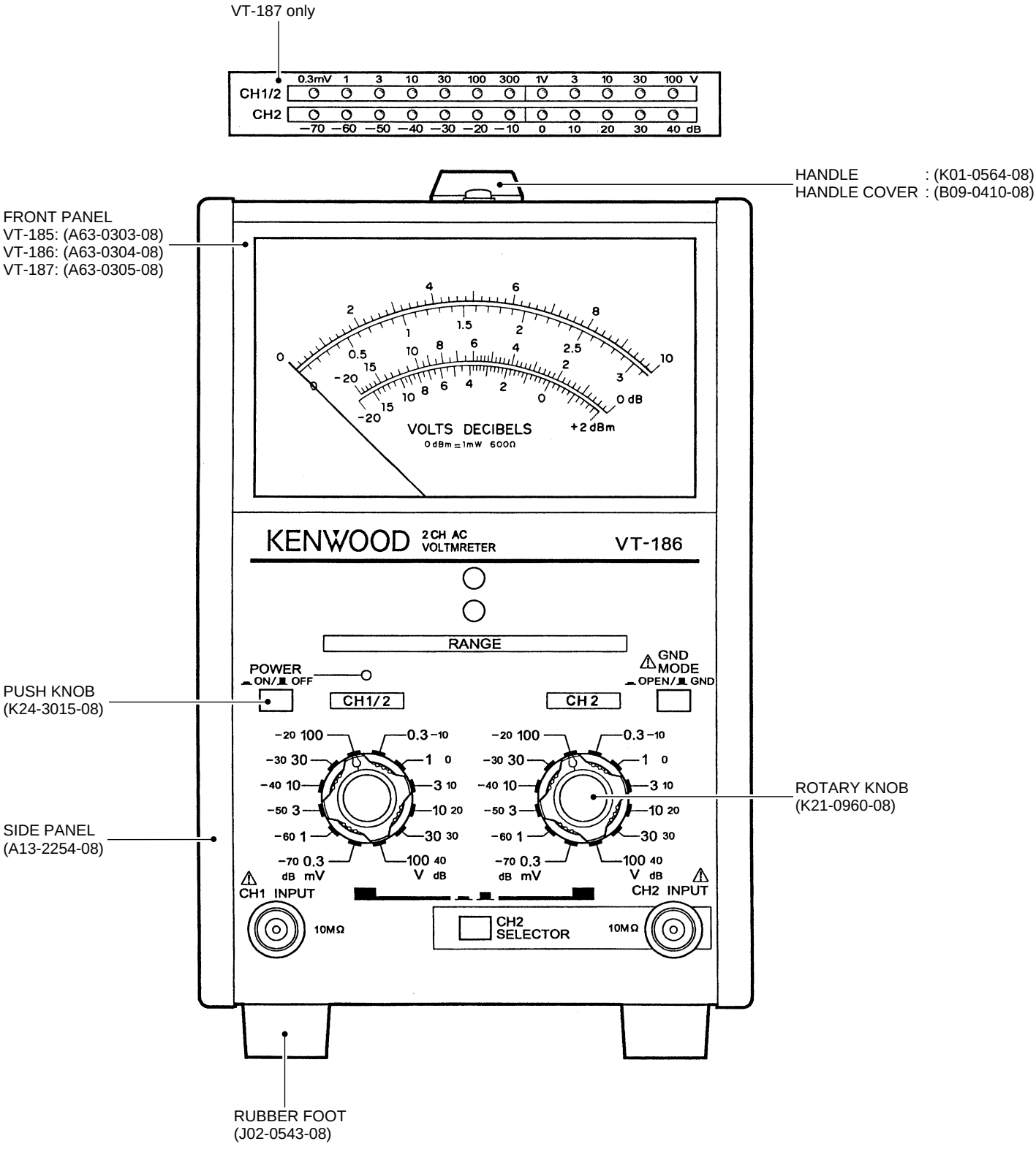
2CH AC VOLTMETER

VT-185/VT-186/VT-187

SERVICE MANUAL

KENWOOD

KENWOOD TMI CORPORATION



WARNING

The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

CONTENTS

SPECIFICATIONS

ITEMS	VT-185	VT-186	VT-187
Meter Section			
Measurable voltage	1mV to 300mV in ranges: 1, 3, 10, 30, 100, 300mV, 1 , 3, 10, 30, 100, 300V full scal.	0.3mV to 100mV in 12 ranges : 0.3, 1, 3, 10, 30, 100, 300mV, 1, 3, 10, 30, 100V full scale.	
dB	-80 to +50dB (0dB=1V)	-90 to +40dB (0dB=1V)	
dBm	-80 to +52dBm (0dBm=1mW at 600Ω)	-90 to +42dBm (0dBm=1mW at 600Ω)	
Error	Within ±3% of full scale at 1kHz		
Frequency response	±10% at 5Hz to 1MHz, ±5% at 10Hz to 500kHz, ±3% at 20Hz to 200kHz and ±2% at 30Hz to 100kHz as response to 1KHz response.		
Input impedance	10MΩ ±5%, with less than 45pF parallel capacitance.		
Max. input voltage	500V(DC +AC peak) 1V to 300V range 100V(DC +AC peak) 1mV to 300mV range	500V(DC +AC peak) 1V to 100V range 100V(DC +AC peak) 0.3mV to 300mV range	
Stability	Within ±0.5% of full scale for ±10% line voltage fluctuation		
Residual Voltage	Less than 20 μV with input shorted on 1mV range	Less than 30 μV with input shorted on 0.3mV range	
Crosstalk Individual	Less than -80dB with other input terminated with 600Ω		
Crosstolk Interlock	Less than -50dB with other input terminated with 600Ω		
Amplifier Section			
Gain	Approx. 60dB	Approx. 70dB	
Output voltage	1Vrms (full scale) ±20%		
Output resistance	600Ω ±20% at 1kHz		
Distortion	Less than 1% at full scale (Rated by signal to noise ratio in 0.3mV, 1mV and 1V range).	Less than 1% at full scale (Rated by signal noise ratio in 1mV and 1V ranges)	
Signal to noise ratio	Over 40dB at full scale. (Over 30dB at 0.3mV range)		
Frequency response	Within ±3dB at 5Hz to 500kHz		
Environmental			
Coefficient	±: 0.08%/°C		
Temperature	Within specifications : 10 to 40°C Full operation : 0 to 50°C		
Relative humidity	Less than 80%		
Maximum altitude	2000m		
Overvoltage Category	Ⅱ		
Pollution Degree	2		
Power Supply Section			
Line voltage	100/120/220/230 Vac ±10% 50/60Hz		
Power consumption	Max. 11W		
Dimensions W X H X D (mm)	128 (128) X 190 (210) X 239 (269) Value in ( ) include protrusions		
Net Weight	Approx. 3.1 kg		Approx. 3.2 kg
Accessories			
Power cable	1 pc.		
Input cable	CA-41p 2 pcs.		
Replacement fuse	1 pc.		
Instruction manual	1 copy		
Adjust driver	1 pc.		
Regulatory Information (VT-186 only)			
EMI	EN55011 (1991) CLASS B		
Immunity	IEC801-2 (1991) 8kVAD		
	IEC801-3 (1984) 3V/M		
	IEC801-4 (1988)		

■ The above specifications are subject to charge without noise.

SAFETY

SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. The specified voltage is shown on the rear panel. If the power cord is not applied for specified voltage, there is always a certain amount of danger of electric shock.

Line voltage

This instrument operates using ac-power input voltages that 100/120/220/230 V at frequencies from 50 Hz to 60Hz.

Power cord

The ground wire of the 3-wire AC power plug places the chassis and housing of the instrument at earth ground. Do not attempt to defeat the ground wire connection or float the instrument ; to do so may pose a great safety hazard. The appropriate power cord is supplied as an option that is specified when the instrument is ordered.
The optional power cords are shown as follows in Fig.1

Line fuse

The fuse holder is located on the rear panel and contains the line fuse. Verify that the proper fuse is installed by replacing the line fuse.

Voltage conversion

This instrument can be operated from 100 to 230V, 50/60Hz power source.
Use the following procedure to change from 100 to 230V operation or vice versa.

1. Remove the fuse holder.
2. Replace fuse F1 with a fuse of appropriate value.
3. Reinsert it for appropriate voltage range.
4. When performing the reinsertion of fuse holder for the voltage conversion, the appropriate power cord should be used. (See fig.1)

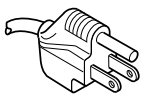
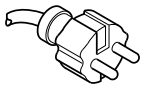
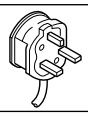
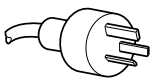
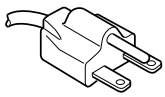
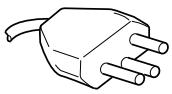
Plug configuration	power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord
	North American 120 volt/60 Hz Rated 15 amp (12 amp max ; NEC)	0.2A, 250V slow blow 5x20mm	None	E30-1983-08
	Universal Europe 230 volt/50 Hz Rated 16 amp	0.1A, 250V slow blow 5x20 mm	None	E30-1982-08
	U.K. 230 volt/50 Hz Rated 5 amp	0.1A, 250V slow blow 5x20 mm	5A Type C	E30-1985-08
	Australian 240 volt/50 Hz Rated 10 amp	0.1A, 250V slow blow 5x20 mm	None	E30-1986-08
	North American 240 volt/60 Hz Rated 15 amp (12 amp max ; NEC)	0.2A, 250V slow blow 5x20mm	None	–
	Switzerland 230 volt/50Hz Rated 10 amp	0.3A, 250V slow blow 5x20 mm	None	–

Fig.1 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

The voltage or sentence in parenthes is applicable in case of the "VT-185".
In studying the operation of each circuit in voltmeter please refer to "BLOCK DIAGRAM".

General

A Signal voltage to be measured, which is input from the INPUT connector, is passed through the First Attenuator and is converted to a low impedance by the Impedance Convertor. The impedance-converted signal is normalized, or further attenuated in proportion to 1mVrms fullscale value through the Second and Third Attenuator. The normalized signal is magnified 20-fold by the Main Amplifier and is fed to the Output Amplifier and the Absolute-Mean Value Detector.

The Output Amplifier magnifies the signal 50-fold and feeds to the OUTPUT connector. The Absolute-Mean Value Detector converts the signal from the Main Amplifier to DC current in proportion to the absolute mean value. The converted signal activates the Meter.

The Attenuator Control encodes the signal led from the RANGE selector to generate an Attenuator Control signal. This signal controls the First, Second and Third Attenuator to set the sensitivity corresponding to each range.

The Power Supply feeds to the functional circuit ±5V DC voltages stabilized by its IC regulator.

Description of Functional Circuit

1) First Attenuator

A potential divider acts as an attenuator. The amount of attenuation is switched in two steps by relay contacts:0dB and -60dB.

2) Impedance Converter

A FET differential input Amplifier acts as an impedance converter with 0dB(10dB) gain, which converts the First Attenuator output signal to a sufficiently low impedance and feeds of the Second Attenuator.

3) Second Attenuator

A resistance divider acts as an attenuator. The amount of attenuation is switch in two steps by relay contacts:0dB and -30dB.

4) Third Attenuator

A resistance divider network acts as an attenuator. The amount of attenuation is switched in four steps by FET switch:0dB, -10dB, -20dB, and -30dB.

5) Main Amplifier

A wideband, non-inverting differential amplifier acts as a main amplifier, which has high input impedance, low output impedance and 20-fold gain. This output signal level is 20mVrms for the fullscale read on the Meter.

6) Output Amplifier

A wideband, non-inverting differential amplifier acts as an output amplifier, which has 50-fold gain and 600Ω output impedance. The output signal level is 1Vrms for fullscale read on the Meter, and works stable even for capacitive loads.

7) Absolute-Mean Value Detector

An absolute-mean value detector comprised of a high through-rate and high gain amplifier, which has very good linearity by negative feedback from the current flowing through the Meter load. In switching, this provides a sufficiently wide frequency band so that the high frequency phase compensation circuit is reset.

8) Attenuator Control

A logic control circuit comprised of a diode matrix and output buffer transistors. This encodes a 12-bit signal from the RANGE selector switch to 6-bit signals, which control the First, Second and Third Attenuator. The remote control connector is connected to this circuit.

9) Power Supply

The power source circuit supply ±5V DC from the AC input, which contain a silicon diode bridge for full-wave rectification, high-capacitance electrolytic capacitors for smoothing, and an IC regulator stabilization.

10) CH1/CH2 Rotary Switch

A 12-contact rotary switch for setting a desired channel 1 and 2 measurable voltage range. This feeds a signal corresponding to the range into the Attenuator Control.

11) CH2 Rotary Switch

A 12-contact rotary switch for setting a desired channel 2 measurable voltage range. This feeds a signal corresponding to the range into the Attenuator Control.

12) CH2 Selector Switch

A Selector which is used to select either individual or interlocked range setting of channels 1 and 2.

13) CH1/CH2 Select Circuit

The range setting individual or interlocked selection circuit are control by IC.

