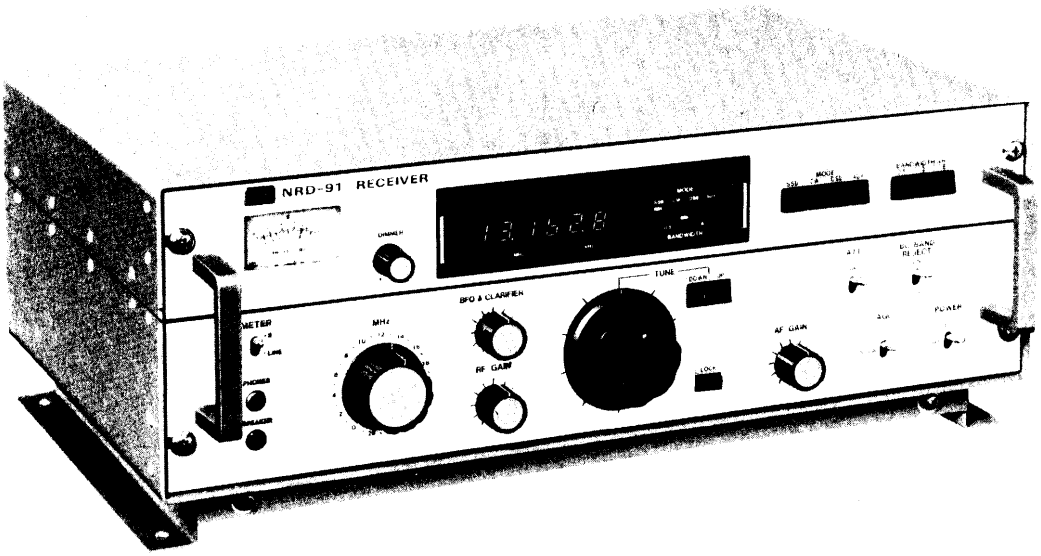
# INSTRUCTION MANUAL

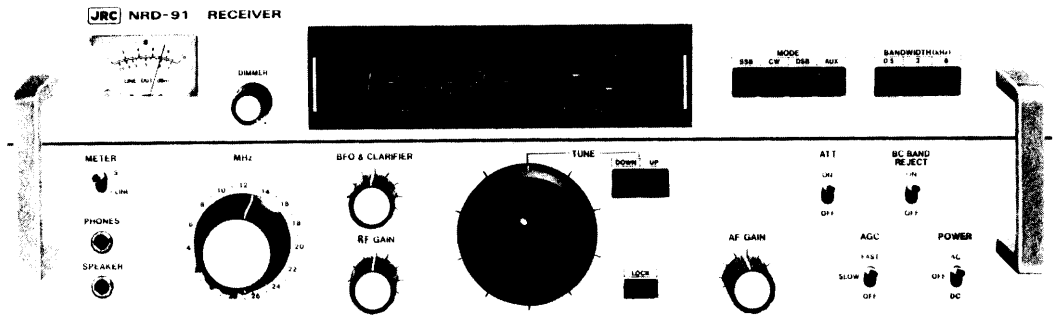
## MODEL NRD-91

## RECEIVER

JRC Japan Radio Co., Ltd.




MODEL NRD-91 RECEIVER
OUTSIDE VIEW (DESK-MOUNT TYPE)




MODEL NRD-91 RECEIVER
OUTSIDE VIEW (CONSOLE OR RACK TYPE)

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Appendixed Drawings

# CAUTION

1. Read this instruction manual thoroughly before turning on this receiver.

2. When connecting the BK cable and other cables, refer to Fig. 3.3 of Paragraph 3.3.

3. When the transmitting waves are strongly induced in the receiving antenna, take the countermeasure described in Paragraph 3.2.

4. Do not turn semifixed resistors, high frequency transformers, trimmer capacitors, etc. mounted on the printed circuit board unless absolutely necessary, because they are all preadjusted at the factory.

5. If the MHz knob is set at inadequate position, the receiver is muted. Therefore, the MHz knob must be set correctly.

6. This receiver has low-voltage-operable ICs and transistors. Be sure to turn off both power switches when connecting or removing the printed circuit board and cables to external equipments.

7. If the AUX mode is selected at a condition where additional crystal is not provided, the receiver operates actually in the DSB mode even though the AUX mode is indicated on the front panel.

8. The illumination of LEDS (Receiving frequency, Mode and Bandwidth indicators) is gradually reduced as turning [DIMMER] knob counterclockwise. Finally they fade out completely at the minimum position.

9. When the mode is except SSB and Frequency Display shows the frequency between 000.0kHz and 001.4kHz, MHz LED displays the frequency obtained by adding 1MHz to the display of MHz Selector Switch. In such a case, Receiver receives the frequency displayed by LED.

10. When the mode is except SSB, the upper limit of the received frequency to be displayed is 30001.4kHz and the lower limit is 001.5kHz.

# 1. GENERAL DESCRIPTION

The model NRD–91 Receiver is a highly reliable receiver with the simple circuit composition, developed by JRC based on our many year's experiment and technical results. PLL synthesizer is equipped in the first local oscillator to prvode the high accuracy of frequency setting, so that this receiver has enough performances for use in the SSB mode as a back-up receiver.

## 1.1 FEATURES

1) Provided with digital synthesizer of PLL type
   The reference oscillator with the high stability ($\pm 5 \times 10^{-6}$ ppm) ensures high stability of frequencies over a wide frequency range for reception.
2) Wide receiving frequency range
   This receiver covers the wide receiving frequency range from 90 kHz to 29.9999 MHz.
3) Digital indication of receiving frequencies
   This receiver is provided with light emitting diodes for a numerical display of the receiving frequency from 100 Hz digit to 10 MHz digit.
   Therefore, the frequency can be set correctly.
4) BC band rejector
   BC band rejector reduces the interferences such as cross-modulation and intermodulation due to the strong radio wave of the broadcasting wave generating during receiving the MHF radio wave.
5) Directly connected to Teleprinter and FAX
   The line output terminal, 600Ω 0 dBm, is provided. By adding the optional crystal, FSk or FAX can be received in the AUX mode. At this time, the center frequency of the line output is 1.7 kHz and 1.9 kHz respectively.
6) Entirely modular construction
   The circuits are accomodated in the plug-in type printed circuit boards (excluding the panel section and power supply unit). Thus, maintenance and check are facilitated.
7) Operable on either AC or DC power
   The receiver can be operated on AC or DC power by changing the power switch on the panel.

## 1.2 SPECIFICATIONS

1) Receiving frequency range
   90 kHz to 29.9999 MHz
2) Circuit system
   Double superheterodyne with up-conversion system using a phase-locked digital frequency synthesizer.
   1st IF : 70.455 MHz
   2nd IF : 455 kHz
3) Reception mode
   CW(A1A), MCW(A2A, H2A), DSB(A3E), SSB(R3E, H3E, J3E) and FSK(F1B) or FAX (F3C)

But FSK and FAX are option.

4) Receiving frequency indication
Light emitting diode for six-digit numerical display (10 MHz- to 100 Hz- digit)

5) Tuning method
Continuous tuning with MHz knob, UP/DOWN switch and TUNE knob of 10 kHz/ rotation (minimum step: 100 Hz)

6) Sensitivity

| Mode / Receiving frequency | A1A | A3E | J3E |
|---|---|---|---|
| 90–199.9 kHz | 20 μV or less | 60 μV or less | — |
| 200–1599.9 kHz | 10 μV or less | 30 μV or less | — |
| 1.6–29.9999 MHz | 2 μV or less | 6 μV or less | 3 μV or less |

75Ω standard signal generator is directly connected to the antenna terminal S/N 20 dB, Output 100 mW, Bandwidth 3 kHz, 400 Hz 30% modulation.

7) Selectivity

| Attenuation / Bandwidth | 6 dB bandwidth | 60 dB bandwidth |
|---|---|---|
| 6 kHz | 4.4 kHz or more | 10 kHz or less |
| 3 kHz | 2–2.6 kHz | 6 kHz or less |
| 0.5 kHz | 0.5–1.0 kHz | 3 kHz or less |

8) Frequency stability
1 hour after 15-minute preheating $\pm 10 \times 10^{-6}$ or less, but under the condition where the receiving frequency is 1.6 MHz or more in the SSB mode.

9) Image rejection ratio
60 dB or more

10) IF rejection ratio
60 dB or more

11) Spurious response
60 dB or more

12) Blocking
The input level of the unwanted signal is more than 10 mV which suppress the output level of the wanted signal by 3 dB, under a condition where the unwanted signal is separated by 20 kHz or more from the wanted signal of 10 μV. (SSB mode, 3 kHz, AGC ON)

13) Cross-modulation

The cross-modulation output, which is generated when the 20 kHz detuned unwanted signal of 90 dB is added at the wanted signal of 60 dB, is 30 dB or less for the wanted signal output.

14) Intermodulation

The second or third intermodulation output, which is generated when the two 80 dB interference waves of 20 kHz detuned are added, is below the wanted signal output.

15) AGC characteristic

The variation of the AF output is 10 dB or less for the antenna input level of 3 $\mu$V to 100 mV.

16) AF characteristics

| | | |
|---|---|---|
| Speaker output | : | 1W or more (600Ω) |
| Line output | : | 1mW or more (600Ω) |
| Headphone output | : | 10mW or more (600Ω) |
| Frequency response | : | 3 dB or less at the frequency range of 300 to 3000 Hz |
| Distortion factor | : | Speaker output 3% or less at 500mW |
| | | Line output 3% or less at 1mW |

17) Radiation

$1 \times 10^{-9}$W or less

18) Nominal input impedance

50–75 ohms

19) Variable range of BFO

±2 kHz or more

20) Variable range of Clarifier

±50 Hz or more

21) Power supply

| | |
|---|---|
| AC power supply | 100/110/200/220V±10% 50/60 Hz approx. 30VA |
| DC power supply | 24V±10% (negative grounded) approx. 25W |

22) Temparature range and relative humidity

−10°C to +50°C, 95% at +35°C

23) Dimensions and weight

Without the cabinet case

| | |
|---|---|
| 149(H) x 480(W) x 294(D) excluding protuberence | Approx. 7 kg |

With the cabinet case

| | |
|---|---|
| 190(H) x 489(W) x 305(D) excluding protuberence | Approx. 11.5 kg |

# 2. COMPOSITION

## 2.1 STANDARD COMPOSITION

The composition of this receiver depends on its type, that is, desk-mount type or rack type.

| Item | Model or code | Q'ty | Remarks |
|---|---|---|---|
| Receiver | NRD–91 | 1 | |
| Cabinet case | MPBX10832 | 1 | Provided for only the desk-mount type |
| Speaker | NVA–92 | 1 | 600Ω 1W |
| Power cable | 6ZCJD00005 | 1 | |
| BK cable | MPKC03108 | 1 | |
| Instruction manual | | 1 | |
| ANT Connector | M–P–7 | 1 | Provided for only the desk-mount type |
| Spare parts | 6ZXJD51043 | 1 set | * |
| Test data | | 1 copy | |

* Spare parts include: One each of BK relay, and fuses.

## 2.2 OPTIONS

| Item | Model or code | Remarks |
|---|---|---|
| Headphones | ST–3 | 600 ohms |
| DC power cable | MPKC01741 | For DC24V |
| Extension card for maintenance | CMH–330 | Used for checking each PC boad in operation |
| Additional crystal | | Crystal to be mounted in the AUX position<br>In case of FSK 456.7 kHz<br>In case of FAX 456.9 kHz |

# 3. INSTALLATION

## 3.1 INSTALLATION

(1) When installing the receiver on the 19-inch standard rack, place the guide bolt provided on the side of the chassis on the rails, and push the receiver to the inside of the rack. Then, fix the receiver in position by screwing the 5-mm screws through the mounting holes at two positions of both left and right sides of the front panel.

(2) When installing the receiver on the desk, use the special cabinet (optionally available on separate order).
Attach the slide rails (supplied with the cabinet case) onto left and right sides of chassis of the receiver and mount the receiver in the cabinet case. Fix the receiver to the cabinet case by screwing the 5-mm screws through four mounting holes on the front panel.

## 3.2 ANTI-INDUCTION OF THE TRANSMITTING WAVE

When the receiver is operated with a paired transmitter, it sometimes happens that the transmitting wave of own station is induced in the receiving antenna.

When the induction current of the transmitting waves is 1 ampere or less, the receiver is protected by the built-in input protective circuit. But if the induction current exceeds 1 ampere, the input circuit of the receiver may be burnt out.

When the receiving antenna suffers from such an excessive induction current, move the receiving antenna as far as possible from the transmitting antenna, or insert the anti-inducer in series between the receiving antenna and antenna input connector as shown in Fig. 3.1.

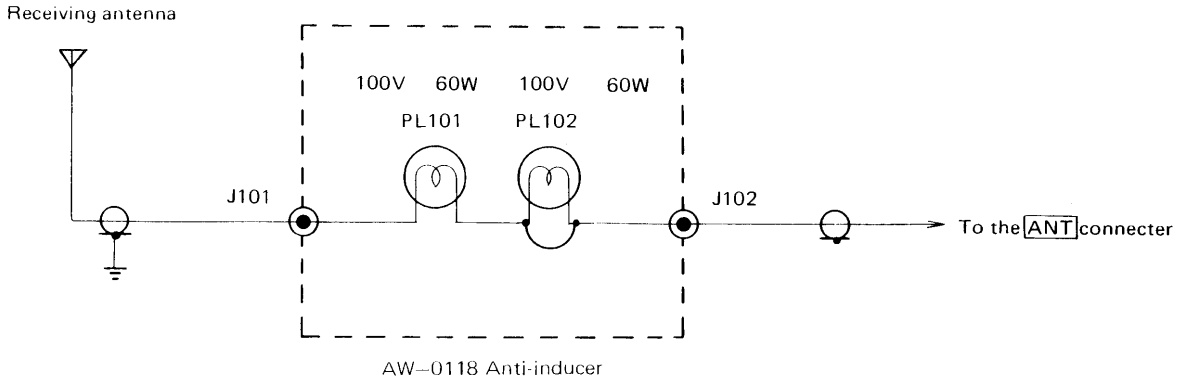



**Fig. 3.1 Protection of the Receiver by the Anti-inducer**

## 3.3 CONNECTION OF EXTERNAL LINES

(1) This receiver is operable in either AC100±10% (50/60 Hz) or DC24V±10%.
For AC operation, connect the AC power cable to **AC 100V** located on the rear panel of the main frame. For DC operation, connect the DC power cable MPKC01741 (option) to **DC 24V** located on the rear panel of the main frame.

When changing the power voltage at the installation place, change the terminal connection of the power transformer located inside the chassis as shown in Fig. 3.2. For the location of the transformer, see the annexed part arrangement drawing.

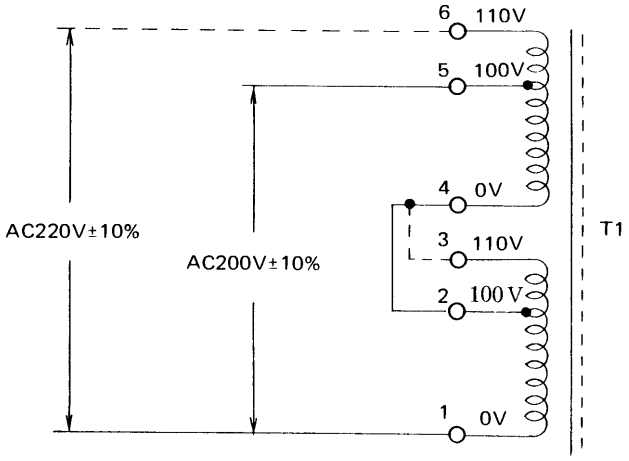



**Fig. 3.2**

(2) Connect the antenna cable to the [ANT] connector provided at the rear panel.
(3) Connect the grounded wire to the terminal [E] on the rear panel.
(4) If the break-in relay circuit is to be used, connect the special cable (MPKC03108) to the [BK & LINE] connector. The AF output signal (600Ω unbalanced speaker output, and 600Ω balanced line output) can be also taken out from this connector. See Fig. 3.3 for details.

