	HTA0334	TRANSISTOR 2SA1226E4	1	1
TR 833	HTA0334	TRANSISTOR 2SA1226E4	1	1
TR 863	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 865	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 867	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 881	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 882	HTA0263	TRANSISTOR 2SA1052D	1	1
TR 2108	HTC0590	TRANSISTOR 2SC162184	1	1
TR 2109	HTC0590	TRANSISTOR 2SC162184	1	1
TR 2201	HTC0781	TRANSISTOR 2SC3068	1	1
TR 5150	HTC0691	TRANSISTOR 2SC2735JC/2SC2735J04	1	1

PANEL (PEF-783)

A : VC-6025 B : VC-6045 PEF-783 PANEL

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
	HYL0002	HLDR.LED LE60-68	1	1
C 1401	CCE0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 1402	CCE0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 1404	CCG0219	C.CERAMIC 50 V10000 PF+-10%	1	1
C 1405	CCG0219	C.CERAMIC 50 V10000 PF+-10%	1	1
D 1601	HDP0033	DIODE(LED) PG5534SY	1	1
D 1602	8392133 4	DIODE GL-9PR2	1	1
D 1605	8392133 4	DIODE GL-9PR2	1	1
D 1606	8392133 4	DIODE GL-9PR2	1	1
D 1607	8392133 4	DIODE GL-9PR2	1	1
D 1608	8392133 4	DIODE GL-9PR2	1	1
D 1609	8392133 4	DIODE GL-9PR2	1	1
D 1610	8392133 4	DIODE GL-9PR2	1	1
D 1611	8392133 4	DIODE GL-9PR2	1	1
IC 1601	IDM1258	IC.DIGITAL HD74LS164P/SN74LS164N	1	1
IC 1602	IDM1258	IC.DIGITAL HD74LS164P/SN74LS164N	1	1
R 1401	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1402	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1605	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1606	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1607	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1608	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1609	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1610	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1611	RME0873	R.METAL 1/8W 560 OHM +-5%	1	1
R 1612	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 1620	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 1621	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 1622	RME0868	R.METAL 1/8W 220 OHM +-5%	1	1
R 1622	RME0912	R.METAL 1/8W 0 OHM	1	
R 1623	RME0898	R.METAL 1/8W 68 KOHM +-5%	1	1
R 1631	RME0864	R.METAL 1/8W 100 OHM +-5%	1	1
R 1632	RME1080	R.METAL 1/4W 100 OHM +-1%	1	1
R 1633	RME1060	R.METAL 1/4W 100 OHM +-1%	1	1
R 1634	RME1109	R.METAL 1/4W 200 OHM +-1%	1	1
R 1635	RME1154	R.METAL 1/4W 600 OHM +-0.5%	1	1
RM 1601	RZA0202	R.BLOCK EXB-LES 502S(5BIT.5K)	1	1
RM 1602	RZA0202	R.BLOCK EXB-LES 502S(5BIT.5K)	1	1
RM 1603	RZA0202	R.BLOCK EXB-LES 502S(5BIT.5K)	1	1
RV 1601	RDV0546	VR.CARBON V12LS(PVB)N10KOHM SHAFT18	1	1
RV 1602	RNR0209	VR.METAL 1/2W 1D KOHMB +-25%	1	1
RV 1603	RDV0543	VR.CARBON V12LS(PVB)N 1KOHM SHAFT18	1	1
RV 1604	RDV0546	VR.CARBON V12LS(PVB)N10KOHM SHAFT18	1	1
RV 1605	RDV0546	VR.CARBON V12LS(PVB)N10KOHM SHAFT18	1	1
RV 1606	RNR0210	VR.METAL 1/2W 4.7KOHMB +-25%	1	1
RV 1607	RDV0546	VR.CARBON V12LS(PVB)N10KOHM SHAFT18	1	1
RV 2400	RNR0229	VR METAL RK163 10KOHM L3S	1	1
S 1601	SSP0572	SW.PUSH SPPH2 TYPE-A NONLOCK	1	1
S 1602	SSP0572	SW.PUSH SPPH2 TYPE-A NONLOCK	1	1

POWER (PEF-784)

A : VC-6025 B : VC-6045 PEF-784 POWER SUPPLY

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
	8620992	SHEET 35X45 UL94V-1	1	1
	8480993	SHEET 25X25 UL94V-1	1	1
	8488452	SHEET 25X36 UL94V-1	1	1
C 850	CCC1030	CAPACITOR 50 V10000 PF+80-20		1
C 850	CQA0124	C.PLASTIC 50 V 0.1 UF+-10%	1	
C 855	CCC1002	C.CERAMIC 50 V 10 PF+-5PF	1	1
C 856	CCC1002	C.CERAMIC 50 V 10 PF+-5PF	1	1
C 857	CCD0275	C.CERAMIC 500 V 2 PF+-0.25PF	1	1
C 858	CCD0275	C.CERAMIC 500 V 2 PF+-0.25PF	1	1
C 859	CCC0997	C.CERAMIC 50 V 5 PF+-0.25PF	1	
C 862	CCC1030	CAPACITOR 50 V10000 PF+80-20	1	1
C 863	CCC1030	CAPACITOR 50 V10000 PF+80-20	1	1
C 871	CQA0037	C.PLASTIC 25D V10000 PF+-10%	1	1
C 872	CQA0037	C.PLASTIC 25D V10000 PF+-10%	1	1
C 873	CQA0037	C.PLASTIC 25D V10000 PF+-10%	1	1
C 874	CQA0037	C.PLASTIC 25D V10000 PF+-10%	1	1
C 885	CCC1026	C.CERAMIC 50 V 150 PF+-10%	1	1
C 886	CCC1026	C.CERAMIC 50 V 150 PF+-10%	1	1
C 901	CEE0032	C.AL ELYC 25 V 47 UF+-20%	1	1
C 904	CCD0272	C.CERAMIC 500 V 1 PF+-0.25PF	1	1
C 908	CCD0287	C.CERAMIC 500 V 47DD PF+100-0%	1	1
C 911	CCC1030	CAPACITOR 50 V10000 PF+80-20	1	1
C 912	CEK0162	C.AL ELYC 160 V 1 UF+-20%	1	1
C 1004	CQA0139	C.PLASTIC 50 V 0.068UF +-5%	1	1
C 1005	CEC0175	C.AL ELYC 25 V 10 UF	1	1
C 1010	CQA0099	C.PLASTIC 50 V22000 PF+-10%	1	1
C 1011	CES0032	C.AL ELYC 25 V 47 UF+-20%	1	1
C 1013	CQE0131	C.PLASTIC 630 V 0.018UF +-5%	1	
C 1013	CQE0121	C.PLASTIC 630 V 0.01 UF+-5%		1
C 1020	CEK0209	C.AL ELYC 100 V 22 UF+-20 %	1	1
C 1021	CEK0209	C.AL ELYC 100 V 22 UF+-20 %	1	1
C 1022	CES0134	C.AL ELYC 50 V 1 UF+-20%	1	1
C 1023	CQA0101	C.PLASTIC 50 V47000 PF+-10%	1	1
C 1024	CES0032	C.AL ELYC 25 V 47 UF+-20%	1	1
C 1031	CCD0375	C.CERAMIC 2 KV 10000 PF+80%-20%	1	1
C 1032	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1033	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1034	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1035	CCD0246	C.CERAMIC 2000 V 1000 PF+-10%	1	1
C 1040	CCD0286	C.CERAMIC 500 V 1000 PF+100-0%	1	1
C 1041	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1042	CST0033	C.AL ELYC 160 V 1UF	1	1
C 1043	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1254	CCD0234	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1255	CCD0286	C.CERAMIC 500 V 1000 PF+100-0%	1	1
C 1256	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1257	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%	1	1
C 1258	EBA0037	C.PLASTIC 250 V10000 PF+-10%	1	1
C 1259	EQA0037	C.PLASTIC 250 V10000 PF+-10%	1	1
C 1280	CCC1030	CAPACITOR 50 V10000 PF+80-20	1	1
C 1281	CCD0287	C.CERAMIC 500 V 4700 PF+100-0%	1	1
C 1282	CCD0287	C.CERAMIC 500 V 4700 PF+100-0%	1	1
C 1502	CCD0338	C.CERAMIC DE7100F222M-VA1-KC	1	1
C 1503	CCD0338	C.CERAMIC DE7100F222M-VA1-KC	1	1
C 1504	CCD0338	C.CERAMIC DE7100F222M-VA1-KC	1	1

A : VC-6025 B : VC-6045 PEF-783 PANEL

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
S 1603	SSL0076	SW.LEVER AL25-2M4(WITH NOB A24004)	1	1
S 1605	SSP0570	SW.PUSH SPPH1 TYPE-A SELFLOCK	1	1
S 1606	SSP0573	SW.PUSH SPUV30(STROKE1.5MM.RESET)	1	1
S 1607	SSP0571	SW.PUSH SPPH1 TYPE-A NONLOCK	1	1
S 1608	SSP0573	SW.PUSH SPUV30(STROKE1.5MM.RESET)	1	1
S 1609	SSP0571	SW.PUSH SPPH1 TYPE-A NONLOCK	1	1
S 1610	SSP057D	SW.PUSH SPPH1 TYPE-A SELFLOCK	1	1
S 1611	SSP057D	SW.PUSH SPPH1 TYPE-A SELFLOCK	1	1
S 1612	SSP057D	SW.PUSH SPPH1 TYPE-A SELFLOCK	1	1

A : VC-6025 B : VC-6045 PEF-784 POWER SUPPLY

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
C 1505	CCD0338	C.CERAMIC DE7100F222M-VA1-KC	1	1
C 1506	CEK0179	C.AL ELYC 400 V 56 UF +-20%	1	1
C 1507	CEK0208	C.AL ELYC 50 V 22 UF+-20%	1	1
C 1508	CEK0186	C.AL ELYC 50 V 4.7 UF+-20%	1	1
C 1509	CEK0178	C.AL ELYC 400 V 39 UF +-20%	1	1
C 1511	CCD0341	C.CERAMIC 1KV 1000 PF+-10%	1	1
C 1512	CEK0184	C.AL ELYC 25 V 47 UF +-20%	1	1
C 1513	CCD0341	C.CERAMIC 1KV 1000 PF+-10%	1	1
C 1514	CCC1030	CAPACITOR 50 V10000 PF+80-20	1	1
C 1522	CCD0246	C.CERAMIC 2000 V 1000 PF+-10%	1	1
C 1531	CEK0180	C.AL ELYC 160 V 4.7 UF +-20%	1	1
C 1532	CES0376	C.AL ELYC 160 V 4.7 UF +-20%	1	1
C 1533	CES0376	C.AL ELYC 160 V 4.7 UF +-20%	1	1
C 1541	CEK0181	C.AL ELYC 63 V 47 UF +-20%	1	1
C 1542	CES0377	C.AL ELYC 63 V 47 UF +-20%	1	1
C 1551	CEK0172	C.AL ELYC KME 16VB-1000 CC	1	1
C 1552	CES0318	C.AL ELYC 16V 1000UF +-20%	1	1
C 1553	CES0318	C.AL ELYC 16V 1000UF +-20%	1	1
C 1554	CEK0172	C.AL ELYC KME 16VB-1000 CC	1	1
C 1561	CEK0171	C.AL ELYC KME 10VB-1000 CC	1	1
C 1562	CES0318	C.AL ELYC 16V 1000UF +-20%	1	1
C 1563	CES0318	C.AL ELYC 16V 1000UF +-20%	1	1
C 1571	CEK0182	C.AL ELYC 16 V 330 UF +-20%	1	1
C 1572	CES0378	C.AL ELYC 16 V 330 UF +-20%	1	1
C 1573	CES0318	C.AL ELYC 16V 1000UF +-20%	1	1
C 1574	CES0378	C.AL ELYC 16 V 330 UF +-20%	1	1
C 1593	CES0038	C.AL ELYC 50 V 2.2 UF+-20%	1	1
C 1594	CQA0124	C.PLASTIC 50 V 0.1 UF+-10%	1	1
CV 859	CVT0054	C.VARIABLE TZ03Z050RR169 (-5P)	1	1
D 862	HDM0139	DIODE MTZ 3.3JA	1	1
D 863	HDM0139	DIODE MTZ 3.3JA	1	1
D 871	HDS0437	DIODE 1SS133	1	1
D 872	HDS0437	DIODE 1SS133	1	1
D 873	HDM0051	DIODE MA161		1
D 873	HDX0055	DIODE 1SS165	1	
D 874	HDM0051	DIODE MA161		1
D 874	HDX0055	DIODE 1SS165	1	
D 875	HDS0437	DIODE 1SS133	1	1
D 901	HDS0437	DIODE 1SS133	1	1
D 902	HDX0055	DIODE 1SS165	1	1
D 903	HDS0437	DIODE 1SS133	1	1
D 910	HDS0437	DIODE 1SS133	1	1
D 911	HDM0139	DIODE MTZ 3.3JA	1	1
D 1013	HDR0215	DIODE RU3AMLF-81	1	1
D 1022	HDS0437	DIODE 1SS133	1	1
D 1023	HDM0175	DIODE HZ7A3	1	1
D 1024	HDS0437	DIODE 1SS133	1	1
D 1026	HDM0142	DIODE MTZ 12JC	1	1
D 1029	HDS0437	DIODE 1SS133	1	1
D 1030	HDS0437	DIODE 1SS133	1	1
D 1031	HDS0437	DIODE 1SS133	1	1
D 1032	HDS0437	DIODE 1SS133	1	1
D 1040	HDS0250	DIODE 1S53	1	1
D 1041	HDS0250	DIODE 1S53	1	1

A : VC-6025 B : VC-6045 PEF-784 POWER SUPPLY

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
D 1042	HDS0250	DIODE 1SS83	1	1
D 1043	HDS0250	DIODE 1SS83	1	1
D 1271	HDM0141	DIODE MTZ 7.5JC	1	1
D 1280	HDM0141	DIODE MTZ 7.5JC	1	1
D 1281	HDS0250	DIODE 1SS83	1	1
D 1282	HDS0250	DIODE 1SS83	1	1
D 1283	HDS0250	DIODE 1SS83	1	1
D 1284	HDS0250	DIODE 1SS83	1	1
D 1501	HDS0234	DIODE RBV-406	1	1
D 1502	HDS0092	DIODE SIB 3.0B	1	1
D 1503	HDA0071	DIODE AU01	1	1
D 1504	HDA0071	DIODE AU01	1	1
D 1514	HD60081	DIODE GZB 2.4B	1	1
D 1515	HD60083	DIODE GZB 6.8B	1	1
D 1520	HDD0141	DIODE 6TA10E	1	1
D 1521	HDA0071	DIODE AU01	1	1
D 1531	HDA0074	DIODE AU01A	1	1
D 1541	HDA0071	DIODE AU01	1	1
D 1551	HDF0055	DIODE FMB-26	1	1
D 1561	HDF0052	DIODE FMB-24	1	1
D 1571	HDF0053	DIODE FMB-24	1	1
D 1591	HD90437	DIODE 1SS133	1	1
F 1001	EFZ0013	ICPROTECT ICP-F10 (8.4A)	1	1
IC 1501	IIS0109	IC-HYBRID STK7308	1	1
IC 1591	HZP0030	PHOTOCOPUL PC716V	1	1
J 1502	ETZ0121	TAB 62747-1	1	1
J 1503	ETZ0121	TAB 62747-1	1	1
L 1001	TLE0173	COIL EL06079K1 101K (100UH)	1	1
L 1002	TLE0172	COIL EL05079K1 470K (47UH)		
L 1502	TLX0174	COIL LL0243	1	1
L 1510	TLX0175	COIL BL02AR1-A62	1	1
L 1511	TLX0175	COIL BL02RN1-A62	1	1
L 1532	TLT0085	COIL 47 UH+-10% 0.9AA	1	1
L 1542	TLT0085	COIL 47 UH+-10% 0.9AA	1	1
L 1552	TLT0086	COIL 22 UH+-10% 1.3 A	1	1
L 1562	TLT0086	COIL 22 UH+-10% 1.3 A	1	1
L 1572	TLT0086	COIL 22 UH+-10% 1.3 A	1	1
P 851	JBB0060	CONNECTOR 852-XH-A	1	1
P 890	JBB0021	CONNECTOR 830-XH-A	1	1
P 1042	JBB0022	CONNECTOR 840-XH-A	1	1
P 1280	JBB0021	CONNECTOR 830-XH-A	1	1
P 1290	JBB0021	CONNECTOR 830-XH-A	1	1
P 1501	JBB0024	CONNECTOR B15B-XH-A	1	1
P 1502	JBB0023	CONNECTOR B8B-XH-A	1	1
R 850	RCE0903	R.CARBON 1/4W 1.5 MOHM +-5%		1
R 850	RSE0434	R.SOLID 1/4W 10 MOHM +-5%	1	
R 851	RCE0756	R.CARBON 1/4W 82 OHM +-5%	1	1
R 852	RCE0756	R.CARBON 1/4W 82 OHM +-5%	1	1
R 855	RCE0775	R.CARBON 1/4W 3.3 KOHM +-5%		1
R 855	RCE0780	R.CARBON 1/4W 8.2 KOHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-784 POWER SUPPLY

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
R 1019	RCE0755	R.CARBON 1/4W 68 OHM +-5%	1	1
R 1020	RCE0779	R.CARBON 1/4W 6.8 KOHM +-5%	1	1
R 1021	RCE0780	R.CARBON 1/4W 8.2 KOHM +-5%	1	1
R 1022	RCE0757	R.CARBON 1/4W 33 KOHM +-5%	1	1
R 1023	RME1241	R.METAL 1/4W 45.2 K OHM +-1%	1	1
R 1024	RME1726	R.METAL EAO-82CKF2432(24.3K)/SN14	1	1
R 1025	RCE0779	R.CARBON 1/4W 6.8 KOHM +-5%	1	1
R 1026	RCE0775	R.CARBON 1/4W 3.3 KOHM +-5%	1	1
R 1027	RCE0755	R.CARBON 1/4W 330 OHM +-5%	1	1
R 1028	RNE1759	R.METAL 2W 5.5 KOHM +-5%	1	1
R 1029	RCE0785	R.CARBON 1/4W 22 KOHM +-5%	1	1
R 1032	RCE0715	R.CARBON 1/2W 6.8 KOHM +-5%	1	1
R 1035	RMV0012	R.METAL VR37 15 MOHM +-1%	1	1
R 1040	RCE0798	R.CARBON 1/4W 330 KOHM +-5%	1	1
R 1041	RCE0749	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 1042	RCE0790	R.CARBON 1/4W 56 KOHM +-5%	1	1
R 1043	RSE0434	R.SOLID 1/4W 10 MOHM +-5%	1	1
R 1251	RCE0795	R.CARBON 1/4W 150 KOHM +-5%	1	1
R 1252	RMV0012	R.METAL VR37 15 MOHM +-1%	1	1
R 1253	RSE0434	R.SOLID 1/4W 10 MOHM +-5%	1	1
R 1254	RNV0014	R.METAL 1/2W 6.20 MEG +-1.0%	1	1
R 1255	RCE0735	R.CARBON 1/2W 1.0 MOHM +-5%	1	1
R 1256	RCE0792	R.CARBON 1/4W 82 KOHM +-5%	1	1
R 1257	RCE0794	R.CARBON 1/4W 120 KOHM +-5%	1	1
R 1258	RCE0781	R.CARBON 1/4W 10 KOHM +-5%	1	1
R 1259	RCE0712	R.CARBON 1/2W 10.0 KOHM +-5%	1	1
R 1260	RCE0725	R.CARBON 1/2W 47 KOHM +-5%	1	1
R 1271	RCE0781	R.CARBON 1/4W 10 KOHM +-5%	1	1
R 1272	RCE0794	R.CARBON 1/4W 120 KOHM +-5%	1	1
R 1280	RCE0786	R.CARBON 1/4W 27 KOHM +-5%	1	1
R 1281	RCE0781	R.CARBON 1/4W 10 KOHM +-5%	1	1
R 1282	RCE0785	R.CARBON 1/4W 22 KOHM +-5%	1	1
R 1283	RCE0757	R.CARBON 1/4W 100 OHM +-5%	1	1
R 1284	RCE0757	R.CARBON 1/4W 100 OHM +-5%	1	1
R 1501	RWK0005	R.WIRE 3W 10 OHM+-5%	1	1
R 1502	RWK0002	R.WIRE 3W 2 OHM +-5%	1	1
R 1503	RCE0729	R.CARBON 1/2W 100 KOHM +-5%	1	1
R 1504	RCE0729	R.CARBON 1/2W 100 KOHM +-5%	1	1
R 1505	RCE0748	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 1506	RCE0783	R.CARBON 1/4W 15 KOHM +-5%		
R 1506	RCE0762	R.CARBON 1/4W 12 KOHM +-5%	1	
R 1507	RCE0778	R.CARBON 1/4W 5.6 KOHM +-5%	1	1
R 1508	RCE0779	R.CARBON 1/4W 6.8 KOHM +-5%	1	1
R 1509	RCE0762	R.CARBON 1/4W 12 KOHM +-5%	1	1
R 1512	RMR2791	R.METAL 2 W 47 OHM +-5%	1	1
R 1515	RCE0773	R.CARBON 1/4W 2.2 KOHM +-5%	1	1
R 1521	RCE0685	R.CARBON 1/2W 22 OHM +-5%	1	1
R 1522	RMR2789	R.METAL 2 W 22 OHM +-5%	1	1
R 1591	RCE0729	R.CARBON 1/2W 100 KOHM +-5%	1	1
R 1592	RCE0729	R.CARBON 1/2W 100 KOHM +-5%	1	1
R 1593	RCE0789	R.CARBON 1/4W 47 KOHM +-5%	1	1
RV 1042	RNE0068	VR.METAL EVM-K3GA00B54(50K)	1	1
RV 1253	RNE0089	VR.METAL EVM-K3GA00B15(100K)	1	1
RV 1281	RNE0089	VR.METAL EVM-K3GA00B15(100K)	1	1
RV 1506	RNE0057	VR.METAL EVM-K3GA00B53(5K)	1	1