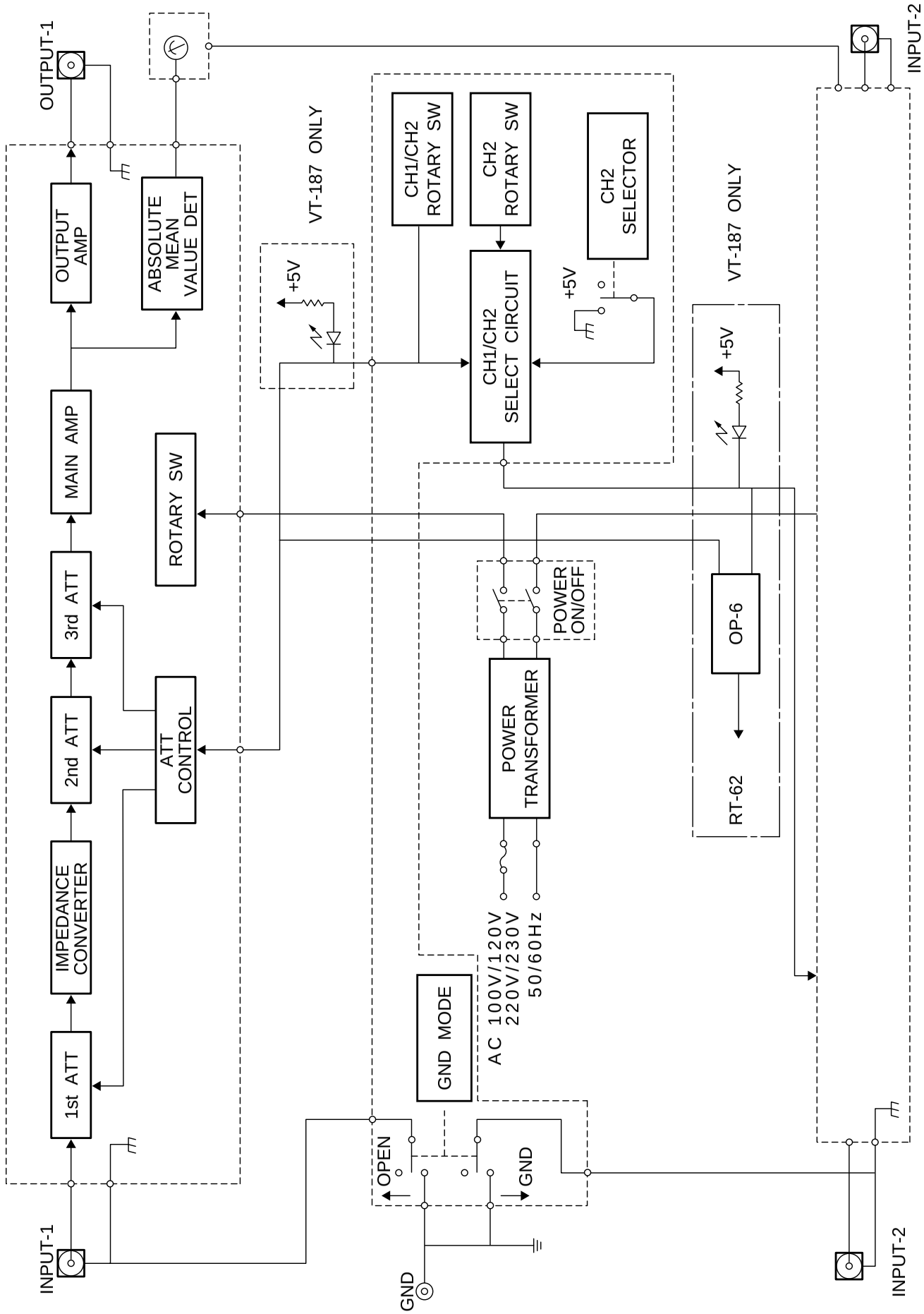
14) GND MODE Switch

A switch is used to disconnect the input negative circuits from the casing ground.

15) Power ON/OFF

The power switch is designed to act on the secondary side of the power transformer.

BLOCK DIAGRAM



ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need to be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.
The following calibration requires an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the scope sufficiently (more than 30 minutes) before starting.
Before calibrating the unit, check the power supply voltage.

TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Maker
Digital Multimeter	DL-712	KENWOOD
Frequency Counter	FC-756	KENWOOD
Oscilloscope	CS-6010	KENWOOD
Calibrator	5100B	FLUKE
CR Oscillator	AG-203	KENWOOD
Attenuator	RA-920	KENWOOD
Q-Meter	4343B	YHP
Distortion Meter	885	Shibasoku
Insulation Meter	SM-5	TOA
50Ω Termination	TA-57	KENWOOD

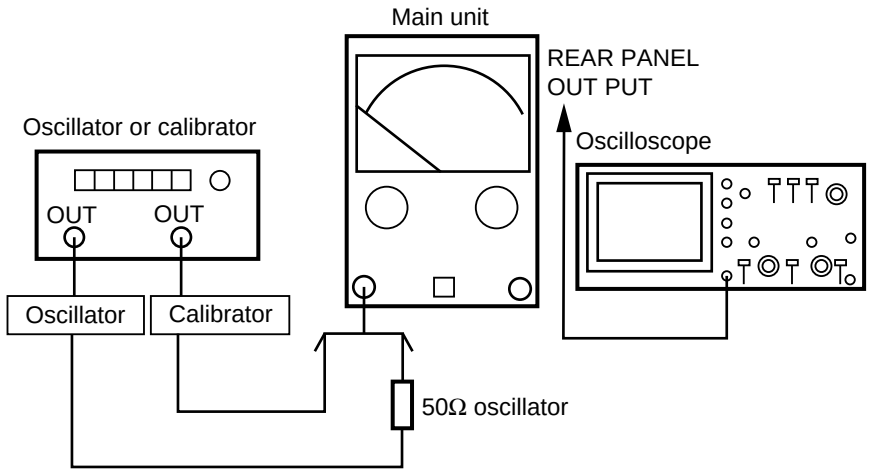
PREPARATION FOR ADJUSTMENT

Control Settings

The control settings listed below must be used for each adjustment procedure.
Exceptions to these settings will be noted as they occur. After completing a adjustment, return the controls to the following settings.

NAME OF KNOBS	POSITION
RANGE	VT-185 : 300V VT-186 : 100V VT-187 : 100V
GND MODE	GND
CH2 SELECTOR	OFF

ADJUSTMENT

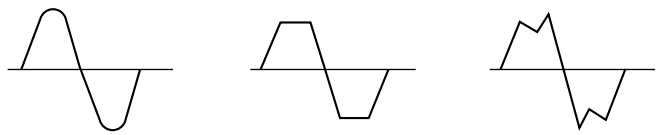
<table>
<tr><th>ITEM</th><th>ADJUSTMENT POINT</th><th>PROCEDURE</th></tr>
<tr><td>300mV range</td><td>VR102</td><td>


(Unless otherwise specified, the above connection should be used as to the following items.)

CH1/2 SWITCH : 300mV (VT-185)
0.3V (VT-186/VT-187)
CH2 SWITCH : 300mV (VT-185)
0.3V (VT-186/VT-187)
CH2 SELECTOR : OFF

1) Input 1 kHz (or 400 Hz), 300 mVrms sine wave, and set the pointer to 3.0 of the 0-3 scale. Check that the variable range is less than 98% and more than 102% with respect to 3.0 (full-scale).

2) Waveforms shown on the oscilloscope shall not be deformed.



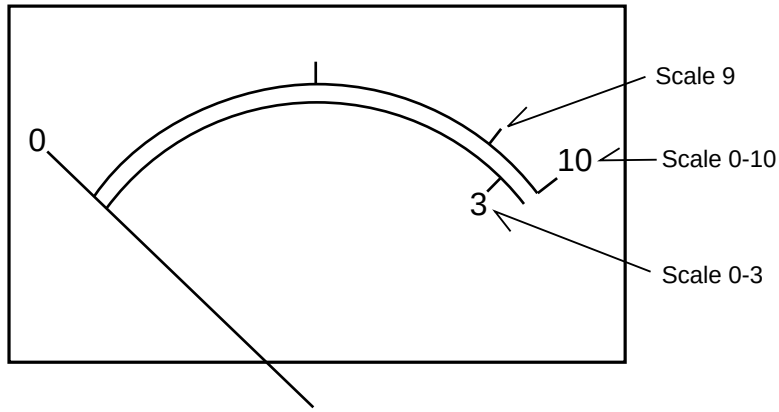
OK NG NG
</td></tr>
<tr><td>1V range</td><td>VR101</td><td>
CH1/2 SWITCH : 1V
CH2 SWITCH : 1V
CH2 SELECTOR : OFF

1) Input 1kHz (or 400 Hz), 1 Vrms sine wave, and set the pointer to 10.0 V of the 0-10 scale. Check that the variable range is less than 98% and more than 102% with respect to 10.0 (full-scale).

2) Check that the operating, when CH2 SELECTOR is switched ON ( ) .

3) Waveforms shown on the oscilloscope shall not be deformed.
</td></tr>
</table>

ADJUSTMENT

ITEM	ADJUSTMENT POINT	PROCEDURE
100 kHz frequency characteristics	TC101	CH1/2 SWITCH : 1V CH2 SWITCH : 1V CH2 SELECTOR : OFF 1) Input a 1kHz (or 400 Hz), 1 Vrms sine wave, and adjust the oscillator output so that the pointer of the set points at 9.0. 2) Adjust the TC so that the pointer points at 9.0 when the frequency is changed to 100 kHz while the oscillator output remains unchanged. 

* New Parts
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

❶

Ref. No	185	186	187	Parts No.	Description
VT-185 (Y80-2090-00), VT-186 (Y80-2100-00), VT-187 (Y80-2110-00)					
				A01-4087-08	CASE;TOP
				A01-4089-08	CASE;BOTTOM
				A13-2254-08	FRAME
			-	A22-1346-08	SUB PANEL(VT-185/186)
		-		A22-1347-08	SUB PANEL(VT-187)
		-	-	A63-0303-08	PANEL(VT-185)
	-		-	A63-0304-08	PANEL(VT-186)
	-	-		A63-0305-08	PANEL(VT-187)
			-	A83-0152-08	REAR PANEL(VT-185/186)
		-		A83-0153-08	REAR PANEL(VT-187)
				B09-0410-08	CAP
				B31-0780-08	METER
				B42-6147-08	LABEL;KENWOOD
				B42-6146-08	S/NO.LABEL
				B63-0307-08	INSTRUCTION MANUAL;JAP./ENG./CHIN.
				E04-0503-08	BNC RECEPTACLE
				E23-1532-08	EARTH LUG
				E30-1984-08	JIS POWER CORD
				E30-1982-08	CEE POWER CORD
				E30-1986-08	SAA POWER CORD
				E30-1983-08	UL/CSA POWER CORD
				E30-1985-08	BS POWER CORD
				E68-0626-08	AC INLET
				F50-0129-08	FUSE(5*20) 0.2A/250V
				F50-0131-08	FUSE(5*20) 0.315A/250V
			-	F15-0785-08	BLIND PLATE
				F11-1528-08	SHIELD CASE
				J02-0543-08	RUBBER FOOT
				J21-8927-08	BRACKET
				K01-0564-08	HANDLE
				k21-0960-0	KNOB
				k24-3015-08	KNOB
				L07-1552-08	POWER TRANSFORMER
				R31-0810-05	V.R.
				N09-4530-08	SCREW,SEMS BINDING (M3.5X12)
				N09-4531-08	SCREW,TRUSS TAPTITE (M3x6)
				N09-4532-08	SCREW,FLAT HD (M4X15)
				N10-2030-41	HEXAGON NUT (M3)
				N10-2040-41	HEXAGON NUT (M4)
				N14-0644-08	FLANGE NUT (M3.5)
				N14-0645-08	NUT (M6x0.75P)
				N15-1030-41	PLAIN WASHER
				N19-0755-08	WASHER
				N19-0754-08	WASHER
				N16-0040-41	SPRING WASHER
				N30-2606-41	SCREW,PAN HD (M2.6X6)
				N30-3012-41	SCREW,PAN HD (M3X12)
				N30-3006-41	SCREW,PAN HD (M3X6)
				N16-0030-41	SPRING WASHER
				N32-3006-41	SCREW,FLAT HD (M3X6)
				N66-3008-41	SCREW,SEMS PAN HD (M3X8)
		-	-	H53-0236-08	CARTON BOX (VT-185)
	-		-	H53-0237-08	CARTON BOX (VT-186)
	-	-		H53-0238-08	CARTON BOX (VT-187)

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Y : AAFES(Europe) **X :** Australia **M :** Other Areas ⚠ indicates safety critical components.