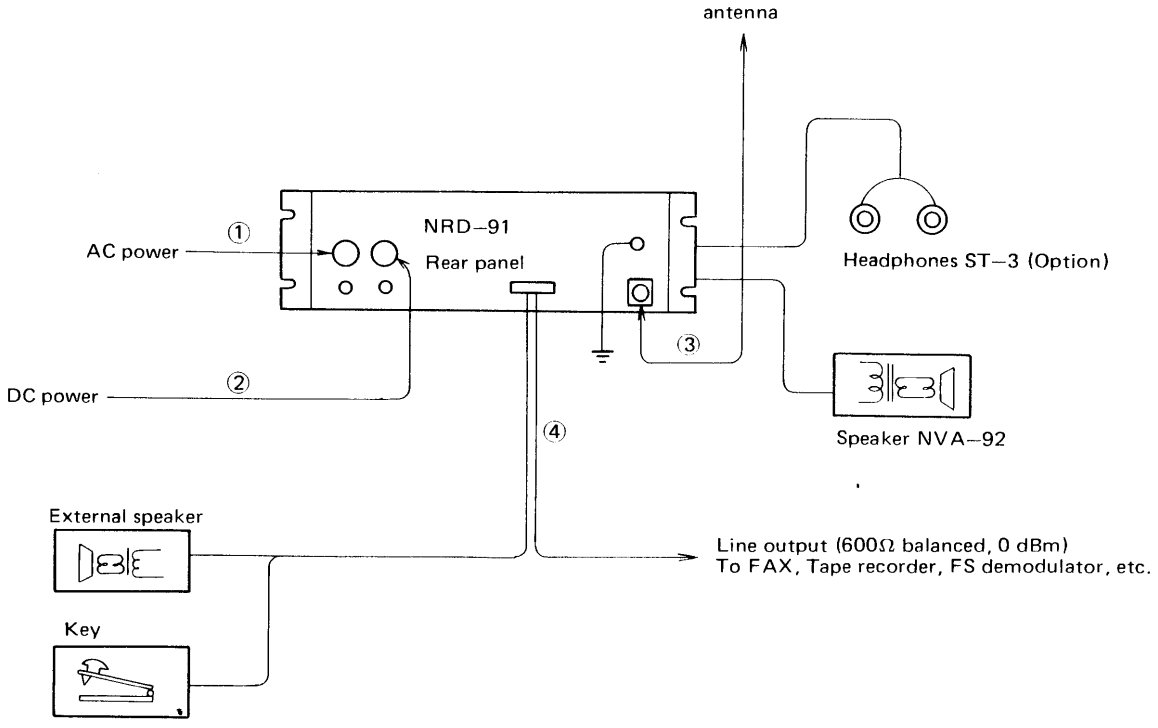



**Fig. 3.3**

| Item | Indication | Cable and connector | Pin | Color | Explanation | |
|---|---|---|---|---|---|---|
| 1 | AC100V, 110V 200V, 220V | Connector HS16P–2<br>Cable 6ZCJD00005 | 1 | White | For AC power input<br>The cable is attached with the receiver, only when the receiver is mounted in the cabinet and shipped. | |
| | | | 2 | Black | | |
| 2 | DC24V | Connector HS12P–2<br>Cable MPKC01741 | 1 | White | +24V | For DC power input<br>Cable is option. |
| | | | 2 | Black | 0V (grounded) | |
| 3 | ANT | M–P–3/5/7 | – | – | Antenna input | |
| 4 | BK & LINE | Connector S–1312–CEA<br>Cable MPKC03108 | 1 | White | –BK (key signal) | |
| | | | 2 | Red | +BK (BK power +24V) | |
| | | | 3 | Black | E | 600Ω unbalanced 1W output |
| | | | 4 | Green | Speaker | |
| | | | 5 | Silver | Shielded (common ground) | |
| | | | 6 | – | Not used | |
| | | | 7 | White | Line | 600Ω balanced, 0 dBm AF output |
| | | | 8 | Red | Line | |
| | | | 9 | Black | Center tap | |
| | | | 10 | Green | Not used | |
| | | | 11 | Silver | Shielded (common ground) | |
| | | | 12 | – | Not used | |

## 3.4 HOW TO MOUNT AUX CRYSTAL

By adding the crystal to the AUX mode position, the center frequency of the line output can be 1.7 kHz in case of FSK reception and 1.9 kHz in FAX reception when setting the frequency indication on the panel to the wanted receiving frequency, and this line output can be connected to FS demodulator or FAX. The frequency of the crystal is 456.7 kHz in FSK reception and 456.9 kHz in FAX reception. Since this receiver has one AUX crystal space, one of FSK, FAX or other desirable mode is available. Please inform us of your desirable mode or the frequency of the crystal when ordering.

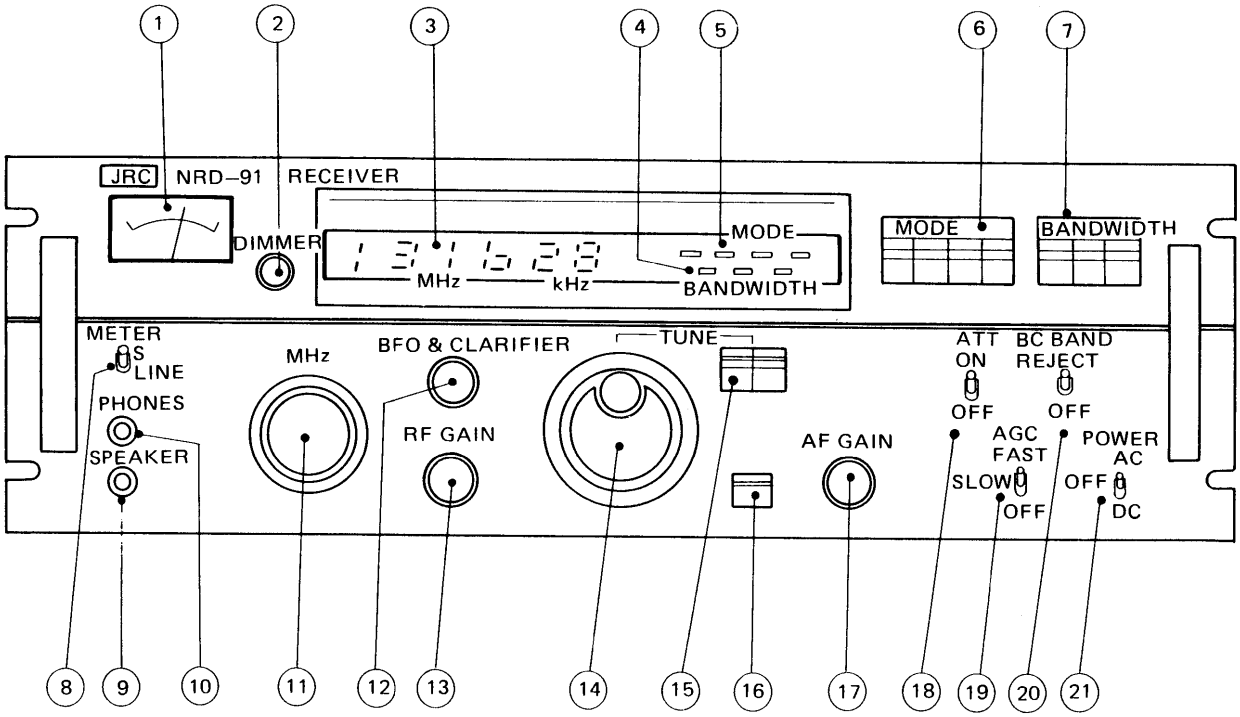
Mount the crystal according to the following procedures.

1. Insert the crystal into AUX (X3) on CMH–379 IF 2nd unit and solder it.
2. Connect two holes (AUX) positioned near the connector (P10) on the same unit by means of the leading wire.
3. Connect the speaker and turn on the power.
   If the beat sound comes out through the speaker when setting the mode to AUX, the crystal is mounted correctly.

   Note) The beat sound can be easily known by comparing the noise in AUX mode with the noise in DSB mode, because the noise increases when changing the mode from DSB to AUX.

# 4. OPERATION

## 4.1 OPERATION PANEL




| No. | Control | Function |
|---|---|---|
| 1 | Meter | Indicating the strength of the receiving waves or level of the AF output (line output) |
| 2 | DIMMER knob | Used for adjusting the brightness of all LEDs. Adjust the brightness by this knob according to the circumstance. LEDs fade out if this knob is turned fully counterclockwise. Keep this in your mind when using this receiver. |
| 3 | Receiving frequency indicator | Displaying the receiving frequency by 6-digit numerical numbers. In case of SSB mode, the carrier frequency is displayed and in case of modes other than SSB, the assigned frequency is displayed. |
| 4 | BANDWIDTH indicator | Displaying the bandwidth of the IF filter specified by the BANDWIDTH ⑦ selector switch (one of 0.5 kHz, 3 kHz and 6 kHz) |
| 5 | MODE indicator | Displaying the mode specified by the MODE switch⑥ (one of SSB, CW, DSB and AUX) |

| No. | Control | Function |
|---|---|---|
| 6 | MODE selector | Used for selecting the reception mode (one of SSB, CW, DSB and AUX). When changing the mode from one of AUX, DSB and CW to SSB, the frequency obtained by subtracting 1.5 kHz from the original frequency is displayed on the frequency indicator③. This is because that the carrier frequency is displayed in case of SSB reception. Since AUX is option, make a special order if necessary. If this AUX mode is specified when the optional crystal is not mounted, actual reception mode is DSB even though the AUX mode is indicated by the MODE indicator. |
| 7 | BANDWIDTH selector | Selecting the bandwidth of the IF filter (intermediate frequency) (one of 0.5 kHz, 3 kHz and 6 kHz). |
| 8 | METER selector switch | Selecting the content to be indicated for the meter①. When setting this switch to S, turning RF GAIN ⑬ fully clockwise, and setting the AGC switch ⑲ to FAST or SLOW, the meter pointer indicates the relative signal strength of the HF input of the receiver. When setting this switch to LINE, the meter indicates the line output level (600Ω balanced). |
| 9 | SPEAKER jack | Used for connecting the special speaker, NVA–92 or the speaker of 600Ω impedance. |
| 10 | PHONES jack | Used for connecting the optional headphones, ST–3 or the headphone of 600Ω impedance. |
| 11 | MHz selector | Used for setting the MHz digit of the receiving frequency. The full rotation of this knob covers 30 bands (1 MHz step). |
| 12 | BFO & CLARIFIER knob | Serving as BFO adjustment knob in case of CW mode. This knob can vary the frequency of 455 kHz beat oscillator (BFO) by more than ±2 kHz. Therefore, the tone of the telegraph signal can be adjusted.<br>This knob also serves as a fine adjustment knob (CLARIFIER) of the receiving frequency in SSB and AUX modes. This can vary the center frequency of the oscillating frequency by more than ±50 Hz. |
| 13 | RF GAIN knob | Gain controller for the RF amplifier and IF amplifier. It is recommended to adjust according to the strength of the receiving signal for obtaining the optimum volume. |
| 14 | TUNE knob | Used for setting the receiving frequency in 100 Hz steps. The full rotation changes the receiving frequency by 10 kHz. |
| 15 | UP/DOWN switch | Fast forward switch of the receiving frequency. While pressing UP (or DOWN), the frequency increases (or decreases) at a speed of approx. 125 kHz/second. |

| No. | Control | Function |
|---|---|---|
| 16 | LOCK switch | Used for locking the set frequency electrically so as not to be changed by careless misoperation. By setting this switch to the locked condition (pressed), the receiving frequency will not be changed even though operating the TUNE knob ⑭ and UP/DOWN switch ⑮ . For releasing the locked condition, press this switch again. |
| 17 | AF GAIN knob | This is a volume adjustment knob for the speaker or headphones. And this knob does not affect the level of the line output (600Ω balanced) on the rear panel of the receiver. |
| 18 | Attenuator switch | Used for selecting the ON or OFF condition of the 20 dB HF attenuator for the receiver input. Set this switch to ON for the better reception when the signal is received at the near distance and the desired signal is interfered due to the strong neighboring signals etc. But usually, set this switch to the OFF position. |
| 19 | AGC switch | Used for selecting the ON or OFF condition of the AGC circuit and selecting the discharging time constant. The FAST position is for the reception of DSB signals, and the SLOW position is normally for the reception of CW or SSB signal affected by fading. By setting this switch to OFF, the AGC circuit remains inoperative and signals are saturated. Thus, control the gain by the RF GAIN knob ⑬ for the best receiving condition. |
| 20 | BC BAND REJECTOR | Set this switch to ON for the better reception when the cross-modulation or intermodulation due to the strong radio wave of the broadcasting wave (525 to 1605 kHz) interferes the MHF reception. |
| 21 | POWER switch | Used for turning ON or OFF the power. Also used for selecting AC or DC power supply. |

## 4.2 OPERATING PROCEDURES

Before turning on the power switch, check the following items.

(1) Power voltage check

The label, which shows the nominal power voltage, is placed above the power connector located on the rear panel of the receiver. Check that the power voltage to be used is within the range of the nominal value ±10%.

(2) Antenna system check

Check that each connecting part of the antenna cable to be connected to this receiver is firmly connected. When the antenna coupler and antenna changer are used, check that they are correctly set.

(3) Check of the connectors on the rear panel
Check that each connector and grounded wire on the rear panel of the receiver are surely connected.
(4) Connect the speaker or headphone to [SPEAKER] or [PHONES] jack.

### 4.2.1 Basic Operation of SSB Reception

(1) Set the [AF GAIN] knob to the position where the knob is turned clockwise by 4 or 5 graduations from the minimum position.
(2) Set the [POWER] switch to [AC] in case of the AC power supply, or to [DC] in case of the DC power supply.
(3) Press the [SSB] button among the [MODE] switches.
(4) Set the desired receiving frequency by using the [MHz] knob, [UP/DOWN] switch and [TUNE] knob.
(5) Set the [RF GAIN] knob to the maximum position and turn the AGC switch to [SLOW].
(6) After hearing the desired signal, turn the [AF GAIN] knob and set it for an optimum sound volume.
(7) Adjust the [BFO & CLARIFIER] knob so as to set the tone the most natural to hear.
(8) When the received radio wave is not strongly affected by fading, turn the [RF GAIN] knob slightly counterclockwise and [AF GAIN] knob slightly clockwise so as to obtain the best S/N of the reception voice.

### 4.2.2 Basic Operation of CW Reception (Morse Telegraph)

(1) Set the [AF GAIN] knob to 4 or 5 graduations.
(2) Press the [CW] button among the [MODE] switches.
(3) Set the desired receiving frequency by using the [MHz] knob, the [UP/DOWN] switch and [TUNE] knob.
(4) Press the [0.5 kHz] button among the [BANDWIDTH] switches.
(5) Set the [RF GAIN] knob almost to the center position and the [AGC] switch to [OFF].
(6) When hearing the desired signal, set the volume to the optimum level by adjusting the [AF GAIN] knob.
(7) By adjusting the [BFO & CLARIFIER] knob, set the tone the most pleasant to hear.
(8) Adjust [RF GAIN] and [AF GAIN] so that S/N of the receiving signal will be the best.
(9) When the receiving wave is affected by fading or the strong wave and weak wave are received reciprocally, set the [AGC] switch to [SLOW] or [FAST] and turn the [RF GAIN] knob slightly clockwise.

### 4.2.3 Operation of DSB Reception

(1) Press the [DSB] button among [MODE] switches, and [6 kHz] button among [BANDWIDTH] switches.
(2) Set the [RF GAIN] knob to the maximum position and set the [AGC] switch to [FAST].
(3) Set the desired receiving frequency by using the [MHz] knob, [UP/DOWN] switch and [TUNE] knob.

(4) By adjusting the [AF GAIN] knob, set the volume to the optimum level.
(5) In case of strong interference, press the [3 kHz] button among [BANDWIDTH] switches.

### 4.2.4 Operation of FSK Reception

A teleprinter and FS demodulator are adaptative to this receiver to receive a FSK signal. Receive the FSK signal in the following procedures. But this mode is option.

(1) Press the [AUX] button among [MODE] switches.
(2) Select the proper [BANDWIDTH] button in accordance with the frequency shift width and modulation speed of an FSK signal under reception. In case of the narrow band direct printing telegraph, select [0,5 kHz].
(3) Set the [AGC] switch to [FAST] and the [RF GAIN] knob to the maximum position (fully clockwise).
(4) Set the desired receiving frequency by using the [MHz] knob, [UP/DOWN] switch and [TUNE] knob.
(5) After receiving the siganl, adjust the [AF GAIN] knob so as to obtain the desired volume, as required.
(6) Set the [METER] switch located on the front panel of the FS demodulator to [TUNE].
(7) Adjust the [BFO & CLARIFIER] knob so that the [TUNE] meter of the FS demodulator deflects maximumly and LEDs of both MARK and SPACE blink in the same brightness.

Note) When performing the teletype communication by connecting this receiver to the narrow band direct printing terminal, be sure not to change the [BANDWIDTH] after the circuit is connected once. Otherwise, it may happen that the phase is out due to the difference of the delay time of the filter.

### 4.2.5 Operation of FAX Reception

A radio facsimile equipment is also adaptative to this receiver to receive the FAX signal. Receive the FAX signal in the following procedures. But this mode is also option.

(1) Press the [AUX] button among [MODE] switches.
(2) Select the proper [BANDWIDTH] button in accordance with the modulation speed and frequency shift width of the FAX signal under reception. In case of the broad band facsimile such as weather facsimile, etc., press [3 kHz].
(3) Set the [AGC] switch to [FAST] and the [RF GAIN] knob to the maximum position (fully clockwise).
(4) Set the desired receiving frequency by using the [MHz] knob, [UP/DOWN] switch and [TUNE] knob.
(5) After receiving the signal, adjust the [AF GAIN] knob so as to obtain the desired volume, as required.
(6) Adjust the [BFO & CLARIFIER] knob so that LEDs for tuning, located on the front panel of the facsimile recorder, [TUNE 1] and [TUNE 2] will light the most brilliantly in the same brightness.

### 4.2.6 Further Operation

(1) Operation of ATT.

The receiving antenna catches many kinds of radio wave from the strong one to weak one. If many strong waves arrive at the high frequency stage of the receiver, interferences such as intermodulation, blocking, cross-modulation and so on arise, so that sometimes the desired radio waves cannot be received well. Also, when the partner station is located very close to your station, the sound is distorted because the AGC circuit cannot control such a strong radio wave. In such a case, by setting [ATT] to [ON], the receiving condition is greatly improved. If [S] meter deflects, the desired radio wave can be received even though [ATT] is set to [ON]. Especially, when receiving the radio wave below 1.6 MHz, it is recommended to always set [ATT] to [ON] except at the stand-by condition.

(2) Operation of BC BAND REJECT

While receiving the MHF band (below 3 MHz), many other radio waves may be received besides the radio wave of the desired station. These are called cross-modulation and intermodulation interferences due to the strong radio wave of the broadcasting wave (525 to 1605 kHz). In such a condition, by setting [BC BAND REJECT] switch to [ON], an eliminator filter located at the ANT input circuit operates so as to reject such interferences, so that the receiving condition will be remarkably improved. When the desired wave is comparatively strong, use the above-described [ATT] together with [BC BAND REJECT].