A : VC-6025 B : VC-6045 PEF-784 POWER SUPPLY

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
R 856	RCE0775	R.CARBON 1/4W 3.3 KOHM +-5%	1	1
R 856	RCE0790	R.CARBON 1/4W 8.2 KOHM +-5%	1	1
R 857	RNR3726	R.METAL 1W 22 KOHM +-5%	1	1
R 858	RNR3726	R.METAL 1W 22 KOHM +-5%	1	1
R 859	RCE0761	R.CARBON 1/4W 220 OHM +-5%		1
R 859	RCE0758	R.CARBON 1/4W 120 OHM +-5%	1	1
R 860	RCE0769	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 861	RCE0769	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 862	RCE0755	R.CARBON 1/4W 68 OHM +-5%	1	1
R 863	RCE0755	R.CARBON 1/4W 68 OHM +-5%	1	1
R 865	RCE0796	R.CARBON 1/4W 180 KOHM +-5%	1	1
R 866	RCE0796	R.CARBON 1/4W 180 KOHM +-5%	1	1
R 867	RCE0778	R.CARBON 1/4W 5.6 KOHM +-5%	1	1
R 868	RCE0778	R.CARBON 1/4W 5.6 KOHM +-5%	1	1
R 869	RZZ0032	R.FUSING RF-25S 470 OHMJ	1	1
R 870	RZZ0032	R.FUSING RF-25S 470 OHMJ	1	1
R 871	RME1079	R.METAL 1/4W 3.92K OHM +-1%		1
R 871	RME1244	R.METAL 1/4W 3.65 K OHM +-1%	1	
R 872	RME1079	R.METAL 1/4W 3.92K OHM +-1%		1
R 872	RME1244	R.METAL 1/4W 3.65 K OHM +-1%	1	
R 873	RME1072	R.METAL 1/4W 1.00K OHM +-1%		1
R 873	RME1071	R.METAL 1/4W 825 OHM +-1%	1	
R 881	RCE0753	R.CARBON 1/4W 47 OHM +-5%	1	1
R 882	RCE0753	R.CARBON 1/4W 47 OHM +-5%	1	1
R 883	RCE0771	R.CARBON 1/4W 1.5 KOHM +-5%	1	1
R 884	RCE0771	R.CARBON 1/4W 1.5 KOHM +-5%	1	1
R 891	RCE0743	R.CARBON 1/4W 330 OHM +-5%		1
R 891	RCE0743	R.CARBON 1/4W 4.7 OHM +-5%	1	
R 892	RCE0743	R.CARBON 1/4W 330 OHM +-5%		1
R 892	RCE0743	R.CARBON 1/4W 4.7 OHM +-5%	1	
R 893	RCE0757	R.CARBON 1/4W 100 OHM +-5%	1	1
R 894	RCE0757	R.CARBON 1/4W 100 OHM +-5%	1	1
R 895	RME1077	R.METAL 1/4W 2.67K OHM +-1%		1
R 896	RME1077	R.METAL 1/4W 2.67K OHM +-1%	1	
R 897	RCE0761	R.CARBON 1/4W 220 OHM +-5%	1	1
R 898	RME1082	R.METAL 1/4W 6.91K OHM +-1%	1	1
R 901	RME1080	R.METAL 1/4W 4.75K OHM +-1%	1	1
R 902	RCE0781	R.CARBON 1/4W 10 KOHM +-5%	1	1
R 904	RCE0721	R.CARBON 1/2W 22 KOHM +-5%	1	1
R 905	RME1087	R.METAL 1/4W 19.2 KOHM +-1%	1	1
R 907	RCE0753	R.CARBON 1/4W 47 OHM +-5%	1	1
R 908	RCE0743	R.CARBON 1/4W 820 OHM +-5%	1	1
R 909	RCE0790	R.CARBON 1/4W 56 KOHM +-5%	1	1
R 910	RCE0788	R.CARBON 1/4W 39 KOHM +-5%	1	1
R 911	RME1541	R.METAL ERG-2SJ682P (2W+6.8KOHM)	1	1
R 915	RZZ0031	R.FUSING RF-25S 220 OHMJ	1	1
R 1001	RCE0782	R.CARBON 1/4W 12 KOHM +-5%	1	1
R 1002	RCE0775	R.CARBON 1/4W 3.3 KOHM +-5%	1	1
R 1003	RCE0772	R.CARBON 1/4W 1.8 KOHM +-5%	1	1
R 1004	RCE0775	R.CARBON 1/4W 3.3 KOHM +-5%	1	1
R 1005	RCE0785	R.CARBON 1/4W 22 KOHM +-5%	1	1
R 1006	RCE0769	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 1007	RCE0769	R.CARBON 1/4W 1.0 KOHM +-5%	1	1
R 1010	RCE0757	R.CARBON 1/4W 100 OHM +-5%	1	1
R 1011	RCE0693	R.CARBON 1/2W 100 OHM +-5%	1	1
R 1012	RCE0693	R.CARBON 1/2W 100 OHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-784 POWER SUPPLY

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
S 1501	SSP0575	SW.PUSH SDDS (W/O WIRE TERMINAL)	1	1
T 1010	TTM0006	TRANSFORM H-DRIVE HD-12	1	1
T 1013	BL74287 A	XFMR 10KV(+B=50VDC) FOR V-660	1	
T 1013	BL74287 B	XFMR 15KV(+B=50VDC) FOR V-1060		1
T 1501	BS07597	XFMR MTH1KA030	1	1
TR 851	HTC0148	TRANSISTOR 2SC535-C-	1	1
TR 852	HTC0148	TRANSISTOR 2SC535-C-	1	1
TR 853	HTC0148	TRANSISTOR 2SC458-C-	1	1
TR 854	HTC0148	TRANSISTOR 2SC458-C-	1	1
TR 871	HTA0258	TRANSISTOR 2SA1210S	1	1
TR 872	HTA0258	TRANSISTOR 2SA1210S	1	1
TR 881	HTC0338	TRANSISTOR 2SC1906	1	1
TR 882	HTC0338	TRANSISTOR 2SC1906	1	1
TR 885	HTC0669	TRANSISTOR 2SC2992S	1	1
TR 886	HTC0669	TRANSISTOR 2SC2992S	1	1
TR 901	HTC0192	TRANSISTOR 2SC644TK-C	1	1
TR 906	HTC0338	TRANSISTOR 2SC1906	1	1
TR 910	HTA0256	TRANSISTOR 2SA1210S	1	1
TR 912	HTC0669	TRANSISTOR 2SC2992S	1	1
TR 1001	HTA0224	TRANSISTOR 2SA1029 O	1	1
TR 1002	HTA0224	TRANSISTOR 2SA1029 O	1	1
TR 1010	HTC0856	TRANSISTOR 2SC1213A-C-	1	1
TR 1013	HTC0921	TRANSISTOR 2SC5089	1	1
TR 1020	HTC0746	TRANSISTOR 2SC458-C-	1	1
TR 1021	HTC0148	TRANSISTOR 2SC458-C-	1	1
TR 1022	HTA0224	TRANSISTOR 2SA1029 O	1	1
TR 1023	HTA0224	TRANSISTOR 2SA1029 O	1	1
TR 1251	HTA0104	TRANSISTOR 2SA778A K	1	1
TR 1514	HTC0148	TRANSISTOR 2SC458-C-	1	1

V OUT (PEF-785)

A : VC-6025 B : VC-6045 PEF-785 V-OUT B : Not used

SYMBOL	PART CODE	DESCRIPTION					Q.TY A	Q.TY B
	ENH0007	HEAT SINK	NZ-5C				1	1
	ENH0007	HEAT SINK	NZ-5C				1	1
C 501	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 502	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 503	CES0133	C.AL ELYC	16 V	47	UF+-20%		1	1
C 504	CES0033	C.AL ELYC	160 V	1UF			1	1
C 505	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 509	CCG0205	C.CERAMIC	50	V 1000	PF+-10%		1	1
C 510	CCG0205	C.CERAMIC	50	V 1000	PF+-10%		1	1
C 516	CCG0126	C.CERAMIC	50	V 12	PF+-5%		1	
C 516	CCG0120	C.CERAMIC	50	V 6	PF+-0.5PF			1
C 517	CCG0128	C.CERAMIC	50	V 15	PF+-5%		1	
C 521	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 525	CCG0116	C.CERAMIC	50	V 2	PF+-0.25PF		1	1
C 526	CCG0116	C.CERAMIC	50	V 2	PF+-0.25PF		1	1
C 531	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 535	CCG0126	C.CERAMIC	50	V 12	PF+-5%		1	1
C 536	CCG0126	C.CERAMIC	50	V 12	PF+-5%		1	1
C 543	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 544	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 555	CCB0119	C.CERAMIC	50	V 5	PF+-0.25PF			R
C 556	CCG0120	C.CERAMIC	50	V 6	PF+-0.5PF			1
C 556	CCG0136	C.CERAMIC	50	V 33	PF+-5%		1	
C 557	CES0212	C.AL ELYC	10	V 100	UF+-20% BP		1	1
C 558	CCG0209	C.CERAMIC	50	V 4700	PF+-10%			1
C 559	CCG0213	C.CERAMIC	50	V 0.1	UF+80-20%		1	
C 561	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 565	CBA0037	C.PLASTIC	250	V10000	PF+-10%		1	1
C 577	CCG0217	C.CERAMIC	50	V47000	PF+-10%		1	1
C 578	CCG0211	C.CERAMIC	50	V10000	PF+-10%		1	1
C 580	CCG0141	C.CERAMIC	50	V 68	PF+-5%		1	1
C 582	CCG0179	C.CERAMIC	50V	150PF+-5%	SL		1	1
C 592	CCG0197	C.CERAMIC	50	V 150	PF+-5%			1
C 592	CCG0200	C.CERAMIC	50	V 390	PF+-5%		1	
C 594	CCG0164	C.CERAMIC	50	V 220	PF+-5%			1
C 594	CCG0201	C.CERAMIC	50	V 470	PF+-5%		1	
C 1301	CES0133	C.AL ELYC	16	V 47	UF+-20%		1	1
C 1302	CCG0205	C.CERAMIC	50	V 680	PF+-5%		1	1
C 1303	CCG0205	C.CERAMIC	50	V 1000	PF+-10%		1	1
CV 515	CVT0056	C.VARIABLE	TZ03Z100NR169		(-10P)			1
CV 515	CVT0057	C.VARIABLE	TZ03T200NR169		(-20P)		1	
CV 517	CVT0056	C.VARIABLE	TZ03Z100NR169		(-10P)			1
CV 517	CVT0057	C.VARIABLE	TZ03T200NR169		(-20P)		1	
CV 555	CVT0057	C.VARIABLE	TZ03T200NR169		(-20P)			1
CV 556	CVT0057	C.VARIABLE	TZ03T200NR169		(-20P)		1	1
D 559	HDS0437	DIODE	1SS133				1	
D 591	HDH0143	DIODE	MTZ 7.5JC				1	1
D 594	HDS0437	DIODE	1SS133				1	1

A : VC-6025 B : VC-6045 PEF-785 V-OUT

SYMBOL	PART CODE	DESCRIPTION				Q.TY A	Q.TY B
R 537	RME0862	R.METAL	1/8W	68	OHM +-5%	1	1
R 538	RME0862	R.METAL	1/8W	68	OHM +-5%	1	1
R 543	RME0858	R.METAL	1/8W	33	OHM +-5%	1	1
R 544	RME0858	R.METAL	1/8W	33	OHM +-5%	1	1
R 545	RME1058	R.METAL	1/4W	68.1	OHM +-1%		1
R 545	RME1061	R.METAL	1/4W	121	OHM +-1%	1	
R 546	RME1058	R.METAL	1/4W	68.1	OHM +-1%		1
R 546	RME1061	R.METAL	1/4W	121	OHM +-1%	1	
R 547	RME1058	R.METAL	1/4W	68.1	OHM +-1%		1
R 547	RME1061	R.METAL	1/4W	121	OHM +-1%	1	
R 548	RME1058	R.METAL	1/4W	68.1	OHM +-1%		1
R 548	RME1061	R.METAL	1/4W	121	OHM +-1%	1	
R 549	RME1048	R.METAL	1/4W	10.0	OHM +-1%	1	1
R 550	RME1048	R.METAL	1/4W	10.0	OHM +-1%	1	1
R 551	RME1063	R.METAL	1/4W	182	OHM +-1%	1	1
R 551	RME1066	R.METAL	1/4W	332	OHM +-1%		1
R 552	RME1063	R.METAL	1/4W	182	OHM +-1%		1
R 552	RME1066	R.METAL	1/4W	332	OHM +-1%	1	
R 553	RME1063	R.METAL	1/4W	182	OHM +-1%		1
R 553	RME1066	R.METAL	1/4W	332	OHM +-1%	1	
R 554	RME1063	R.METAL	1/4W	182	OHM +-1%		1
R 554	RME1066	R.METAL	1/4W	332	OHM +-1%	1	
R 555	RME1104	R.METAL	1/4W	51.1	OHM +-1%	1	
R 555	RME1059	R.METAL	1/4W	82.5	OHM +-1%		1
R 556	RME0858	R.METAL	1/8W	33	OHM +-5%	1	
R 556	RME0860	R.METAL	1/8W	47	OHM +-5%		1
R 557	RME0883	R.METAL	1/8W	5.9	KOHM +-5%	1	
R 557	RME0887	R.METAL	1/8W	8.2	KOHM +-5%		1
R 558	RME0888	R.METAL	1/8W	10	KOHM +-5%		1
R 558	RME0895	R.METAL	1/8W	39	KOHM +-5%	1	
R 559	RME0871	R.METAL	1/8W	390	OHM +-5%		1
R 559	RME0912	R.METAL	1/8W	0	OHM	1	
R 560	RCE0717	R.CARBON	1/2W	10.0	KOHM +-5%		1
R 561	RME0880	R.METAL	1/8W	2.2	KOHM +-5%		1
R 563	RME0863	R.METAL	1/8W	82	OHM +-5%		1
R 563	RME0849	R.METAL	1/8W	270	OHM +-5%	1	
R 564	RME0863	R.METAL	1/8W	82	OHM +-5%		1
R 564	RME0849	R.METAL	1/8W	270	OHM +-5%	1	
R 565	RMR4032	R.METAL	(W/O FIN)	2W	390 OHM +-1%		1
R 565	RMR2844	R.METAL	RSF5B	660	OHMJ	1	
R 566	RMR4032	R.METAL	(W/O FIN)	2W	390 OHM +-1%		1
R 566	RMR2844	R.METAL	RSF5B	660	OHMJ	1	
R 571A	RME0871	R.METAL	1/8W	390	OHM +-5%	1	
R 571B	RME0871	R.METAL	1/8W	390	OHM +-5%		1
R 572A	RME0871	R.METAL	1/8W	390	OHM +-5%	1	
R 572B	RME0871	R.METAL	1/8W	390	OHM +-5%		1
R 573	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	1
R 574	RME0890	R.METAL	1/8W	15	KOHM +-5%	1	1
R 575	RME0874	R.METAL	1/8W	680	OHM +-5%	1	1
R 576	RME0863	R.METAL	1/8W	82	OHM +-5%	1	1
R 577	RME0894	R.METAL	1/8W	33	KOHM +-5%	1	1
R 578	RME1077	R.METAL	1/4W	2.67	KOHM +-1%	1	1
R 579	RME1077	R.METAL	1/4W	2.67	KOHM +-1%	1	1
R 580	RME0876	R.METAL	1/8W	1.0	KOHM +-5%	1	1
R 581	RME0878	R.METAL	1/8W	1.5	KOHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-785 V-OUT B : Not used

SYMBOL	PART CODE	DESCRIPTION				Q.TY A	Q.TY B
IC 1301	IDM0539	IC.DIGITAL	MN3102			1	1
JP 1	RME0912	R.METAL	1/8W	0	OHM	1	1
L 563	6354946 B	COIL	T-COIL(3T,7T)				1
L 563	6376798	COIL	TC01L(7T,18T)			1	
L 564	6354946 B	COIL	T-COIL(3T,7T)				1
L 564	6376798	COIL	TC01L(7T,18T)			1	
L 581	TLE0076	COIL	EL04068KI 100		UH+-10%	1	1
P 501	JBS0076	CONNECTOR	5SB-XH-A			1	1
P 502	JBB0027	CONNECTOR	B2B-XH-A			1	1
P 503	JBB0023	CONNECTOR	B8B-XH-A			1	1
P 563	8355704 12	CORD	RED L=60			1	1
P 564	8355704 12	CORD	RED L=60			1	1
R 503	RCE0775	R.CARBON	1/4W	3.3	KOHM +-5%	1	1
R 503	RME1060	R.METAL	1/4W	100	OHM +-1%	1	1
R 504	RME1060	R.METAL	1/4W	100	OHM +-1%	1	1
R 505	RME0860	R.METAL	1/8W	47	OHM +-5%	1	1
R 507	RME1290	R.METAL	1/4W	1.1	KOHM +-1%	1	1
R 508	RME1290	R.METAL	1/4W	1.1	KOHM +-1%	1	1
R 509	RME0856	R.METAL	1/8W	22	OHM +-5%	1	1
R 510	RME0856	R.METAL	1/8W	22	OHM +-5%	1	1
R 511	RME0866	R.METAL	1/8W	150	OHM +-5%	1	1
R 512	RME0866	R.METAL	1/8W	150	OHM +-5%	1	1
R 513	RME0865	R.METAL	1/8W	150	OHM +-5%		1
R 513	RME0865	R.METAL	1/8W	120	OHM +-5%	1	
R 514	RCE0761	R.CARBON	1/4W	220	OHM +-5%	1	1
R 515	RME0873	R.METAL	1/8W	560	OHM +-5%		1
R 515	RME0879	R.METAL	1/8W	1.8	KOHM +-5%	1	
R 516	RME0887	R.METAL	1/8W	8.2	KOHM +-5%		1
R 516	RME0888	R.METAL	1/8W	10	KOHM +-5%	1	
R 517	RME0863	R.METAL	1/8W	82	OHM +-5%		1
R 517	RME0867	R.METAL	1/2W	180	OHM +-5%	1	
R 521	RME1078	R.METAL	1/4W	3.32	KOHM +-1%	1	1
R 522	RME1078	R.METAL	1/4W	3.32	KOHM +-1%	1	1
R 524	RME1104	R.METAL	1/4W	51.1	OHM +-1%	1	1
R 524A	RME1086	R.METAL	1/4W	15.0	KOHM +-1%	1	1
R 525	RME0858	R.METAL	1/8W	33	OHM +-5%		1
R 525	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 526	RME0858	R.METAL	1/8W	33	OHM +-5%		1
R 526	RME0852	R.METAL	1/8W	10	OHM +-5%	1	
R 527	RME1064	R.METAL	1/4W	221	OHM +-1%	1	1
R 528	RME1064	R.METAL	1/4W	221	OHM +-1%	1	1
R 529	RCE0715	R.CARBON	1/2W	6.8	KOHM +-5%	1	1
R 530	RCE0715	R.CARBON	1/2W	6.8	KOHM +-5%	1	1
R 531	RME1066	R.METAL	1/4W	332	OHM +-1%	1	1
R 532	RME1066	R.METAL	1/4W	332	OHM +-1%	1	1
R 533	RME1067	R.METAL	1/4W	392	OHM +-1%	1	1
R 534	RME1067	R.METAL	1/4W	392	OHM +-1%	1	1
R 535	RME0858	R.METAL	1/8W	33	OHM +-5%	1	1
R 536	RME0858	R.METAL	1/8W	33	OHM +-5%	1	1

A : VC-6025 B : VC-6045 PEF-785 V-OUT

SYMBOL	PART CODE	DESCRIPTION				Q.TY A	Q.TY B
R 582	RME0878	R.METAL	1/8W	1.5	KOHM +-5%	1	1
R 590	RME0860	R.METAL	1/8W	47	OHM +-5%	1	1
R 591	RME0884	R.METAL	1/8W	4.7	KOHM +-5%	1	1
R 592	RME0900	R.METAL	1/8W	100	KOHM +-5%	1	1
R 593	RME0896	R.METAL	1/8W	47	KOHM +-5%	1	1
R 594	RME0868	R.METAL	1/8W	220	OHM +-5%	1	1
R 1301	RME1198	R.METAL	1/8W	390	KOHM +-5%	1	1
R 1302	RME0895	R.METAL	1/8W	39	KOHM +-5%	1	1
R 1303	RME1174	R.METAL	1/4W	2.00	KOHM +-1%	1	1
R 1304	RME0860	R.METAL	1/8W	47	OHM +-5%	1	1
R 1305	RME1065	R.METAL	1/4W	267	OHM +-1%	1	1
RV 505	RNE0046	VR.METAL	EWN 39C00YB22(200)			1	1
RV 574	RNE0042	VR.METAL	EVN-39C 00Y B1A		10KOHM	1	1
RV 576	RNE0049	VR.METAL	EWN 39C00YB12(100)			1	1
RV 1303	RNE0050	VR.METAL	EVN 39C00YB52(500)			1	1
TR 501	HTC0864	TRANSISTOR	2SC3775	OY-4		1	1
TR 502	HTC0864	TRANSISTOR	2SC3775	OY-4		1	1
TR 503	HTC0864	TRANSISTOR	2SC3775	OY-4		1	1
TR 504	HTC0864	TRANSISTOR	2SC3775	OY-4		1	1
TR 541	HTC0685	TRANSISTOR	2SC2407(1)			1	1
TR 542	HTC0685	TRANSISTOR	2SC2407(1)			1	1
TR 561A	HTC0397	TRANSISTOR	2SC1252M			1	1
TR 562A	HTC0397	TRANSISTOR	2SC1252M			1	1
TR 571	HTC0686	TRANSISTOR	2SC2442C			1	1
TR 572	HTC0686	TRANSISTOR	2SC2442C			1	1
TR 591	HTC0684	TRANSISTOR	2SC2462C			1	1

CRT SOCKET 1 (PEF-789)

A : VC-6025 B : VC-6045 PEF-789 CRT SOCKET

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 1044	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%		1
C 1045	CCC1025	C.CERAMIC 50 V 100 PF+-10%		1
J 1001	8390152	SOCKET 1339		1
L 1061	TLE0107	INDUCTOR ELE-Y R47 MA		1
L 1062	TLE0107	INDUCTOR ELE-Y R47 MA		1
NL 1043	ELS0032	LAMP SA-200DSS-ON-1		1
P 1001	JBS0022	CONNECTOR S3B-XH-A		1
P 1043	JBB0022	CONNECTOR B6B-XH-A		1
P 1061	E7P0002	PIN 171255-1		1
P 1062	E7P0002	PIN 171255-1		1
P 1281	JBB0021	CONNECTOR B3B-XH-A		1
R 1061	RME1722	R.METAL 1/6W 165 OHM +-1.0%		1
R 1062	RME1722	R.METAL 1/6W 165 OHM +-1.0%		1
R 1066	RCE0781	R.CARBON 1/6W 10 KOHM +-5%		1
R 1067	RCE0745	R.CARBON 1/6W 10 OHM +-5%		1

FILTER (PEF-816)

A : VC-6025 B : VC-6045 PEF-816 FILTER

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 1501	CQE0118	C PLASTIC ECQ-E2A224MW	1	1
C 1510	CQE0118	C PLASTIC ECQ-E2A224MW	1	1
L 1501	TLP9843	COIL 250VAC 15MM	1	1
R 1510	RCE0733	R.CARBON 1/2W 470 KOHM +-5%	1	1
SG 1501	EZH0094	AG20 P C 2526-L3N	1	1
SG 1502	EZH0084	AG20 P C 2526-L3N	1	1

ATT READOUT (PEF-833)

A : VC-6025 B : VC-6045 PEF-833 ATT READOUT

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
RM 5153(	RZA0202	R.BLOCK EXB-L6ES 502S(5B1F.5K)	1	1

CRT SOCKET 2 (PEF-835)

A : VC-6025 B : VC-6045 PEF-835 CRT SOCKET2

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 1054	CCD0231	C.CERAMIC 2000 V 4700 PF+80-20%		1
C 1055	CCC1025	C.CERAMIC 50 V 100 PF+-10%		1
J 1011	8390152	SOCKET 1339		1
L 1071	TLE0109	INDUCTOR ELE-Y R68 MA		1
L 1072	TLE0109	INDUCTOR ELE-Y R68 MA		1
NL 1055	ELS0032	LAMP SA-200DSS-ON-1		1
P 1011	JBS0022	CONNECTOR S3B-XH-A		1
P 1055	JBB0022	CONNECTOR B6B-XH-A		1
P 1071	E7P0002	PIN 171255-1		1
P 1072	E7P0002	PIN 171255-1		1
P 1291	JBB0021	CONNECTOR B3B-XH-A		1
R 1071	RME1062	R.METAL 1/4W 150 OHM +-1%		1
R 1071	RME1065	R.METAL 1/4W 475 OHM +-1%		
R 1072	RME1062	R.METAL 1/4W 150 OHM +-1%		1
R 1072	RME1065	R.METAL 1/4W 475 OHM +-1%		
R 1076	RCE0761	R.CARBON 1/6W 10 KOHM +-5%		1
R 1077	RCE0745	R.CARBON 1/6W 4.7 OHM +-5%		1

CYCLE (PEF-837)