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Ref. No	185	186	187	Parts No.	Description
				H10-2894-08	FOAMED STYREN PAD
				H20-1750-08	VINYL COVER
				W01-0522-08	ACCESSORIES
		-	-	W02-2358-08	MAIN R UNIT(VT-185)
	-			W02-2359-08	MAIN R UNIT(VT-186/VT-187)
		-	-	W02-2361-08	MAIN L UNIT(VT-185)
	-			W02-2362-08	MAIN L UNIT(VT-186/VT-187)
				W02-2370-08	POWER UNIT
		-	-	W02-2371-08	RANGE UNIT(VT-185)
	-		-	W02-2372-08	RANGE UNIT(VT-186)
	-	-		W02-2373-08	RANGE UNIT(VT-187)
				W02-2374-08	METER UNIT
	-	-		W02-2364-08	CONTROL UNIT(VT-187)

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Ref. No	185	186	187	Parts No.	Description		
MAIN L UNIT VT-185 (W02-2361-08), VT-186/VT-187 (W02-2362-08)							
				J73-0539-08	PCB(UNMOUNTED)		
				F10-2551-08	SHIELD PLATE		
				F01-2356-08	HEAT SINK		
				N30-3006-41	SCREW,PAN HD		
C101				C91-0501-05	CAP. FILM	0.047U -	630V
C102				CQ93M1H332J	CAP. PLASTIC	3300P J	50V
C104				CC45FCH2H222K	CAP. CERAMIC	2200P K	500V
C105				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C106				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C107		-	-	CC45FCH1H070D	CAP. CERAMIC	7P D	50V
C107	-			CC45FCH1H330J	CAP. CERAMIC	33P J	50V
C108				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C110				CE04EW1E100Z	CAP. ELECTRO	10U Z	25V
C111				CC45FCH1H010C	CAP. CERAMIC	1P C	50V
C112				CC45FCH1H020C	CAP. CERAMIC	2P C	50V
C113				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C114				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C115				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C116				CC45FCH1H120J	CAP. CERAMIC	12P J	50V
C117				CC45FCH1H120J	CAP. CERAMIC	12P J	50V
C118				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C119				CE04EW1C101Z	CAP. ELECTRO	100U Z	16V
C121				CE04EW1C470Z	CAP. ELECTRO	47U Z	16V
C122				CE04EW1A471Z	CAP. ELECTRO	470U Z	10V
C123				CE04EW1C470Z	CAP. ELECTRO	47U Z	16V
C124				CC45FCH1H220J	CAP. CERAMIC	22P J	50V
C126				CE04EW1C331Z	CAP. ELECTRO	330U Z	16V
C129				CE04HW1H010Z	CAP. ELECTRO	1U Z	50V
C130				CE04HW1H010Z	CAP. ELECTRO	1U Z	50V
C132				CE04EW1C470Z	CAP. ELECTRO	47U Z	16V
C133				CE04EW1C470Z	CAP. ELECTRO	47U Z	16V
C134				CE04EW1C102M	CAP. ELECTRO	1000U M	16V
C135				CE04EW1C102M	CAP. ELECTRO	1000U M	16V
C136				CQ92FM1H104J	CAP. PLASTIC	0.1U J	50V
C137				CQ92FM1H104J	CAP. PLASTIC	0.1U J	50V
C138				CQ92FM1H104J	CAP. PLASTIC	0.1U J	50V
C139				CQ92FM1H104J	CAP. PLASTIC	0.1U J	50V
C140		-	-	CC45FCH2H222K	CAP. CERAMIC	2200P K	500V
C141				CF93AN2E104K	CAP. METALIZED	0.1U K	250V
C142				CC45FCH1H120J	CAP. CERAMIC	12P J	
C143				CC45FCH1H070D	CAP. CERAMIC	7P D	50V
C147				CQ92FM1H103J	CAP. PLASTIC	0.01U J	50V
C148				CC45FCH1H100J	CAP. CERAMIC	10P J	50V
C150				CQ92BP1H122K	CAP. PLASTIC	1200P K	50V
C151				CQ92FM1H104J	CAP. PLASTIC	0.1U J	50V
C152				CE04EW1A221Z	CAP. ELECTRO	220U Z	10V
C153				CC45FCH1H010C	CAP. CERAMIC	1P C	50V
D101				1N4148	DIODE		
D102				1N4148	DIODE		
D103				1N4148	DIODE		
D106				1N4148	DIODE		
D107				1N4148	DIODE		
D108				1N4148	DIODE		
D109				1N4148	DIODE		

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❷

Ref. No	185	186	187	Parts No.	Description
D110				1N4148	DIODE
D111				1N4148	DIODE
D112				1N4148	DIODE
D113	-			1N4148	DIODE
D114				1N4148	DIODE
D115				1N4148	DIODE
D116	-			1N4148	DIODE
D117				1N4148	DIODE
D118				1N4148	DIODE
D119				1N4148	DIODE
D120		-	-	1N4148	DIODE
D121				1N4148	DIODE
D122				1N4148	DIODE
D123				1N4148	DIODE
D124				1N4148	DIODE
D125				1N4148	DIODE
D126				1N4148	DIODE
D127				1N4148	DIODE
D128				1N4148	DIODE
D129				1N4148	DIODE
D130				1N4148	DIODE
D131				1N4148	DIODE
D132				1N4148	DIODE
D133				1N4148	DIODE
D134				W02	DIODE,BRIDGE
D135	-			1N4148	DIODE
J1				E38-1758-08	JUMPING WIRE
J2				E38-1758-08	JUMPING WIRE
J3				E38-1759-08	JUMPING WIRE
J101				E38-1758-08	JUMPING WIRE
J102				E38-1758-08	JUMPING WIRE
J103				E38-1759-08	JUMPING WIRE
J104				E38-1758-08	JUMPING WIRE
J106				E38-1758-08	JUMPING WIRE
J107				E38-1758-08	JUMPING WIRE
J108				E38-1758-08	JUMPING WIRE
J109				E38-1758-08	JUMPING WIRE
J111				E38-1758-08	JUMPING WIRE
J112				E38-1758-08	JUMPING WIRE
J113				E38-1759-08	JUMPING WIRE
J115				E38-1758-08	JUMPING WIRE
J118				E38-1758-08	JUMPING WIRE
J120				E38-1759-08	JUMPING WIRE
J121				E38-1759-08	JUMPING WIRE
J123				E38-1759-08	JUMPING WIRE
J128				E38-1759-08	JUMPING WIRE
K101				S51-1503-05	RELAY
K102				S51-1503-05	RELAY
P1				E40-7602-08	PIN CONNECTOR 2P
P2				E40-7604-08	PIN CONNECTOR 2P
P4				E40-7604-08	PIN CONNECTOR 2P
P5				E40-7604-08	PIN CONNECTOR 2P
P6				E40-7605-08	PIN CONNECTOR 3P
P8				E40-7605-08	PIN CONNECTOR 3P
P11				E40-7604-08	PIN CONNECTOR 2P

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❸

Ref. No	185	186	187	Parts No.	Description		
P101				E40-7603-08	PIN CONNECTOR 15P		
P102				E40-7601-08	PIN CONNECTOR 8P		
P103				E40-7601-08	PIN CONNECTOR 8P		
Q101				2SK163(K)	FET, N-CHANNEL		
Q102				2SK163(K)	FET, N-CHANNEL		
Q103				2SA970(GR)	TR.SI,PNP		
Q104				2SC1923(O)	TR.SI,NPN		
Q111				2SC1815(GR)	TR.SI,NPN		
Q112				2SA970(GR)	TR.SI,PNP		
Q113				2SA970(GR)	TR.SI,PNP		
Q114				2SC1923(O)	TR.SI,NPN		
Q115				2SC1923(O)	TR.SI,NPN		
Q116				2SA970(GR)	TR.SI,PNP		
Q117				2SA970(GR)	TR.SI,PNP		
Q118				2SC1923(O)	TR.SI,NPN		
Q119				2SA970(GR)	TR.SI,PNP		
Q120				2SA970(GR)	TR.SI,PNP		
Q121				2SK30A(Y)	FET, N-CHANNEL		
Q122				2SC1923(O)	TR.SI,NPN		
Q123				2SC1923(O)	TR.SI,NPN		
Q124				2SK30A(Y)	FET, N-CHANNEL		
R101				RN14BK2H1005F	RES. METAL FILM -	F	-
R102				RN14BK2B9531F	RES. METAL FILM 9.53K	F	1/8W
R103				R92-1450-05	RESISTOR 6.8K	-	1W
R104				RD14BB2B681J	RES. CARBON FILM 680	J	1/8W
R106				RD14BB2B335J	RES. CARBON FILM -	J	1/8W
R107				RD14BB2B472J	RES. CARBON FILM 4.7K	J	1/8W
R108				RD14BB2B201J	RES. CARBON FILM -	J	1/8W
R109				RD14BB2E102J	RES. CARBON FILM 1K	J	1/4W
R110				RD14BB2E750J	RES. CARBON FILM 75	J	1/4W
R111		-	-	RN14BK2B1100D	RES. METAL FILM 110	D	1/8W
R111	-			RN14BH2B1241D	RES. METAL FILM 1.24K	D	1/8W
R112		-	-	RN14BK2B1561D	RES. METAL FILM 1.56K	D	1/8W
R112	-			RN14BK2B4300D	RES. METAL FILM 430	D	1/8W
R113				RN14BK2B60R0D	RES. METAL FILM 60	D	1/8W
R114				RN14BK2B2780D	RES. METAL FILM 278	D	1/8W
R115				RN14BK2B2780D	RES. METAL FILM 278	D	1/8W
R116				RN14BK2E1910D	RES. METAL FILM 191	D	1/4W
R117				RD14BB2B151J	RES. CARBON FILM 150	J	1/8W
R118				RN14BK2B4120D	RES. METAL FILM 412	D	1/8W
R119				RN14BK2B4120D	RES. METAL FILM 412	D	1/8W
R120				RN14BK2B4120D	RES. METAL FILM 412	D	1/8W
R121				RD14BB2B150J	RES. CARBON FILM 15	J	1/8W
R124				RD14BB2B391J	RES. CARBON FILM 4.7K	J	1/8W
R125				RD14BB2B391J	RES. CARBON FILM 4.7K	J	1/8W
R126				E38-1759-08	JUMPING WIRE		
R127				E38-1759-08	JUMPING WIRE		
R128				E38-1759-08	JUMPING WIRE		
R129				E38-1759-08	JUMPING WIRE		
R130				RD14BB2B103J	RES. CARBON FILM 10K	J	1/8W
R131				RD14BB2B114J	RES. CARBON FILM 110K	J	1/8W
R132				RD14BB2B103J	RES. CARBON FILM 10K	J	1/8W
R133				RD14BB2B114J	RES. CARBON FILM 110K	J	1/8W
R134				RD14BB2B103J	RES. CARBON FILM 10K	J	1/8W
R135				RD14BB2B114J	RES. CARBON FILM 110K	J	1/8W

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Ref. No	185	186	187	Parts No.	Description		
R136				RD14BB2B103J	RES. CARBON FILM 10K	J	1/8W
R137				RD14BB2B114J	RES. CARBON FILM 110K	J	1/8W
R138				RD14BB2B334J	RES. CARBON FILM 330K	J	1/8W
R139				RD14BB2B683J	RES. CARBON FILM 68K	J	1/8W
R140				RD14BB2E432J	RES. CARBON FILM 4.3K	J	1/4W
R141				RD14BB2B121J	RES. CARBON FILM 120	J	1/8W
R142				RD14BB2E432J	RES. CARBON FILM 4.3K	J	1/4W
R143				RD14BB2B272J	RES. CARBON FILM 2.7K	J	1/8W
R144				RN14BK2B6191F	RES. METAL FILM 6.19K	F	1/8W
R145				RD14BB2B681J	RES. CARBON FILM 680	J	1/8W
R146				RN14BK2B2940F	RES. METAL FILM 294	F	1/8W
R147				RD14BB2B121J	RES. CARBON FILM 120	J	1/8W
R148				RD14BB2E3R3J	RES. CARBON FILM 3.3	J	1/4W
R149				RD14BB2E432J	RES. CARBON FILM 4.3K	J	1/4W
R150				RD14BB2B390J	RES. CARBON FILM 39	J	1/8W
R151				RD14BB2E432J	RES. CARBON FILM 4.3K	J	1/4W
R152				RD14BB2B220J	RES. CARBON FILM 22	J	1/8W
R154				RD14BB2B220J	RES. CARBON FILM 22	J	1/8W
R155				RD14BB2B272J	RES. CARBON FILM 2.7K	J	1/8W
R156				RD14BB2E3R3J	RES. CARBON FILM 3.3	J	1/4W
R157				RD14BB2B681J	RES. CARBON FILM 680	J	1/8W
R158				RN14BK2B1692F	RES. METAL FILM 16.9K	F	1/8W
R159				RN14BK2B3010F	RES. METAL FILM 301	F	1/8W
R160				RD14BB2B681J	RES. CARBON FILM 680	J	1/8W
R161				RN14BK2B5230F	RES. METAL FILM 523	F	1/8W
R162				RD14BB2B472J	RES. CARBON FILM 4.7K	J	1/8W
R163				RN14BK2B3010F	RES. METAL FILM 301	F	1/8W
R164				RN14BK2B3480F	RES. METAL FILM 348	F	1/8W
R165				RD14BB2E432J	RES. CARBON FILM 4.3K	J	1/4W
R166				RD14BB2E432J	RES. CARBON FILM 4.3K	J	1/4W
R167				RD14BB2B390J	RES. CARBON FILM 39	J	1/8W
R168				RD14BB2B681J	RES. CARBON FILM 680	J	1/8W
R169				RD14BB2B114J	RES. CARBON FILM 110K	J	1/8W
R170				RD14BB2B683J	RES. CARBON FILM 68K	J	1/8W
R171				RD14BB2B331J	RES. CARBON FILM 330	J	1/8W
R172				RD14BB2B331J	RES. CARBON FILM 330	J	1/8W
R173				RN14BK2B10R0F	RES. METAL FILM 10	F	1/8W
R177				RD14BB2B472J	RES. CARBON FILM 4.7K	J	1/8W
R178				RD14BB2B472J	RES. CARBON FILM 4.7K	J	1/8W
R179				RD14BB2B331J	RES. CARBON FILM 330	J	1/8W
R180				RD14BB2B472J	RES. CARBON FILM 4.7K	J	1/8W
R181				RD14BB2B201J	RES. CARBON FILM 200	J	1/8W
R182				RN14BK2B2871F	RES. METAL FILM 2.87K	F	1/8W
R183		-	-	E38-1759-08	JUMPING WIRE		
R183	-			RN14BK2B6191F	RES. METAL FILM 6.19K	F	1/8W
R186				RD14BB2B161J	RES. CARBON FILM 160	J	1/8W
TC101				C05-0708-08	CAP.TRIMMER		
U1				PC817	PHOTO COUPLER		
U2				PC817	PHOTO COUPLER		
U3				PC817	PHOTO COUPLER		
U101				MC14066BCP	IC,QUAD ANALOG SWITCH/MPX		
U102				LM7805	IC,FIXED VOLTAGE REGULATOR		
U103				LM7905	IC,FIXED VOLTAGE REGULATOR		
VR101				R12-1545-05	RES. SEMI FIXED 1K		
VR102				R12-0575-05	RES. SEMI FIXED 100		