(3) Operation of AGC switch

The discharging time constant at the position of AGC [SLOW] is set to 3 sec. so as to suppress the noise between communications in SSB mode enough for the pleasant communication. When receiving the radio wave affected by moderate fading, the [SLOW] position seems to give better result.

However, the weak signal promptly after that the strong signal is received may not be able to hear since the gain is not recovered yet. Therefore, when communicating with the ship at a far distance and the one at a near distance by turns, set the [AGC] switch to [FAST].

# 5. CIRCUIT DESCRIPTION

Refer to the annexed blockdiagram for the circuit composition of the receiver. This receiver is composed of receiving, local signal generator, panel and power supply sections.

## 5.1 RECEIVING SECTION

The receiving system is an up-conversion type double-superheterodyne with a first intermediate frequency of 70.455 MHz and a second intermediate frequency of 455 kHz. A signal frequency of 90 kHz to 29.9999 MHz is supplied to the RF input filter after passing through the BK relay and the input protection circuit. The signal thus supplied passes through the 35 MHz LPF and is supplied to one of the seven filter circuits, depending on the operating frequency. The signal is then fed into the 1st Mix. in which the receiving signal is mixed with the first local signal of 70.545 to 100.4549 MHz and is thereby converted into the first IF of 70.455 MHz. The converted output passes through the crystal filter with a center frequency of 70.455 MHz and a bandwidth of 12 kHz, and then is amplified by the 1st IF AMP. Then the siganl is supplied to the 2nd IF in which the amplified signal is mixed with the 2nd local frequency signal of 70 MHz and is thereby converted into a 2nd IF of 455 kHz. The converted output passes through one selected out of three filters with bandwidth of 6 kHz, 3 kHz and 0.5 kHz and the filtered signal is amplified by the 455 kHz IF AMP. 2,3

The amplifed receiving signal is supplied to the AGC circuit and demodulator circuit respectively. The AGC voltage for automatic gain control is applied to the 1st IF AMP (70.455 kHz) and 2nd IF AMP (455 kHz.). In case of DSB detection, the demodulator circuit takes out the carrier component from the receiving frequency signal and operates as a synchronous detector. In case of other than DSB detection, the BFO signal supplied from the BFO circuit and the demodulator circuit operates as a product detector.

The demodulated output is supplied to AF AMP and LINE AMP respectively. AF AMP is a AF power amplifier for speaker and headphones. The gain is adjusted by IC for electronic volume placed on the former stage of AF AMP according to the DC voltage supplied from AF GAIN controller on the front panel.

The LINE AMP output is supplied to **BK & LINE** connector on the rear panel and used for connecting to the tape recorder, FAX, FSK demodulator, etc. The LINE AMP output is approx. 0 dBm which is not affected by the AF GAIN controller on the front panel.

The BK circuit is provided for protecting from burning due to the inducation of own station's transmitting radio wave. This BK circuit is controlled by the external +BK and –BK (keying signal). When –BK line becomes 0V (keyed), the BK circuit operates for grounding the antenna terminal. At the same time, since the AGC circuit is controlled, the gain of the receiver is reduced and the speaker output does not appear (muting condition).

## 5.2 LOCAL SIGANL GENERATOR SECTION

The local signal generator section is composed of the 1st local oscillator, 2nd local oscillator and BFO circuit.

### 5.2.1 1st Local Oscillator

This circuit is single-loop synthesizer which generates the signal of 70.545 to 100.4549 MHz (100 Hz step) corresponding to the receiving frequency from 90 kHz to 29.9999 MHz and provides that frequency to 1st mixer.

The circuit consists of variable divider, phase comparator and VCO. Furthermore the variable divider is composed of integer part and fraction. For frequency data, digits of 10 MHz to 100 kHz are preset in the integer part and digits of 10 kHz to 100 Hz in the fraction.

The reference frequency is 12.5 kHz obtained by dividing the standard signal of 5 MHz by 400. The phase comparator compares the phase between this reference signal and variable divider output and VCO is controlled by the DC voltage corresponding to that phase difference.

### 5.2.2 2nd Local Oscillator

This circuit feeds the signal of 70 MHz to the 2nd mixer. This circuit is composed of analogue type phase comparator, 70 MHz variable crystal oscillator (VXO) and LPF. These are in the phase-lock loop (PLL). The phase comparator compares directly the phases between the standard signal of 5 MHz and 70 MHz, and the 70 MHz variable crystal oscillator is controlled by the DC voltage corresponding to that phase difference. Usually in PLL, the phases are compared between 5 MHz obtained by dividing 70 MHz signal by 14 and the standard signal of 5 MHz. But in this circuit, by comparing the pulse of the waveform of the 5 MHz standard signal (the pulse width is 1/2 cycle of 70 MHz) and 70 MHz signal every 14 cycles of the waveform of 70 MHz signal, the phases of 5 MHz standard signal and 70 MHz siganl are directly compared.

### 5.2.3 BFO Circuit

This circuit operates in CW, SSB or AUX mode, and provides the BFO signal to the product detector. The frequency of the BFO signal can be adjusted by the **BFO & CLARIFIER** knob.

In case of CW mode, the frequency of 455 kHz can be varied by more than ±2 kHz, in SSB mode, the frequency of 456.5 kHz can be varied by more than ±50 Hz, and in AUX mode (option), the frequency of xxxx kHz can be varied by more than ±50 Hz. xxxx means 456.7 in FSK mode and 456.9 in FAX mode.

This circuit operates as the clarifier in SSB and AUX modes.

## 5.3 PANEL SECTION

The panel section is composed of frequency indicator circuit, mode and bandwidth indicator circuit, S meter and controls. They are mounted on one printed circuit board. The frequency indicator circuit consists of 6-digit numerical LEDs for the receiving frequency set by the **MHz** knob and **TUNE** knob.

Since bandwidth and mode selector switches are non-locked type, the switch information is latched, and according to this latched output, LEDs for bandwidth and mode light up. At the same time, this output controls the IF filter selector circuit in the receiving section and BFO selector circuit in the local signal generator section.

S meter indicates the AGC voltage when the **METER** switch on the front panel is set to

[S] and the line output when set to [LINE].

The MHz knob is used for setting the 10 MHz and 1 MHz digits of the receiving frequency. The MHz digit information is sent out in BCD code from this switch and this output is set to 10 MHz and 1 MHz digits of the up/down counter. The [TUNE] knob is provided for setting the receiving frequency in 100 Hz steps. This knob is connected to the circuit so called rotary encoder or pulse generator which generates 50 pulses for one full rotation. Pulse doubler circuit makes this 50 pulses double electrically, so that 100 pulses are generated for one full turn. These pulses are connected to the 100 Hz digit of the up/down counter. Therefore, for the full turn of this knob, 100 (pulses) x 100 Hz, so that full rotation can vary up to 10 kHz.

[UP/DOWN] switch is provided for fast forward for the receiving frequency. By setting this switch to [UP], the up/down counter operates as the up counter. And the multivibrator output is connected to the 100 Hz digit of the counter, thus the receiving frequency is increased. By setting this switch to [DOWN], the counter operates as the down counter and the receiving frequency is decreased. The frequency increasing or decreasing speed by the [UP/DOWN] switch is set to approx. 125 kHz/second.

The [LOCK] switch is provided for locking the set receiving frequency so as not to be changed by careless misoperation. When this switch is set to ON (pushed condition), the pulse output from the [TUNE] knob and multi-vibrator output generated by the [UP/DOWN] switch are prohibited to be applied to the counter. Therefore, the [TUNE] knob and [UP/DOWN] switch will not operate.

The [DIMMER] knob is provided for controlling the brightness of LED by changing the power voltage applied to LED on the front panel (frequency indicator, mode and bandwidth indicators).

## 5.4 POWER SUPPLY SECTION

The power supply section converts the external AC power or DC power to +17V, +15V and +5V DC required in each circuit and +5V for dimmer.

+17V is used in the analogue circuit and +5V in the logic circuit. +15V is a special power for audio power amp (AF AMP.) IC. +5V for dimmer, which is controlled by the [DIMMER] knob on the front panel, changes within the range from approx. 0 to +5V.

# 6. MAINTENANCE

## 6.1 GENERAL

Circuits are mounted on the plug-in type PC board, excluding the power supply section, panel section and VCO (CGA-12), thus facilitating repair and replacement of defective sections. The special tools (option) are available for removing plug-in type PC board. But when the special tools are not available, remove the PC board with picking up the both ends of the upper side of the PC board with the long nose plyers, etc. At this time, be sure not to damage the PC board and aluminum part of the main frame.

The panel unit is coupled with the chassis through three connectors and hence demountable with ease.

This receiver can be taken to the following pieces; PC board unit, top cover, bottom cover, handles attached to the right and left sides on the front, front panel and main chassis.

It is essential for keeping the equipment always in the best operating condition and performing the proper maintenance and check to know the basic operating principle and correct operating condition of the equipment, ordinarily.

## 6.2 GENERAL MAINTENANCE AND CHECK

Table 6.1 shows the general maintenance and check using tester and some tools.

**Table 6.1 Maintenance and Check**

| No. | Item | Maintenance and check |
|---|---|---|
| 1 | Cleaning | For cleaning the panel surface, knobs, switches, top cover and bottom cover, wipe off the stain with a soft cloth or silicon cloth. For the inside of the set, remove the dust with a brush or cleaner. Since no gear is equipped, lubrication is not required. |
| 2 | Looseness of parts | Check whether screws and nuts are loosened, knobs, switches and volumes are loosened, connectors are loosened relays and ICs are inserted into sockets surely, or not. Fasten them firmly and attach them surely. |
| 3 | Fuses | When fuses for the power supply blow, check the cause carefully and replace them.<br>l-ampere glass-tube fuse is used for AC power and 3-ampere glass-tube fuse for DC power (included in the spare parts set) |
| 4 | Printed circuit board | Remove the plug-in type printed circuit board from the main chassis and check whether the parts mounted on the PC board discolor or are burnt or not. When replacing parts, use the spare parts. When replacing the part excluded in the spare parts, give an order for parts to the sales agent or service station of JRC. |
| 5 | DC voltage | Check the DC voltage of the POWER unit (CBD-357) by means of the tester. The standard values are +17V, +15V and +5V. |

## 6.3 TROUBLESHOOTING

Troubles may happen sometimes while using a receiver for a long period. Some troubles are due to the receiver itself, but some of them may be caused by reasons other than the receiver. Thus, even if the receiver is under a trouble condition, do not conclude that the trouble is due to the receiver without checking the cause by yourself. Check whether the trouble is due to the receiver itself or due to the external problems according to the trouble-shooting before contacting with JRC or JRC's sales agent or service station. The inspecting methods for typical troubles are described below.

### 6.3.1 Decline of the sensitivity

The word "Sensitivity" is used ambiguously among users. In this section, the decline of sensitivity means not only that the sound volume is not large but also that S/N of the output signal of the receiver reduces.

**Explanation**

For some constant high frequency input signal, the sound does not depend on the performance of the receiver. This depends only on the gain from the input stage to the AF output stage of the receiver.

For example, "the former receiver could produce the sound loudly enough with RF GAIN set to 8 graduation and AF GAIN to 2. But the present receiver can't produce the sound loudly with the same gain settings, unlike the former receiver. This receiver has very bad sensitivity." This doesn't make sense at all. The effectiveness of RF GAIN volume and AF GAIN volume for the setting graduation is different among makers. Even in case of the same model receivers, there are some differences. Also, even though the distance from the partner station and frequency are the same, the wave strength varies largely depending on the year, season, time, etc. Thus, in order to compare the sensitivity of the receivers, S/N of the receiver must be compared between receivers under the following condition: Connect the same antennas to the receivers to be compared, and receive the same frequency at the same time, by setting the speaker sound volume to the almost same level.

**Checking procedure**

(1) Check whether the receiver is misoperated or not. Check whether ATT is set to ON, or not. Receive the radio wave in other frequency band. When the sensitivity is very bad in the special band, receive that radio wave by other receiver, if possible. If the difference is remarkable between receivers when receiving the same signal in the same time by the same antenna, it can conclude that the trouble is due to the receiver itself. If that difference is not remarkable, that is not the trouble of the receiver itself. This difference depends on variation in receivers.

(2) When the sensitivity reduces even if the frequency band is changed, start the check from the antenna system. When an antenna multi-coupler or antenna changer is inserted between the antenna and receiver, connect the antenna directly to the receiver. If the sensitivity is still bad, connect another antenna to the receiver. If the sensitivity is greatly improved when connecting the antenna directly to the receiver, check the cable, antenna multi-coupler and antenna changer successively.

(3) When it is confirmed that the receiver itself is bad, replace the BK relay of the receiver, RF input filter circuit CFL-184 and/or RF AMP CAF-191.

### 6.3.2 No sound

The sound does not come through the speaker even though the speaker is connected to the receiver correctly, and no defects have been found in the speaker and indications of the receiver. In such a case, check the receiver in the following procedures.

#### Checking procedure

(1) Remove the BK & LINE connector from the receiver.
If the sound comes out through the speaker, -BK is grounded somewhere in the BK line. Check wirings of other receivers, transmitters and consoles to which -BK line is connected in parallel.

(2) Lock-out check of the synthesizer
Take out the receiver from the cabinet case or rack, and check LEDs from the top after turning on the power. LEDs can be visually checked through the hole on the top cover of the receiver. If LED are off, it is correct. But if LED light, the synthesizer is locked out. But the following case is not abnormal condition: After changing the receiver frequency, LED light until the synthesizer is locked.

### 6.3.3 Noise and beat

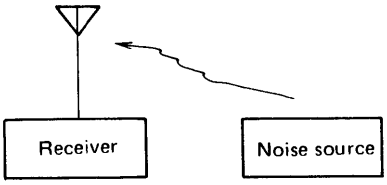
Even though changing the receiving frequency band, noise or beat sound comes through the speaker. But that noise is evidently not external noise.

Especially, in case of small ship, many kinds of electronic equipments are concentrated in the small room, so that the mutual interference may happen among equipments. In many cases, the receiver suffers interference. When the mutual interference arises, search the surrounding for the source of noise. Especially, when mounting a new electronic equipment, you must check whether the new equipment gives the noise interference to the receiver or not.

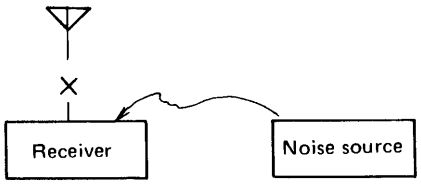
#### Checking procedure

(1) Investigation of the source of noise
At first, set the receiver to such a condition where the noise comes out through the speaker. Turn off the power of the equipments other than the receiver successively. If the noise stops when turning off the power of some equipment, it is considered that the equipment is the source of the noise. Sometimes, the power supply itself may generate the high frequency noise, not the electronic equipment. In such a case, use the other power supply line.

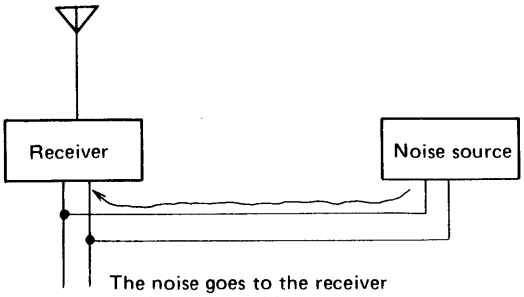
(2) Investigation of the route of noise
After checking the noise source, the route of the noise must be investigated. The noise routes are largely classified as shown in the figure.




The noise goes to the antenna




The noise goes directly to the receiver




The noise goes to the receiver via the power cable.

By removing the antenna, connecting the receiver to other antenna, using the other power supply line and moving the installation place, the route can be found.

(3) Countermeasure

Basically, the countermeasure must be taken at the noise source side. In any cases, all equipments must be grounded. If the equipment is surely grounded by means of the wide copper board, the noise interference may be resolved. Also, a line filter which suppresses the HF noise is very effective at the power supply wire. After finding the noise source and noise route, please examine the trouble and ask the countermeasure to the maker or sales agent of that equipment which is of the noise source.

### 6.3.4 Interference by the transmitter of your station

At the station where many radio equipments are installed, when some transmitter transmits the radio wave, the receiver may catch the noise in spite of that the frequency is different. It is a rule that the receiver is muted by using -BK signal while transmitting. But when performing the simultaneous transmission and reception because of the duplex communication, it is important to separate transmitting antenna and receiving antenna as far as possible. Even though the antennas are located at same distance from the transmitting antenna, the receiving antenna located not in parallel to the transmitting antenna has less interference.

Generally, the interference depends on the difference between the receiving frequency and transmitting frequency. The bigger the difference is, the less the interference is. Also, the degree of the interference depends on the performance of the antenna multi-coupler, protective diode, etc.

**Checking procedure**

(1) Connect other antenna

Change the receiving antenna to other antenna placed at the position as far as possible from the transmitting antenna which interferes the receiver.

(2) When the antenna multi-coupler is used, connect the antenna directly to the receiver.

(3) When the arrester-diode is mounted in the antenna system, add the same diodes in series so as to increase the number of the diodes. (See paragraph 6.3.5.)

When the interference does not disappear even after checking with the above procedures, no countermeasure is effective. Thus, leave the record for the degree of interference, combination of the transmitting frequency and receiving frequency for future convenience, and avoid such a combination of frequencies with the strong interference. The receiver itself is designed so as to amplify enough even a signal of 1 $\mu$V, so that it can not be avoided that the some extent of interference occurs in the simultaneous transmission and reception when antenna installation places cannot be separated enough in the small ship, etc.

### 6.3.5 Intermodulation

While receiving some frequency, it sometimes happen to hear such several signal as cannot be radiated by that frequency. This phenomenon is caused by intermodulation.