A : VC-6025 B : VC-6045 PEF-837 CYCLE

SYMBOL	..PART CODE..	..... DESCRIPTION	Q.TY A	Q.TY B
C 2005	CES0033	C.AL ELYC 25 V 100 UF+-20%	1	1
C 2009	CQ40121	C.PLASTIC 50 V33000 PF+-10%	1	1
C 2006	CQ40122	C.PLASTIC 50 V47000 PF+-10%	1	1
C 2007	CES0378	C.AL ELYC 16 V 330 UF +-20%	1	1
C 2008	CES0378	C.AL ELYC 16 V 330 UF +-20%	1	1
C 2012	CMD0547	C.MICA 300 V 470 PF+-5%	1	1
C 2013	CQE0116	C.PLASTIC 100 V 0.47UF+-5%	1	1
C 2014	CCC0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 2015	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	1
C 2016	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 2017	CQA0132	C.PLASTIC 50 V 0.33UF+-10%	1	1
C 2038	CQA0132	C.PLASTIC 50 V 0.33UF+-10%	1	1
C 2039	CCG0213	C.CERAMIC 50 V 0.1 UF+80-20%	1	1
C 2042	CCG0207	C.CERAMIC 50 V 2200 PF+-10%	1	1
C 2043	CES0038	C.AL ELYC 50 V 2.2 UF+-20%	1	1
C 2050	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 2051	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 2052	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 2060	CCG0136	C.CERAMIC 50 V 33 PF+-5%	1	1
C 2061	CCG0211	C.CERAMIC 50 V10000 PF+-10%	1	1
C 2070	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 2071	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 2072	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 2092	CCG0144	C.CERAMIC 50 V 220 PF+-5%	1	1
D 2004	HDS0437	DIODE 1SS133	1	1
D 2020	HDMD139	DIODE MTZ 3.3JA	1	1
IC 2048	ILT0043	IC.ANALOG TL964CN	1	1
IC 2050	ILN0085	IC.ANALOG NJM 3190	1	1
IC 2092	IDM1221	IC.DIGITAL M074LS00P/SN74LS00N	1	1
IC 2090	HT90161	TRANSISTOR DTC124EK	1	1
IC 2091	HT90161	TRANSISTOR DTC124EK	1	1
L 2092	TLE0072	COIL ELQ4Q6SKI 220 UH+-10%	1	1
P 2001	JBS0071	CONNECTOR 58-10-AP-G8-C	1	1
P 2002	JBS0027	CONNECTOR 58-6-AP-G8-C	1	1
R 2001	RME0384	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 2002	RME0902	R.METAL 1/8W 220 KOHM +-5%	1	1
R 2003	RME0849	R.METAL 1/6W 270 OHM +-5%	1	1
R 2004	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 2005	RME0907	R.METAL 1/8W 2.2 MOHM +-10%	1	1
R 2006	RME0907	R.METAL 1/8W 2.2 MOHM +-10%	1	1
R 2007	RME1064	R.METAL 1/4W 221 OHM +-1%	1	1
R 2010	RME0850	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 2011	RME0882	R.METAL 1/8W 3.3 KOHM +-5%	1	1
R 2012	RME0896	R.METAL 1/8W 47 KOHM +-5%	1	1
R 2013	RME0880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 2014	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 2015	RME0896	R.METAL 1/8W 47 KOHM +-5%	1	1
R 2017	RME0912	R.METAL 1/8W 0 OHM	1	1
R 2020	RCE0716	R.CARBON 1/2W 8.2 KOHM +-5%	1	1
R 2021	RME1714	R.METAL 1/4W 221 KOHM +-0.5%	1	1
R 2022	RME1715	R.METAL 1/6W 22.1 KOHM +-0.5%	1	1

A : VC-6025 B : VC-6045 PEF-837 CYCLE

SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
R 2023	RME0884	R.METAL	1/8W 6.7 KOHM +-5%	1	1
R 2024	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 2025	RME1712	R.METAL	1/4W 2.21 KOHM +-0.5%	1	1
R 2026	RME0864	R.METAL	1/8W 6.7 KOHM +-5%	1	1
R 2027	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 2029	RME0855	R.METAL	1/8W 18 OHM +-5%	1	1
R 2030	RME0864	R.METAL	1/8W 100 OHM +-5%	1	1
R 2031	RME1098	R.METAL	1/4W 150 KOHM +-1%	1	1
R 2032	RME1086	R.METAL	1/4W 15.0 KOHM +-1%	1	1
R 2033	RME0884	R.METAL	1/8W 6.7 KOHM +-5%	1	1
R 2034	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 2035	RME1074	R.METAL	1/4W 1.50KOHM +-1%	1	1
R 2036	RME0884	R.METAL	1/8W 6.7 KOHM +-5%	1	1
R 2037	RME0888	R.METAL	1/8W 10 KOHM +-5%	1	1
R 2038	RME1098	R.METAL	1/4W 33.2 KOHM +-1%	1	1
R 2039	RME1090	R.METAL	1/4W 33.2 KOHM +-1%	1	1
R 2040	RME0878	R.METAL	1/8W 1.5 KOHM +-5%	1	1
R 2041	RME0875	R.METAL	1/8W 820 OHM +-5%	1	1
R 2043	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 2045	RME0912	R.METAL	1/8W 0 OHM	1	1
R 2052	RME0881	R.METAL	1/8W 2.7 KOHM +-5%	1	1
R 2054	RME0869	R.METAL	1/8W 270 OHM +-5%	1	1
R 2055	RME0892	R.METAL	1/8W 220 KOHM +-5%	1	1
R 2060	RME0869	R.METAL	1/8W 270 OHM +-5%	1	1
R 2061	RME1077	R.METAL	1/4W 2.67KOHM +-1%	1	1
R 2062	RME1083	R.METAL	1/4W 8.25KOHM +-1%	1	1
R 2063	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 2065	RME0872	R.METAL	1/8W 470 OHM +-5%	1	1
R 2080	RME1090	R.METAL	1/4W 1.1 KOHM +-1%	1	1
R 2081	RME1078	R.METAL	1/4W 3.32KOHM +-1%	1	1
R 2082	RME1718	R.MET-CHIP	1/8W 5.6 MOHM +-10%	1	1
R 2085	RME0880	R.METAL	1/8W 2.2 KOHM +-5%	1	1
R 2092	RME0892	R.METAL	1/8W 22 KOHM +-5%	1	1
R 2093	RME0876	R.METAL	1/8W 1.6 KOHM +-5%	1	1
R 2094	RME0876	R.METAL	1/8W 1.8 KOHM +-5%	1	1
R 2095	RME0862	R.METAL	1/8W 3.3 KOHM +-5%	1	1
TR 2010	HTC0590	TRANSISTOR	2SC1621B4	1	1
TR 2013	HTC0686	TRANSISTOR	2SC2462C	1	1
TR 2015	HTA0263	TRANSISTOR	2SA1052B	1	1
TR 2022	HTB0177	TRANSISTOR	2SB624BV3	1	1
TR 2025	HTB0177	TRANSISTOR	2SB624BV3	1	1
TR 2032	HTB0177	TRANSISTOR	2SB624BV3	1	1
TR 2035	HTB0177	TRANSISTOR	2SB624BV3	1	1
TR 2038	HTC0813	TRANSISTOR	2SC2853E	1	1
TR 2040	HTC0590	TRANSISTOR	2SC1623B4	1	1
TR 2043	HTD0202	TRANSISTOR	2SD594DV3	1	1
TR 2045	HTA0263	TRANSISTOR	2SA1052D	1	1
TR 2060	HTK0160	TRANSISTOR	2SK303 V4	1	1
TR 2063	HTC0686	TRANSISTOR	2SC2462C	1	1
TR 2080	HTA0263	TRANSISTOR	2SA1052D	1	1

A : VC-6025 B : VC-6045 CHASSIS

SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
J 502	8474249	TIP	CZ121	1	1
J 1501	JSG0002	SOCKET	GS1A2R32-3111-150	1	1
J 2605	JHB0088	COAX.CON	BNCD71	1	1
R 1	RCE0745	R.CARBON	1/4W 10 OHM +-5%	1	1
R 101	RCE0745	R.CARBON	1/4W 10 OHM +-5%	1	1
R 301	RCE0766	R.CARBON	1/4W 82 OHM +-5%	1	1
V 1001	DPX0090	CRT	150DGB31	1	
V 1001	DPX0091	CRT	E63548J1		1

CHASSIS

A : VC-6025 B : VC-6045 CHASSIS R : Not used

SYMBOL	PART CODE		DESCRIPTION		Q'TY A	Q'TY B
	8474248		TIP	CZ174	1	1
	ERL0093		CABLE TIE	SKB-4M	1	1
	ERL0089		CABLE TIE	PLTIM-XMR	3	3
	ERL0069		BAND	SKB-3M	1	1
	8478326		CABLE.ASSY	8478326	1	1
	3211476	A	CABLE.ASSY	FOR ROT.COIL	1	1
	3211484	A	CABLE.ASSY			
	3211475	BA	CABLE.ASSY	3211475-BA	1	1
	3211475	CA	CABLE.ASSY	3211475-CA	R	R
	3211475	CB	CABLE.ASSY	3211475-CB	1	1
	3211475	DB	CABLE.ASSY	3211475-DB	1	1
	3211475	EA	CABLE.ASSY	3211475-EA	1	1
	3211475	FA	CABLE.ASSY	3211475-FA	1	1
	3211475	HA	CABLE.ASSY	3211475-HA	1	1
	3211475	KB	CABLE.ASSY	3211475-KB	1	1
	3211475	KA	CABLE.ASSY	3211475-NA	1	1
	3211475	PA	CABLE.ASSY	3211475-PA	1	1
	3211475	QA	CABLE.ASSY	3211475-QA	1	1
	3211475	RA	CABLE.ASSY	3211475-RA	1	1
	3211475	SA	CABLE.ASSY	3211475-SA	1	1
	3211475	VA	CABLE.ASSY	3211475-VA	1	1
	3218945	WA	CABLE ASSY	3218945-WA	1	1
	3218545	XA	CABLE ASSY	3218945-XA	1	1
	3225016	BB	CABLE.ASSY	3225016-BB	1	1
	3225001	EA	CABLE.ASSY	3225001-EA	1	1
	3225001	GA	CABLE.ASSY	3225001-GA	1	1
	3225001	HA	CABLE.ASSY	3225001-HA	1	1
	3225001	JA	CABLE.ASSY	3225001-JA	1	1
	3225005	MB	CABLE.ASSY	3225005-MB	1	1
	3225005	LA	CABLE.ASSY	3225005-LA	1	1
	3225005	KA	CABLE.ASSY	3225005-KA	1	1
C 10	CCC1013		C.CERAMIC	50 V 39 PF+-5%	1	1
C 110	CCC1013		C.CERAMIC	50 V 39 PF+-5%	1	1
C 305	CCC1136		C.CERAMIC	50 V 100 PF+-5%	1	1
DL 450	8311698		DELAY LINE	750DL 10DNS 1860HM	1	1
F 1501	EF60575		FUSE	EAK2A (250V 2A)	2	2
J 1	JHB0088		COAX.CON	BNCD71	1	1
J 101	JHB0088		COAX.CON	BNCD71	1	1
J 301	JHB0088		COAX.CON	BNCD71	1	1
J 302	JHB0088		COAX.CON	BNCD71	1	1

DIGITAL (PEF-880)

A : VC-6025 B : VC-6045 PEF-880 DIGITAL

SYMBOL	PART CODE	DESCRIPTION		Q'TY A	Q'TY B
	IY10101	SOCKET.IC	IC61-0324-028	1	1
	EFP0149	PIN	PP-10 (10MM)	3	3
C5300-12	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	13	13
C5314-16	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	3	3
C5320-24	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	5	5
C 5201	CCG0295	C.CERAMIC	25 V 0.1 UF+80-20%	1	1
C 5204	CEK0146	C.AL ELYC	16 V 10 UF+-20%	1	1
C 5210	CCG0276	C.CERAMIC	50 V 100 PF+-5%	1	1
C 5253	CCG0295	C.CERAMIC	25 V 0.1 UF+80-20%	1	1
C 5254	CEK0146	C.AL ELYC	16 V 10 UF+-20%	1	1
C 5260	CCG0274	C.CERAMIC	50 V 100 PF+-5%	1	1
C 5330	CCG0246	C.CERAMIC	50 V 1 PF+-0.25PF	1	1
C 5343	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	1
C 5344	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5345	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	1
C 5346	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5347	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	1
C 5348	CCG0295	C.CERAMIC	25 V 0.1 UF+80-20%	1	1
C 5349	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	1
C 5350	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5351	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5400	CCG0286	C.CERAMIC	50 V 1000 PF+-10%	1	1
C 5401	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5402	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5403	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5404	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5405	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5406	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5407	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5408	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5409	CCG0278	C.CERAMIC	50 V 220 PF+-5%	1	1
C 5501	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5502	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5503	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5504	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5505	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5506	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5507	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5508	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5509	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5510	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5511	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5512	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5513	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5514	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5515	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5516	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5517	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5518	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5518A	CES0133	C.AL ELYC	16 V 47 UF+-20%	1	1
C 5519	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5520	CCG0292	C.CERAMIC	50 V 0.01UF+-10%	1	1
C 5521	CCG0282	C.CERAMIC	50 V 470 PF+-5%	1	1
C 5522	CCG0282	C.CERAMIC	50 V 470 PF+-5%	1	1
C 5523	CCG0282	C.CERAMIC	50 V 470 PF+-5%	1	1

A : VC-6025 B : VC-6043 PEF-880 DIGITAL R : Not used

SYMBOL	..PART CODE..	DESCRIPTION	A	B
C 5524	CCG0255	C.CERAMIC 50 V 10 PF+-0.5PF	1	1
C 5525	CCG0250	C.CERAMIC 50 V 5 PF+-0.25PF	1	1
C 5526	CCG0283	C.CERAMIC 50 V 560 PF+-5%	1	1
C 5527	CCG0283	C.CERAMIC 50 V 560 PF+-5%	1	1
C 5528	CCG0283	C.CERAMIC 50 V 560 PF+-5%	1	1
C 5532	CCG0247	C.CERAMIC 50 V 33 PF+-5%	1	1
C 5540	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5541	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
C 5542	CES0379	C.AL ELYC 10 V 470 UF +-20%	1	1
C 5543	CES0379	C.AL ELYC 10 V 470 UF +-20%	1	1
C 5545	CCG0163	C.CERAMIC 50 V 22 PF+-5%	1	1
C 5550	CCG0292	C.CERAMIC 50 V 0.01UF+-10%	1	1
C 5560	CCG0292	C.CERAMIC 50 V 0.01UF+-10%	1	1
C 5561	CCG0292	C.CERAMIC 50 V 0.01UF+-10%	1	1
C 8681	CCG0292	C.CERAMIC 50 V 0.01UF+-10%	1	1
C 8682	CCG0292	C.CERAMIC 50 V 0.01UF+-10%	1	1
C 8683	CCG0295	C.CERAMIC 25 V 0.1 UF-80-20%	1	1
C 8684	CES0133	C.AL ELYC 16 V 47 UF+-20%	1	1
CN 1	J8P0407	PIN PM-1-14P	1	1
CN 2	J8P0406	PIN PM-1-4P	1	1
D 5102.	HD10007	DIODE 1MN10	2	2
D 5210	HDS0437	DIODE 1SS133	1	1
D 5211	HDH0236	DIODE MZM7C	1	1
D 5260	HDS0437	DIODE 1SS133	1	1
D 5261	HDH0236	DIODE MZM7C	1	1
D 5540	HDS0437	DIODE 1SS133	1	1
D 8080	HDS0518	DIODE 1S8153	1	1
IC 5301	IDH1215	IC.DIGITAL HD14053BFP/MC14053BFP	1	1
IC 5302	IDH1366	IC.DIGITAL HD74HC4040FP	1	1
IC 5303	ILM0497	IC MA74IP8	1	1
IC 5304	ILN0082	IC.ANALOG NJM319M	1	1
IC 5305	IDH1300	IC.DIGITAL HD74HC04FP	1	1
IC 5306	IDH1297	IC.DIGITAL HD74HC02FP	1	1
IC 5307	IDH1388	IC.DIGITAL HD74HC377FP	1	1
IC 5308	IDH1303	IC.DIGITAL HD74HC74FP	1	1
IC 5309	IDH1289	IC.DIGITAL HD74HC153FP	1	1
IC 5310	IDT0251	IC.DIGITAL TMP82C54M-2	1	1
IC 5311	IDH1303	IC.DIGITAL HD74HC74FP	1	1
IC 5312	IDH1301	IC.DIGITAL HD74HC08FP	1	1
IC 5313	IDH1299	IC.DIGITAL HD74HC32FP	1	1
IC 5314	IDH1299	IC.DIGITAL HD74HC32FP	1	1
IC 5315	IDT0147	IC.DIGITAL TC74HC86F	1	1
IC 5316	IDT0142	IC.DIGITAL TC74HC00AF	1	1
IC 5317	IDH1303	IC.DIGITAL HD74HC74FP	1	1
IC 5318	IDH1303	IC.DIGITAL HD74HC74FP	1	1
IC 5320	ILN0081	IC.ANALOG NJM 2902M	1	1
IC 5321	ILH0185	IC.ANALOG HA1924MP	1	1
IC 5322	ILH0185	IC.ANALOG HA1924MP	1	1
IC 5323	INH0003	IC HM63021P-35	1	1
IC 5324	INH0003	IC HM63021P-35	1	1
IC 5501	IMH0006	IC HD6418801CP10	1	1
IC 5502	INM0016	IC MBM27C512-25 (LCC)	1	1
IC 5503	IMH0012	IC HM62256LFP-15T	1	1

A : VC-6025 B : VC-6043 PEF-880 DIGITAL R : Not used

SYMBOL	..PART CODE..	DESCRIPTION	A	B
R 5263	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5301	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5302	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5303	RME1060	R.METAL 1/4W 100 OHM +-1%	1	1
R 5304	RME1238	R.METAL 1/6W 24.9 K OHM +-1%	1	1
R 5305	RME1075	R.METAL 1/4W 3.32KOHM +-1%	1	1
R 5306	RME1074	R.METAL 1/4W 2.21KOHM +-1%	1	1
R 5307	RME1221	R.METAL 1/4W 1.37KOHM +-1%	1	1
R 5309	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	1
R 5310	RME1079	R.METAL 1/4W 3.92KOHM +-1%	1	1
R 5311	RME1464	R.METAL 0.1W 220 KOHM+-5%	1	1
R 5312	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 5313	RME1424	R.METAL 0.1W 100 OHM+-5%	1	1
R 5314	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5315	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5316	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5317	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	1
R 5318	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5319	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5320	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5321	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 5323	RME1442	R.METAL 0.1W 100 KOHM+-5%	1	1
R 5325	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5330	RME1074	R.METAL 1/4W 1.50KOHM +-1%	1	1
R 5331	RME1074	R.METAL 1/4W 1.50KOHM +-1%	1	1
R 5332	RME1174	R.METAL 1/4W 2.00KOHM +-1%	1	1
R 5333	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5334	RME1425	R.METAL 0.1W 82 OHM+-5%	1	1
R 5335	RME1418	R.METAL 0.1W 22 OHM+-5%	1	1
R 5336	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5337	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5338	RME1444	R.METAL 0.1W 3.3 KOHM+-5%	1	1
R 5339	RME1444	R.METAL 0.1W 3.3 KOHM+-5%	1	1
R 5340	RME1444	R.METAL 0.1W 3.3 KOHM+-5%	1	1
R 5341	RME1466	R.METAL 0.1W 3.3 KOHM+-5%	1	1
R 5350	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5351	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5352	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5354	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5501	RME1459	R.METAL 0.5W 10 KOHM+-5%	1	1
R 5502	RME1450	R.METAL 0.1W 10 KOHM+-5%	1	1
R 5503	RME1450	R.METAL 0.1W 10 KOHM+-5%	1	1
R 5504	RME1450	R.METAL 0.1W 10 KOHM+-5%	1	1
R 5505	RME1450	R.METAL 0.1W 10 KOHM+-5%	1	1
R 5510	RME1458	R.METAL 0.1W 47 KOHM+-5%	R	R
R 5510A	RME1413	R.METAL 0.1W 0 OHM	1	1
R 5511	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5512	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5513	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5514	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5515	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5516	RME1464	R.METAL 0.1W 220 KOHM+-5%	1	1
R 5517	RME1083	R.METAL 1/4W 8.25KOHM +-1%	1	1
R 5518	RME1590	R.METAL ERO-S2CKF 2430(243)	1	1
R 5519	RME1461	R.METAL 0.1W 82 KOHM+-5%	1	1
R 5520	RME1084	R.METAL 1/4W 10.0 KOHM +-1%	1	1

A : VC-6025 B : VC-6043 PEF-880 DIGITAL R : Not used

SYMBOL	..PART CODE..	DESCRIPTION	A	B
IC 5504	IDT0261	IC.DIGITAL TMP82C54M-2	1	1
IC 5505	XAE0024	XTAL EXO-3(13.432MHZ)	1	1
IC 5506	IDT0260	IC.DIGITAL TMP82C55AF-10	1	1
IC 5507	IDH1304	IC.DIGITAL HD74HC138FP	1	1
IC 5508	IDH1304	IC.DIGITAL HD74HC138FP	1	1
IC 5509	IDT0186	IC.DIGITAL TC74HC244AF	1	1
IC 5510	IDT0190	IC.DIGITAL TC74HC574F	1	1
IC 5511	IDM0822	IC.DIGITAL MC14540BF	1	1
IC 5512	IDT0142	IC.DIGITAL TC74HC00AF	1	1
IC 5513	IDH1300	IC.DIGITAL HD74HC04FP	1	1
IC 5514	IDH1287	IC.DIGITAL HD74HC27FP	1	1
IC 5515	IDH1299	IC.DIGITAL HD74HC32FP	1	1
IC 5516	IDH1299	IC.DIGITAL HD74HC32FP	1	1
IC 5517	IDH1388	IC.DIGITAL HD74HC377FP	1	1
IC 5518	IDT0260	IC.DIGITAL TMP82C55AF-10	1	1
IC 5519	IDT0190	IC.DIGITAL TC74HC574AF	1	1
IC 5520	IDT0190	IC.DIGITAL TC74HC574F	1	1
IC 5521	ILM0496	IC.ANALOG MS2015FP	1	1
IC 5521A	IDH1215	IC.DIGITAL HD14053BFP/MC14053BFP	1	1
IC 5522	ILM0496	IC.ANALOG MS2015FP	1	1
IC 5522A	IDH1215	IC.DIGITAL HD14053BFP/MC14053BFP	1	1
IC 5550	IDT0179	IC.DIGITAL TC74HC157F	1	1
IC 5560	IDT0142	IC.DIGITAL TC74HC00AF	1	1
IC 5561	IDH1300	IC.DIGITAL HD74HC04FP	1	1
K 8060	SRK0007	RLY.LATCH G5A-237P 12VDC	1	1
L 5332	TLN0034	CHIP COIL NL322522-101K (100MH)	1	1
L 5334	TLN0036	CHIP COIL NL322522-101K (100MH)	1	1
L 5335	TLH0036	CHIP COIL NL322522-101K (100MH)	1	1
L 5356	TLH0036	CHIP COIL NL322522-101K (100MH)	1	1
L 5506	TLT0085	COIL 47 UH+-10% 0.9A	1	1
L 5507	TLT0085	COIL 47 UH+-10% 0.9A	1	1
L 5801	TLE0055	COIL EL06466KI 10 UH+-10%	1	1
L 81408	TLN0004	COIL 0.150HM 450 MA +-20%	A	1
L 81418	TLN0004	COIL 0.150HM 450 MA +-20%	A	1
P 4924	JB80021	CONNECTOR 836-XH-A	1	1
P 5014	JB80060	CONNECTOR 856-XH-A	1	1
P 5400	JB80022	CONNECTOR 860-XH-A	1	1
P 5501	JB80024	CONNECTOR 8150-XH-A	1	1
P 5503	JB80060	CONNECTOR 856-XH-A	1	1
P 5504	JB80060	CONNECTOR B5B-XH-A	1	1
P 5601	JB80026	CONNECTOR B10B-XH-A	1	1
P 5602	JB80028	CONNECTOR B4B-XH-A	1	1
P 5701	JB80058	CONNECTOR B12B-XH-A	1	1
R 5208	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 5208A	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5212	RME1414	R.METAL 0.1W 10 OHM+-5%	1	1
R 5213	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5216	RME1430	R.METAL 0.1W 220 OHM+-5%	1	1
R 5256	RME1430	R.METAL 0.1W 220 OHM+-5%	1	1
R 5258	RME1077	R.METAL 1/4W 2.67KOHM +-1%	1	1
R 5258A	RME1437	R.METAL 0.1W 820 OHM+-5%	1	1
R 5262	RME1414	R.METAL 0.1W 10 OHM+-5%	1	1