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❺

Ref. No	185	186	187	Parts No.	Description		
MAIN R UNIT VT-185 (W02-2358-08), VT-186/VT-187 (W02-2359-08)							
				J73-0539-08	PCB(UNMOUNTED)		
				F10-2551-08	SHIELD PLATE		
				F01-2356-08	HEAT SINK		
				N30-3006-41	SCREW,PAN HD		
C101				C91-0501-05	CAP. FILM 0.047U	-	630V
C102				CQ93M1H332J	CAP. PLASTIC 3300P	J	50V
C103				CC45FCH2H222K	CAP. CERAMIC 2200P	K	500V
C104				CC45FCH2H222K	CAP. CERAMIC 2200P	K	500V
C105				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C106				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C107		-	-	CC45FCH1H070D	CAP. CERAMIC 7P	D	50V
C107	-			CC45FCH1H330J	CAP. CERAMIC 33P	J	50V
C108				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C110				CE04EW1E100Z	CAP. ELECTRO 10U	Z	25V
C111				CC45FCH1H010C	CAP. CERAMIC 1P	C	50V
C112				CC45FCH1H020C	CAP. CERAMIC 2P	C	50V
C113				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C114				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C115				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C116				CC45FCH1H120J	CAP. CERAMIC 12P	J	50V
C117				CC45FCH1H120J	CAP. CERAMIC 12P	J	50V
C118				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C119				CE04EW1C101Z	CAP. ELECTRO 100U	Z	16V
C121				CE04EW1C470Z	CAP. ELECTRO 47U	Z	16V
C122				CE04EW1A471Z	CAP. ELECTRO 470U	Z	10V
C123				CE04EW1C470Z	CAP. ELECTRO 47U	Z	16V
C124				CC45FCH1H220J	CAP. CERAMIC 22P	J	50V
C126				CE04EW1C331Z	CAP. ELECTRO 330U	Z	16V
C129				CE04HW1H010Z	CAP. ELECTRO 1U	Z	50V
C130				CE04HW1H010Z	CAP. ELECTRO 1U	Z	50V
C132				CE04EW1C470Z	CAP. ELECTRO 47U	Z	16V
C133				CE04EW1C470Z	CAP. ELECTRO 47U	Z	16V
C134				CE04EW1C102M	CAP. ELECTRO 1000U	M	16V
C135				CE04EW1C102M	CAP. ELECTRO 1000U	M	16V
C136				CQ92FM1H104J	CAP. PLASTIC 0.1U	J	50V
C137				CQ92FM1H104J	CAP. PLASTIC 0.1U	J	50V
C138				CQ92FM1H104J	CAP. PLASTIC 0.1U	J	50V
C139				CQ92FM1H104J	CAP. PLASTIC 0.1U	J	50V
C140				CC45FCH2H222K	CAP. CERAMIC 2200P	K	500V
C141				CF93AN2E104K	CAP. METALIZED 0.1U	K	250V
C142				CC45FCH1H120J	CAP. CERAMIC 12P	J	50V
C143				CC45FCH1H070D	CAP. CERAMIC 7P	D	50V
C147				CQ92FM1H103J	CAP. PLASTIC 0.01U	J	50V
C148				CC45FCH1H100J	CAP. CERAMIC 10P	J	50V
C150				CQ92BP1H122K	CAP. PLASTIC 1200P	K	50V
C151				CQ92FM1H104J	CAP. PLASTIC 0.1U	J	50V
C152				CE04EW1A221Z	CAP. ELECTRO 220U	Z	10V
C153				CC45FCH1H010C	CAP. CERAMIC 1P	C	50V
D101				1N4148	DIODE		
D102				1N4148	DIODE		
D103				1N4148	DIODE		
D106				1N4148	DIODE		
D107				1N4148	DIODE		
D108				1N4148	DIODE		

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Ref. No	185	186	187	Parts No.	Description
D109				1N4148	DIODE
D110				1N4148	DIODE
D111				1N4148	DIODE
D112				1N4148	DIODE
D113	-			1N4148	DIODE
D114				1N4148	DIODE
D115				1N4148	DIODE
D116				1N4148	DIODE
D117				1N4148	DIODE
D118				1N4148	DIODE
D119				1N4148	DIODE
D120		-	-	1N4148	DIODE
D121				1N4148	DIODE
D122				1N4148	DIODE
D123				1N4148	DIODE
D124				1N4148	DIODE
D125				1N4148	DIODE
D126				1N4148	DIODE
D127				1N4148	DIODE
D128				1N4148	DIODE
D129				1N4148	DIODE
D130				1N4148	DIODE
D131				1N4148	DIODE
D132				1N4148	DIODE
D133				1N4148	DIODE
D134				W02	DIODE,BRIDGE
D135	-			1N4148	DIODE
J1				E38-1758-08	JUMPING WIRE
J2				E38-1758-08	JUMPING WIRE
J3				E38-1759-08	JUMPING WIRE
J101				E38-1758-08	JUMPING WIRE
J102				E38-1758-08	JUMPING WIRE
J103				E38-1759-08	JUMPING WIRE
J104				E38-1758-08	JUMPING WIRE
J106				E38-1758-08	JUMPING WIRE
J107				E38-1758-08	JUMPING WIRE
J108				E38-1758-08	JUMPING WIRE
J109				E38-1758-08	JUMPING WIRE
J110				E38-1758-08	JUMPING WIRE
J111				E38-1758-08	JUMPING WIRE
J112				E38-1758-08	JUMPING WIRE
J113				E38-1759-08	JUMPING WIRE
J114				E38-1758-08	JUMPING WIRE
J115				E38-1758-08	JUMPING WIRE
J116				E38-1759-08	JUMPING WIRE
J117				E38-1758-08	JUMPING WIRE
J119				E38-1759-08	JUMPING WIRE
J122				E38-1759-08	JUMPING WIRE
J124				E38-1759-08	JUMPING WIRE
J125				E38-1759-08	JUMPING WIRE
J126				E38-1759-08	JUMPING WIRE
J127				E38-1759-08	JUMPING WIRE
J128				E38-1759-08	JUMPING WIRE
K101				S51-1503-05	RELAY
K102				S51-1503-05	RELAY

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Ref. No	185	186	187	Parts No.	Description			
P1				E40-7602-08	PIN CONNECTOR 2P			
P2				E40-7604-08	PIN CONNECTOR 2P			
P4				E40-7604-08	PIN CONNECTOR 2P			
P6				E40-7605-08	PIN CONNECTOR 3P			
P7				E40-7605-08	PIN CONNECTOR 3P			
P8				E40-7605-08	PIN CONNECTOR 3P			
P11				E40-7604-08	PIN CONNECTOR 2P			
P101				E40-7603-08	PIN CONNECTOR 15P			
P102				E40-7601-08	PIN CONNECTOR 8P			
P103				E40-7601-08	PIN CONNECTOR 8P			
Q101				2SK163(K)	FET, N-CHANNEL			
Q102				2SK163(K)	FET, N-CHANNEL			
Q103				2SA970(GR)	TR.SI,PNP			
Q104				2SC1923(O)	TR.SI,NPN			
Q105				2SA1015(GR)	TR.SI,PNP			
Q106				2SA1015(GR)	TR.SI,PNP			
Q107				2SA1015(GR)	TR.SI,PNP			
Q108				2SA1015(GR)	TR.SI,PNP			
Q109				2SA1015(GR)	TR.SI,PNP			
Q110				2SA1015(GR)	TR.SI,PNP			
Q111				2SC1815(GR)	TR.SI,NPN			
Q112				2SA970(GR)	TR.SI,PNP			
Q113				2SA970(GR)	TR.SI,PNP			
Q114				2SC1923(O)	TR.SI,NPN			
Q115				2SC1923(O)	TR.SI,NPN			
Q116				2SA970(GR)	TR.SI,PNP			
Q117				2SA970(GR)	TR.SI,PNP			
Q118				2SC1923(O)	TR.SI,NPN			
Q119				2SA970(GR)	TR.SI,PNP			
Q120				2SA970(GR)	TR.SI,PNP			
Q121				2SK30A(Y)	FET, N-CHANNEL			
Q122				2SC1923(O)	TR.SI,NPN			
Q123				2SC1923(O)	TR.SI,NPN			
Q124				2SK30A(Y)	FET, N-CHANNEL			
R101				RN14BK2H1005F	RES. METAL FILM	10M	F	-
R102				RN14BK2B9531F	RES. METAL FILM	9.53K	F	1/8W
R103				R92-1450-05	RESISTOR	6.8K	-	1W
R104				RD14BB2B681J	RES. CARBON FILM	680	J	1/8W
R106				RD14BB2B335J	RES. CARBON FILM	3.3M	J	1/8W
R107				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R108				RD14BB2B201J	RES. CARBON FILM	200	J	1/8W
R109				RD14BB2E102J	RES. CARBON FILM	1K	J	1/4W
R110				RD14BB2E750J	RES. CARBON FILM	75	J	1/4W
R111		-	-	RN14BK2B1100D	RES. METAL FILM	110	D	1/8W
R111	-			RN14BK2B1241D	RES. METAL FILM	1.24K	D	1/8W
R112		-	-	RN14BK2B1561D	RES. METAL FILM	1.56K	D	1/8W
R112	-			RN14BK2B4300D	RES. METAL FILM	430	D	1/8W
R113				RN14BK2B60R0D	RES. METAL FILM	60	D	1/8W
R114				RN14BK2B2780D	RES. METAL FILM	278	D	1/8W
R115				RN14BK2B2780D	RES. METAL FILM	278	D	1/8W
R116				RN14BK2E1910D	RES. METAL FILM	191	D	1/4W
R117				RD14BB2B151J	RES. CARBON FILM	150	J	1/8W
R118				RN14BK2B4120D	RES. METAL FILM	412	D	1/8W
R119				RN14BK2B4120D	RES. METAL FILM	412	D	1/8W
R120				RN14BK2B4120D	RES. METAL FILM	412	D	1/8W

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❽

Ref. No	185	186	187	Parts No.	Description			
R121				RD14BB2B150J	RES. CARBON FILM	15	J	1/8W
R122				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R123				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R124				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R125				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R126				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R127				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R128				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R129				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R130				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R131				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R132				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R133				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R134				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R135				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R136				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R137				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R138				RD14BB2B334J	RES. CARBON FILM	330K	J	1/8W
R139				RD14BB2B683J	RES. CARBON FILM	68K	J	1/8W
R140				RD14BB2E432J	RES. CARBON FILM	4.3K	J	1/4W
R141				RD14BB2B121J	RES. CARBON FILM	120	J	1/8W
R142				RD14BB2E432J	RES. CARBON FILM	4.3K	J	1/4W
R143				RD14BB2B272J	RES. CARBON FILM	2.7K	J	1/8W
R144				RN14BK2B6191F	RES. METAL FILM	6.19K	F	1/8W
R145				RD14BB2B681J	RES. CARBON FILM	680	J	1/8W
R146				RN14BK2B2940F	RES. METAL FILM	294	F	1/8W
R147				RD14BB2B121J	RES. CARBON FILM	120	J	1/8W
R148				RD14BB2E3R3J	RES. CARBON FILM	3.3	J	1/4W
R149				RD14BB2E432J	RES. CARBON FILM	4.3K	J	1/4W
R150				RD14BB2B390J	RES. CARBON FILM	39	J	1/8W
R151				RD14BB2E432J	RES. CARBON FILM	4.3K	J	1/4W
R152				RD14BB2B220J	RES. CARBON FILM	22	J	1/8W
R154				RD14BB2B220J	RES. CARBON FILM	22	J	1/8W
R155				RD14BB2B272J	RES. CARBON FILM	2.7K	J	1/8W
R156				RD14BB2E3R3J	RES. CARBON FILM	3.3	J	1/4W
R157				RD14BB2B681J	RES. CARBON FILM	680	J	1/8W
R158				RN14BK2B1692F	RES. METAL FILM	16.9K	F	1/8W
R159				RN14BK2B3010F	RES. METAL FILM	301	F	1/8W
R160				RD14BB2B681J	RES. CARBON FILM	680	J	1/8W
R161				RN14BK2B5230F	RES. METAL FILM	523	F	1/8W
R162				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R163				RN14BK2B3010F	RES. METAL FILM	301	F	1/8W
R164				RN14BK2B3480F	RES. METAL FILM	348	F	1/8W
R165				RD14BB2E432J	RES. CARBON FILM	4.3K	J	1/4W
R166				RD14BB2E432J	RES. CARBON FILM	4.3K	J	1/4W
R167				RD14BB2B390J	RES. CARBON FILM	39	J	1/8W
R168				RD14BB2B681J	RES. CARBON FILM	680	J	1/8W
R169				RD14BB2B114J	RES. CARBON FILM	110K	J	1/8W
R170				RD14BB2B683J	RES. CARBON FILM	68K	J	1/8W
R171				RD14BB2B331J	RES. CARBON FILM	330	J	1/8W
R172				RD14BB2B331J	RES. CARBON FILM	330	J	1/8W
R173				RN14BK2B10R0F	RES. METAL FILM	10	F	1/8W
R177				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R178				RD14BB2B472J	RES. CARBON FILM	4.7K	J	1/8W
R179				RD14BB2B331J	RES. CARBON FILM	330	J	1/8W