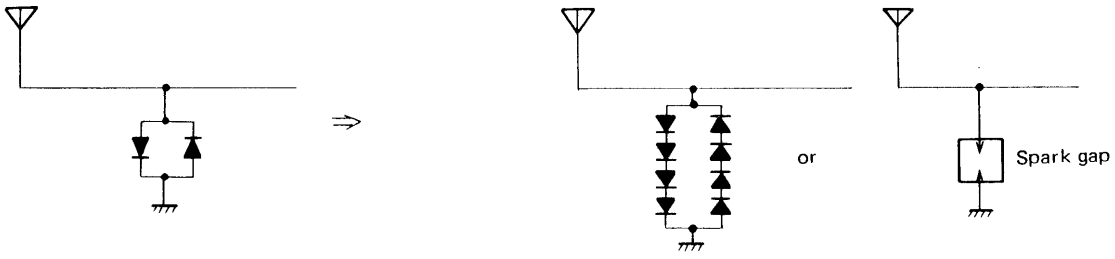
**Checking procedure**

(1) When the antenna multi-coupler is connected to the antenna for receiver, connect the antenna directly to the receiver.

If the above phenomenon disappears, it can be considered that the intermodulation arises at the antenna multi-coupler.

(2) When the phenomenon does not disappear even though the receiver is connected to the antenna directly, check whether arrester-diode is inserted on the way of the feeder line, or not. If inserted, remove that arrester-diode and then receive the signal (at this time, do not operate the transmitter).

If the phenomenon disappears by removing the arrester-diode, add arrester-diodes more or replace them with other type protecting element.



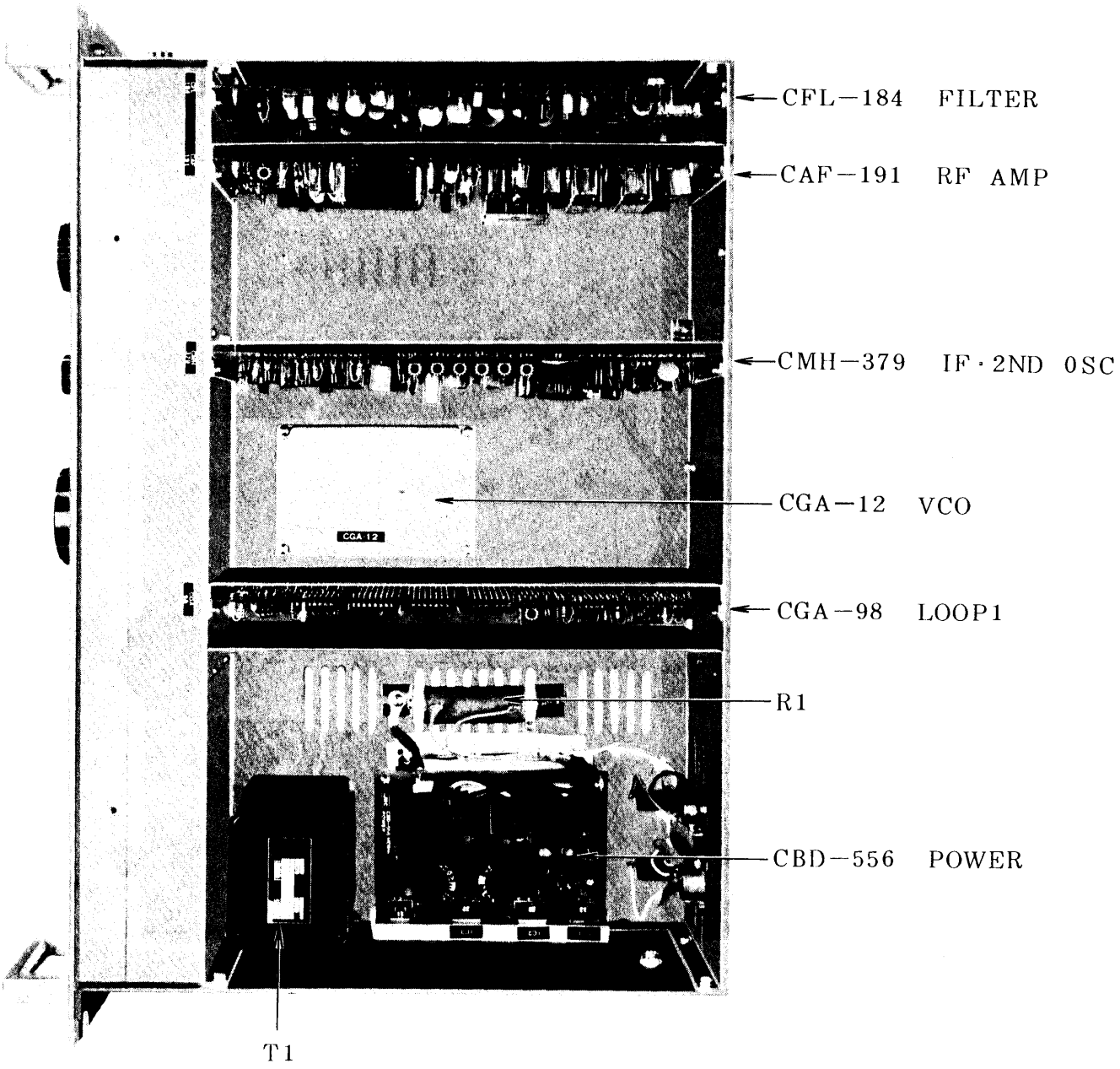

(3) When the phenomenon does not disappear even though the receiver is connected to the antenna directly and the arrester-diodes are removed, this is caused by the characteristics of the receiver. At first, remove the arrester-diodes CD22 to CD27 mounted on the input filter circuit (CFL-184). When the phenomenon does not disappear still now,

turn on the attenuator of the receiver.

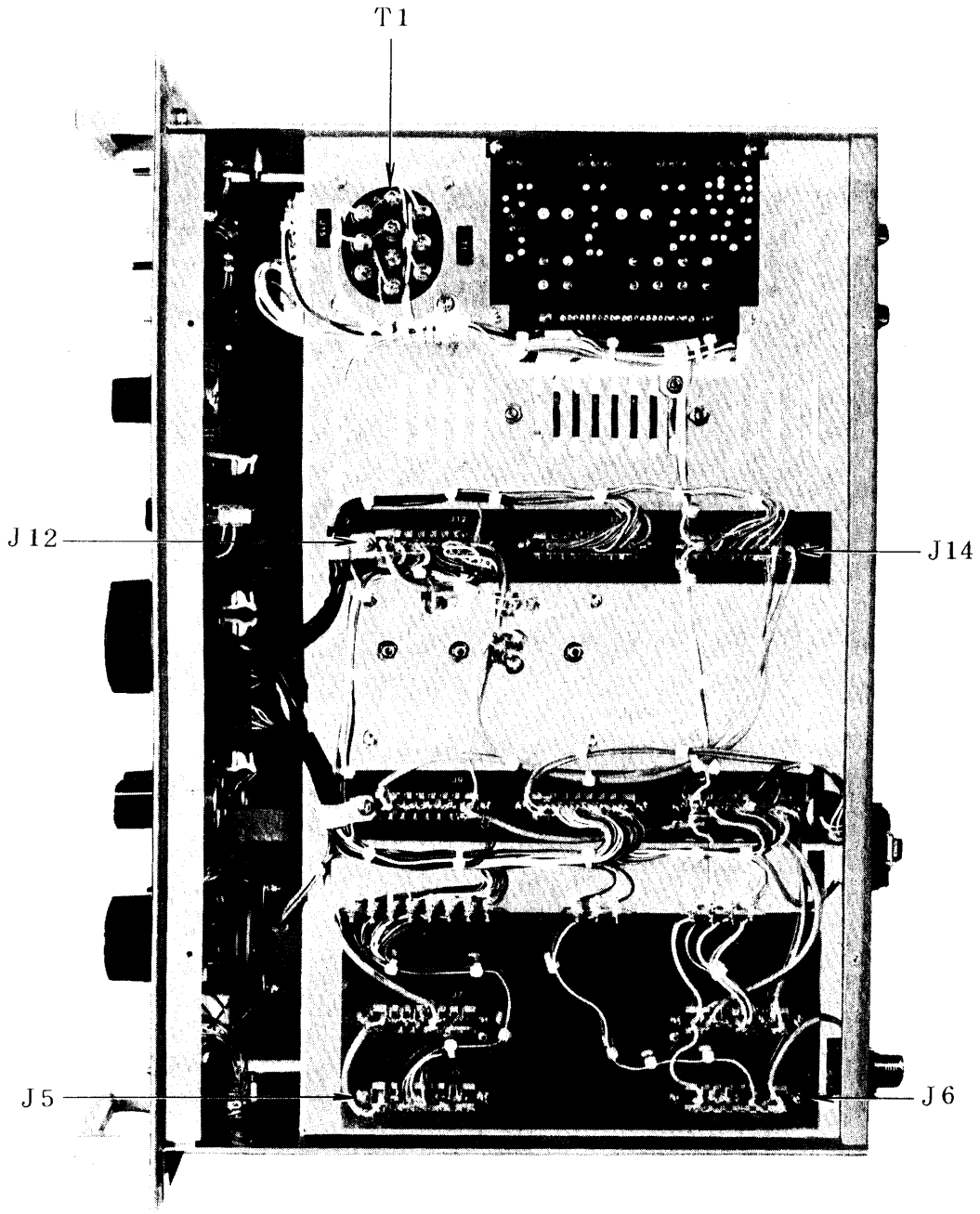
**Explanation**

Intermodulation

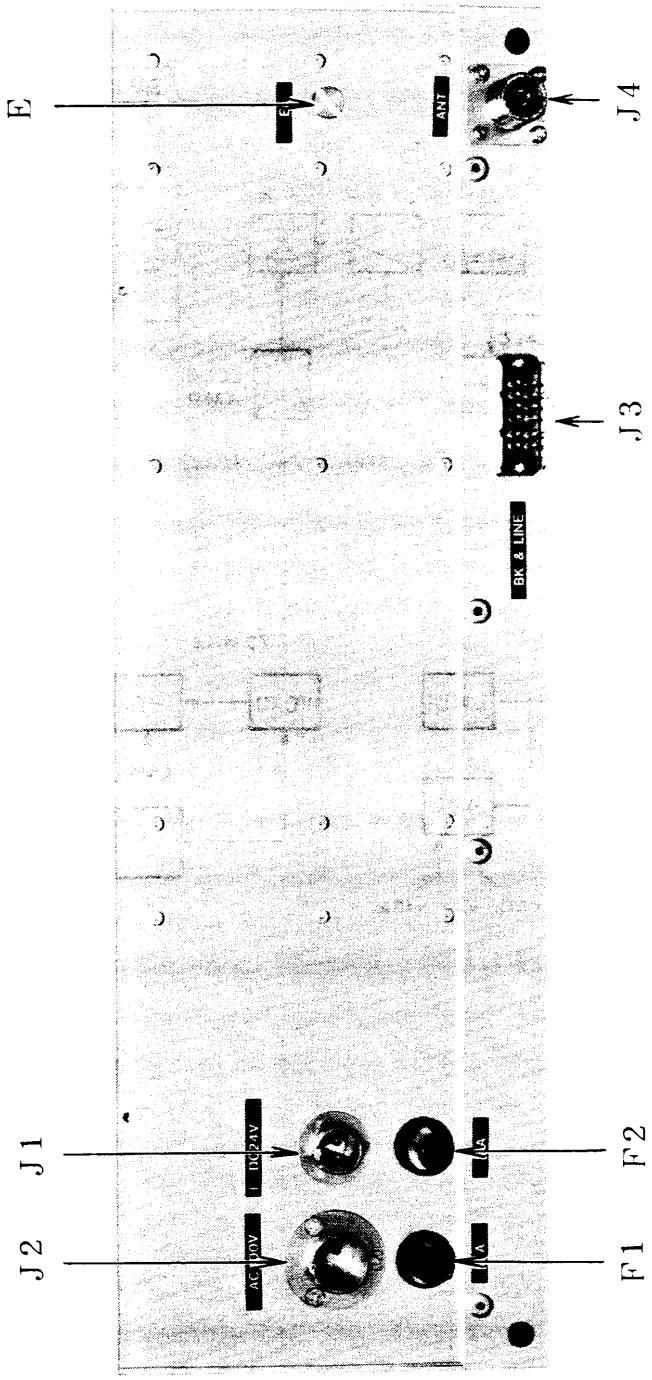
Some radio waves with different frequencies are frequency-converted due to the antenna multi-coupler, arrester-diodes and the non-linearity of amplifiers and mixers in the receiver. This frequency-converted radio wave equal to the receiving frequency and interferes the reception. This phenomenon is called intermodulation. For example, assuming that the receiving frequency $f_D$ is 3855 kHz, and other strong interference wave $fu_1$ is 3925 kHz, $f_D=2fu_1 - fu_2$. If $fu_2$, in which a relation of 3855 kHz=7850 kHz – $fu_2$ exists (in this case, 3995 kHz), is very strong, the mixed signal of 3925 kHz and 3995 kHz will be heard through the receiver which is set to 3855 kHz.