A : VC-6025 B : VC-6043 PEF-880 DIGITAL R : Not used

SYMBOL	..PART CODE..	DESCRIPTION	A	B
R 5521	RME1155	R.METAL 1/4W 4.00KOHM +-0.5%	1	1
R 5521A	RME1711	R.METAL 1/4W 4.00 KOHM +-0.5%	1	1
R 5522	RME1285	R.METAL 1/4W 4.99 KOHM +-0.5%	1	1
R 5522A	RME1285	R.METAL 1/4W 4.99 KOHM +-0.5%	1	1
R 5523	RME1084	R.METAL 1/4W 10.0 KOHM +-1%	1	1
R 5524	RME1084	R.METAL 1/4W 10.0 KOHM +-1%	1	1
R 5530	RME1450	R.METAL 0.1W 10 KOHM+-5%	1	1
R 5531	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5532	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5533	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5534	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5535	RME1096	R.METAL 1/4W 100 KOHM +-1%	1	1
R 5536	RME1464	R.METAL 0.1W 220 KOHM+-5%	1	1
R 5537	RME1443	R.METAL 0.1W 2.7 KOHM +-5%	1	1
R 5538	RME1083	R.METAL 1/4W 8.25KOHM +-1%	1	1
R 5539	RME1065	R.METAL 1/4W 267 OHM +-1%	1	1
R 5540	RME1461	R.METAL 0.1W 82 KOHM+-5%	1	1
R 5541	RME1084	R.METAL 1/4W 10.0 KOHM +-1%	1	1
R 5543	RME1285	R.METAL 1/4W 4.99 KOHM +-0.5%	1	1
R 5543A	RME1285	R.METAL 1/4W 4.99 KOHM +-0.5%	1	1
R 5544	RME1084	R.METAL 1/4W 10.0 KOHM +-1%	1	1
R 5545	RME1084	R.METAL 1/4W 10.0 KOHM +-1%	1	1
R 5546	RME1450	R.METAL 0.1W 10 KOHM+-5%	R	R
R 5547	RME1450	R.METAL 0.1W 10 KOHM+-5%	R	R
R 5550	RME1078	R.METAL 1/4W 3.32KOHM +-1%	1	1
R 5551	RME1074	R.METAL 1/4W 1.50KOHM +-1%	1	1
R 5552	RME1436	R.METAL 0.1W 680 OHM+-5%	1	1
R 5553	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5554	RME1078	R.METAL 1/4W 3.32KOHM +-1%	1	1
R 5555	RME1074	R.METAL 1/4W 1.50KOHM +-1%	1	1
R 5556	RME1400	R.METAL 1/4W 221 KOHM +-1%	1	1
R 5557	RME1088	R.METAL 1/4W 22.1 KOHM +-1%	1	1
R 5558	RME1413	R.METAL 0.1W 0 OHM	1	1
R 5558A	RME1413	R.METAL 0.1W 0 OHM	R	R
R 5561	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5562	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5563	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5564	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5565	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5566	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5567	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 5568	RME1458	R.METAL 0.1W 47 KOHM+-5%	1	1
R 6001	RME1413	R.METAL 0.1W 0 OHM	R	R
R 6002	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6003	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6004	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6005	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6006	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6007	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6008	RME1413	R.METAL 0.1W 0 OHM	1	1
R 6009	RME1413	R.METAL 0.1W 0 OHM	1	1
R 8116	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 8128	RME1434	R.METAL 0.1W 470 OHM+-5%	1	1
R 8130	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 81404	RME1413	R.METAL 0.1W 0 OHM	1	1
R 81408	RME1413	R.METAL 0.1W 0 OHM	1	1

S/H (PEF-883)

A : VC-6025 B : VC-6045 PEF-883 S/H R : Not used

SYMBOL	PART CODE	DESCRIPTION	A	B
C 5201	CCG0286	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 5202	CCG0257	C.CERAMIC 50 V 12 PF +-5%	1	1
C 5207	CCG0257	C.CERAMIC 50 V 12 PF +-5%	1	1
C 5234	CCG0286	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 5252	CCG0257	C.CERAMIC 50 V 12 PF +-5%	1	1
C 5257	CCG0257	C.CERAMIC 50 V 12 PF +-5%	1	1
C 5506.	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	2	2
C 5556.	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	2	2
C 5001.	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	2	2
C 8049	CCG0278	C.CERAMIC 50 V 220 PF +-5%	1	
C 8049	CCG0275	C.CERAMIC 50 V 120 PF +-5%		1
C 8060	CCG0286	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 8061	CCG0255	C.CERAMIC 50 V 10 PF +-0.5PF	1	1
C 8062	CCG0286	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 8063	CCG0250	C.CERAMIC 50 V 5 PF +-0.25PF	1	
C 8063	CCG0253	C.CERAMIC 50 V 10 PF +-0.5PF		1
C 8064	CCG0254	C.CERAMIC 50 V 9 PF +-0.5PF	1	R
C 8065	CCG0259	C.CERAMIC 50 V 15 PF +-5%	1	1
C 8066	CCG0255	C.CERAMIC 50 V 10 PF +-0.5PF	R	R
C 8067	CCG0292	C.CERAMIC 50 V 0.01UF +-10%	1	1
C 8068	CCG0286	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 8071	CCG0294	C.CERAMIC 50 V 47000 PF +80-20%	1	1
C 8072	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	R	R
C 8073	CCG0255	C.CERAMIC 50 V 10 PF +-0.5PF	R	R
C 8074	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	1	1
C 8075	CCG0294	C.CERAMIC 50 V 47000 PF +80-20%	1	1
C 8076	CCG0286	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 8077	CCG0294	C.CERAMIC 50 V 47000 PF +80-20%	1	1
C 8080	CCG0267	C.CERAMIC 50 V 33 PF +-5%	1	1
C 8081	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	1	1
C 8082	CCG0292	C.CERAMIC 50 V 0.01UF +-10%	1	1
C 8083	CCG0259	C.CERAMIC 50 V 15 PF +-5%	1	
C 8085	CCG0253	C.CERAMIC 50 V 8 PF +-0.5PF		1
C 8102	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	1	1
C 8304.	CCG0295	C.CERAMIC 25 V 0.1 UF +80-20%	2	2
C 8879.	CCG0255	C.CERAMIC 25 V 0.1 UF +80-20%	2	2
CN 1	J8D0002	PIN 8Y-003-14P	1	1
CN 2	J8D0001	PIN 8Y-003-4P	1	1
D 5292	HDH0236	DIODE HZM7C	1	1
D 5252	HDH0236	DIODE HZM7C	1	1
D 8060	HDH0236	DIODE HZM7C	1	1
D 8061	HDH0224	DIODE MSM885	1	1
D 8062	HDH0224	DIODE MSM885	1	1
D 8063	HDH0224	DIODE MSM885	1	1
D 8064	HDH0224	DIODE MSM885	1	1
D 8065	HDS0496	DIODE 1SS123	1	1
D 8066	HDH0224	DIODE MSM885	1	1
D 8067	HDS0496	DIODE 1SS123	1	1
D 8068	HDS0538	DIODE 1SS153	1	1
D 8069	HDH0230	DIODE ZENNER HZM5B	1	1
D 8070	HDS0538	DIODE 1SS153	1	1
D 8071	HDH0235	DIODE ZENNER HZM4B	1	1
D 8072	HDH0250	DIODE RD7.5M02	1	1

PANEL (DSO) (PEF-882)

A : VC-6025 B : VC-6045 PEF-882 PANEL(DSO)

SYMBOL	PART CODE	DESCRIPTION	A	B
R 1601	RME1432	R.METAL 0.1W 330 OHM+-5%	1	1
R 1602	RME1435	R.METAL 0.1W 560 OHM+-5%	1	1
R 1603	RME1435	R.METAL 0.1W 560 OHM+-5%	1	1
R 1604	RME1435	R.METAL 0.1W 560 OHM+-5%	1	1
R 1605	RME1435	R.METAL 0.1W 560 OHM+-5%	1	1
R 1606	RME1435	R.METAL 0.1W 560 OHM+-5%	1	1
S 1601	SSP0624	SW.PB SKH9FG (GREEN)	1	1
S 1602	SSP0611	SW.PB SKH9FF (RED)	1	1
S 1603	SSP0611	SW.PB SKH9FF (RED)	1	1
S 1604	SSP0611	SW.PB SKH9FF (RED)	1	1
S 1605	SSP0611	SW.PB SKH9FF (RED)	1	1
S 1606	SSP0611	SW.PB SKH9FF (RED)	1	1

A : VC-6025 B : VC-6045 PEF-883 S/H R : Not used

SYMBOL	PART CODE	DESCRIPTION	A	B
R 5201	RME1430	R.METAL 0.1W 220 OHM+-5%	1	1
R 5202	RME1445	R.METAL 0.1W 3.9 KOHM+-5%	1	1
R 5203	RME1443	R.METAL 0.1W 2.7 KOHM +-5%	1	1
R 5204	RME1415	R.METAL 0.1W 22 OHM+-5%	1	1
R 5205	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5206	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5207	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5210	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 5211	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 5214	RME1449	R.METAL 0.1W 8.2 KOHM+-5%	1	1
R 5215	RME1443	R.METAL 0.1W 2.7 KOHM +-5%	1	1
R 5216	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	1
R 5217	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5238	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5251	RME1430	R.METAL 0.1W 220 OHM+-5%	1	1
R 5252	RME1445	R.METAL 0.1W 3.9 KOHM+-5%	1	1
R 5253	RME1443	R.METAL 0.1W 2.7 KOHM +-5%	1	1
R 5256	RME1418	R.METAL 0.1W 22 OHM+-5%	1	1
R 5255	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5256	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5257	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 5260	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 5261	RME1446	R.METAL 0.1W 4.7 KOHM+-5%	1	1
R 5264	RME1449	R.METAL 0.1W 8.2 KOHM+-5%	1	1
R 5265	RME1443	R.METAL 0.1W 2.7 KOHM +-5%	1	1
R 5266	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	1
R 5267	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5268	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 5326	RME1413	R.METAL 0.1W 0 OHM	R	R
R 5327	RME1413	R.METAL 0.1W 0 OHM	R	R
R 5328	RME1413	R.METAL 0.1W 0 OHM	R	R
R 8031	RME1438	R.METAL 0.1W 1.0 KOHM+-5%	1	1
R 8032	RME1419	R.METAL 0.1W 27 OHM+-5%	1	1
R 8040	RME1434	R.METAL 0.1W 470 OHM+-5%	1	1
R 8041	RME1426	R.METAL 0.1W 100 OHM+-5%	1	1
R 8042	RME1422	R.METAL 0.1W 47 OHM+-5%	1	1
R 8060	RME1429	R.METAL 0.1W 150 OHM+-5%	1	1
R 8061	RME1430	R.METAL 0.1W 220 OHM+-5%	1	1
R 8062	RME1429	R.METAL 0.1W 150 OHM+-5%	1	1
R 8063	RME1427	R.METAL 0.1W 120 OHM+-5%	1	1
R 8064	RME1430	R.METAL 0.1W 220 OHM+-5%	1	1
R 8065	RME1440	R.METAL 0.1W 1.5 KOHM+-5%	1	1
R 8066	RME1433	R.METAL 0.1W 390 OHM+-5%	1	
R 8066	RME1442	R.METAL 0.1W 2.2 KOHM+-5%		1
R 8067	RME1449	R.METAL 1/10W 4.7 OHM+-10%	1	1
R 8070	RME1442	R.METAL 0.1W 2.2 KOHM+-5%	1	
R 8070	RME1443	R.METAL 0.1W 2.7 KOHM +-5%		1
R 8071	RME1429	R.METAL 0.1W 150 OHM+-5%	1	1
R 8072	RME1434	R.METAL 0.1W 470 OHM+-5%	1	1
R 8073	RME1431	R.METAL 0.1W 270 OHM+-5%	1	1
R 8074	RME1428	R.METAL 0.1W 150 OHM+-5%	1	
R 8074	RME1430	R.METAL 0.1W 220 OHM+-5%		1
R 8075	RME1414	R.METAL 0.1W 10 OHM+-5%	1	1
R 8075	RME1420	R.METAL 0.1W 33 OHM+-5%	1	1
R 8079	RME1420	R.METAL 0.1W 33 OHM+-5%	1	R
R 8081	RME1426	R.METAL 0.1W 100 OHM+-5%	R	R

DLY4 (PEF-886)

A : VC-6025 B : VC-6045 PEF-886 DLY4 R : Not used

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
C 495	CCG0121	C.CERAMIC 50 V 7 PF +-0.5PF		1
C 496	CCG0121	C.CERAMIC 50 V 7 PF +-0.5PF		1
C 497	CCG0121	C.CERAMIC 50 V 7 PF +-0.5PF		1
C 498	CCG0121	C.CERAMIC 50 V 7 PF +-0.5PF		1
C 499	CCG0130	C.CERAMIC 50 V 6 PF +-0.5PF		1
CV 499	CVTQ0057	C.VARIABLE TZ03T200NR169 (~20P)		R
L 495	TLN0017	COIL 0.082UH 450MA +-20%		1
L 496	TLN0017	COIL 0.082UH 450MA +-20%		1
L 497	TLN0012	COIL 0.068UH 450MA +-20%		1
L 4496.	RME0912	R.METAL 1/8W 0 OHM	2	
P 492	JBX2210	CONNECTOR 05J0-ST	1	1

RS-232C (PEF-887)

A : VC-6025 B : VC-6045 PEF-887 RS-232C

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
D 5500	MDD0174	DIODE DAN202	1	1
P 5505	JBS60025	CONNECTOR S15B-XH-A	1	1
P 5506	JBRQ010	CONNECTOR ADBB-25S-LN	1	1
S 5501	SSLQ079	SW,LEVER DNT-8	1	1

A : VC-6025 B : VC-6045 PEF-885 S/H R : Not used

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
R 8088	RME1420	R.METAL 0.1W 55 OHM +-5%	1	1
R 8089	RME1414	R.METAL 0.1W 10 OHM +-5%	1	1
R 8090	RME1445	R.METAL 0.1W 3.9 KOHM +-5%	1	1
R 8091.	RME1413	R.METAL 0.1W 0 OHM	2	2
R 8092	RME1442	R.METAL 0.1W 2.2 KOHM +-5%	1	1
R 8093	RME1426	R.METAL 0.1W 100 OHM +-5%	1	1
R 8094	RME1434	R.METAL 0.1W 470 OHM +-5%	1	1
R 8095	RME1426	R.METAL 0.1W 100 OHM +-5%	R	R
R 8096	RME1418	R.METAL 0.1W 22 OHM +-5%	1	1
R 8098	RME1418	R.METAL 0.1W 22 OHM +-5%	1	1
R 8099	RME1442	R.METAL 0.1W 2.2 KOHM +-5%	1	1
R 8100	RME1428	R.METAL 0.1W 150 OHM +-5%	1	1
R 8101	RME1427	R.METAL 0.1W 120 OHM +-5%	1	1
R 8102	RME1442	R.METAL 0.1W 2.2 KOHM +-5%	1	1
R 8103	RME1419	R.METAL 0.1W 27 OHM +-5%	1	1
R 8105	RME1418	R.METAL 0.1W 22 OHM +-5%	1	1
R 8106	RME1424	R.METAL 0.1W 100 OHM +-5%	1	1
R 8107	RME1426	R.METAL 0.1W 100 OHM +-5%	1	1
R 8108	RME1426	R.METAL 0.1W 100 OHM +-5%	1	1
R 8109	RME1426	R.METAL 0.1W 100 OHM +-5%	R	R
R 8110	RME1427	R.METAL 0.1W 120 OHM +-5%	1	1
R 8111	RME1437	R.METAL 0.1W 820 OHM +-5%	1	1
R 8112	RME1438	R.METAL 0.1W 1.0 KOHM +-5%	1	1
R 8113	RME1438	R.METAL 0.1W 1.0 KOHM +-5%	1	1
R 8114	RME1414	R.METAL 0.1W 10 OHM +-5%	1	1
R 8115	RME1432	R.METAL 0.1W 330 OHM +-5%	1	1
R 8117	RME1447	R.METAL 0.1W 5.6 KOHM +-5%	1	1
R 8118	RME1427	R.METAL 0.1W 120 OHM +-5%	1	1
R 8119	RME1450	R.METAL 0.1W 10 KOHM +-5%	1	1
R 8120	RME1426	R.METAL 0.1W 100 OHM +-5%	1	1
R 8121	RME1428	R.METAL 0.1W 150 OHM +-5%	1	1
R 8122	RME1414	R.METAL 0.1W 10 OHM +-5%	1	1
R 8150	RME1446	R.METAL 0.1W 470 KOHM +-5%	1	1
R 8285.	RME1435	R.METAL 0.1W 560 OHM +-5%	2	2
R 8344.	RME1424	R.METAL 0.1W 68 OHM +-5%	2	2
R 8384.	RME1432	R.METAL 0.1W 330 OHM +-5%	2	2
R 8425.	RME1413	R.METAL 0.1W 0 OHM	2	2
R 8477.	RME1428	R.METAL 0.1W 150 OHM +-5%	2	2
R 8487.	RME1450	R.METAL 0.1W 10 KOHM +-5%	2	2
R 8849.	RME1440	R.METAL 0.1W 1.5 KOHM +-5%	2	2
TR 5201	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 5202	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 5203	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 5206	HTA0243	TRANSISTOR 2SA1052D	1	1
TR 5207	HTC0886	TRANSISTOR 2SC2462C	1	1
TR 5251	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 5252	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 5253	HTD0202	TRANSISTOR 2SD596DV3	1	1
TR 5256	HTA0243	TRANSISTOR 2SA1052D	1	1
TR 5257	HTC0886	TRANSISTOR 2SC2462C	1	1
TR 8060	HTC0871	TRANSISTOR 2SC3772LY4	1	1
TR 8061	HTC0871	TRANSISTOR 2SC3772LY4	1	1
TR 8062	HTC0886	TRANSISTOR 2SC3775 OY-4	1	1
TR 8063	HTK0127	TRANSISTOR 2SK508K52/2SK508K52NV	1	1
TR 8064	HTK0127	TRANSISTOR 2SK508K52/2SK508K52NV	1	1

A : VC-6025 B : VC-6045 PEF-883 S/H

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
TR 8065	HTC0845	TRANSISTOR 2SC2759-U23	1	1
TR 8066	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 8067	HTC0848	TRANSISTOR 2SC2759-U23	1	1
TR 8068	HTC0848	TRANSISTOR 2SC2759-U23	1	1
TR 8069	HTC0848	TRANSISTOR 2SC2759-U23	1	1
TR 8070	HTC0848	TRANSISTOR 2SC2759-U23	1	1
TR 8071	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 8072	HTA0318	TRANSISTOR 2SA1462Y34	1	1
TR 8075	HTC0871	TRANSISTOR 2SC3772LY4	1	1
TR 8076	XTA0161	TRANSISTOR DTC124EK	1	1

ROM PG CKT (PEF-890)

A : VC-6025　B : VC-6045　PEF-890 ROM PG CKT

SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
	IYT0003	SEAL (ROM) 11X11MM T-TYPE MAT SILVER	1	1
	IYX0041	IC SUCKET 13628-01-445	1	1
C 3001	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3002	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3003	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3004	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3005	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3006	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3007	CCSD179	C.CERAMIC 50V 150PF +-5% SL	1	1
C 3010	CCSD205	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 3011	CCSD205	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 3012	CCSD255	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 3013	CCSD205	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 3014	CCSD205	C.CERAMIC 50 V 1000 PF +-10%	1	1
C 3015	CCSD179	C.CERAMIC 50V 150PF +-5% SL	1	1
C 3016	CCSD179	C.CERAMIC 50V 150PF +-5% SL	1	1
C 3050	CDE0064	C.2-LAYER 5.5V 1.0 F +80%-20%	1	1
C 3051	CCSD213	C.CERAMIC 50 V 0.1 UF +80-20%	1	1
C 3101	CCSD136	C.CERAMIC 50 V 33 PF +-5%	1	1
C 3102	CCSD156	C.CERAMIC 50 V 33 PF +-5%	1	1
C 3103	CCSD213	C.CERAMIC 50 V 0.1 UF +80-20%	1	1
C 3106	CCSD213	C.CERAMIC 50 V 0.1 UF +80-20%	1	1
C 3107	CESD133	C.AL ELYC 16 V 47 UF +-20%	1	1
C 3108	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3109	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3210	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3211	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
C 3212	CCSD211	C.CERAMIC 50 V10000 PF +-10%	1	1
D 3001	HDMD139	DIODE MTZ 3.3JA	1	1
D 3002	HDSD437	DIODE 1SS133	1	1
IC 3001	IDM1292	IC.DIGITAL HN27256G-25	1	1
IC 3002	IDM1051	IC.DIGITAL HD74HC74P	1	1
IC 3003	IDM1276	IC.DIGITAL HD74HC573P/TC74HC573P	1	1
IC 3004	IDM1275	IC.DIGITAL HD74HC574P/TC74HC574P	1	1
IC 3005	IDM1275	IC.DIGITAL HD74HC574P/TC74HC574P	1	1
IC 3006	IDM1019	IC.DIGITAL HD74HC32P	1	1
IC 3007	ILM0399	IC.AM.LCD MN1280R	1	1
IC 3101	IDM0685	IC.DIGITAL UPD78C106-36	1	1
IC 3210	IAM0617	IC HM6264ALP-15	1	1
IC 3211	IDH1149	IC.DIGITAL HD74HC155P	1	1
IC 3212	IDH0982	IC.DIGITAL HD74HCD0P/TC74HC00P	1	1
P 3001	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3002	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3003	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3004	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3005	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3006	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3007	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3008	JBS0027	CONNECTOR 50-B-AP-GB-C	1	1
P 3210	JBB0058	CONNECTOR B120-XH-A	1	1
R 3002	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1