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⑨

Ref. No	185	186	187	Parts No.	Description		
R180				RD14BB2B472J	RES. CARBON FILM 4.7K	J	1/8W
R181				RD14BB2B201J	RES. CARBON FILM 200	J	1/8W
R182	-			RN14BK2B2871D	RES. METAL FILM 2.87K	D	1/8W
R183				E38-1759-08	JUMPING WIRE		
R183	-			RN14BK2B6191F	RES. METAL FILM 6.19K	F	1/8W
R185				RD14BB2B821J	RES. CARBON FILM 820	J	1/8W
R186				RD14BB2B161J	RES. CARBON FILM 160	J	1/8W
TC101				C05-0707-08	CAP.TRIMMER		
U101				MC14066BCP	IC,QUAD ANALOG SWITCH/MPX		
U102				LM7805	IC,FIXED VOLTAGE REGULATOR		
U103				LM7905	IC,FIXED VOLTAGE REGULATOR		
VR101				R12-1545-05	RES. SEMI FIXED 1K	-	0.1
VR102				R12-0575-05	RES. SEMI FIXED 100	-	0.1
RANGE UNIT VT-185 (W02-2371-08), VT-186(W02-2372-08), VT-187(W02-2373-08)							
				J73-0546-08	PCB (UNMOUNTED)		
				S68-0660-08	PUSH KNOB		
P2				E40-7605-08	PIN CONNECTOR 3P		
P7				E40-7605-08	PIN CONNECTOR 3P		
JW101				E40-7695-08	CONNECTOR 14P		
JW102	-	-		E40-7694-08	CONNECTOR 13P		
JW201				E40-7695-08	CONNECTOR 14P		
JW202	-	-		E40-7694-08	CONNECTOR 13P		
R1				R90-1201-08	RES. NETWORK 47K x 12		
R3				R90-1201-08	RES. NETWORK 47K x 12		
Q1				2SC1815(GR)	TR. SI, NPN		
U1				74HC257AP	IC, QUAD 2CH MULTIPLEXER (3-STATE)		
U2				74HC257AP	IC, QUAD 2CH MULTIPLEXER (3-STATE)		
U3				74HC257AP	IC, QUAD 2CH MULTIPLEXER (3-STATE		
S1				S68-0658-08	PUSH SWITCH		
S2				S68-0658-08	PUSH SWITCH		
S101				S60-0628-08	ROTARY SWITCH		
S201				S60-0628-08	ROTARY SWITCH		
R2				RD14BB2E472J	RES. CARBON 4.7K	J	1/4W
R4	-	-		RD14BB2E821J	RES. CARBON 820	J	1/4W
R5				RD14BB2E473J	RES. CARBON 47K	J	1/4W
R6				RD14BB2E473J	RES. CARBON 47K	J	1/4W
POWER UNIT VT-187 (W02-2364-08)							
-	-			J73-0648-08	PCB (UNMOUNTED)		
P1	-	-		E40-7611-08	PIN CONNECTOR 4P		
P2	-	-		E40-7608-08	PIN CONNECTOR 4P		
P3	-	-		E40-7700-08	PIN CONNECTOR 4P		
J1	-	-		E38-1758-08	PUSH SW		
IC1	-	-		SN74159N	IC, 4 TO 16 LINE DECOD./DE-MPX		
C1	-	-		CE04EW1C220Z	CAP. ELECTRO 22u	Z	16V
C2	-	-		CE04EW1C220Z	CAP. ELECTRO 22u	Z	16V
C3	-	-		CE04EW1C220Z	CAP. ELECTRO 22u	Z	16V
C4	-	-		CE04EW1C220Z	CAP. ELECTRO 22u	Z	16V
R1	-	-		RD14BB2E333J	RES. CARBON 33K	J	1/4W
R2	-	-		RD14BB2E333J	RES. CARBON 33K	J	1/4W
R3	-	-		RD14BB2E333J	RES. CARBON 33K	J	1/4W
R4	-	-		RD14BB2E333J	RES. CARBON 33K	J	1/4W
R5	-	-		RD14BB2E333J	RES. CARBON 33K	J	1/4W
R6	-	-		RD14BB2E333J	RES. CARBON 33K	J	1/4W

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⑩

Ref. No	185	186	187	Parts No.	Description
POWER UNIT (W02-2370-08)					
				J73-0545-08	PCB (UNMOUNTED)
P1				E40-7606-08	PIN CONNECTOR 4P
P3				E40-7606-08	PIN CONNECTOR 4P
P5				E40-7606-08	PIN CONNECTOR 4P
S003				S40-6501-05	PUSH SWITCH
PANEL METER UNIT (W02-2374-08)					
				J73-0647-08	PCB (UNMOUNTED)
				E21-0819-08	GND
P6				E40-7606-08	PIN CONNECTOR 4P
P10				E40-7604-08	PIN CONNECTOR 2P
P20				E40-7604-08	PIN CONNECTOR 2P

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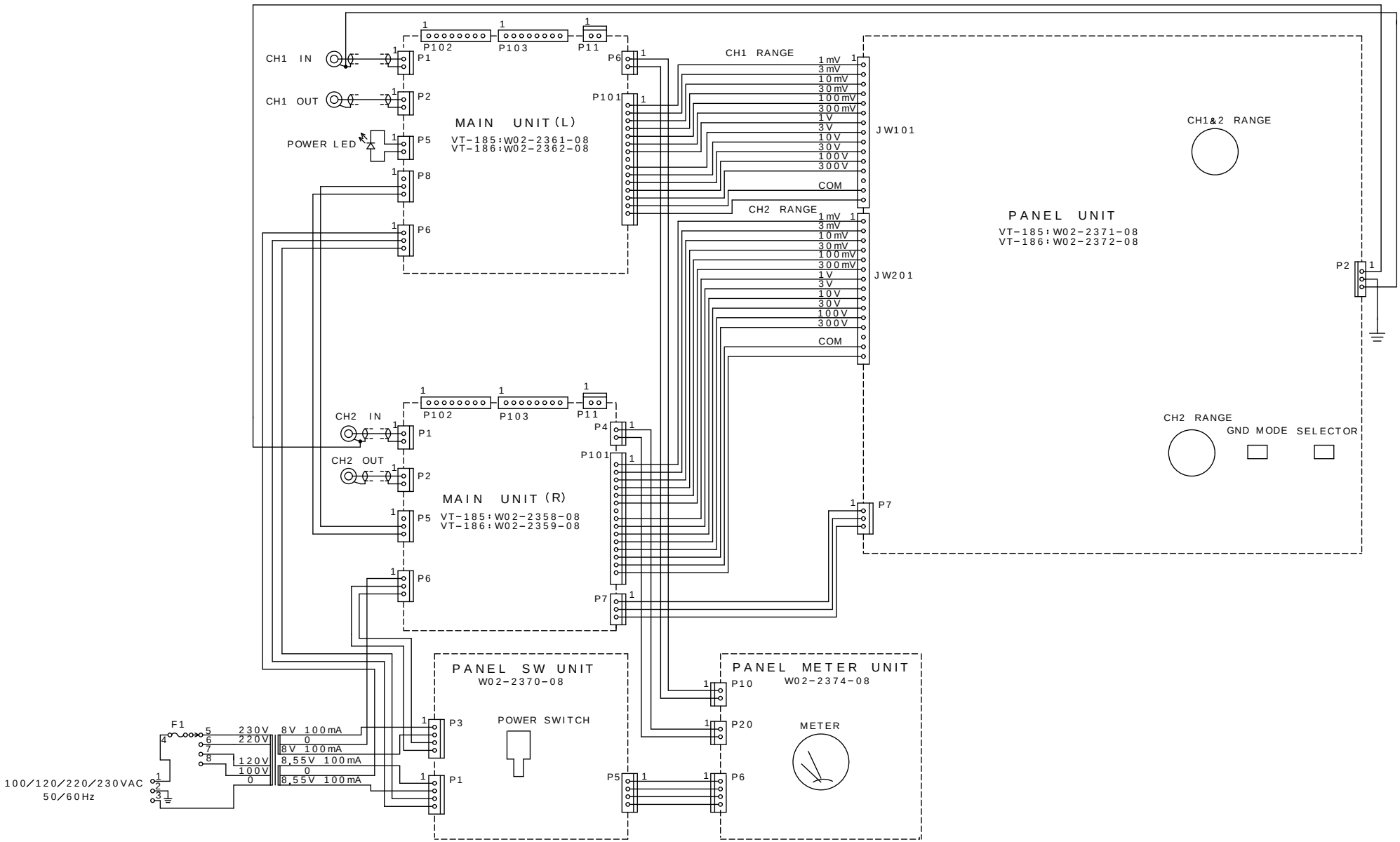
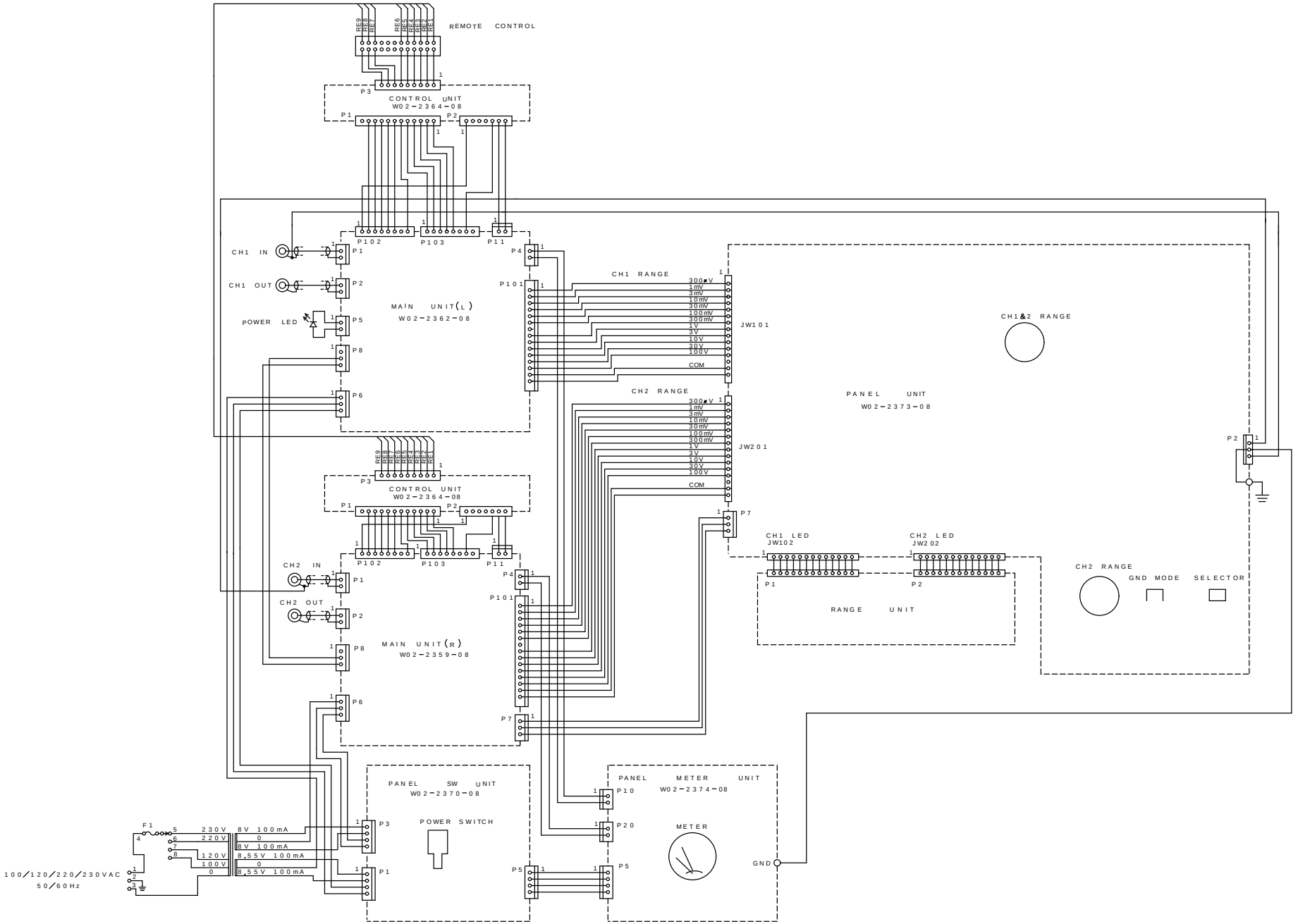
Y : AAFES(Europe) **X :** Australia **M :** Other Areas ⚠ indicates safety critical components.