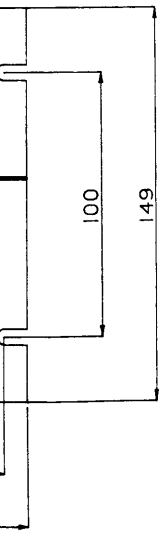

**TOP PARTS ARRANGEMENT**

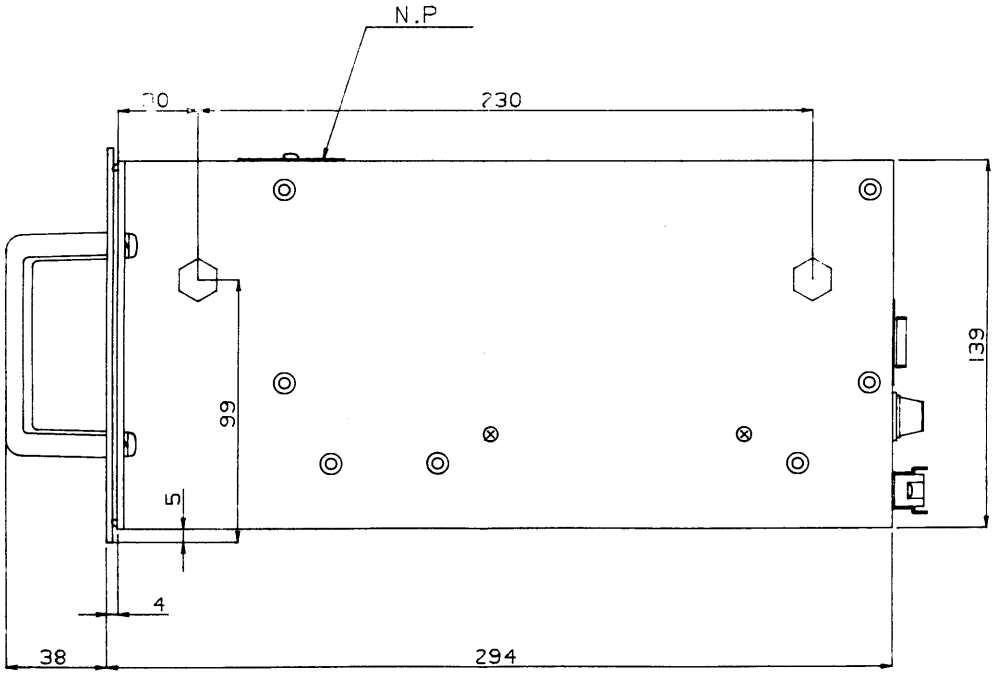



BOTTOM PARTS ARRANGEMENT




REAR PARTS ARRANGEMENT


WEIGHT 7 kg

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| 4 |
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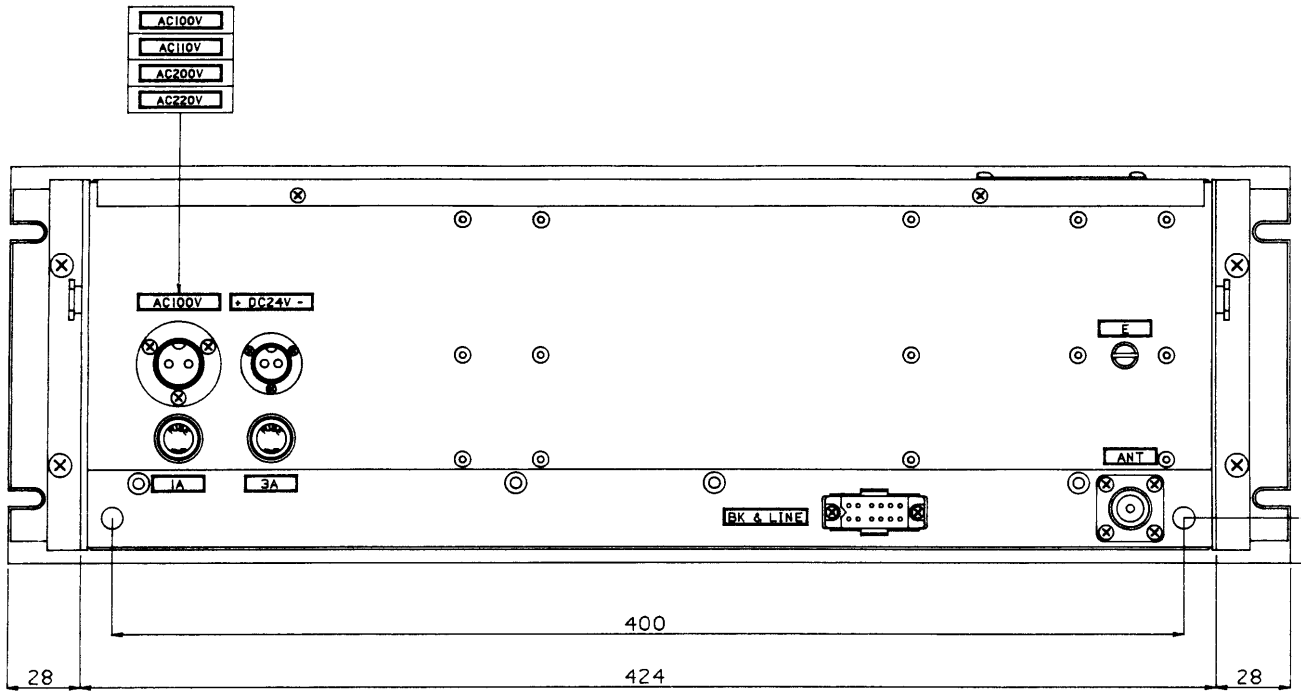
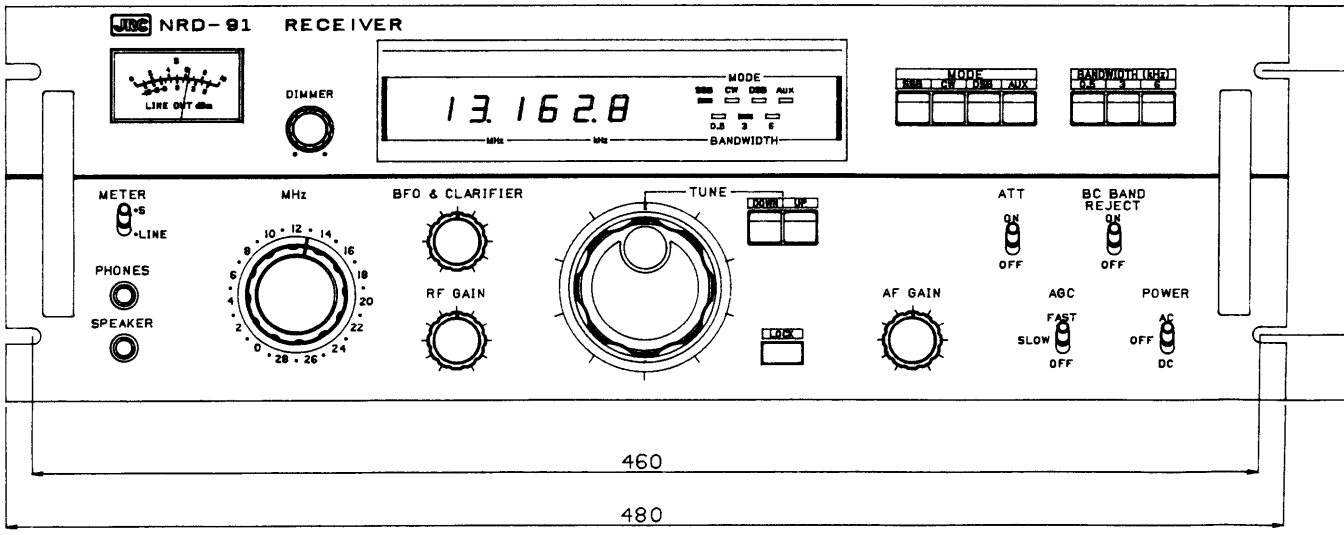
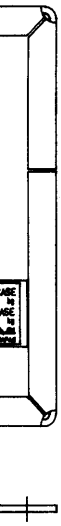
|---|---|---|---|---|
| | APPROVED H. Masuoka | DATE DEC. 1982 | NRD-91 RECEIVER OUTLINE DRAWING | SHEET NO. |
| CHECKED | DESIGNED DRAWN M. Tsuda | SCALE 1/2 | TITLE | |
| | | A2 | | DRAWING NO. CCNRD7151 |
| JRC Japan Radio Co., Ltd. | | | | |

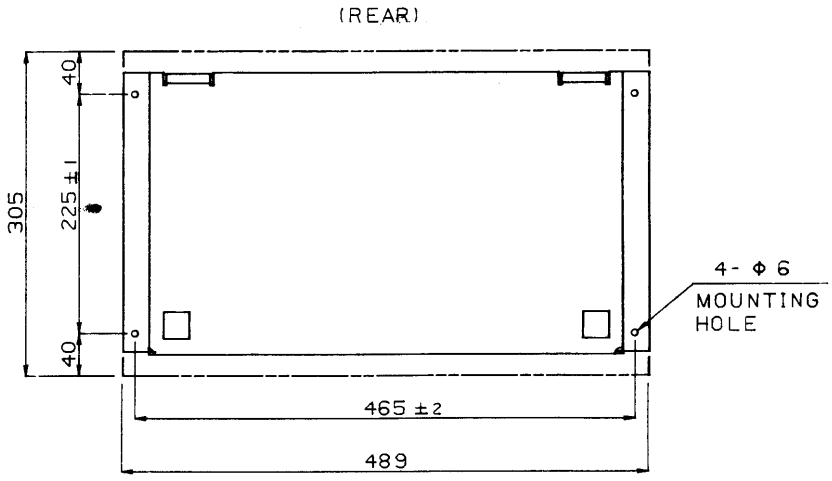



REAR VIEW

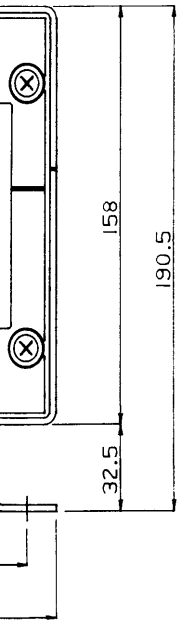


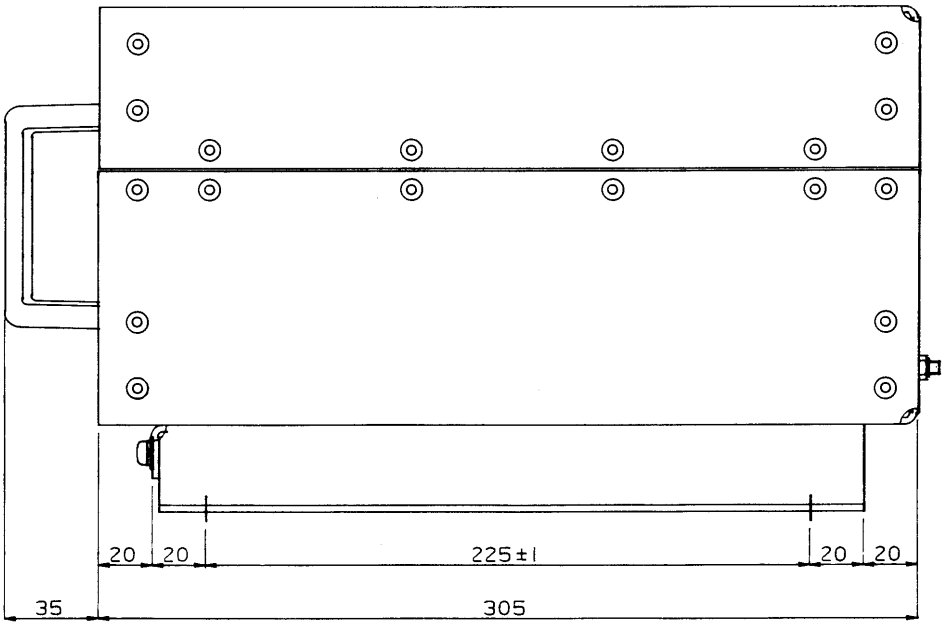

| UNLESS OTHERWISE SPECIFIED | | | | |
|---|---|---|---|---|
| DIMENSION | | SPECIFIED | | TOLERANCE |
| | 0 | TO | 16 | ± 1 |
| OVER | 16 | TO | 50 | ± 2 |
| OVER | 50 | TO | 250 | ± 4 |
| OVER | 250 | TO | 1000 | ± 8 |
| OVER | 1000 | TO | 3000 | ± 12 |






UNDER INSTALLATION

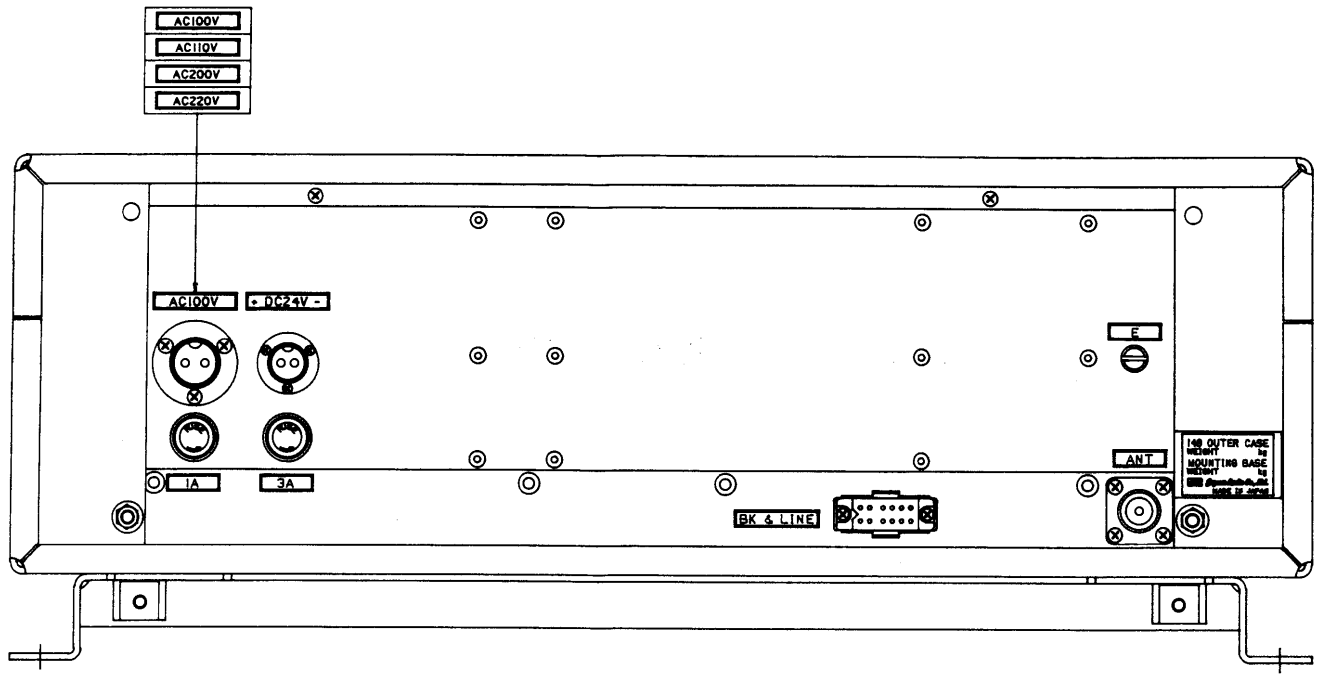


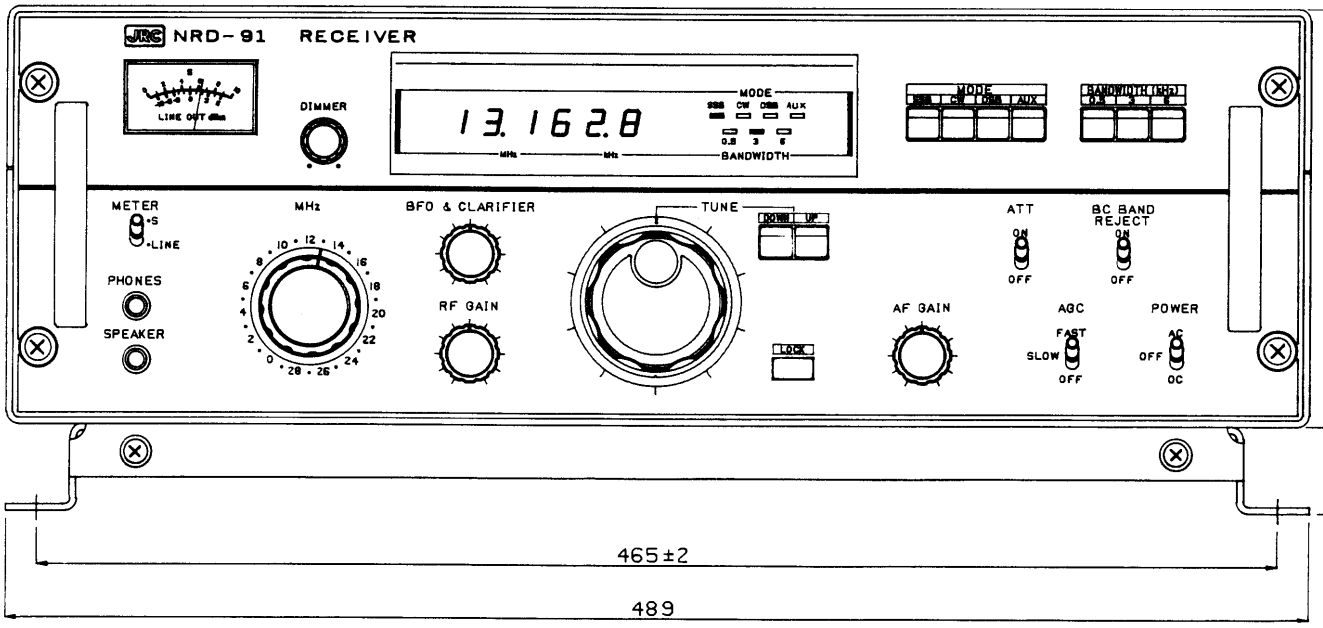

WEIGHT 11.5kg

| SPECIFIED TOLERANCE |
|---|
| ± 1 |
| ± 2 |
| ± 4 |
| ± 8 |
| ± 12 |

| | | | | |
|---|---|---|---|---|
| | APPROVED H Masuoka | DATE DEC.1982 | NRD-91 RECEIVER OUTLINE DRAWING | SHEET NO. |
| CHECKED | DESIGNED DRAWN M. Tsuda | SCALE 1/2 | | |
| | | A2 | | DRAWING NO. CCNRD7153 |
| JRC Japan Radio Co., Ltd. | | | | |

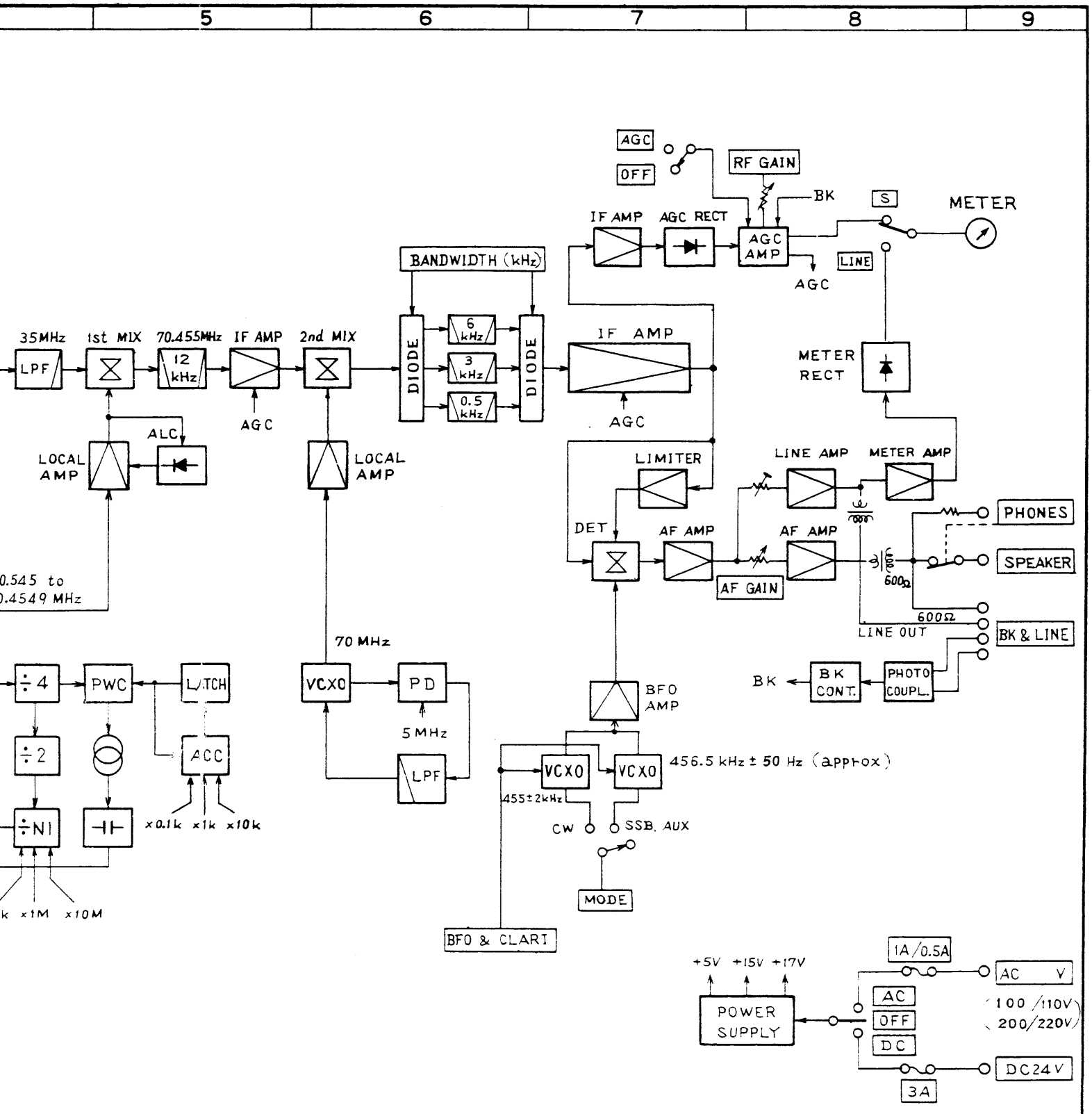



REAR VIEW




| UNLESS OTHERWISE SPECIFIED | | | | |
|---|---|---|---|---|
| DIMENSION | | SPECIFIED | | TOLERANCE |
| | 0 | TO | 16 | ± 1 |
| OVER | 16 | TO | 50 | ± 2 |
| OVER | 50 | TO | 250 | ± 4 |
| OVER | 250 | TO | 1000 | ± 8 |
| OVER | 1000 | TO | 3000 | ± 12 |