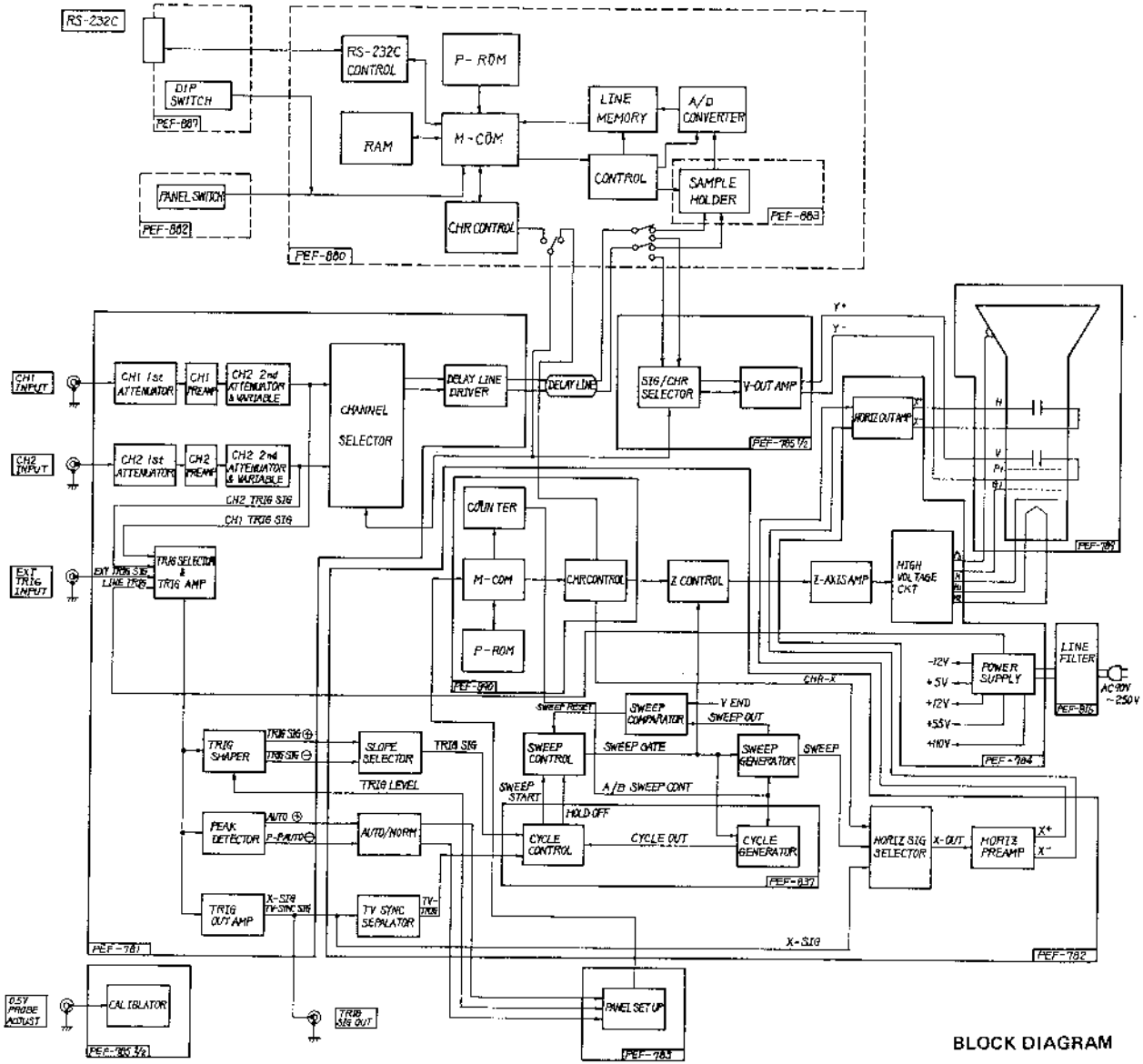
A : VC-6025　B : VC-6045　PEF-890 ROM PG CKT　* : Not used

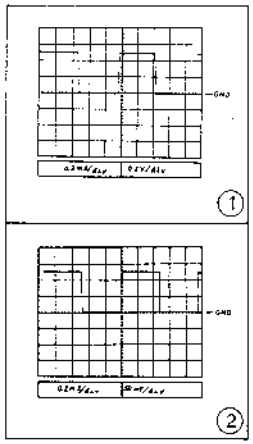
SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
R 3003	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 3004	RME0892	R.METAL 1/8W 22 KOHM +-5%	1	1
R 3005	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 3006	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 3010	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3011	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3012	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3013	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3014	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3015	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3016	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3017	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3018	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3051	RME0869	R.METAL 1/8W 270 OHM +-5%	1	1
R 3052	RME0870	R.METAL 1/8W 330 OHM +-5%	1	1
R 3053	RMED880	R.METAL 1/8W 2.2 KOHM +-5%	1	1
R 3054	RMED883	R.METAL 1/8W 3.9 KOHM +-5%	1	1
R 3055	RMED862	R.METAL 1/8W 68 OHM +-5%	1	1
R 3056	RME0912	R.METAL 1/8W 0 OHM	R	R
R 3101	RME0906	R.METAL 1/8W 1.0 MOHM +-5%	1	1
R 3210	RME0912	R.METAL 1/8W 0 OHM	1	1
R 3211	RME0912	R.METAL 1/8W 0 OHM	R	R
R 3212	RME0912	R.METAL 1/8W 0 OHM	*	*
R 3213	RME0912	R.METAL 1/8W 0 OHM	R	R
R 3214	RME0912	R.METAL 1/8W 0 OHM	1	1
R 3215	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3216	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3217	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3218	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3219	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3220	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3221	RME0875	R.METAL 1/8W 820 OHM +-5%	1	1
R 3251	RME0884	R.METAL 1/8W 4.7 KOHM +-5%	1	1
R 3252	RME0888	R.METAL 1/8W 10 KOHM +-5%	1	1
R 3253	RME0912	R.METAL 1/8W 0 OHM	R	R
R 3254	RME0866	R.METAL 1/8W 150 OHM +-5%	1	1
R 3257	RME0912	R.METAL 1/8W 0 OHM	R	R
R 3258	RME0912	R.METAL 1/8W 0 OHM	1	1
R 3556.	RME0896	R.METAL 1/8W 47 KOHM +-5%	2	2
TR 3001	HFA0224	TRANSISTOR 2SA1029 D	1	1
TR 3002	HFC0686	TRANSISTOR 2SC2462C	1	1
TR 3003	HFA0263	TRANSISTOR 2SA1052D	1	1
TR 3201	HFC0590	TRANSISTOR 2SC1621B4	1	1
X 3101	XAH0069	XTAL HC-49/U 12.000MHZ	1	1

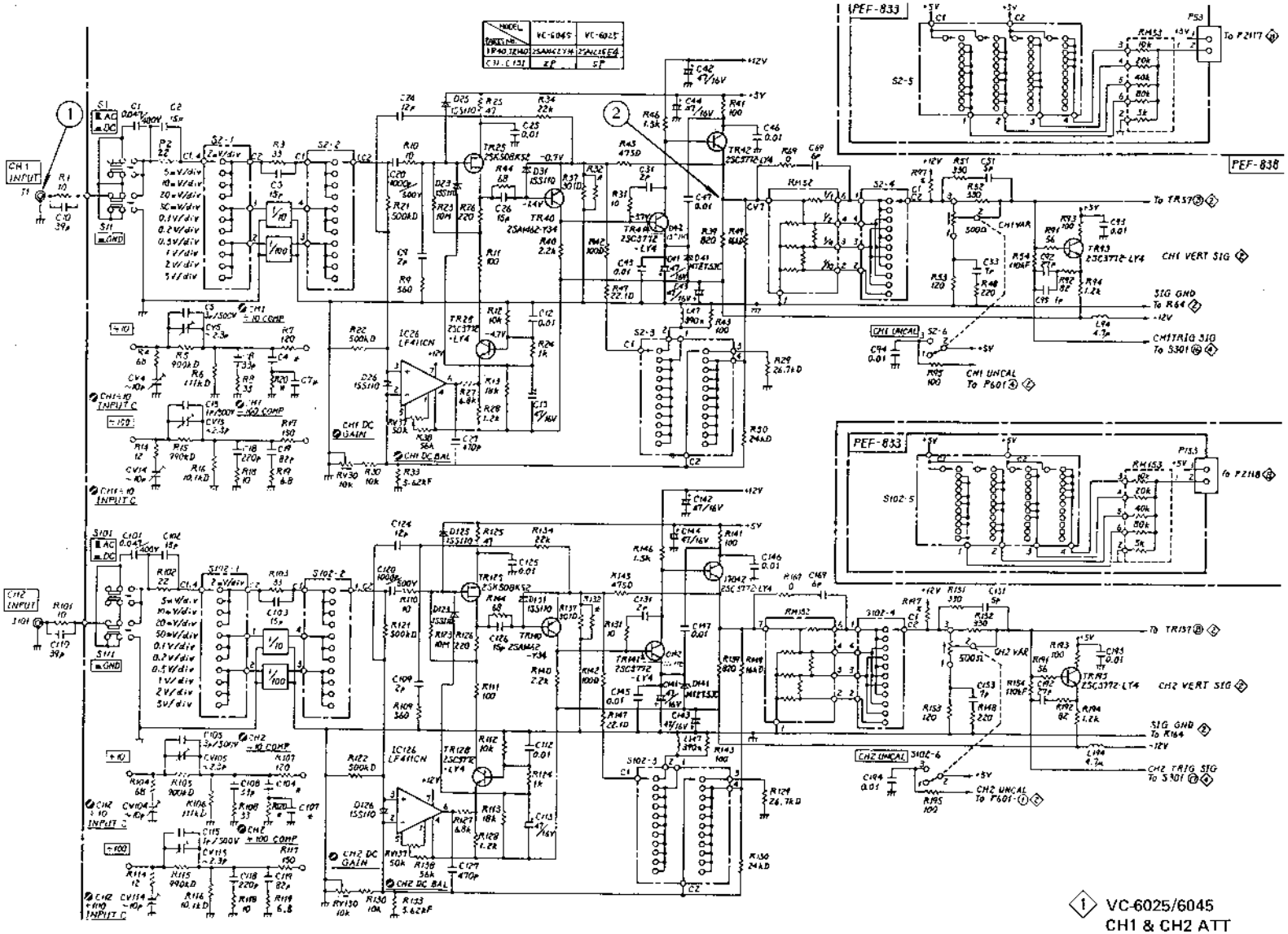
DLY5 (PEF-896)

A : VC-6025　B : VC-6045　PEF-896 DLY5

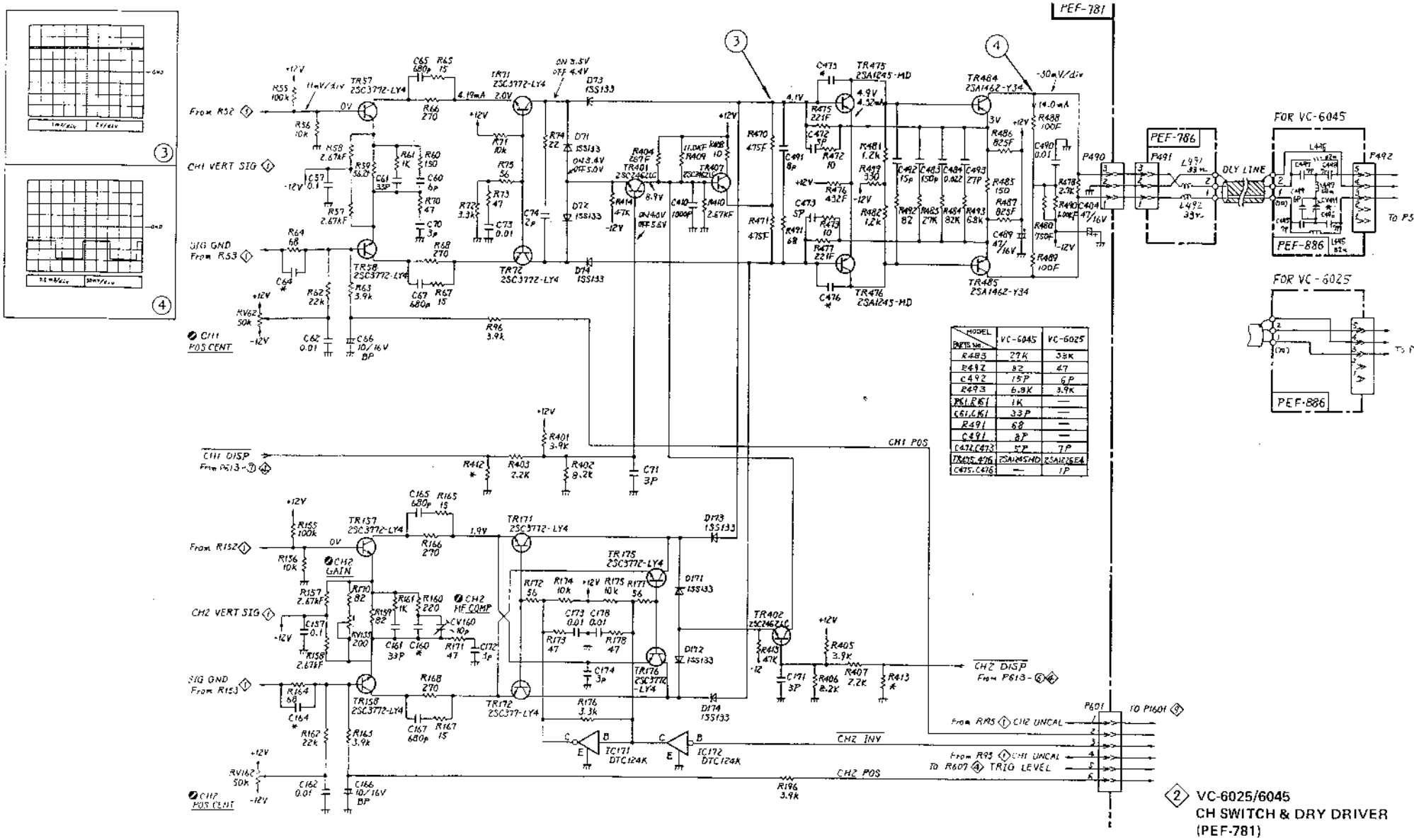
SYMBOL	PART CODE	DESCRIPTION	Q'TY A	Q'TY B
L 491	QLN0015	CCIL 0.033UH 450MA +-20%	1	1
L 492	QLN0015	CCIL 0.033UH 450MA +-20%	1	1
P 491	JBX2203	CONNECTOR 3330-5T	1	1


RS-232C
RS-232C CONTROL
P-ROM
DIP SWITCH
PEF-887
RAM
M-COM
LINE MEMORY
A/D CONVERTER
CONTROL
SAMPLE HOLDER
PEF-883
PANEL SWITCH
PEF-882
CHR CONTROL
PEF-880
CH1 INPUT
CH1 1st ATTENUATOR
CH1 PREAMP
CH2 2nd ATTENUATOR & VARIABLE
CHANNEL SELECTOR
DELAY LINE DRIVER
DELAY LINE
SIG/CHR SELECTOR
V-OUT AMP
PEF-785 1/2
HORIZ OUT AMP
CH2 INPUT
CH2 1st ATTENUATOR
CH2 PREAMP
CH2 2nd ATTENUATOR & VARIABLE
CH2 TRIG SIG
CH1 TRIG SIG
EXT TRIG INPUT
TRIG SELECTOR & TRIG AMP
EXT TRIG SIG
LINE TRIG
COUNTER
M-COM
CHR CONTROL
Z CONTROL
Z-AXIS AMP
HIGH VOLTAGE CKT
P-ROM
PEF-880
PEF-787
LINE FILTER
POWER SUPPLY
-12V
+5V
+12V
+55V
+110V
AC90V ~250V
PEF-816
PEF-784
CHR-X
SWEEP RESET
SWEEP COMPARATOR
V END
SWEEP OUT
TRIG SHAPER
TRIG SIG ⊕
TRIG SIG ⊖
SLOPE SELECTOR
TRIG SIG
SWEEP CONTROL
SWEEP GATE
SWEEP GENERATOR
SWEEP
TRIG LEVEL
SWEEP START
A/B SWEEP CONT
HOLD OFF
PEAK DETECTOR
AUTO ⊕
P-P AUTO ⊖
AUTO/NORM
CYCLE CONTROL
CYCLE OUT
CYCLE GENERATOR
PEF-837
HORIZ SIG SELECTOR
X-OUT
HORIZ PREAMP
X+
X-
TRIG OUT AMP
X-SIG
TV-SYNC SIG
TV SYNC SEPARATOR
TV-TRIG
X-SIG
PEF-781
PEF-782
0.5V PROBE ADJUST
CALIBLATOR
PEF-785 1/2
TRIG SIG OUT
PANEL SET UP
PEF-783
Y+
Y-
H
V
P1
B1
BLOCK DIAGRAM

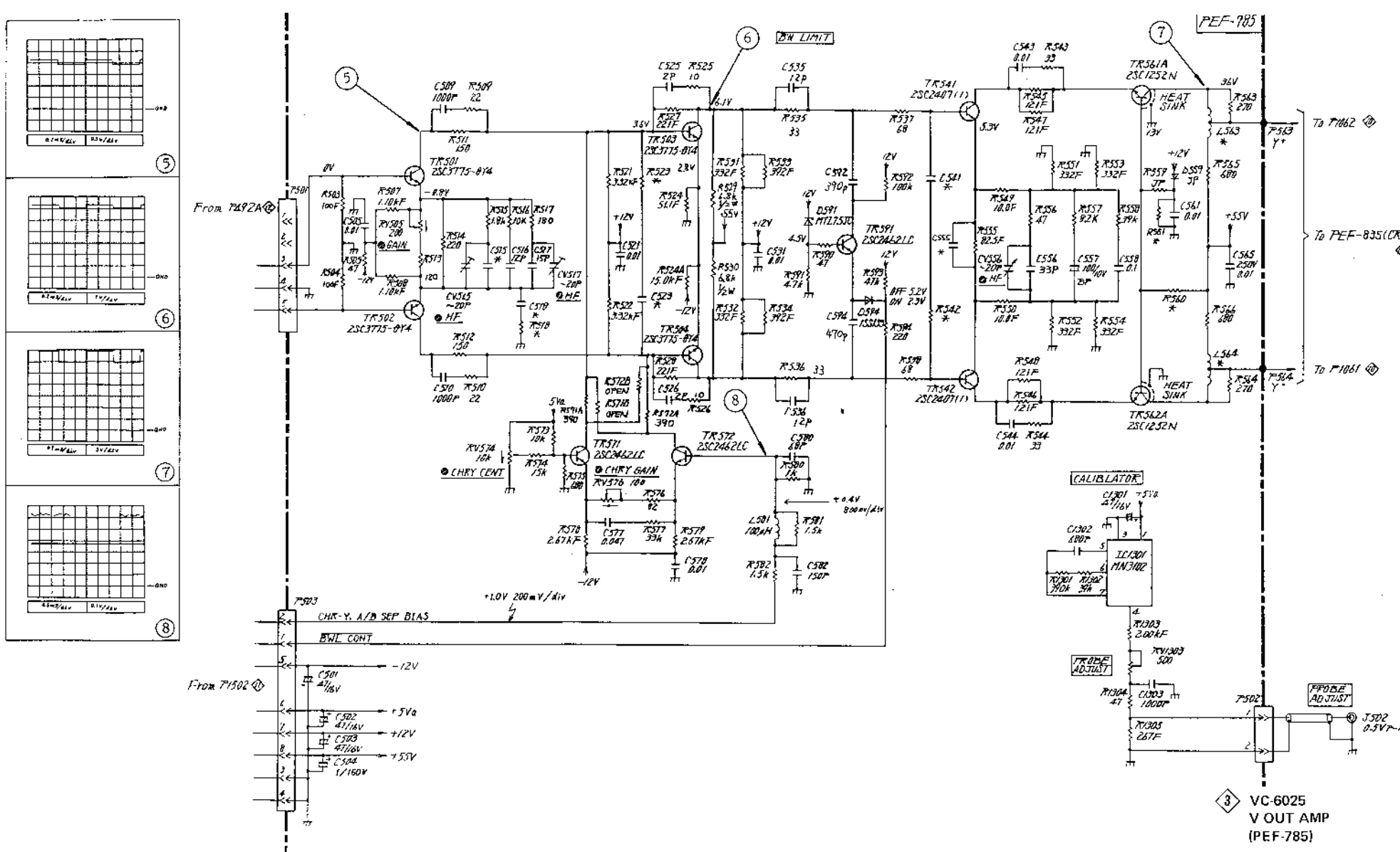


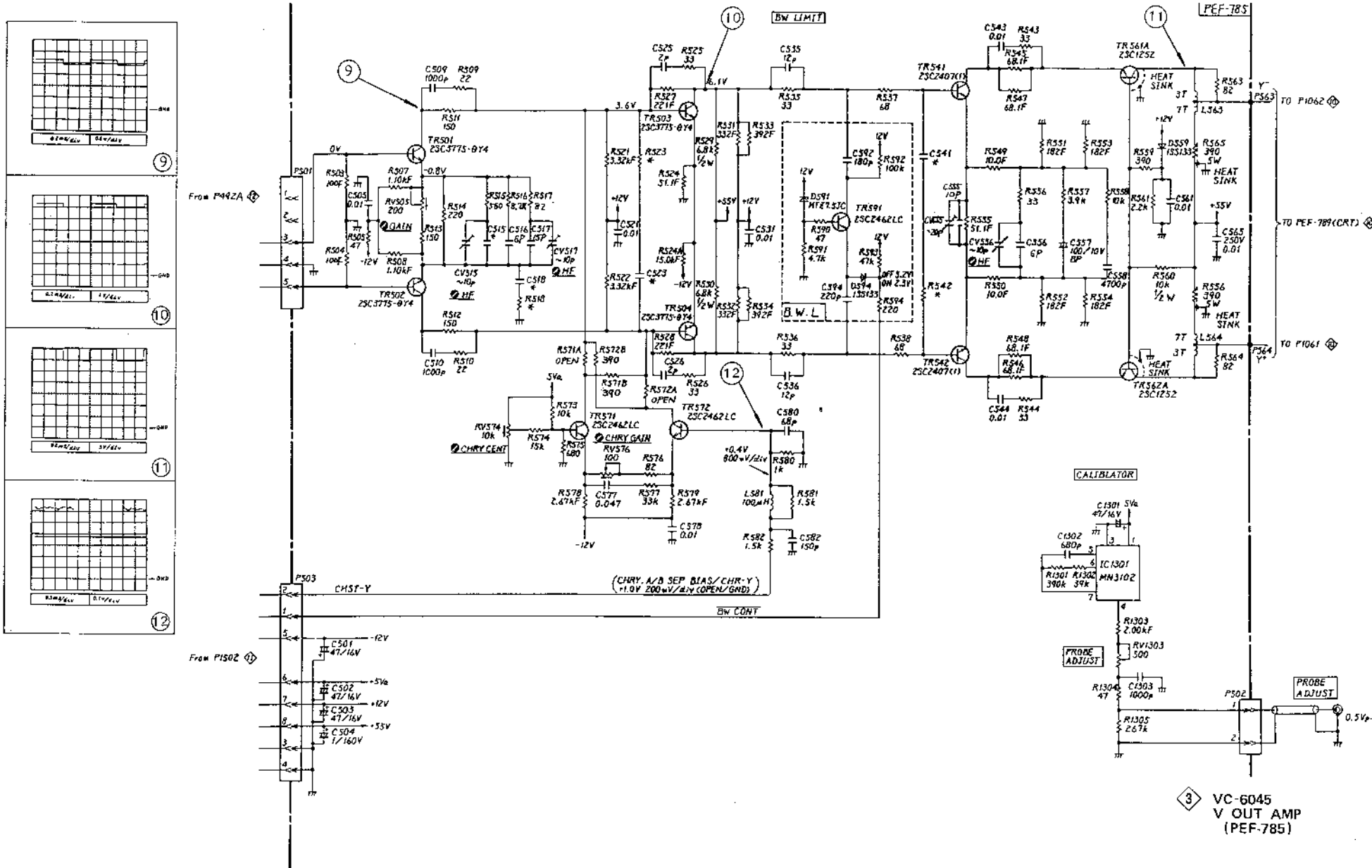


① VC-6025/6045
CH1 & CH2 ATT
(PEF-781)