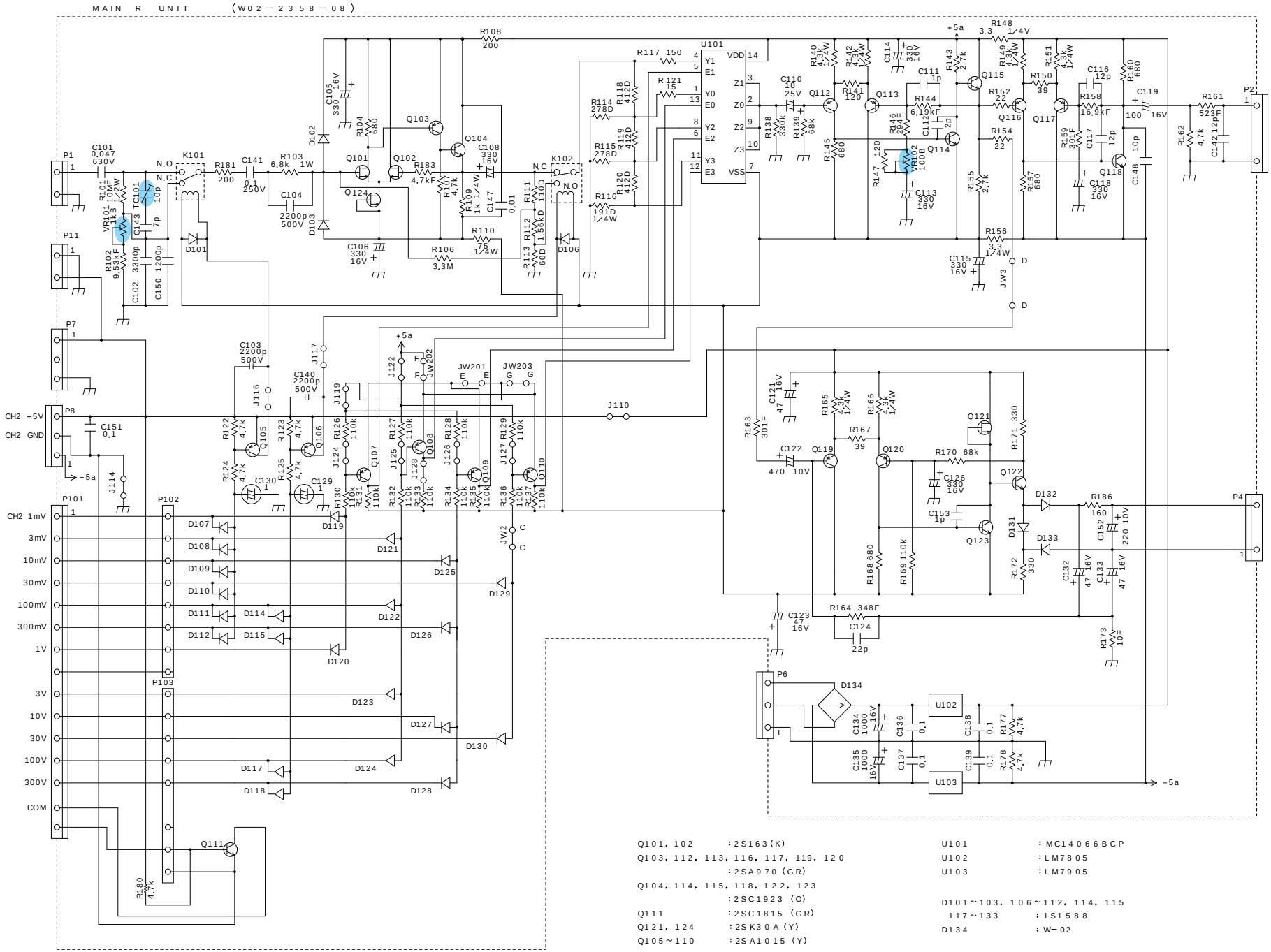
VT-185/VT-186 SCHEMATIC DIAGRAM



VT-187 SCHEMATIC DIAGRAM



VT-185 SCHEMATIC DIAGRAM



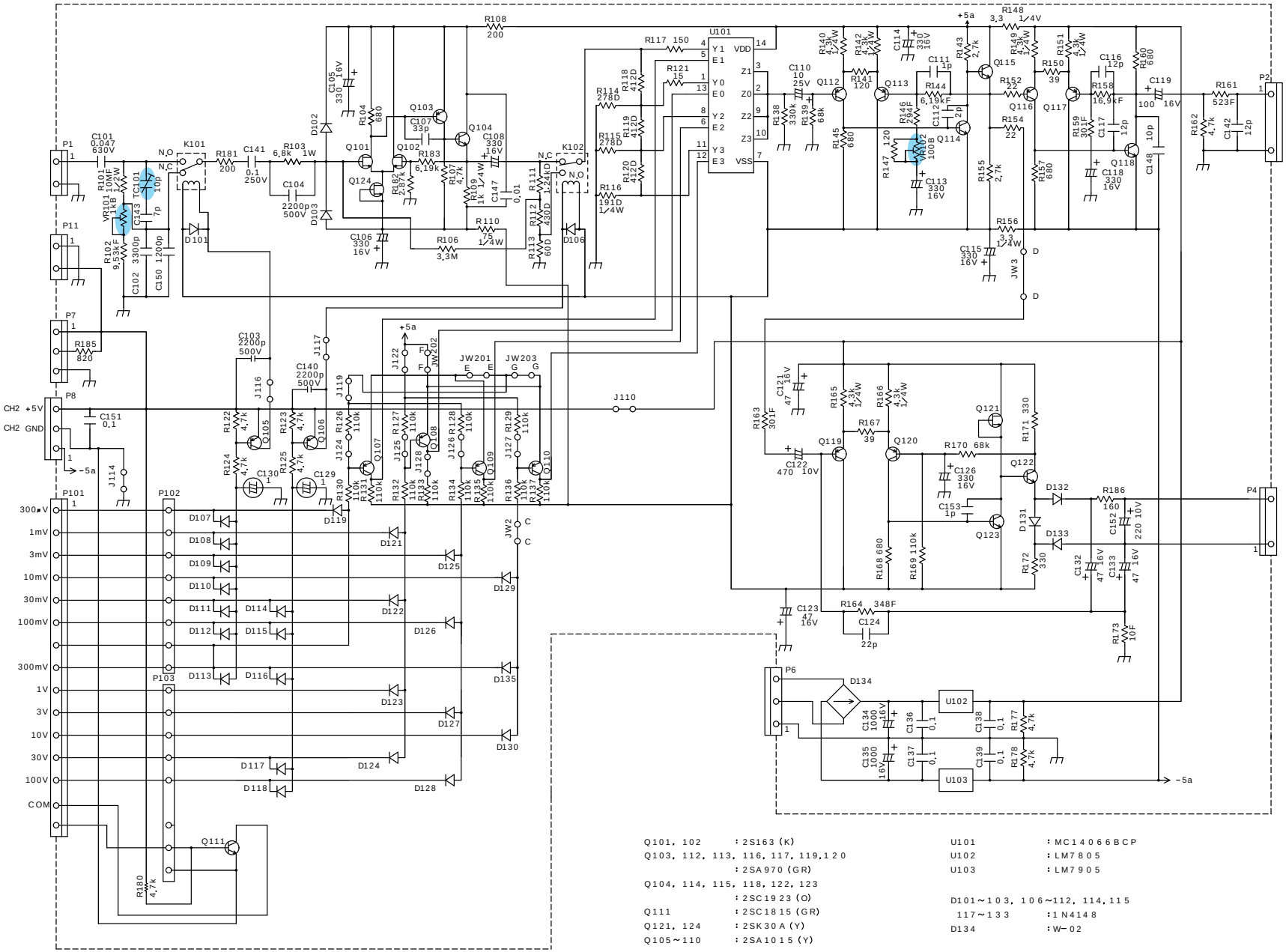
Q101, 102 :2S163(K)
Q103, 112, 113, 116, 117, 119, 120 :2SA970(GR)
Q104, 114, 115, 118, 122, 123 :2SC1923(O)
Q111 :2SC1815(GR)
Q121, 124 :2SK30A(Y)
Q105~110 :2SA1015(Y)

U101 :MC14066BCP
U102 :LM7805
U103 :LM7905

D101~103, 106~112, 114, 115
117~133 :1S1588
D134 :W-02

VT-186/VT-187 SCHEMATIC DIAGRAM

MAIN UNIT R (W02-2359-08)



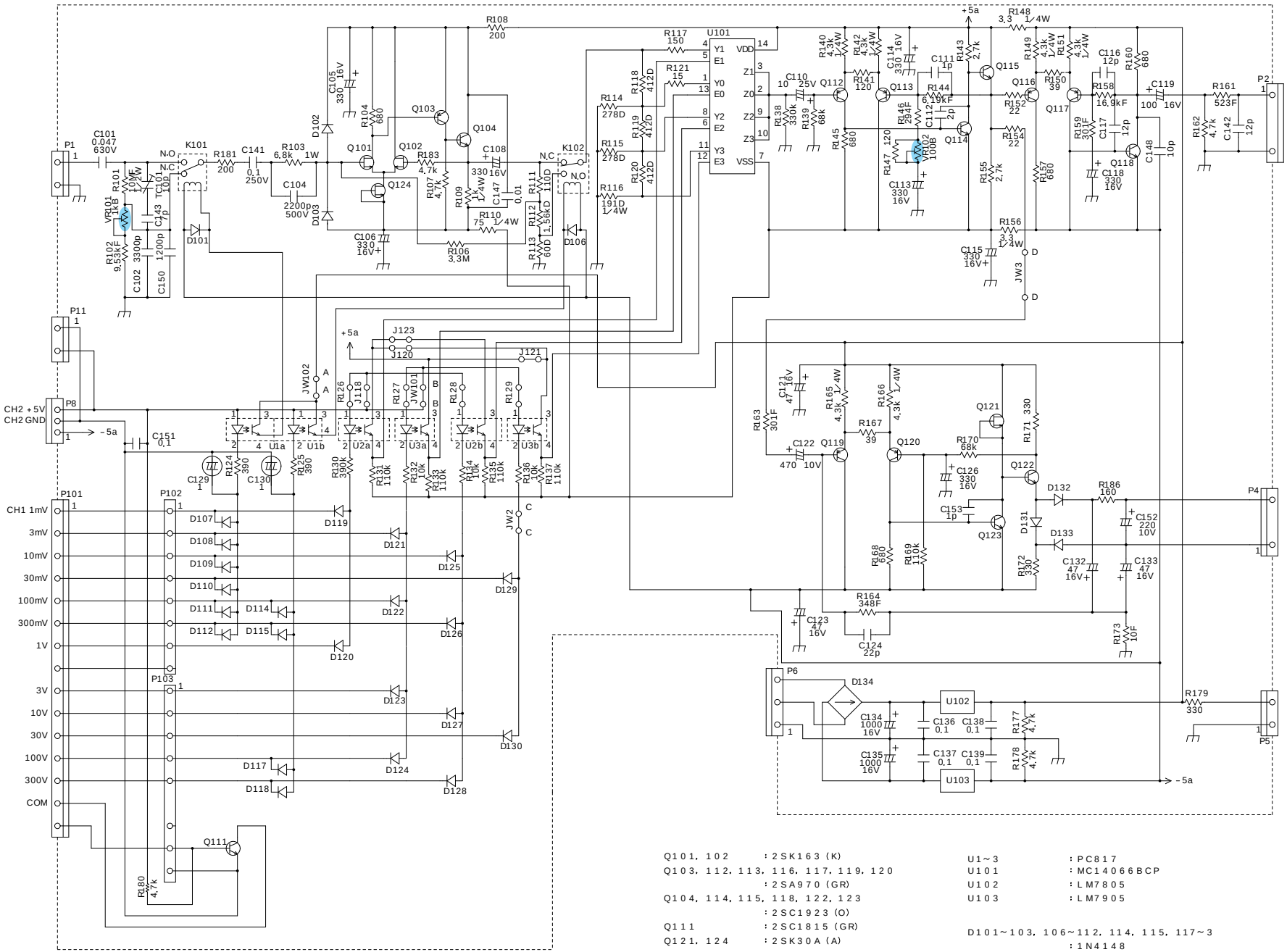
Q101, 102 : 2S163 (K)
Q103, 112, 113, 116, 117, 119, 120 : 2SA970 (GR)
Q104, 114, 115, 118, 122, 123 : 2SC1923 (O)
Q111 : 2SC1815 (GR)
Q121, 124 : 2SK30A (Y)
Q105~110 : 2SA1015 (Y)

U101 : MC14066BCP
U102 : LM7805
U103 : LM7905

D101~103, 106~112, 114, 115, 117~133 : 1N4148
D134 : W-02

VT-185 SCHEMATIC DIAGRAM

MAIN UNIT L (W02-2361-08)