REVISIONS

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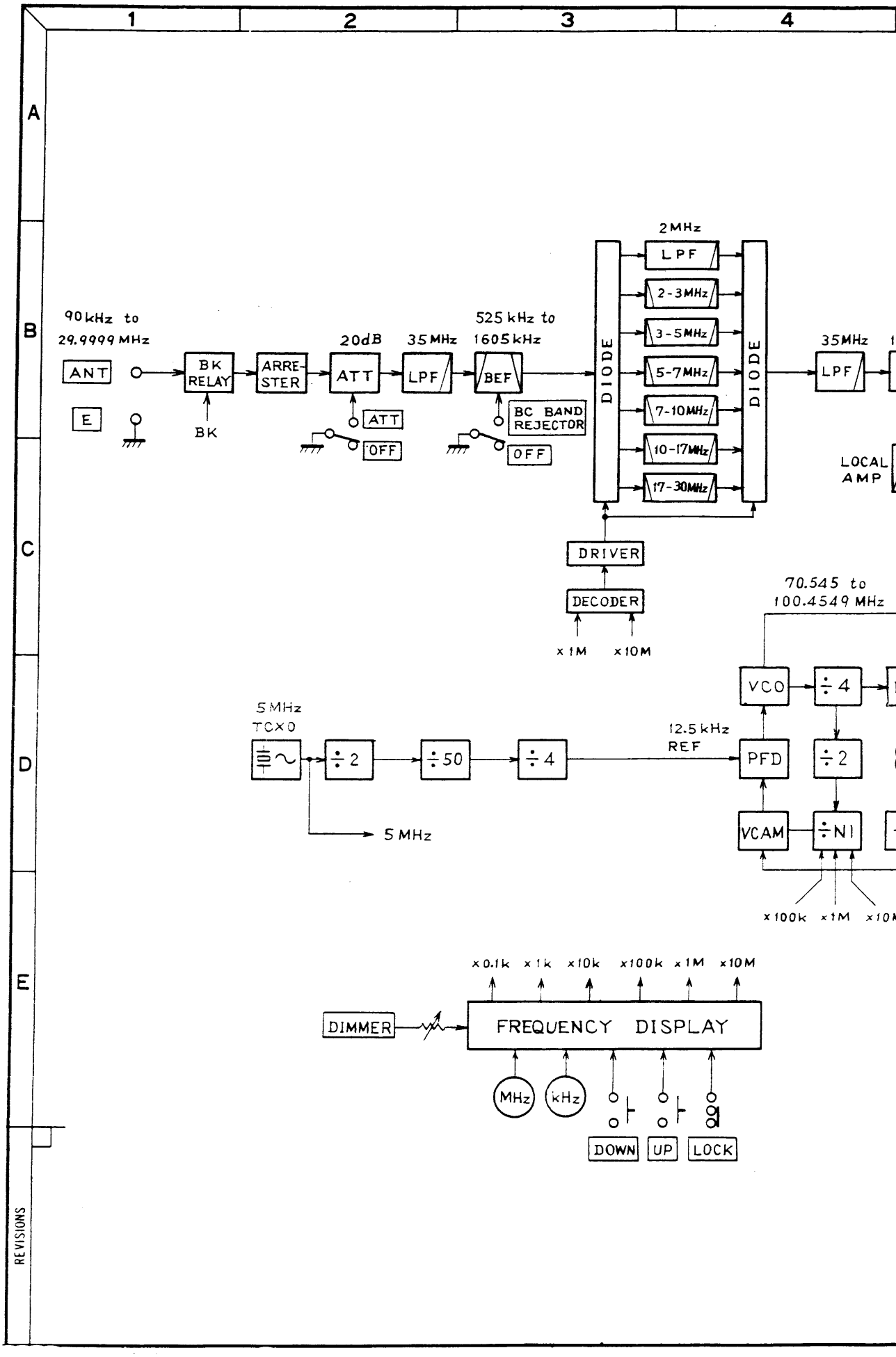
| JRC Japan Radio Co., Ltd. | | | | |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29.9999 MHz
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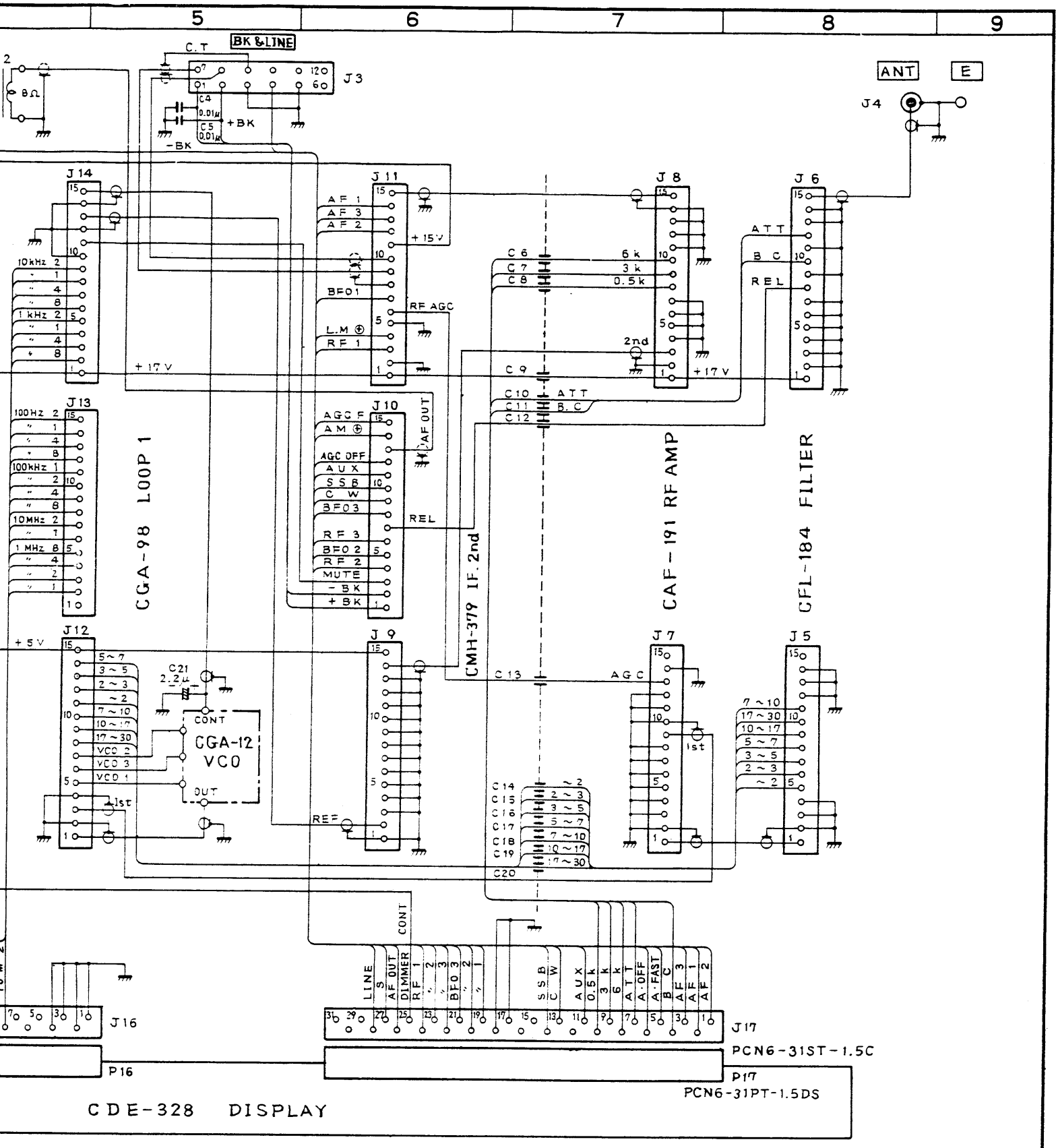
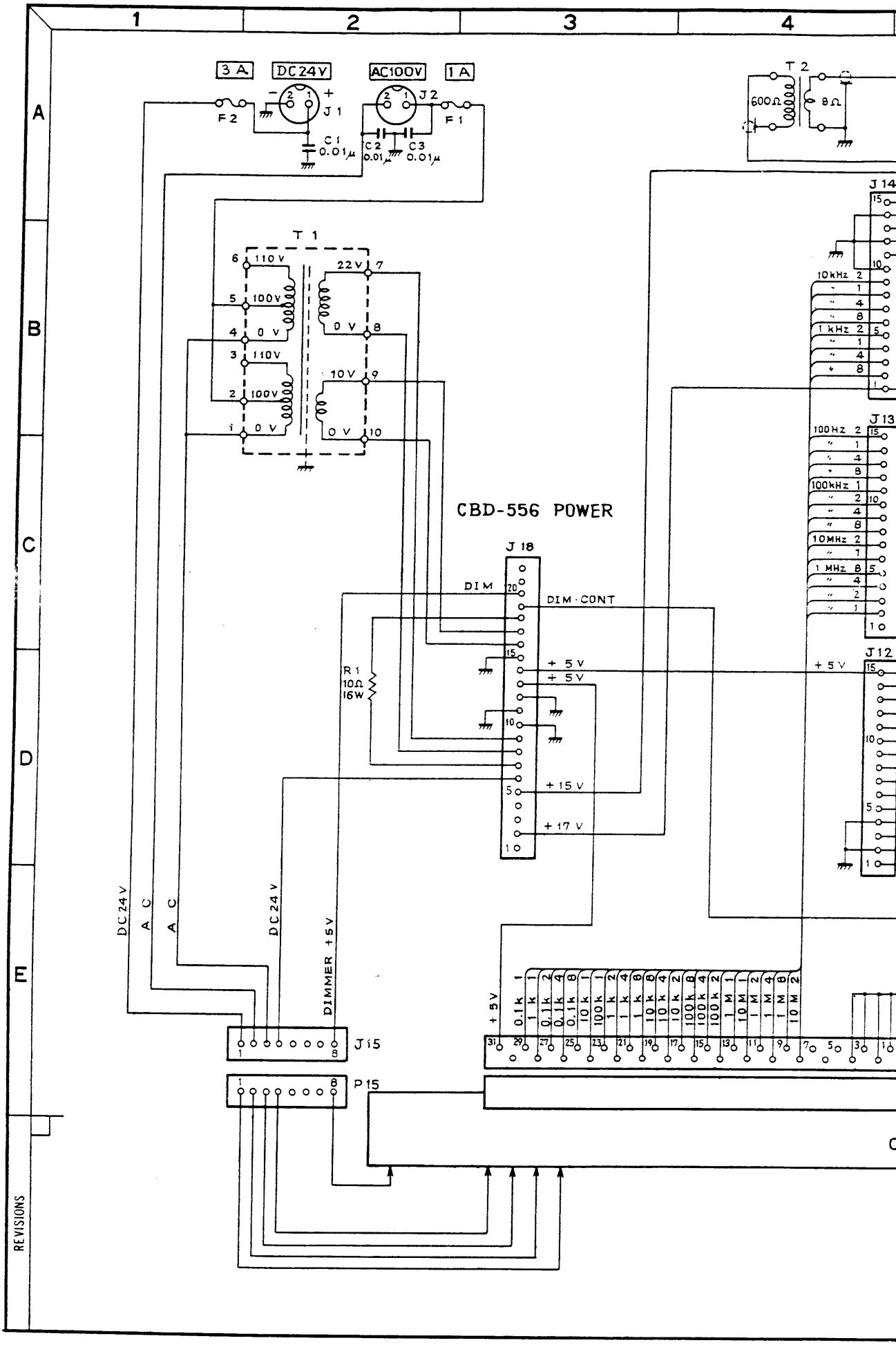
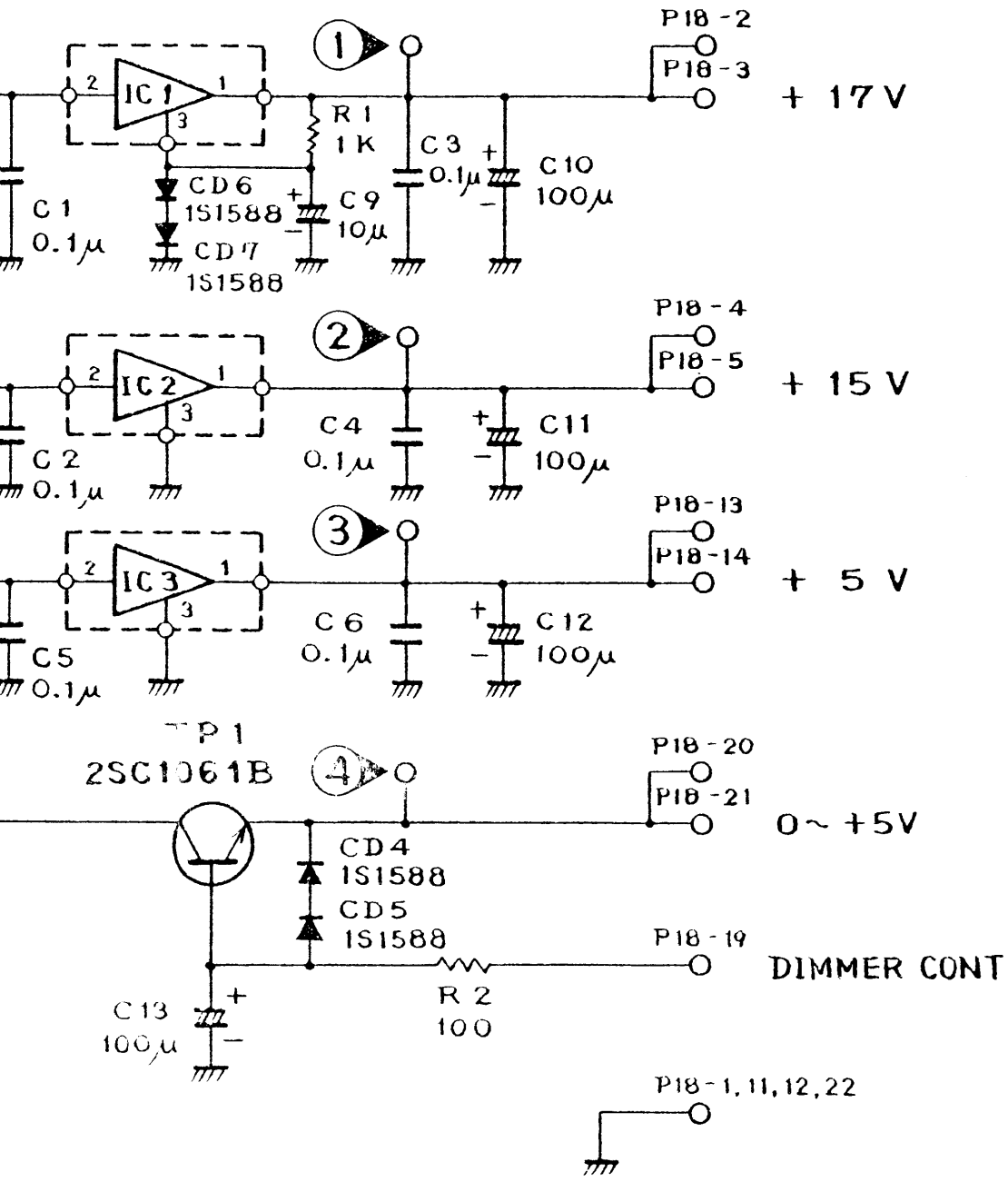
525 kHz to
1605kHz
BEF
BC BAND REJECTOR
OFF
DIODE
2MHz
LPF
2-3MHz
3-5MHz
5-7MHz
7-10MHz
10-17MHz
17-30MHz
DIODE
35MHz
LPF
LOCAL AMP
DRIVER
DECODER
x1M
x10M
70.545 to
100.4549 MHz
VCO
÷4
5MHz
TCXO
÷2
÷50
÷4
12.5kHz
REF
PFD
÷2
5MHz
VCAM
÷N1
x100k
x1M
x10M
x0.1k
x1k
x10k
x100k
x1M
x10M
DIMMER
FREQUENCY DISPLAY
MHz
kHz
DOWN
UP
LOCK




| | | | | |
|---|---|---|---|---|
| | APPROVED T. Ohiono | DATE | TITLE: SHASSIS CONNECTION DIAGRAM | SHEET NO. 1/7 |
| CHECKED Y. Chiba | DESIGNED DRAWN K. Koyama | SCALE A3 | DRAWING NO. DDOO-NRD-91 | |
| JRC Japan Radio Co., Ltd. | | | | |