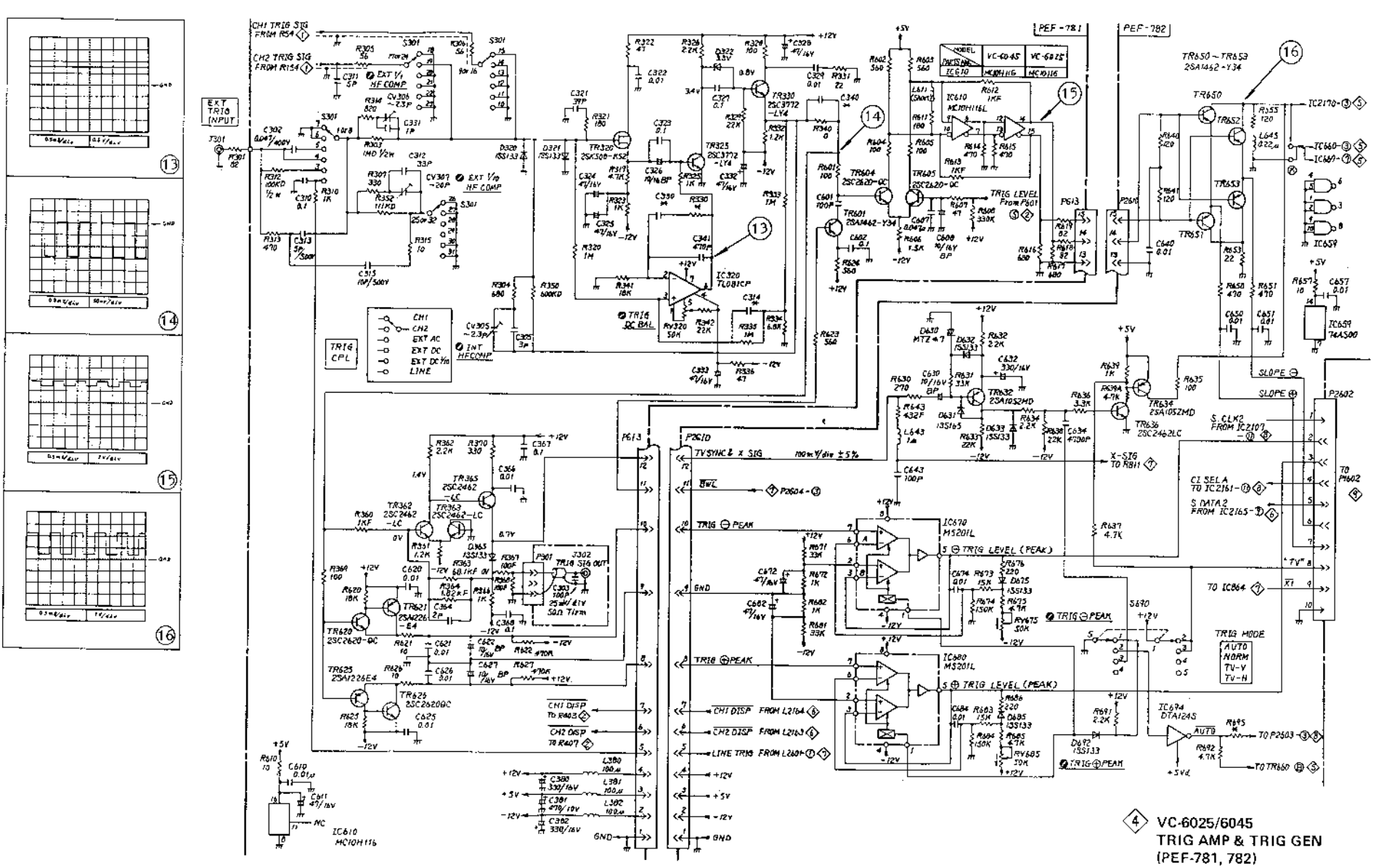


2 VC-6025/6045
CH SWITCH & DRY DRIVER
(PEF-781)


PEF-785
BW LIMIT
TR501 2SC3775-BY4
TR502 2SC3775-BY4
TR503 2SC3775-BY4
TR504 2SC3775-BY4
TR571 2SC2482LC
TR572 2SC2482LC
TR591 2SC2482LC
TR541 2SC2407(1)
TR542 2SC2407(1)
TR561A 2SC1252N
TR562A 2SC1252N
HEAT SINK
HEAT SINK
From P492A
To P1062
To PEF-835(CR
To P1061
CHRY CENT
CHRY GAIN
CALIBLATOR
IC1301 MN3102
PROBE ADJUST
PROBE ADJUST
CHR-Y, A/B SEP BIAS
BWL CONT
From P1502
+1.0V 200mV/div
+0.4V 900mV/div
VC-6025
V OUT AMP
(PEF-785)

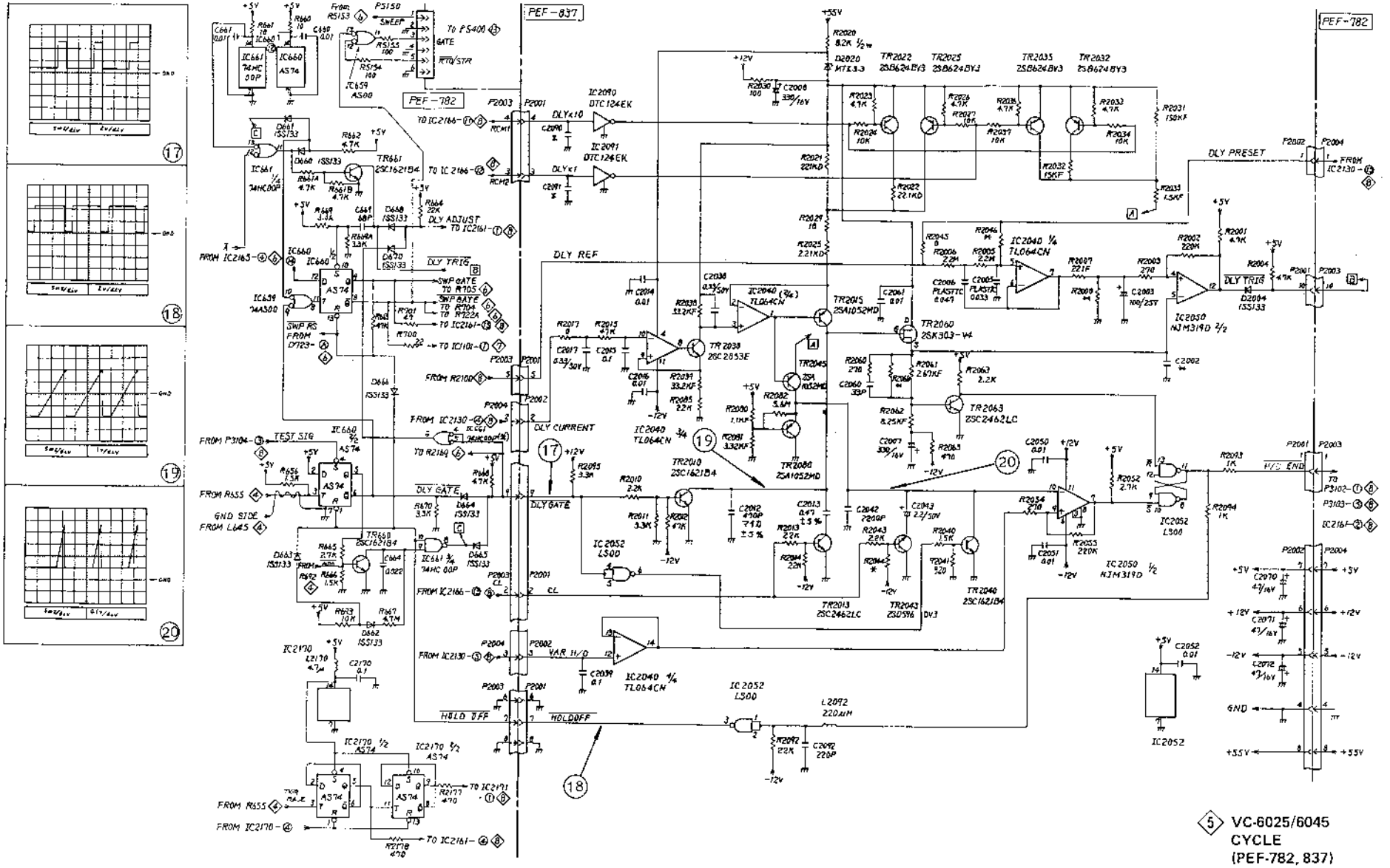


③ VC-6045
V OUT AMP
(PEF-785)

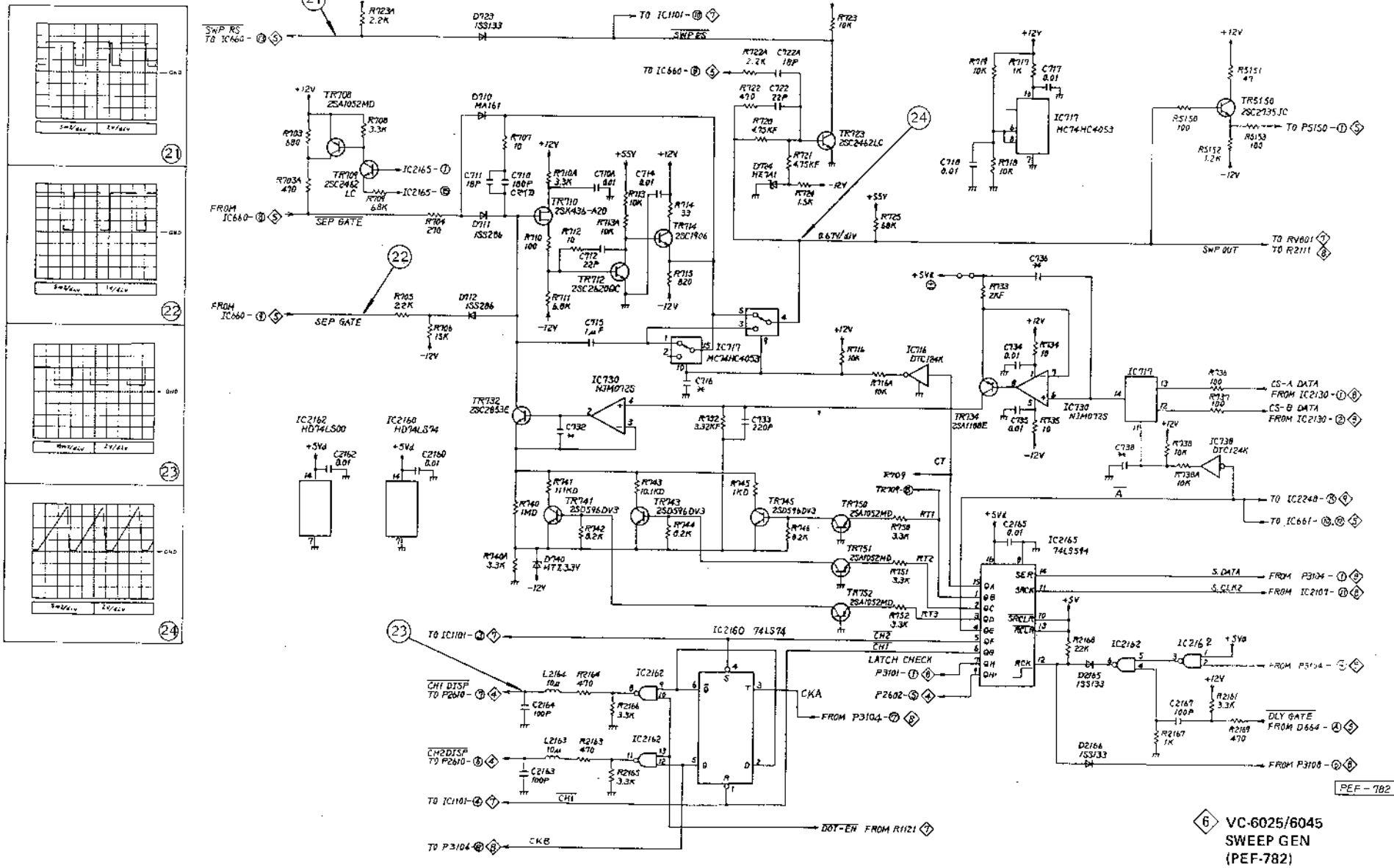


13 14 15 16

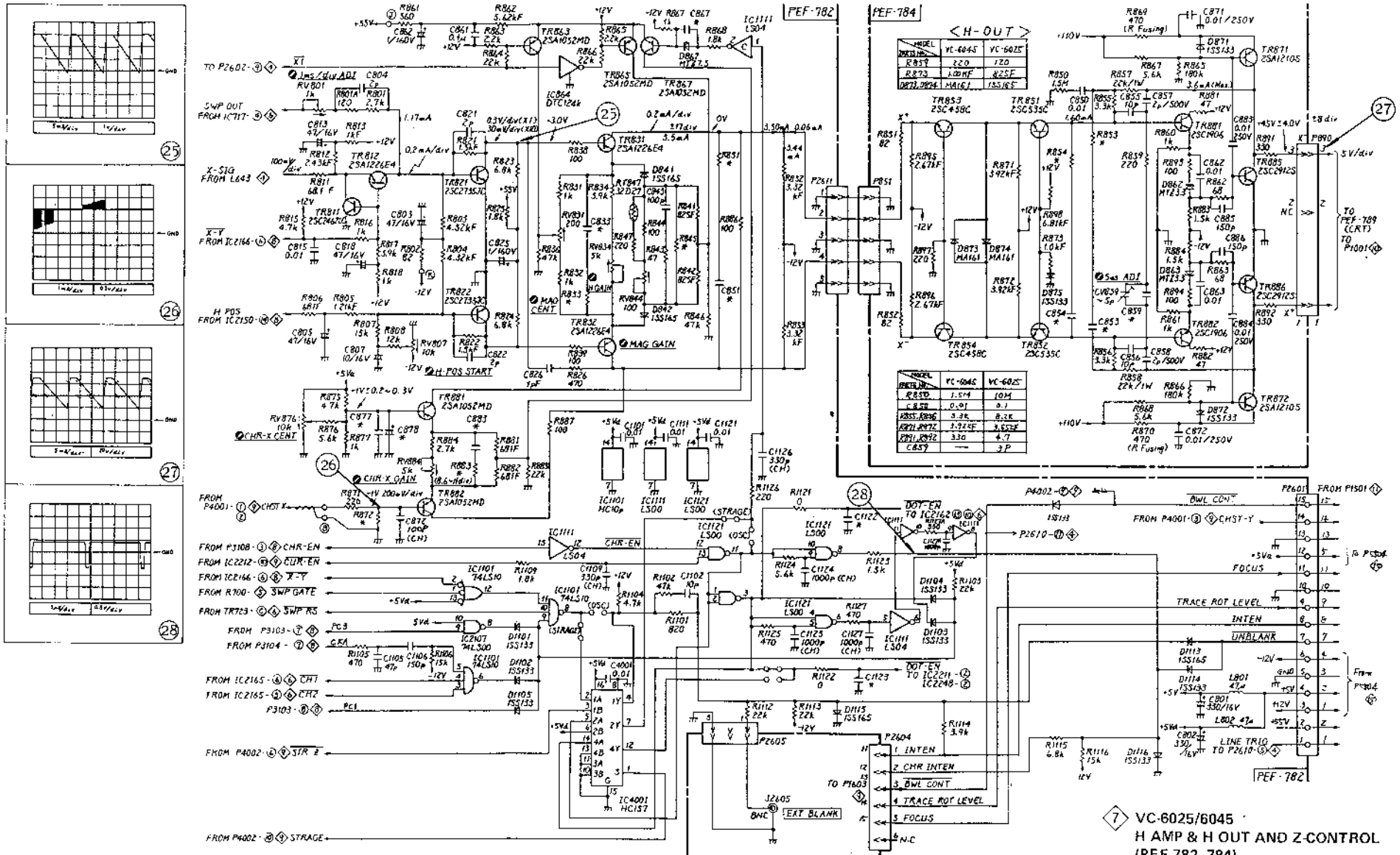
4 VC-6025/6045
TRIG AMP & TRIG GEN
(PEF-781, 782)



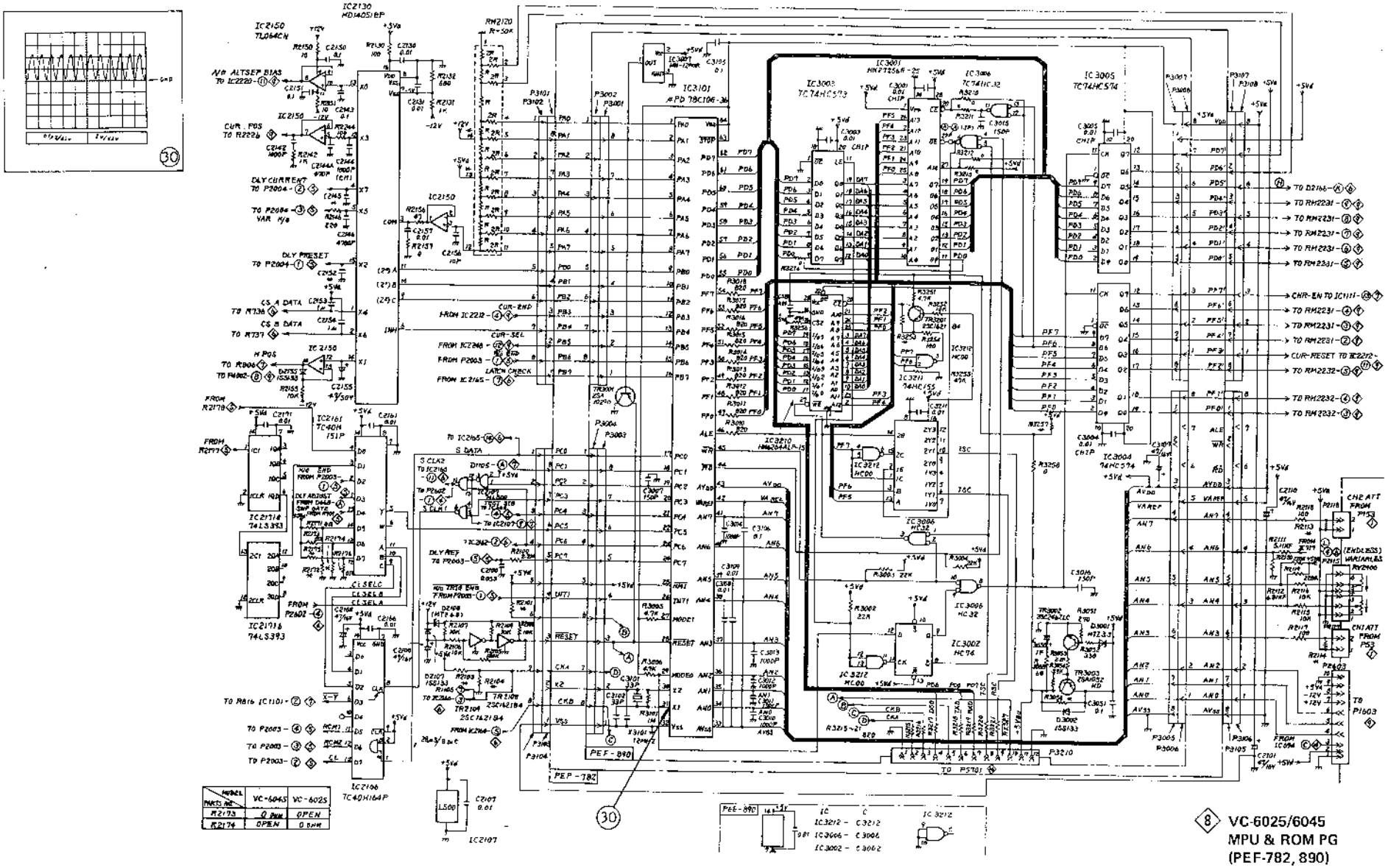
5 VC-6025/6045 CYCLE (PEF-782, 837)



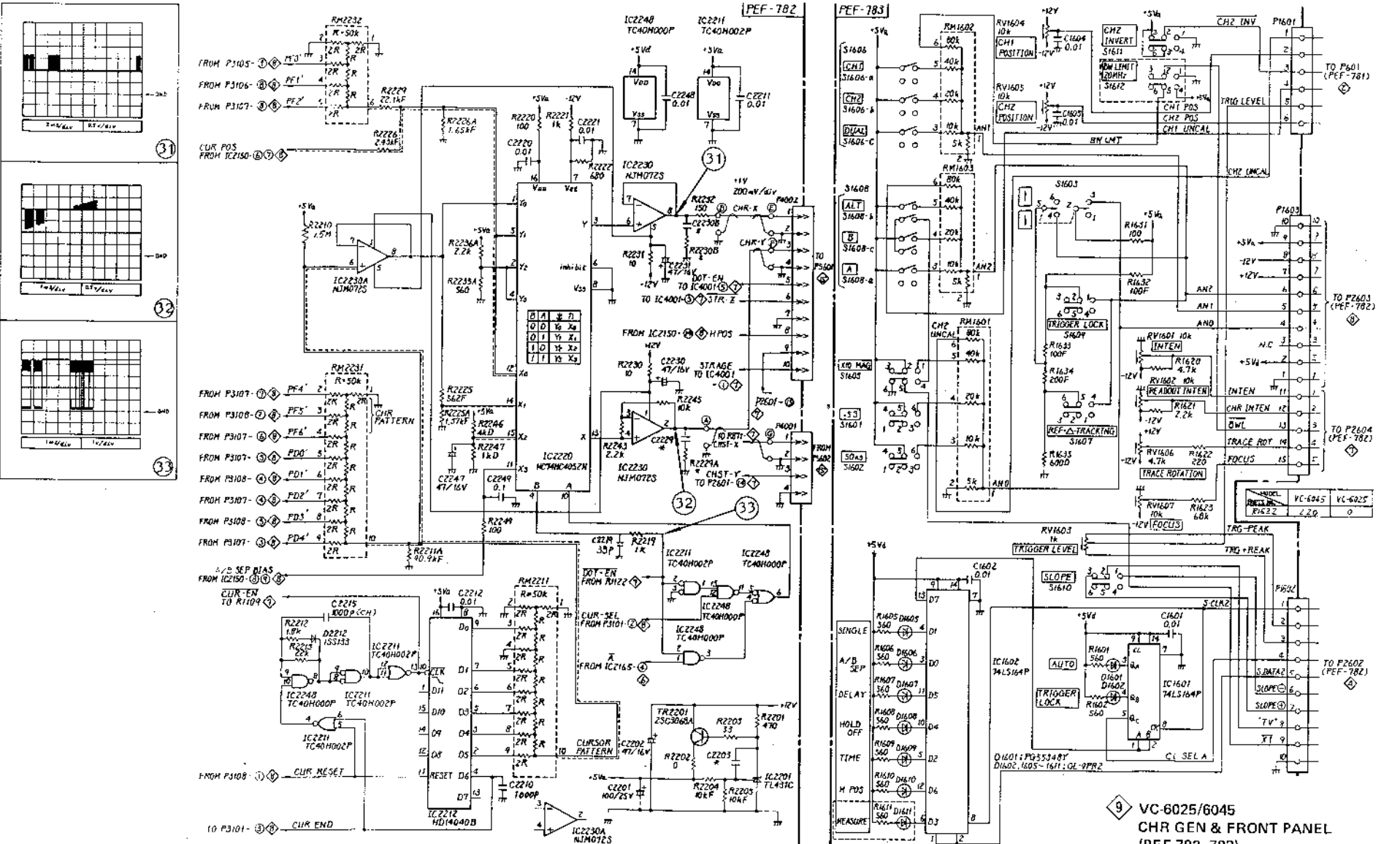
⑥ VC-6025/6045
SWEEP GEN
(PEF-782)