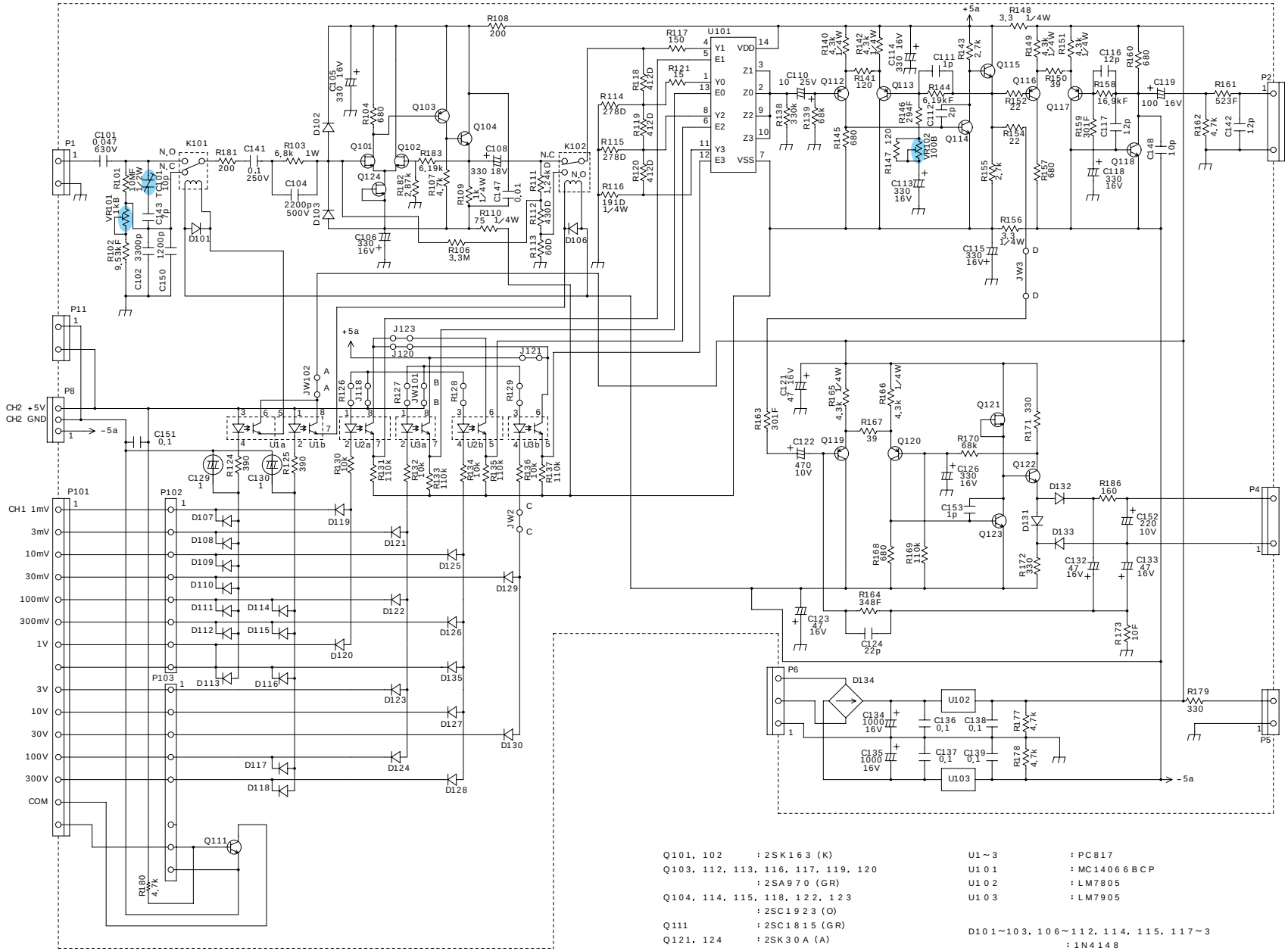
Q101, 102 : 2SK163 (K)
Q103, 112, 113, 116, 117, 119, 120 : 2SA970 (GR)
Q104, 114, 115, 118, 122, 123 : 2SC1923 (O)
Q111 : 2SC1815 (GR)
Q121, 124 : 2SK30A (A)

U1~3 : PC817
U101 : MC14066BCP
U102 : LM7805
U103 : LM7905

D101~103, 106~112, 114, 115, 117~3 : 1N4148
D134 : W-02

VT-186/VT-187 SCHEMATIC DIAGRAM

MAIN UNIT L (W02－2362－08)

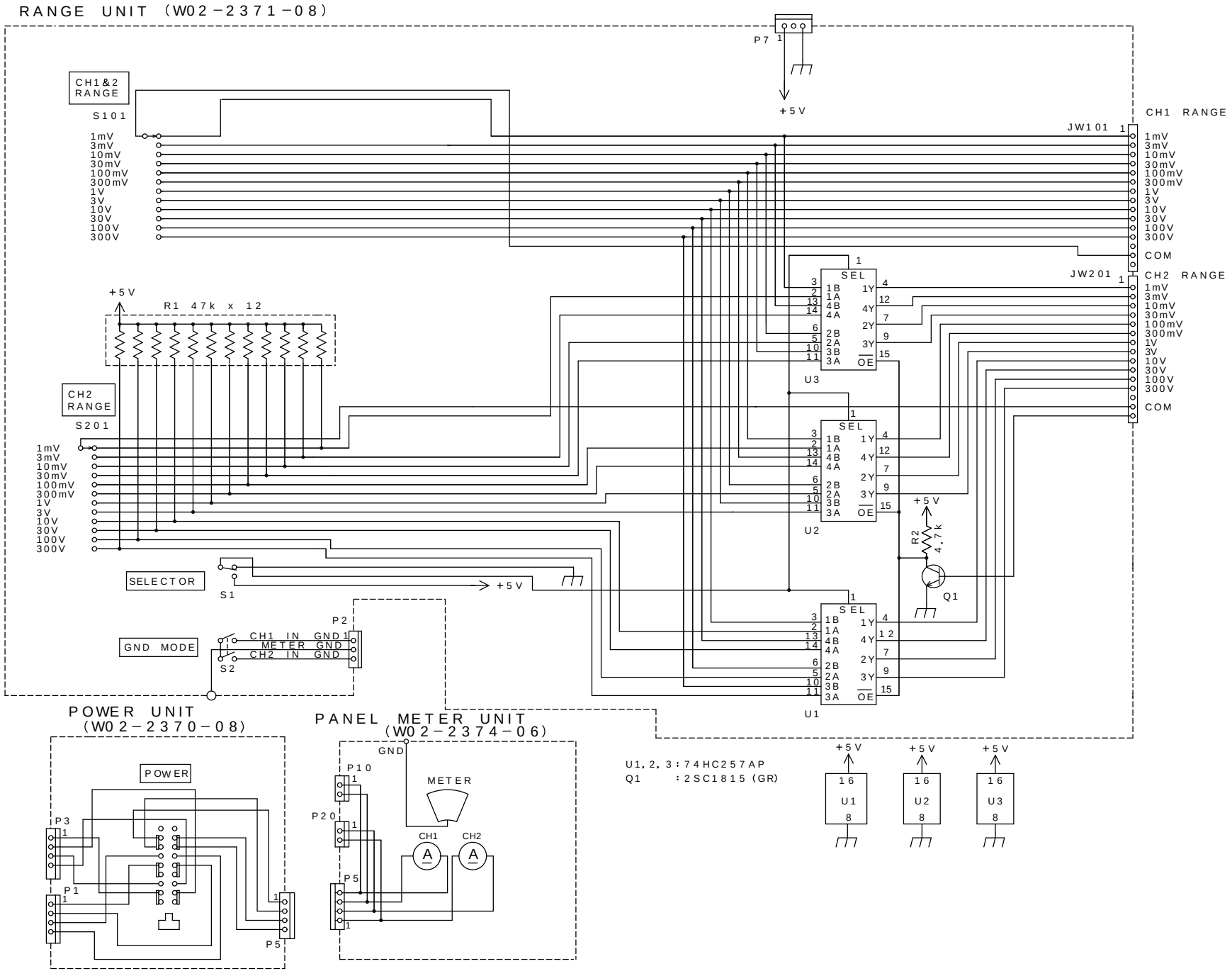


Q101, 102 : 2SK163 (K)
Q103, 112, 113, 116, 117, 119, 120 : 2SA970 (GR)
Q104, 114, 115, 118, 122, 123 : 2SC1923 (O)
Q111 : 2SC1815 (GR)
Q121, 124 : 2SK30A (A)

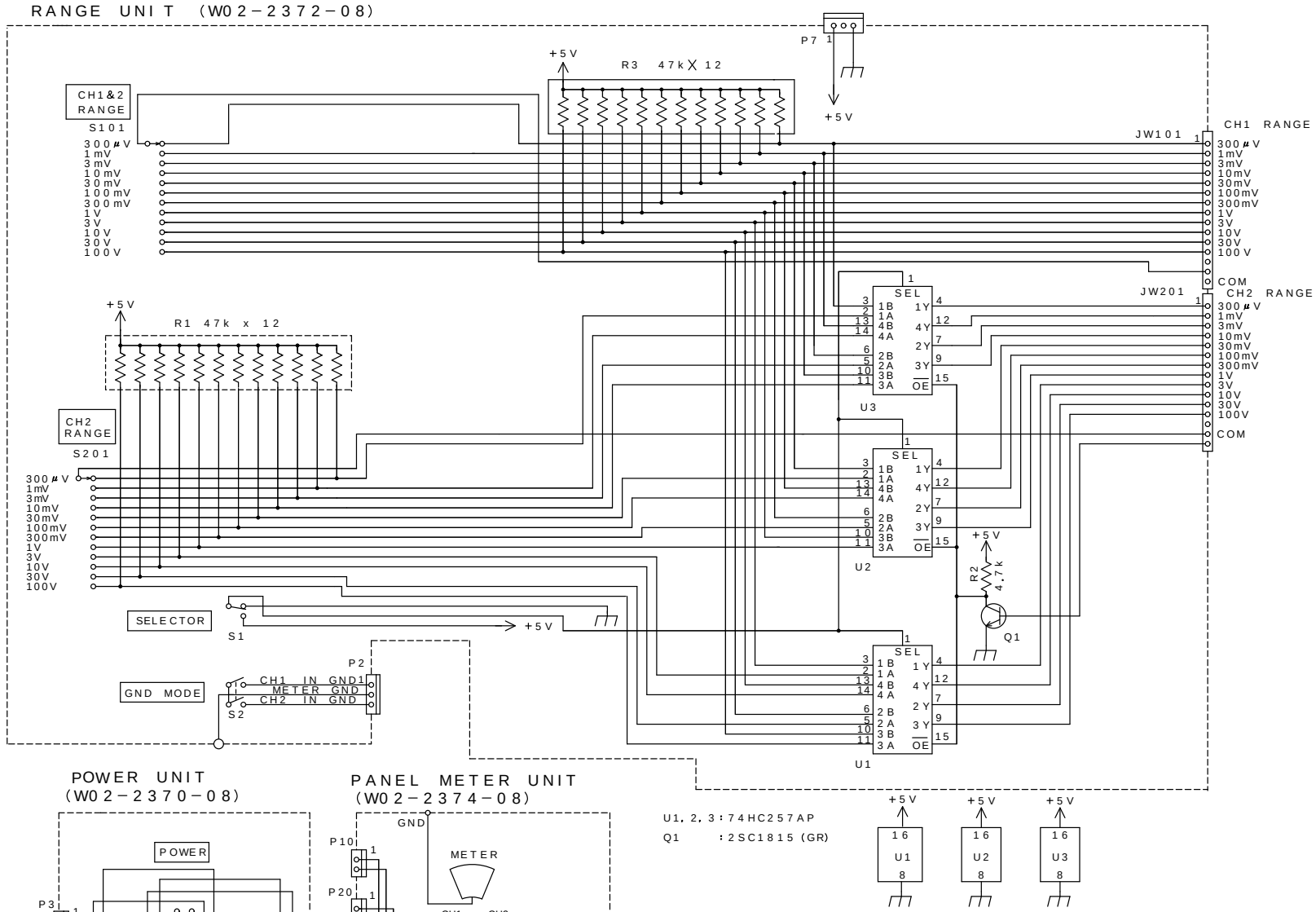
U1～3 : PC817
U101 : MC14066BCP
U102 : LM7805
U103 : LM7905