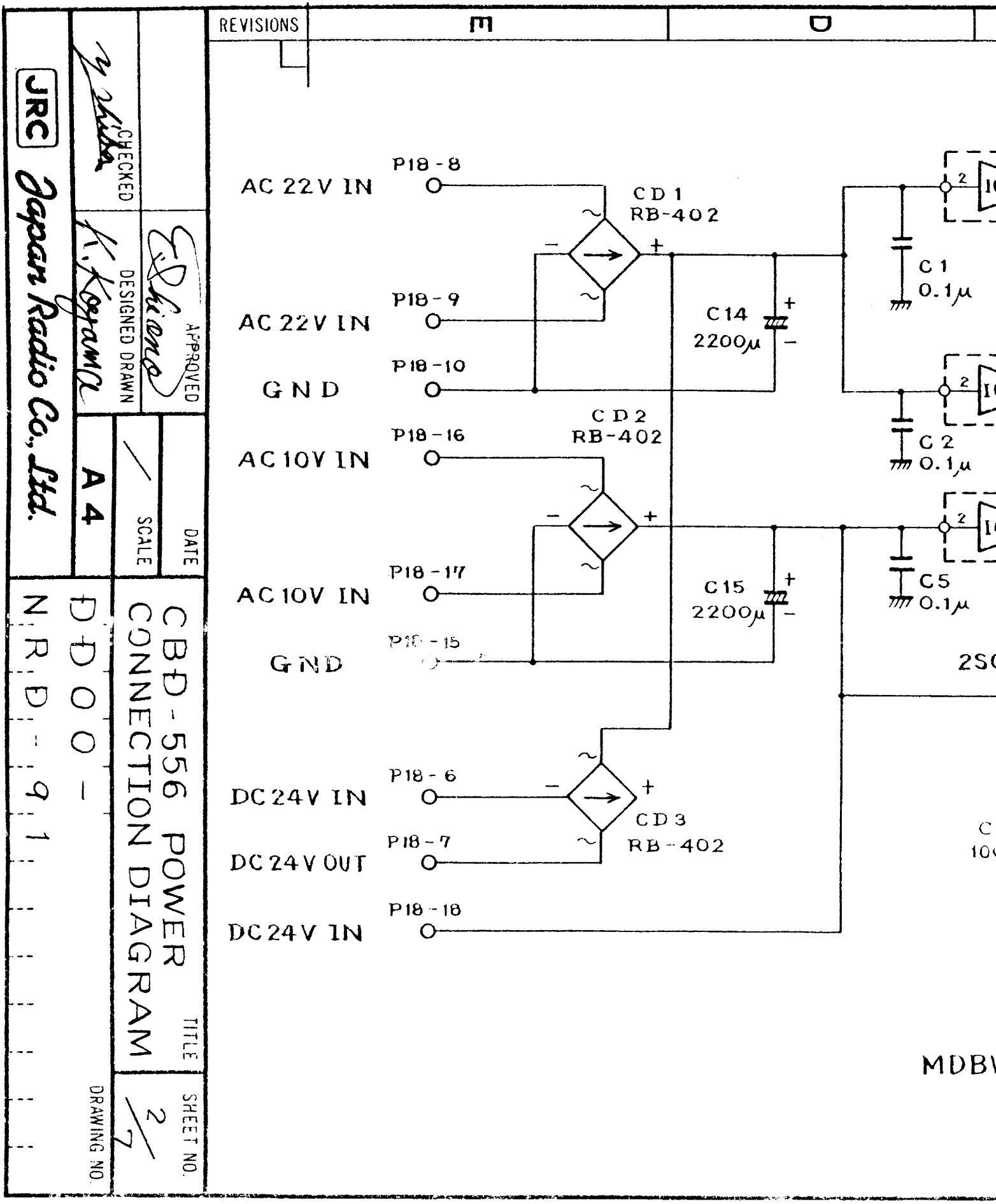

1
2
3
4
A
B
C
D
E
REVISIONS
3 A
DC24V
AC100V
1 A
J 1
J 2
F 2
F 1
C 1
0.01μ
C 2
0.01μ
C 3
0.01μ
T 1
6 110 V
5 100V
4 0 V
3 110V
2 100V
1 0 V
22V 7
0 V 8
10V 9
0 V 10
T 2
600Ω
8Ω
CBD-556 POWER
J 18
DIM
DIM·CONT
+ 5 V
+ 5 V
+ 15 V
+ 17 V
R 1
10Ω
16W
J 14
10kHz
1 kHz
J 13
100Hz
100kHz
10MHz
1 MHz
J 12
+ 5 V
DC 24 V
A C
A C
DC 24 V
DIMMER +5V
J 15
P 15
+ 5V
0.1k 1
1 k 1
0.1k 2
1 k 2
0.1k 4
1 k 4
0.1k 8
1 k 8
10k 1
10 k 1
100k 1
10 k 2
1 k 2
10 k 4
1 k 8
10 k 8
100k 2
100 k 2
10 k 4
100k 4
100 k 4
1 M 1
100 k 2
10 M 1
1 M 2
1 M 4
1 M 8
10 M 2

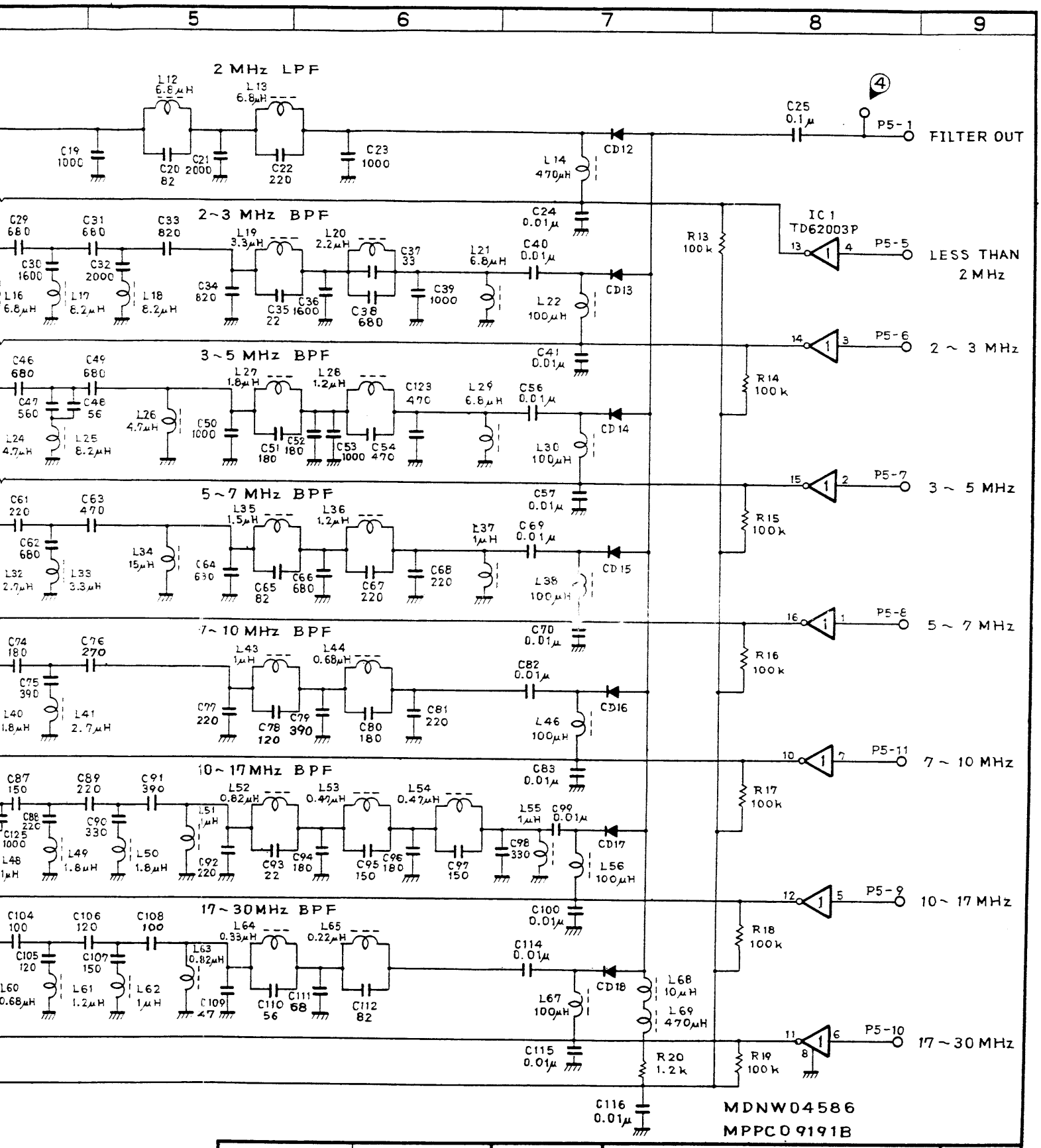



IC 1,2 SI-3152P

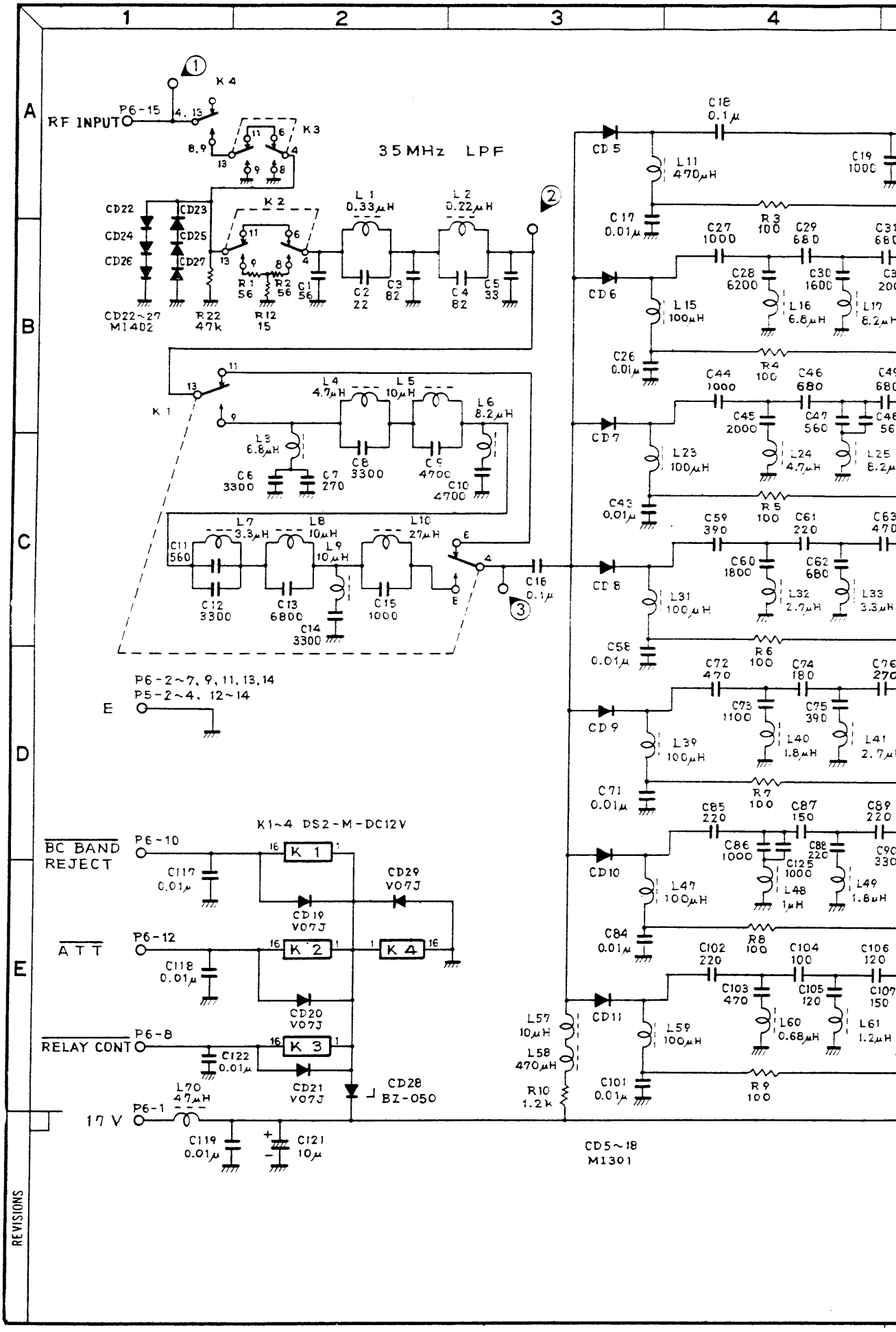
IC 3. SI-3052P

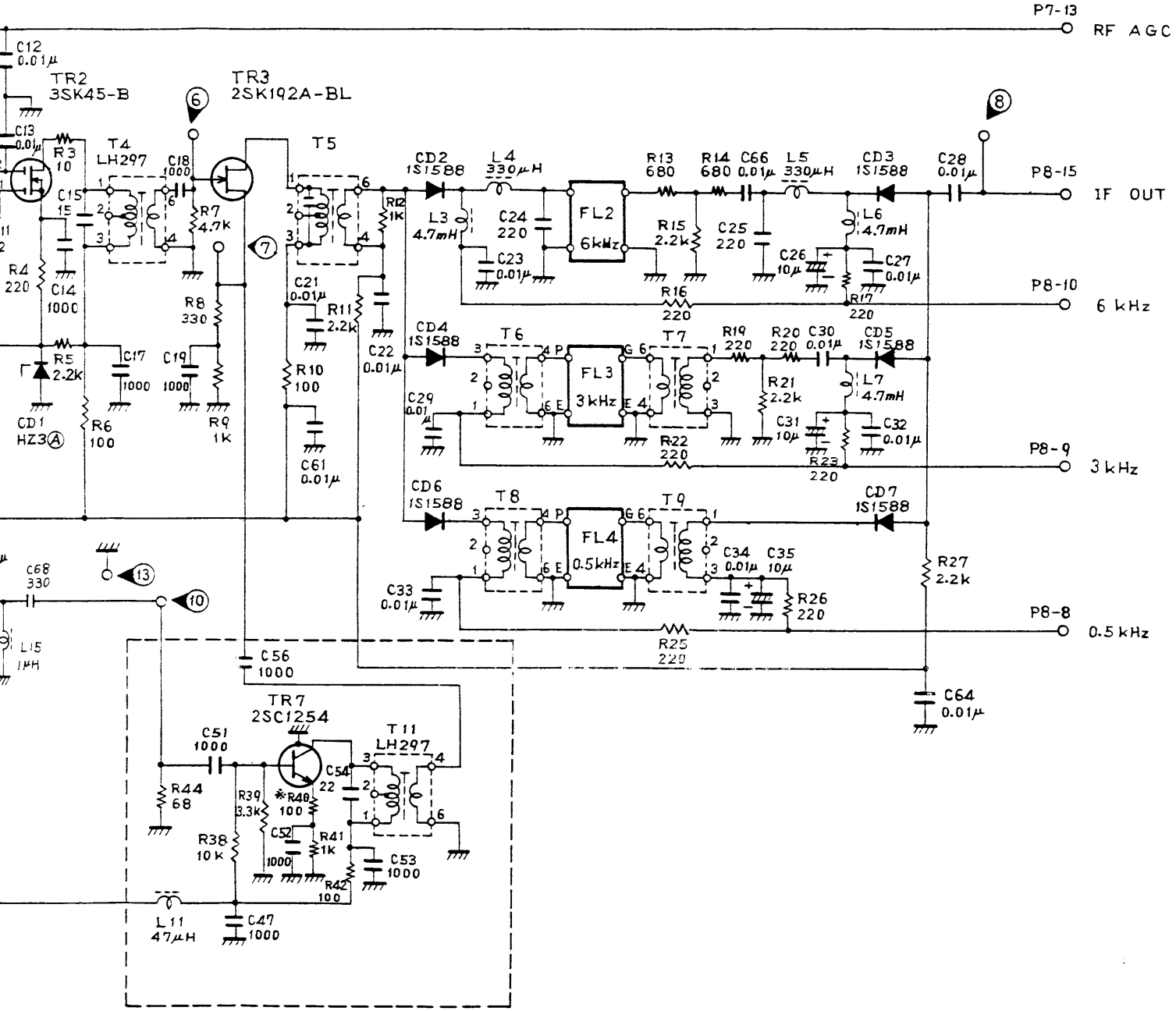
MDBW01181 MPPC09187A


REVISIONS
JRC
Japan Radio Co., Ltd.
CHECKED
DESIGNED DRAWN
APPROVED
A 4
SCALE
DATE
CBD-556 POWER CONNECTION DIAGRAM
TITLE
SHEET NO.
2/7
DRAWING NO.
CBDOO-NRD-91
P18-8
AC 22V IN
P18-9
AC 22V IN
P18-10
GND
CD1
RB-402
C14
2200μ
C1
0.1μ
C2
0.1μ
P18-16
AC 10V IN
P18-17
AC 10V IN
P18-15
GND
CD2
RB-402
C15
2200μ
C5
0.1μ
P18-6
DC 24V IN
P18-7
DC 24V OUT
P18-18
DC 24V IN
CD3
RB-402