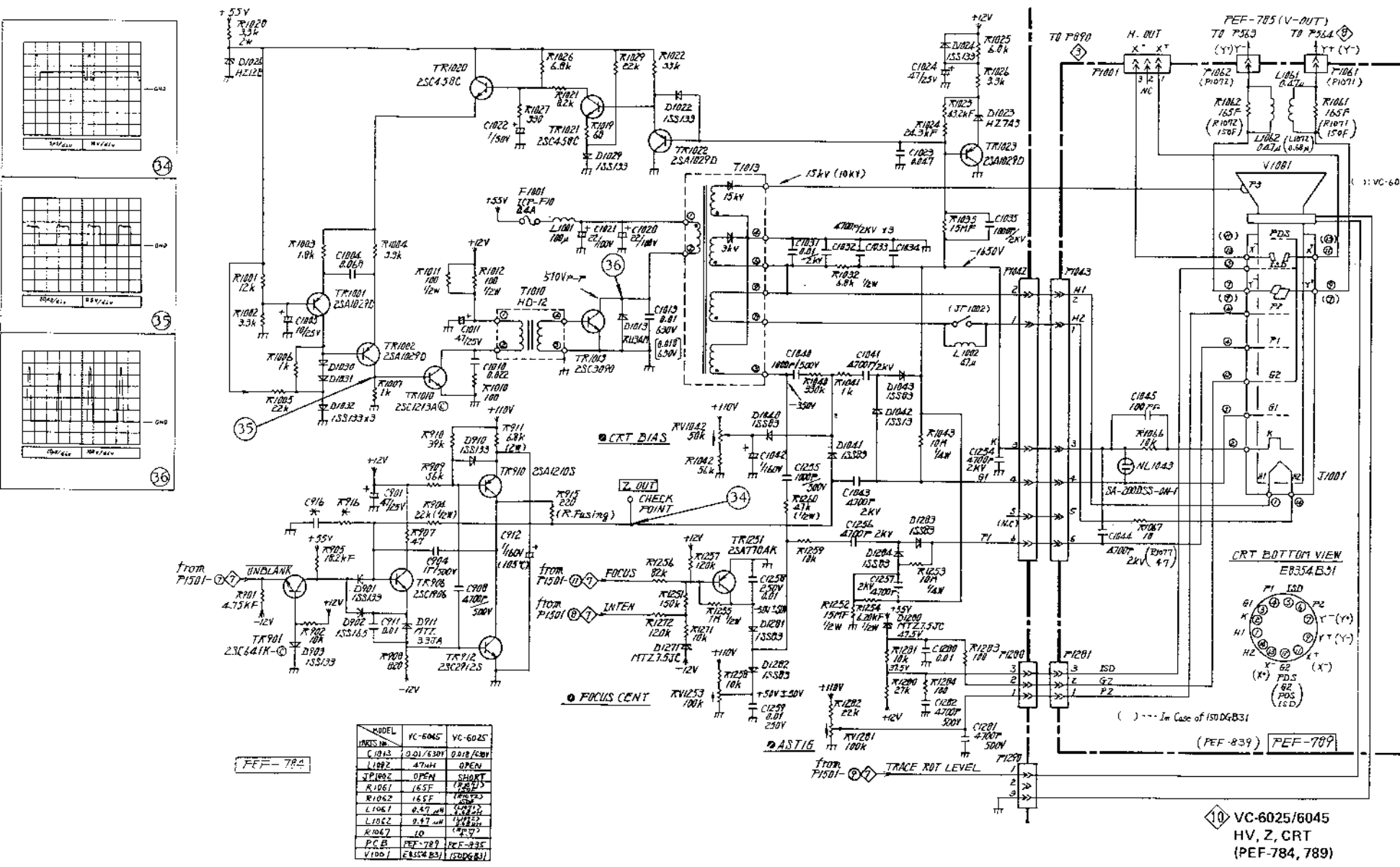
7 VC-6025/6045 · H AMP & H OUT AND Z-CONTROL (PEF-782, 784)



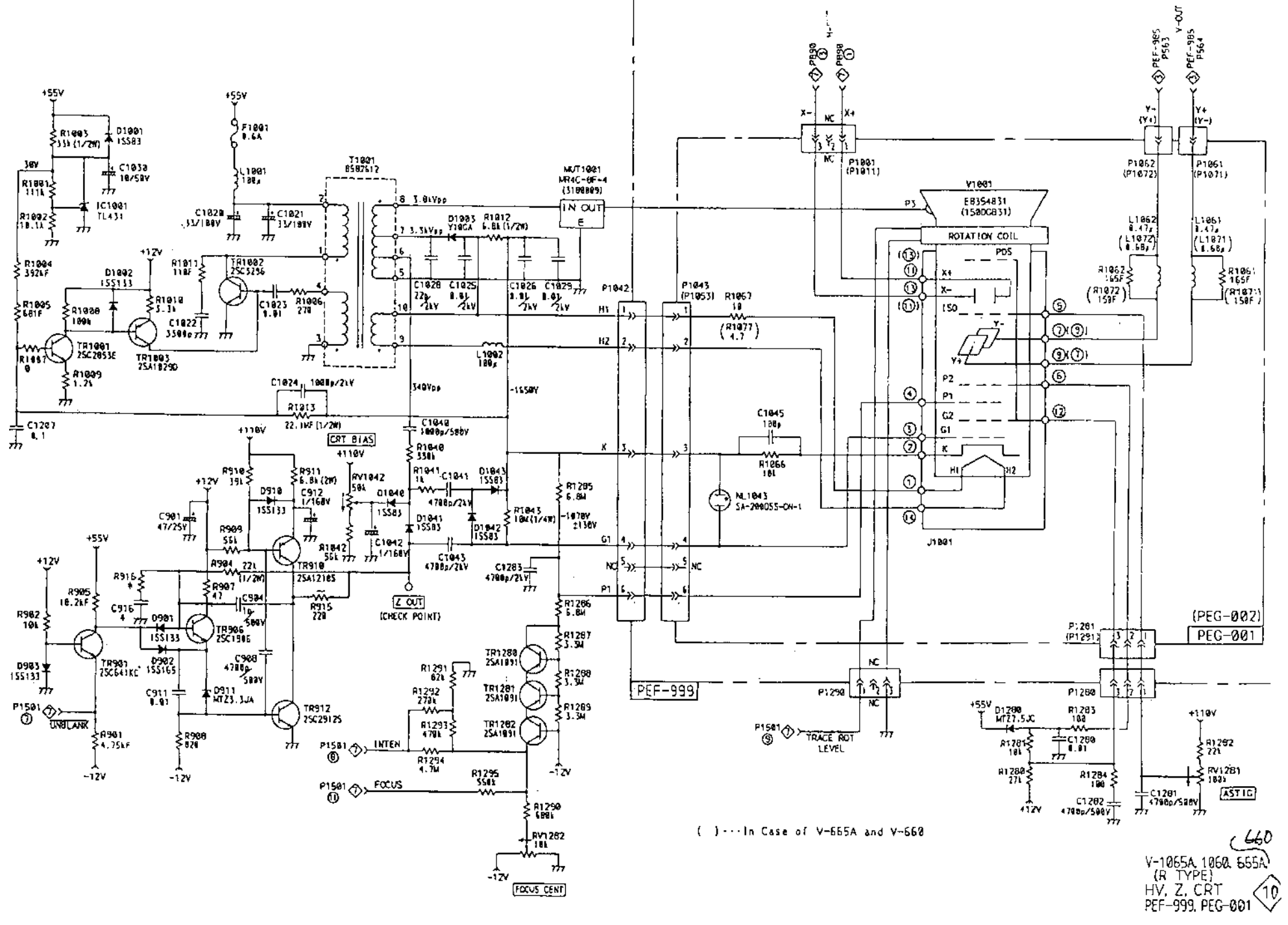
8 VC-6025/6045
MPU & ROM PG
(PEF-782, 890)



⑨ VC-6025/6045
CHR GEN & FRONT PANEL
(PEF-782, 783)



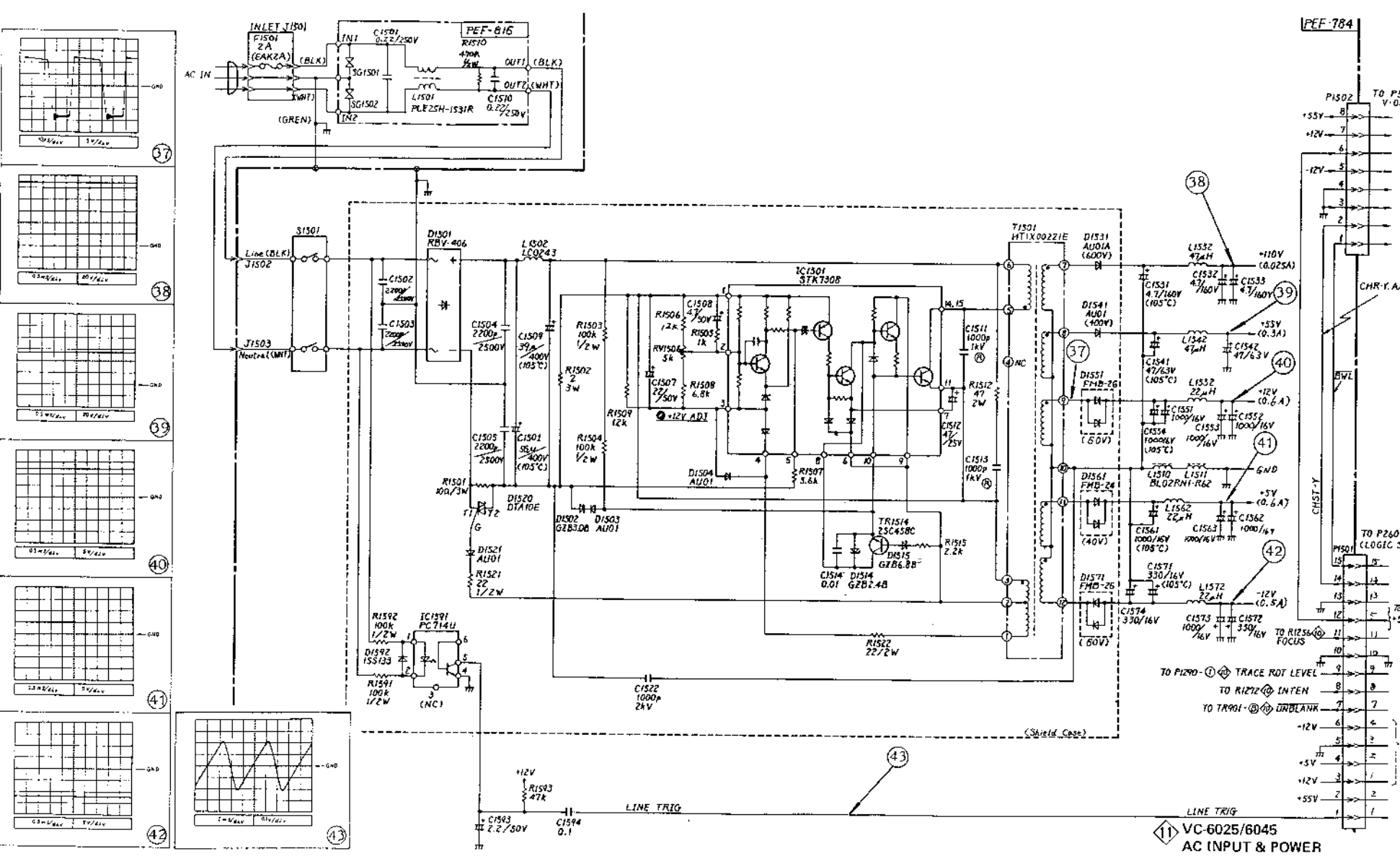
MODEL / PARTS No.	VC-6045	VC-6025
C1013	0.01/630V	0.018/630V
L1002	47uH	OPEN
JP1002	OPEN	SHORT
R1061	165F	(PEF-839)
R1062	165F	(PEF-839)
L1061	0.47 uH	(PEF-839)
L1062	0.47 uH	(PEF-839)
R1067	10	(PEF-839)
PCB	PEF-789	PEF-839
V1001	E8354.B31	15DDG-B31



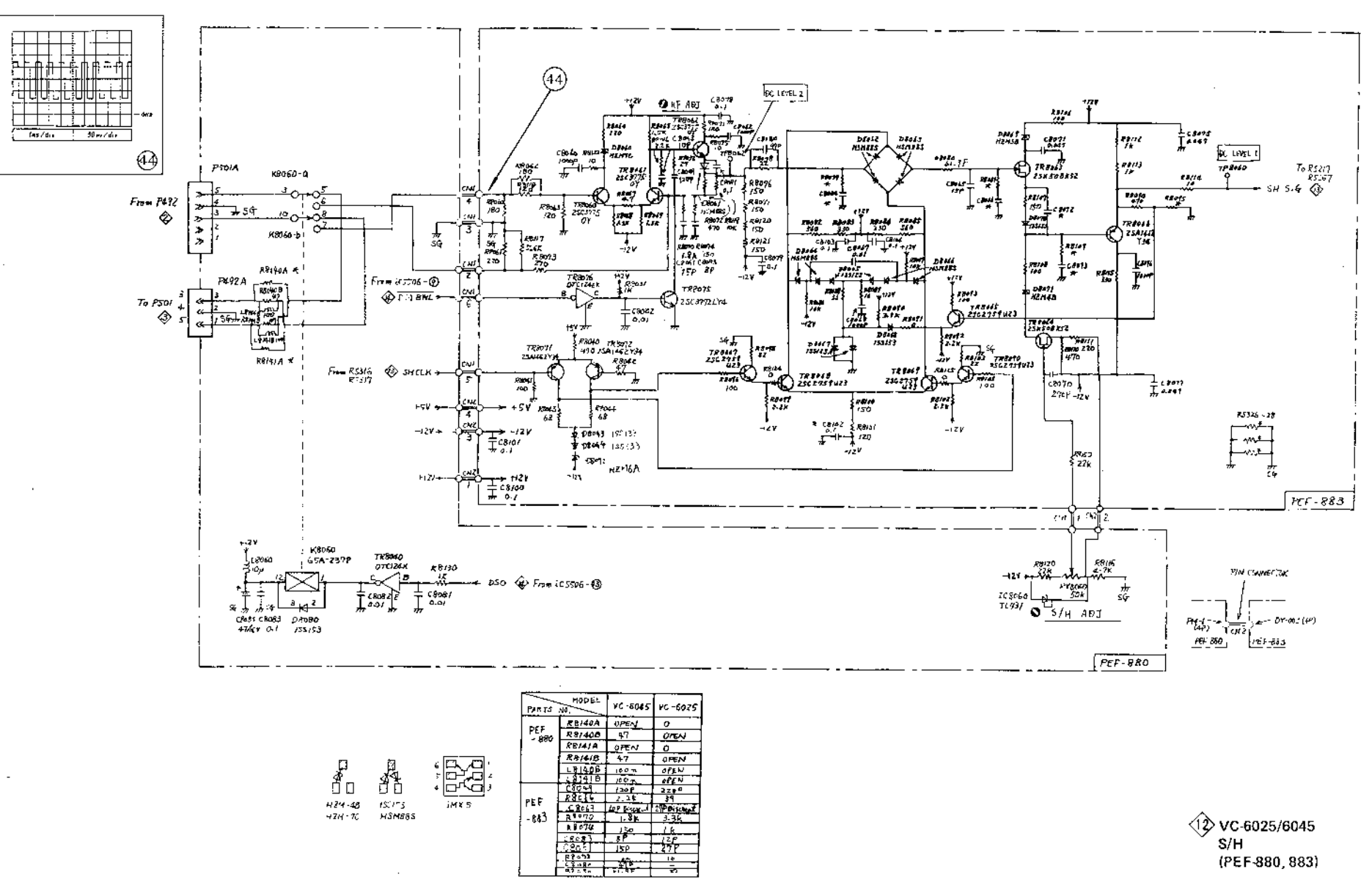
660

V-1065A, 1060, 665A
(R TYPE)
HV, Z, CRT
PEF-999, PEG-001

10



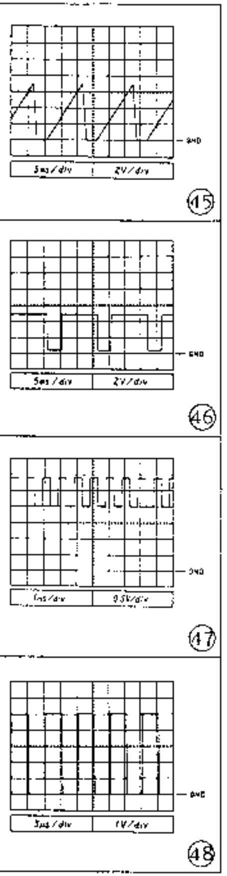
⑪ VC-6025/6045
AC INPUT & POWER
(PEF-784, 816)

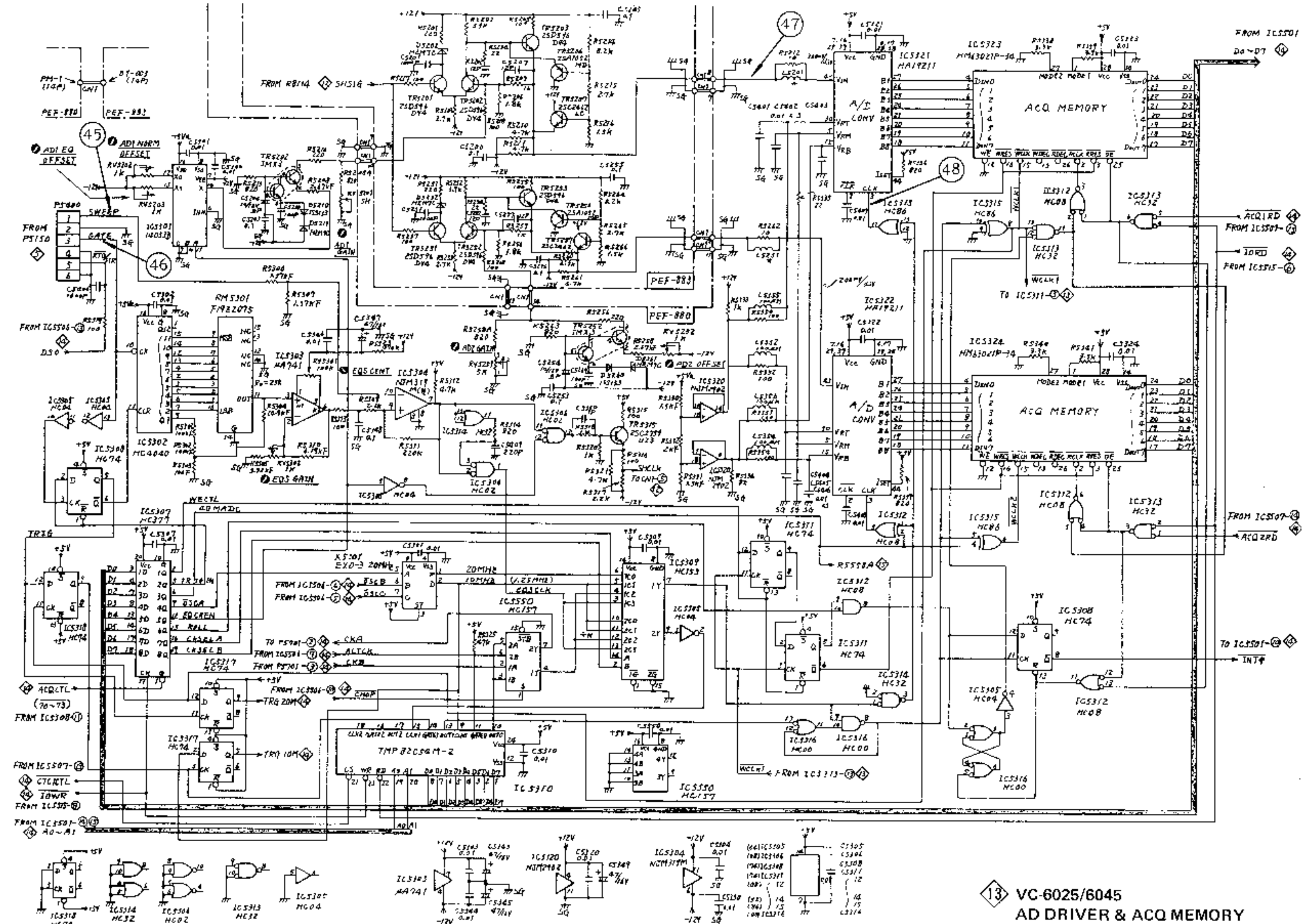


PARTS NO. \ MODEL		VC-6045	VC-6025
PEF-880	RB140A	OPEN	0
	RB140B	47	OPEN
	RB141A	OPEN	0
	RB141B	47	OPEN
	LB140B	100μ	OPEN
	LB141B	100μ	OPEN
PEF-883	CB044	120P	220P
	RB116	2.2K	3.9K
	CB063	1pF	OPEN
	RB070	1.8K	3.3K
	RB074	150	1K
	CB083	5P	12P
	CB087	150	27P
	RB093	47K	10
	CB080	47P	—
	RB095	47K	10

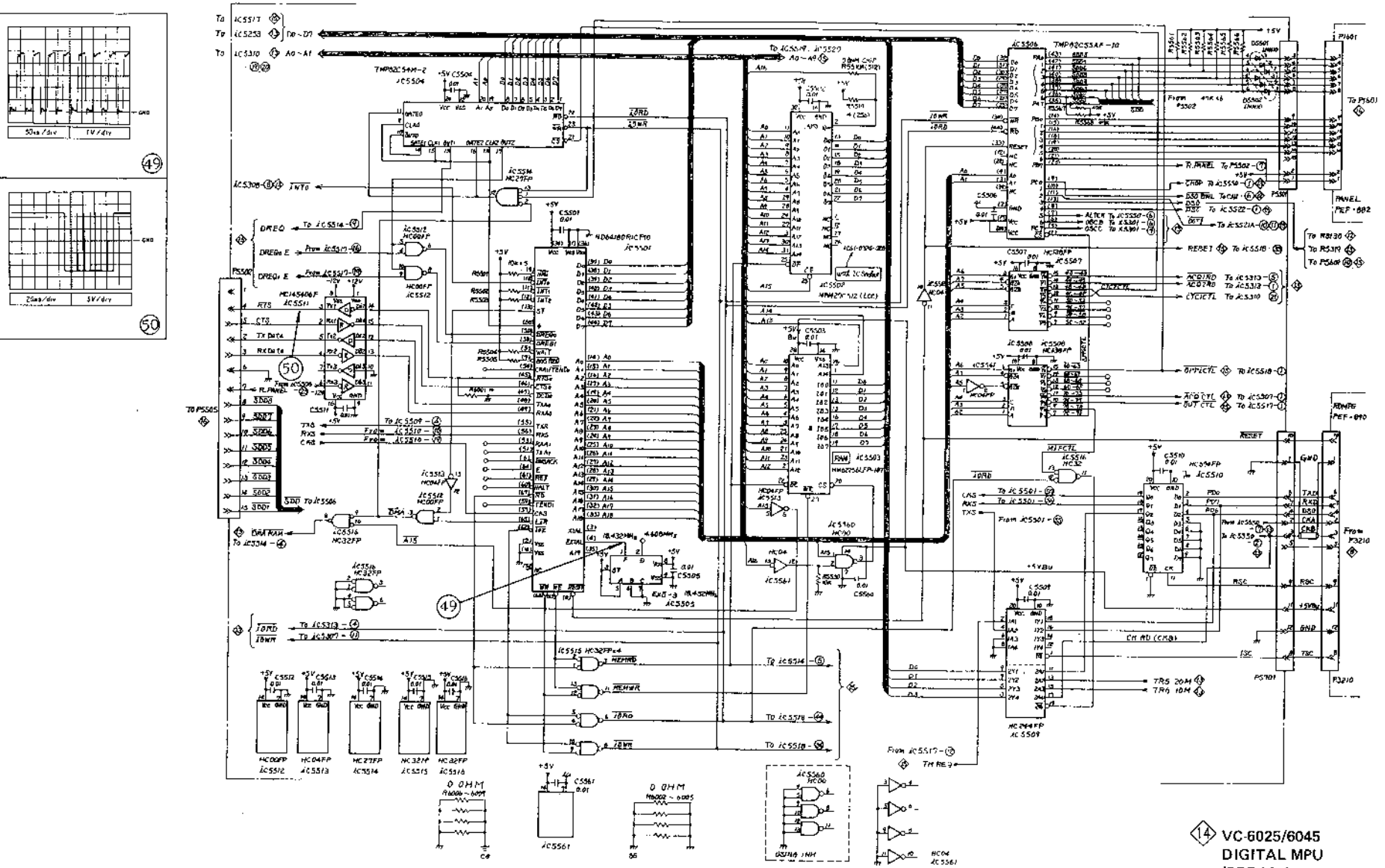
H2H-4B H2H-7C — 1SS175 HSM88S — IMX5

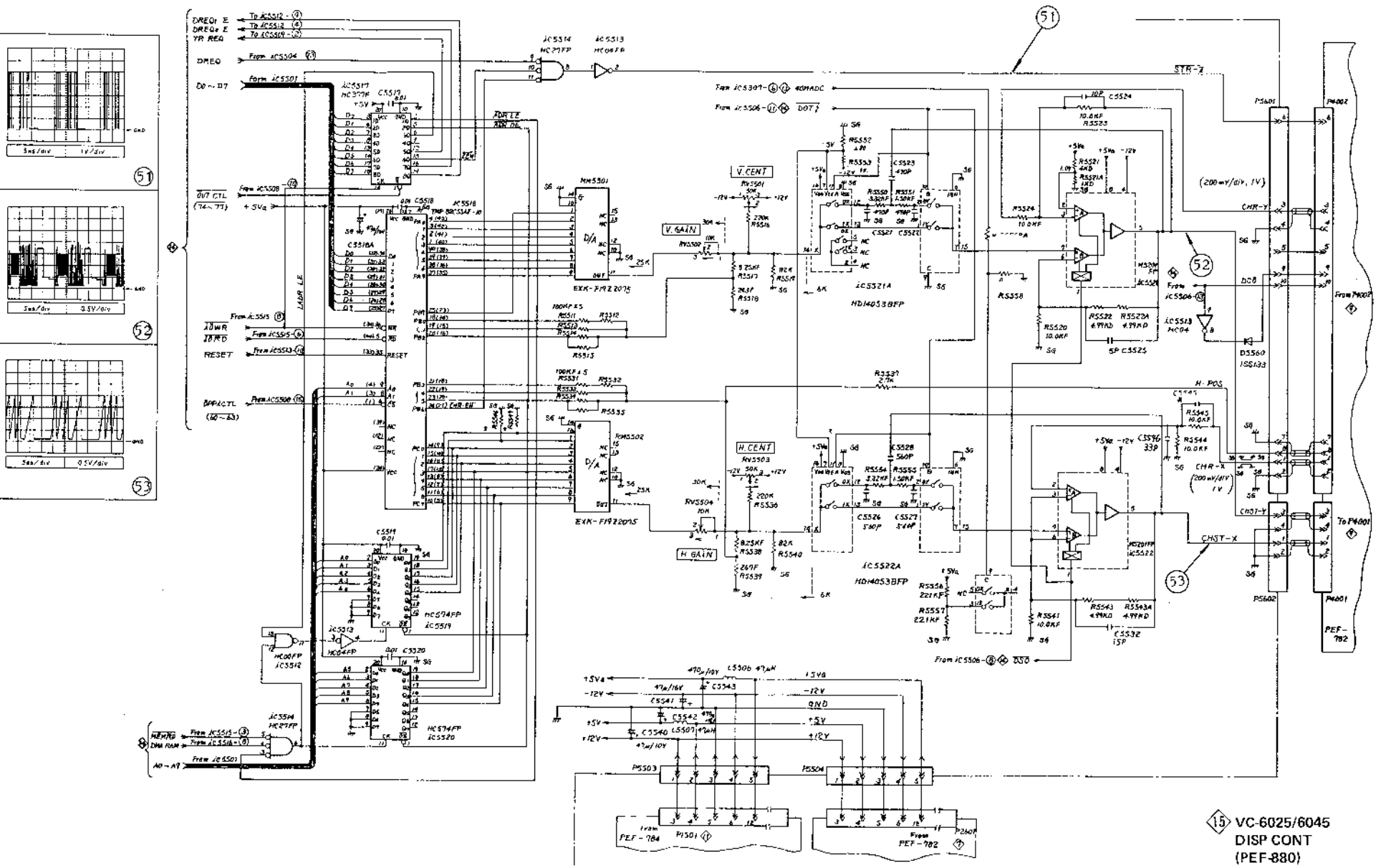
⑫ VC-6025/6045 S/H (PEF-880, 883)