D101～103, 106～112, 114, 115, 117～3 : 1N4148
D134 : W－02

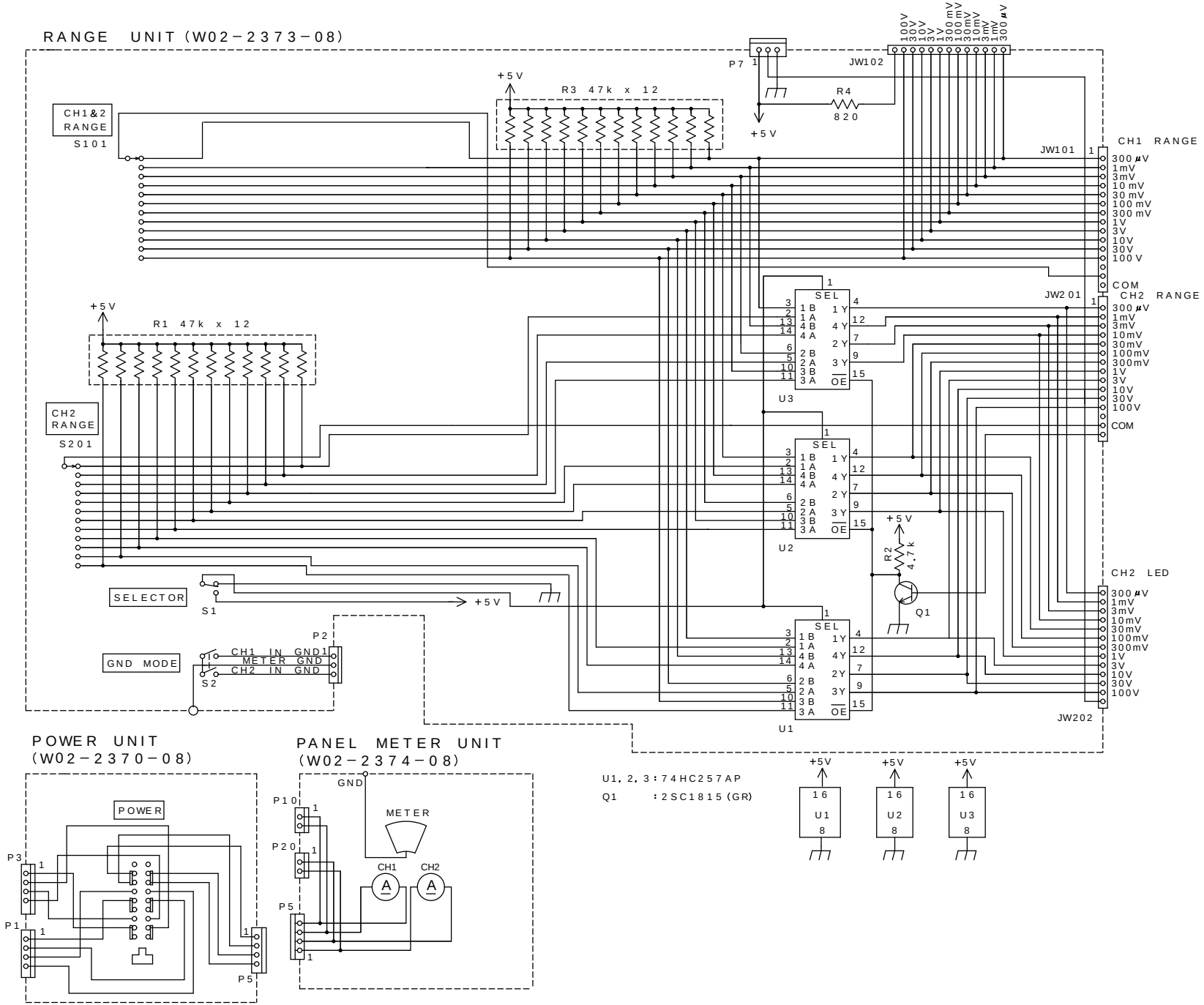
VT-185 SCHEMATIC DIAGRAM



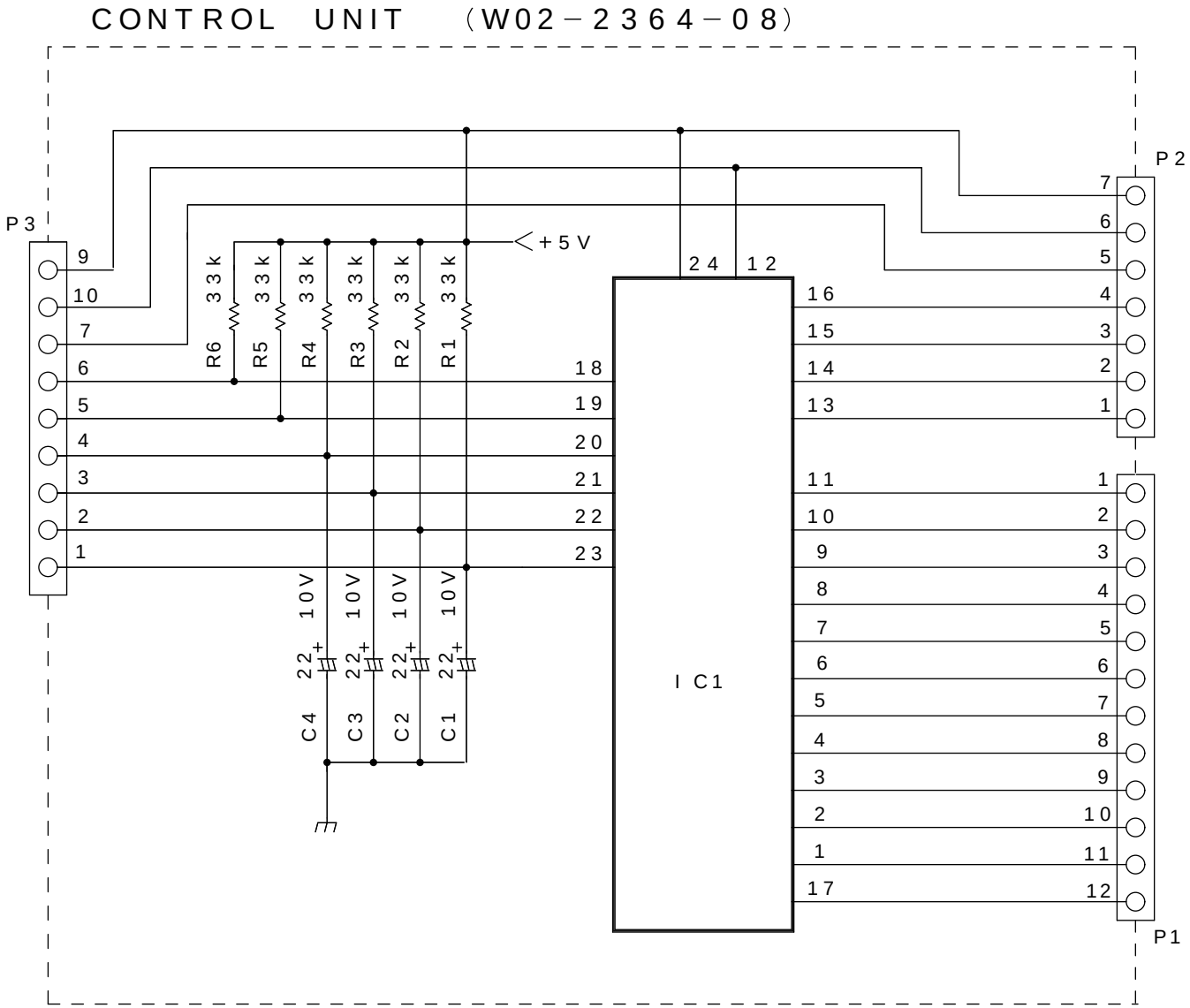
VT-186 SCHEMATIC DIAGRAM



VT-187 SCHEMATIC DIAGRAM

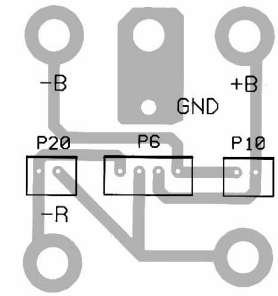


VT-187 SCHEMATIC DIAGRAM



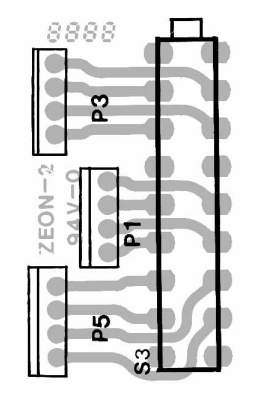
PC BOARD (Component side view)

PANEL METER UNIT

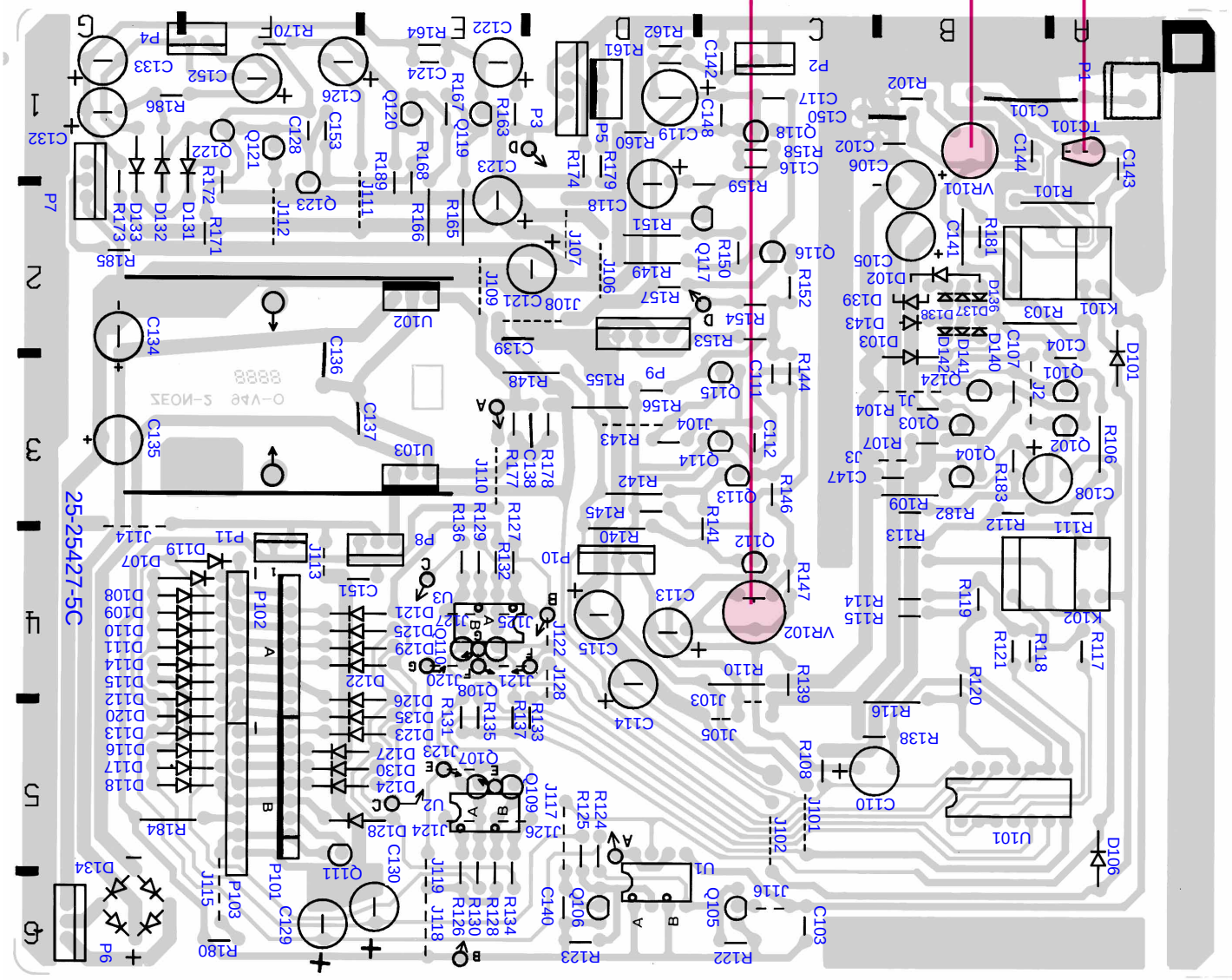


POWER UNIT

Pattern side view



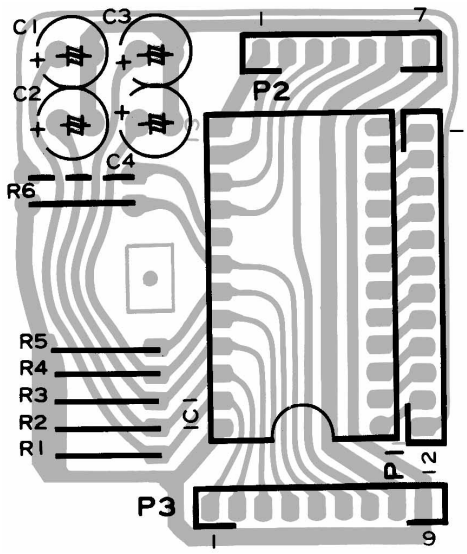
MAIN UNIT (L/R)



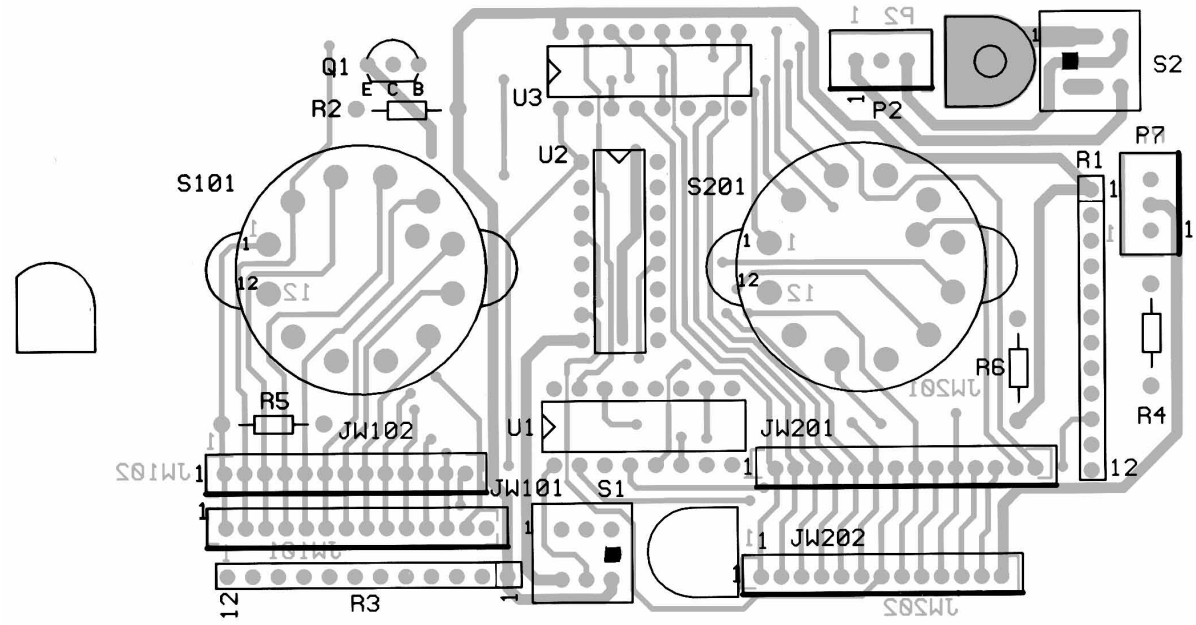
Refer to the schematic diagram for the values of resistors and capacitors.

PC BOARD (Component side view)

CONTROL UNIT



RANGE UNIT



Refer to the schematic diagram for the values of resistors and capacitors.

VT-185/VT-186/VT-187

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KENWOOD TMI CORPORATION
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