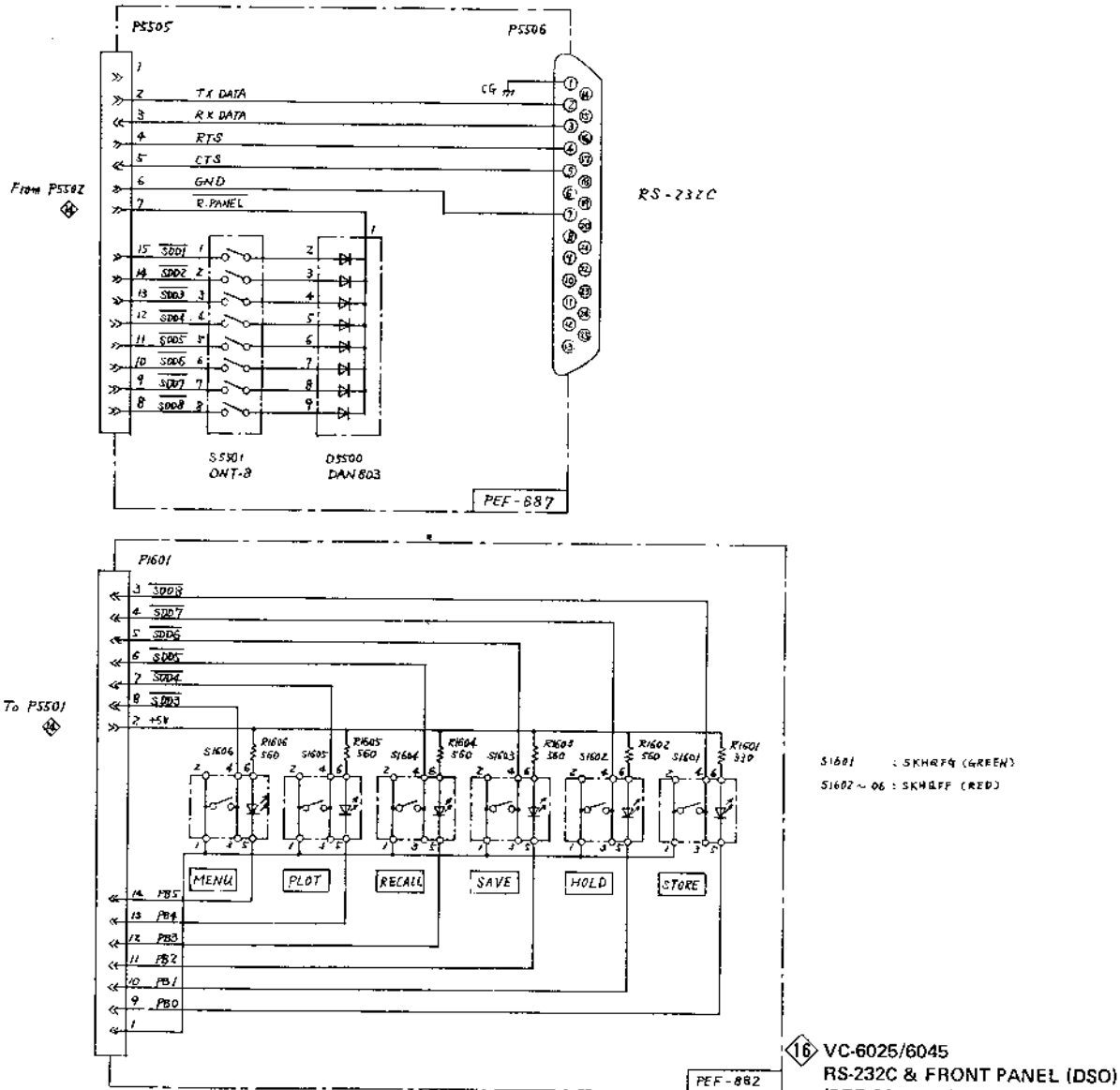




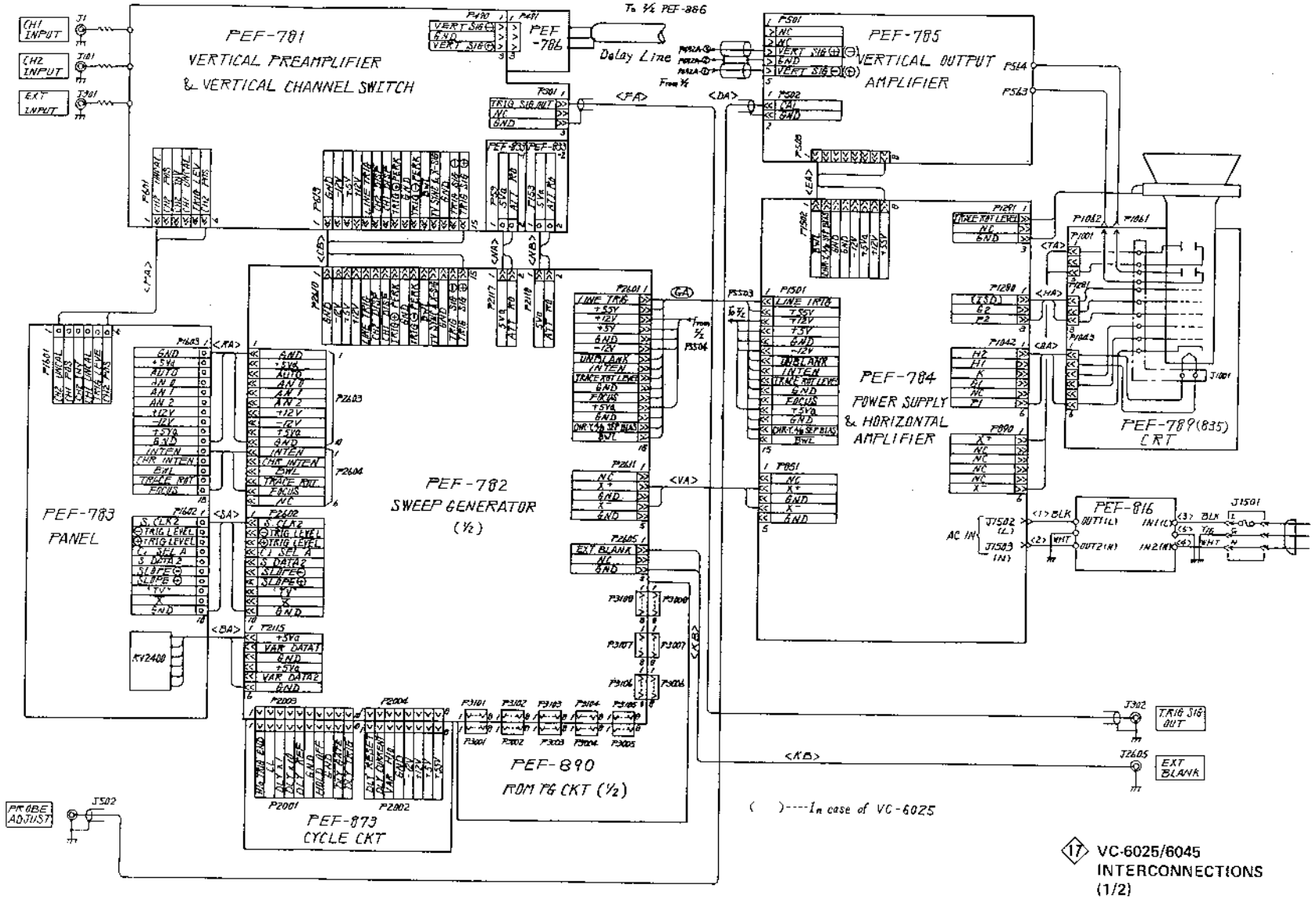
⑬ VC-6025/6045
AD DRIVER & ACQ MEMORY
(PEF 880, 883)


50ns / div
5V / div
GND
49
2Gns / div
5V / div
GND
50
14 VC-6025/6045
DIGITAL MPU
(PEF-880)

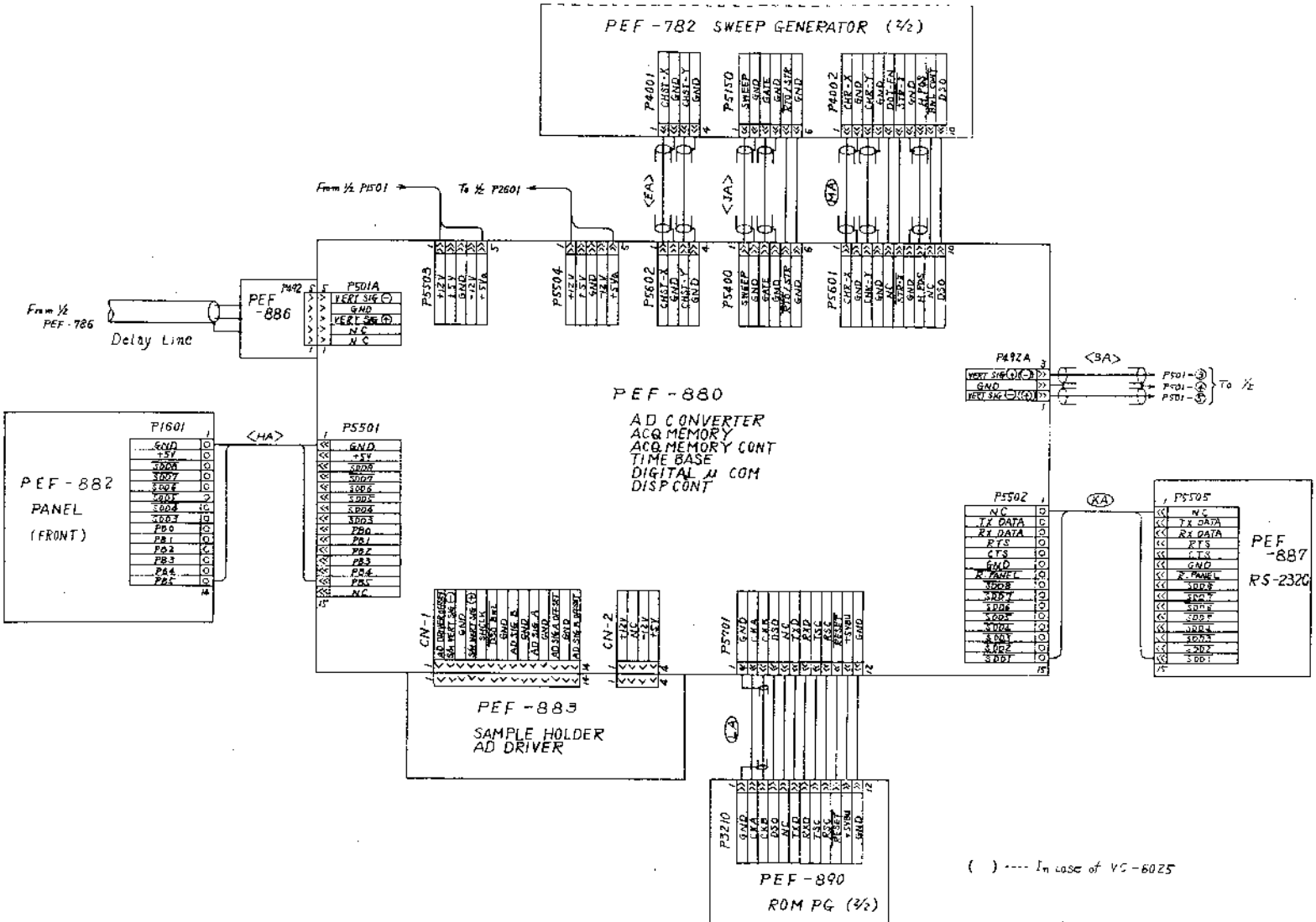

DREQ0 E
DREQ1 E
YR REQ
DREQ
D0 ~ D7
IOWR
IORD
RESET
BPF/LCTL
(60 ~ 83)
V.CENT
V.GAIN
H.CENT
H.GAIN
STR-Z
CHR-Y
CHR-X
CHST-Y
CHST-X
H-POS
(200 mV/div, 1V)
HD14053BFP
HC574FP
HC04FP
HC00FP
HC27FP
HC20FP
PEF-784
PEF-782
PEF-880
VC-6025/6045
DISP CONT
(PEF-880)



16 VC-6025/6045
RS-232C & FRONT PANEL (DSO)
(PEF-882, 887)



17 VC-6025/6045
INTERCONNECTIONS
(1/2)



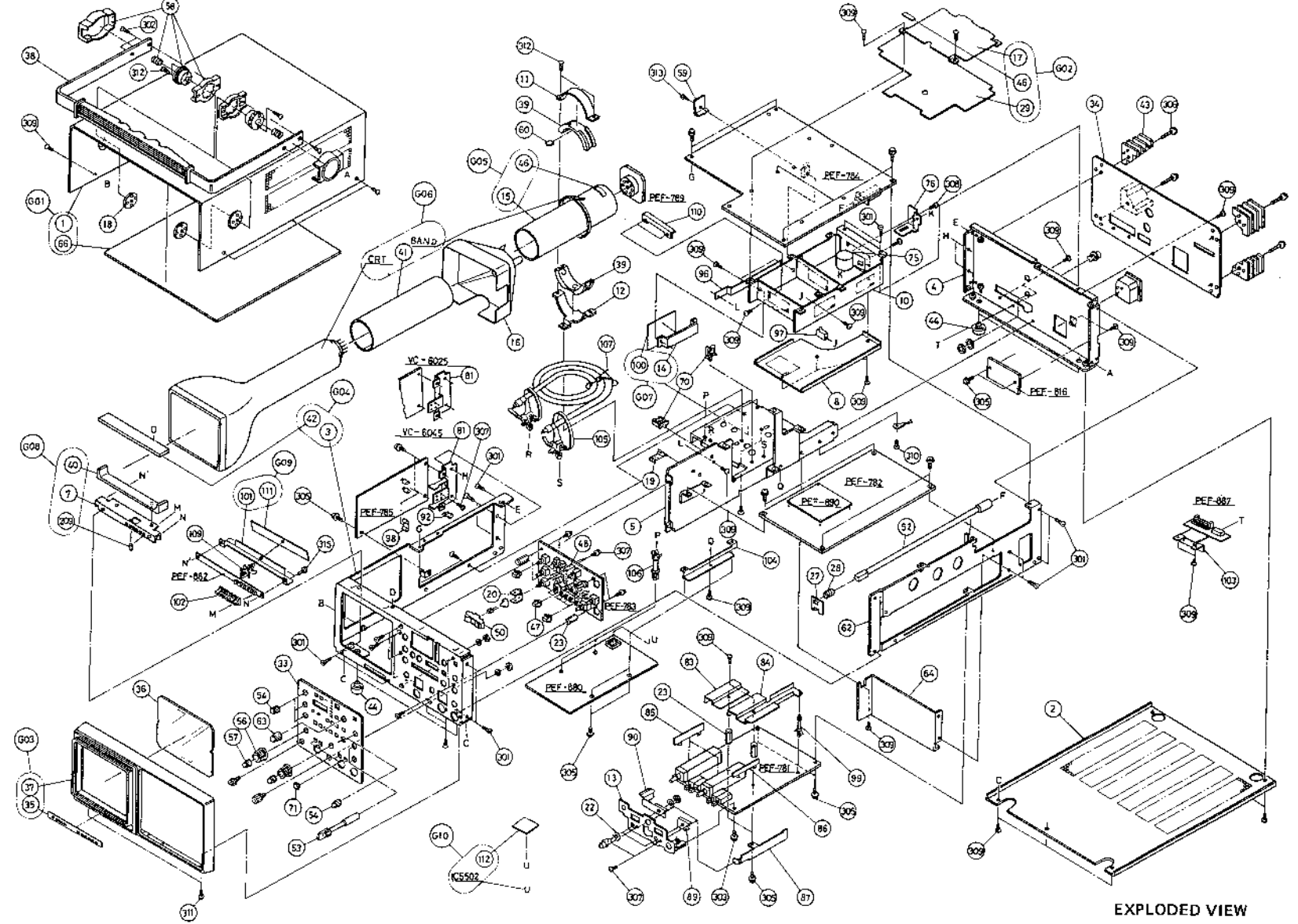
18 VC-6025/6045
INTERCONNECTIONS
(2/2)

11. MECHANICAL PARTS LIST AND EXPLODED VIEW

A:VC-6025 B: VC-6045

SYMBOL	PART CODE	DESCRIPTION	Q'TY	
			A	B
G01	62M0028	TOP Cover Assy	1	1
G02	62M0029	Shield Case Assy	1	1
G03	62M0030	Frame Assy	1	
G03	62M0026	Frame Assy		1
G04	62M0031	Front Chassis Assy	1	1
G05	62M0024	Shield Band Assy	1	
G05	62M0027	Shield Band Assy		1
G06	62X0005	CRT Assy	1	
G06	62X0006	CRT Assy		1
G07	62X0025	HIC Bracket Assy	1	1
G08	62X0004	CRT Bracket Assy	1	1
G09	62M0032	Support Bracket Assy	1	1
G10	62X0007	Seat Assy	1	1
2	3225299 A	Bottom Cover	1	1
2	3227885 A	Bottom Cover For VC-6025(C), VC-6045(C) only	1	1
4	3224311 B	Rear Chassis	1	1
5	2127782 A	C Chassis	1	1
8	8483085 A	HV Cover	1	1
10	3212569 AA	Shield Case	1	1
11	8438037 A	CRT Band (1)	1	1
12	8448099 A	CRT Band (2)	1	1
13	3209528 A	SW Bracket	1	1
16	3225300 A	Shield Case	1	1
18	8398476 A	Nut Plate	2	2
19	8474935 A	Earth Plate	1	1
20	8474942 A	Bracket	1	1
22	8398477 A	BNC Spacer	3	3
23	8474929 A	Spacer	6	6
27	8498220 A	Washer	1	1
28	8483079 A	Spring	1	1
33	3225253 A	Front Panel	1	
33	3225253 B	Front Panel		1
34	3224310 A	Rear Panel	1	1
36	8489075 A	Filter	1	1
38	3208912 A	Handle	1	1
39	3144055 B	Rubber	2	2
43	3149317 C	Rear Foot	4	4
44	3022087 A	Bottom Foot	4	4
47	8473487 A	Button	12	12
48	8474945 A	LED Holder	1	1
50	3211025 AA	Knob	1	1
52	8474939 AA	Knob-Pow	1	1
53	8473750 AA	Knob-L	2	2
54	3149324 H	Knob-S18B	5	5

SYMBOL	PART CODE	DESCRIPTION	Q'ty	
			A	B
56	3196622 F	Knob-ATS	2	2
57	3149324 J	Knob-S18B	2	2
58	8377076 A	Handle Stopper	2	2
59	8456381 C	IC Bracket	1	1
60	8446132 A	Earth Plate	1	1
62	2121662 AA	L Chassis	1	1
63	3196650 D	Knob-M	1	1
64	8480105 A	Shield Plate	1	1
70	8383455 B	Saddle	2	2
71	8446145 B	Knob Guide	4	4
75	8487187 A	Short Ring	1	1
76	8487185 A	Heat Sink	1	1
81	8480112 A	V-OUT Heat Sink	1	
81	8484995 AA	V-OUT Heat Sink		1
83	8485001 A	V-PRE Shield (1)	1	1
84	8485015 A	V-PRE Shield (2)	1	1
85	8485003 A	V-PRE Earth (1)	2	2
86	8485004 A	V-PRE Earth (2)	1	1
87	8485005 A	V-PRE Earth (3)	2	2
89	8485006 A	Earth Plate (1)	1	1
90	8485007 A	Earth Plate (2)	1	1
92	8472331 A	Clip		2
96	8487186 A	HIC Heat Sink	1	1
97	8487166 A	Heat Sink	1	1
98	8427119 B	TR Cap	1	1
99	8481986 F	Double Locking	1	1
102	8505145 A	Button	6	6
103	8505143 A	Bracket	1	1
104	8505142 A	Bracket	1	1
105	8507172 A	Snap Band	2	2
106	8360723 F	Support	2	2
107	ERL0002	Fastener	1	1
109	8360723 A	Support	1	1
110	8510743 A	Bracket	1	1
301	XCA7306	Screw Flat 3x6	20	20
302	XCA7410	Screw Flat 4x10	4	4
303	8340167 M	Screw Sems 3x6	2	2
305	XCA0661	Screw Sems 3x8	37	37
306	8340167 C	Screw Sems 4x20	4	4
307	XCA6205	Screw 2x5	8	8
309	XCA6308	Screw 3x8	25	25
310	XCA6408	Screw 4x8	1	1
311	XCA1818	Screw Black 3x8	2	2
312	XCA6316	Screw 3x16	6	6
315	XCA6306	Screw 3x6	2	2



EXPLODED VIEW

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