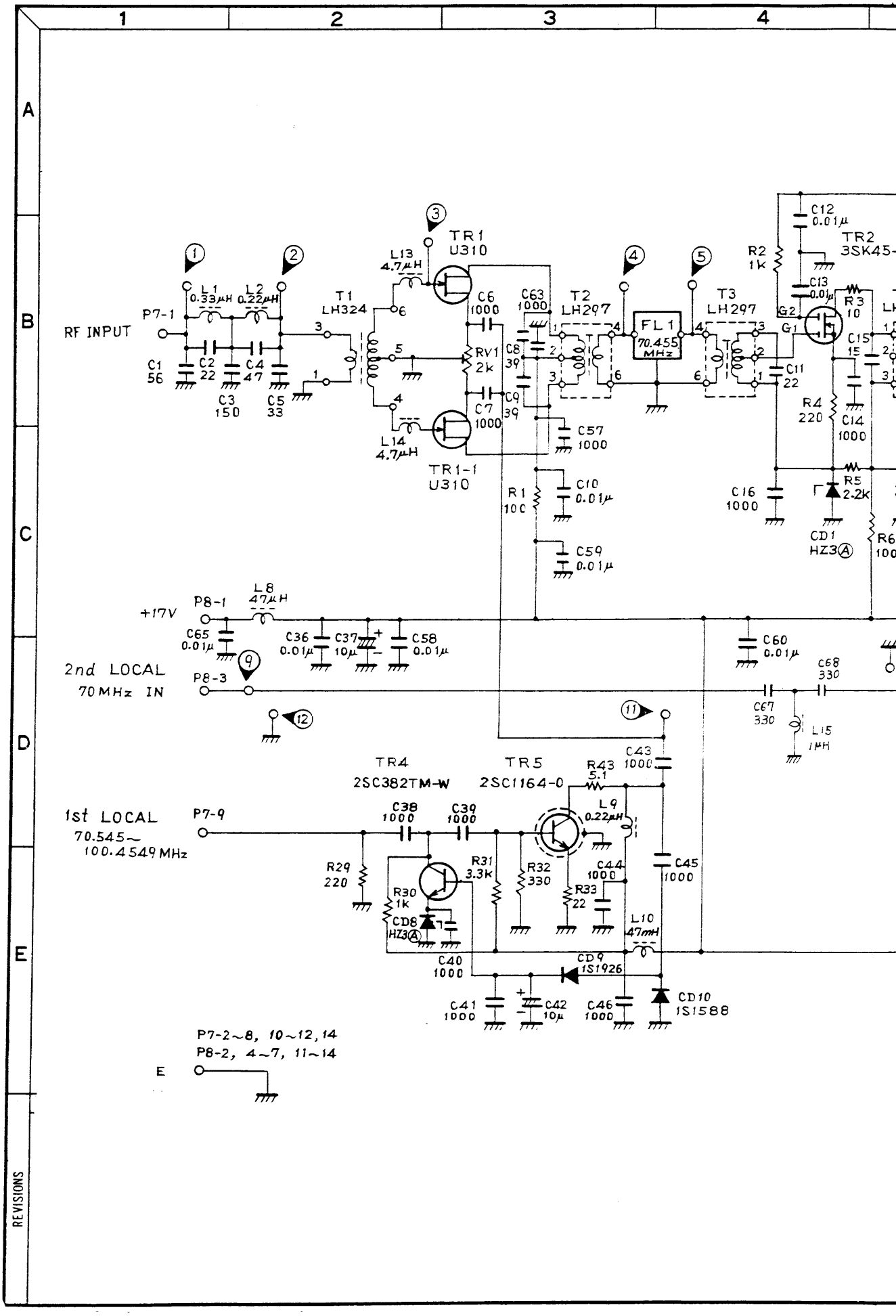

| | | | | |
|---|---|---|---|---|
| | APPROVED T. Shiono | DATE | TITLE: CFL-184 RF INPUT FIL CONNECTION DIAGRAM | SHEET NO. 3/7 |
| CHECKED Yokibori | DESIGNED DRAWN K. Koyama | SCALE / A3 | | DRAWING NO. ĐĐ0 0 - N R Đ - 9 1 |
| JRC Japan Radio Co., Ltd. | | | | |

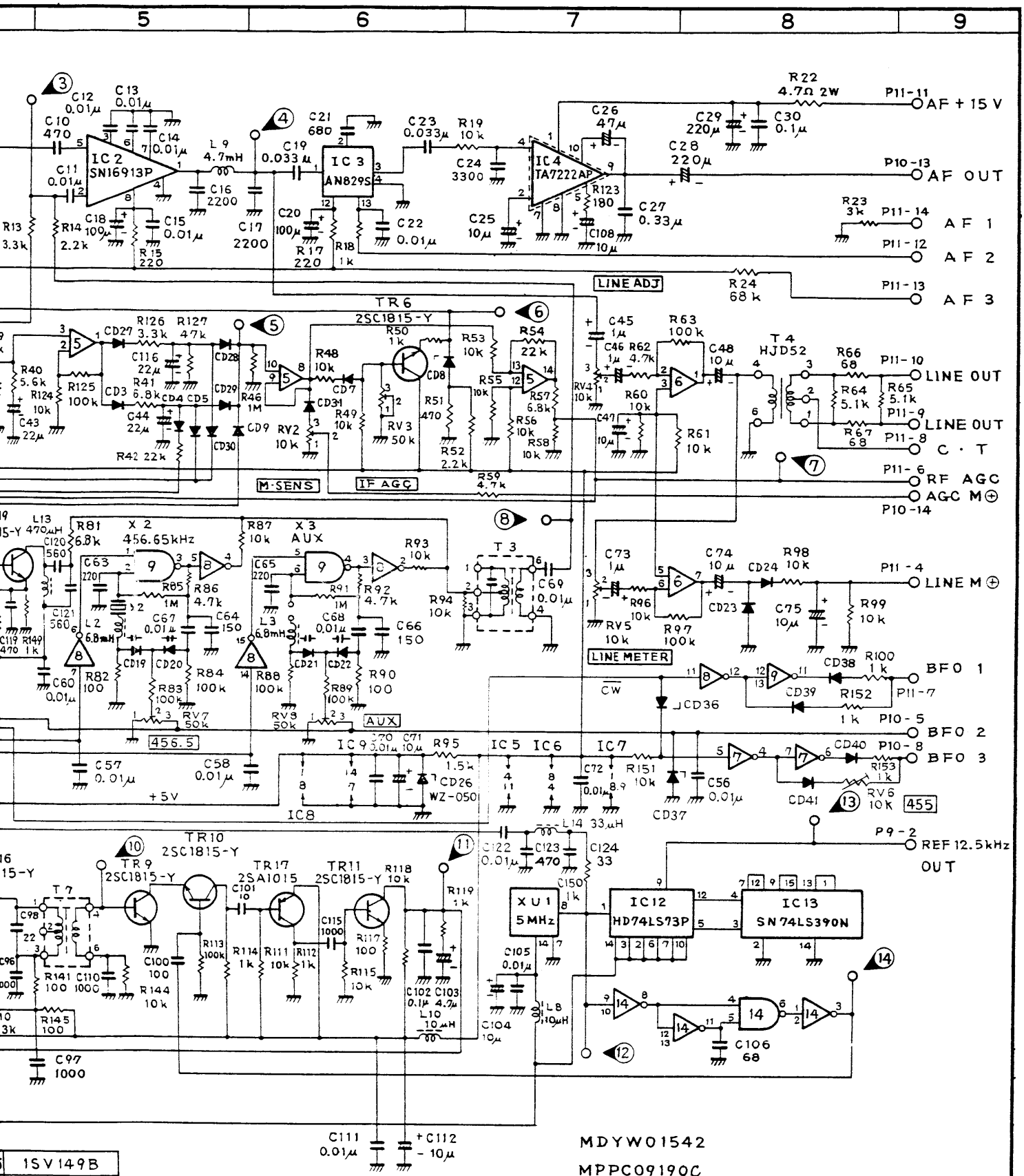

1
2
3
4
A
B
C
D
E
REVISIONS
RF INPUT
P6-15
K4
K3
K2
K1
35MHz LPF
CD22
CD23
CD24
CD25
CD26
CD27
CD22~27
M1402
R22
47k
R12
15
R1
56
R2
56
C1
56
L1
0.33μH
L2
0.22μH
C2
22
C3
82
C4
82
C5
33
L4
4.7μH
L5
10μH
L6
8.2μH
L3
6.8μH
C6
3300
C7
270
C8
3300
C9
4700
C10
4700
L7
3.3μH
L8
10μH
L9
10μH
L10
27μH
C11
560
C12
3300
C13
6800
C14
3300
C15
1000
C16
0.1μ
P6-2~7, 9, 11, 13, 14
P5-2~4, 12~14
E
K1~4 DS2-M-DC12V
BC BAND
REJECT
P6-10
C117
0.01μ
CD29
V07J
CD19
V07J
ATT
P6-12
C118
0.01μ
CD20
V07J
RELAY CONT
P6-8
C122
0.01μ
CD21
V07J
CD28
BZ-050
L70
47μH
P6-1
17 V
C119
0.01μ
C121
10μ
C18
0.1μ
CD5
L11
470μH
C17
0.01μ
R3
100
C27
1000
C29
680
C28
6200
C30
1600
CD6
L15
100μH
L16
6.8μH
C26
0.01μ
R4
100
C44
1000
C46
680
C45
2000
C47
560
CD7
L23
100μH
L24
4.7μH
C43
0.01μ
R5
100
C59
390
C61
220
C60
1800
C62
680
CD8
L31
100μH
L32
2.7μH
L33
3.3μH
C58
0.01μ
R6
100
C72
470
C74
180
C73
1100
C75
390
CD9
L39
100μH
L40
1.8μH
C71
0.01μ
R7
100
C85
220
C87
150
C89
220
C86
1000
C88
220
C125
1000
CD10
L47
100μH
L48
1μH
L49
1.8μH
C84
0.01μ
R8
100
C102
220
C104
100
C106
120
C103
470
C105
120
C107
150
CD11
L57
10μH
L58
470μH
L59
100μH
L60
0.68μH
L61
1.2μH
R10
1.2k
C101
0.01μ
R9
100
CD5~18
M1301




MDHW00611
MPPC 09 188B

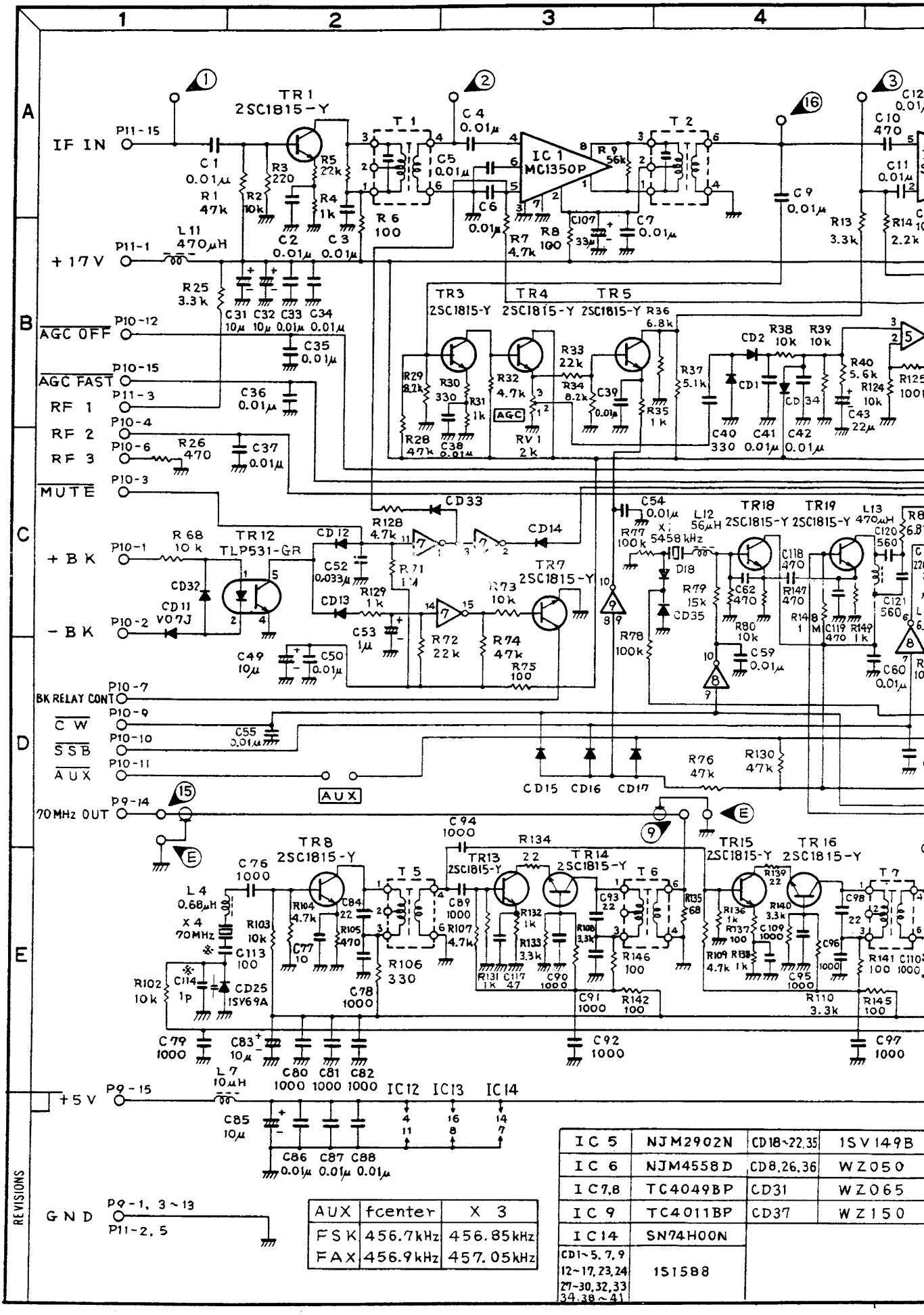
| | | | | |
|---|---|---|---|---|
| | APPROVED | DATE | TITLE: CAF-191 RF AMP CONNECTION DIAGRAM | SHEET NO. 4/7 |
| CHECKED | DESIGNED DRAWN: K. Koyama | SCALE: A3 | DRAWING NO. DD00-NRD-911 | |
| JRC Japan Radio Co., Ltd. | | | | |

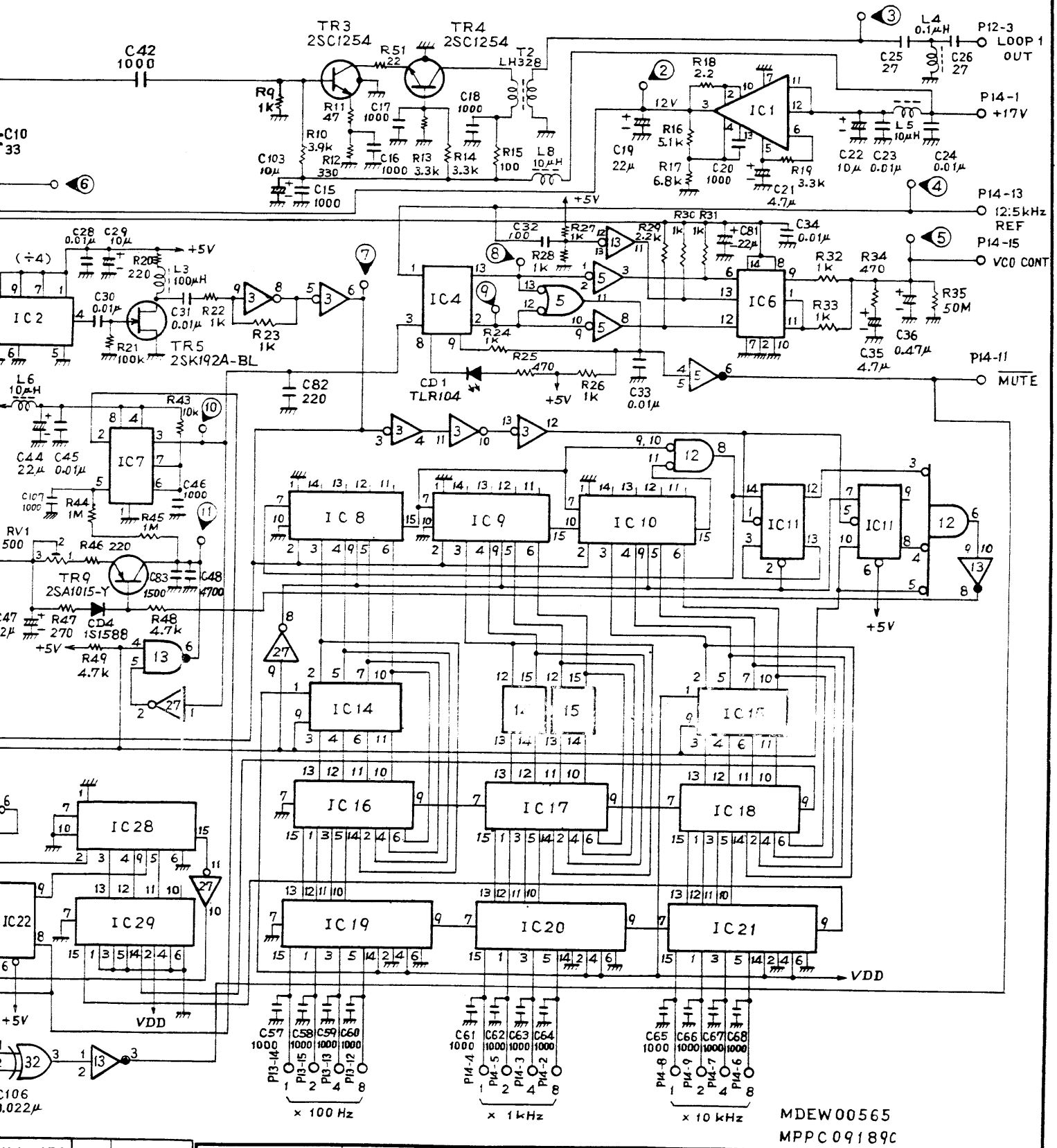

1
2
3
4
A
B
C
D
E
REVISIONS
RF INPUT
P7-1
L1 0.33μH
L2 0.22μH
C1 56
C2 22
C3 150
C4 47
C5 33
T1 LH324
L13 4.7μH
L14 4.7μH
TR1 U310
TR1-1 U310
C6 1000
C7 1000
RV1 2k
C8 39
C9 39
C63 1000
C57 1000
R1 100
C10 0.01μ
C59 0.01μ
T2 LH297
FL1 70.455 MHz
T3 LH297
C11 22
C12 0.01μ
C13 0.01μ
R2 1k
R3 10
R4 220
C14 1000
C15 15
C16 1000
R5 2.2k
CD1 HZ3A
TR2 3SK45-
G1
G2
+17V
P8-1
L8 47μH
C65 0.01μ
C36 0.01μ
C37 10μ
C58 0.01μ
C60 0.01μ
2nd LOCAL
70MHz IN
P8-3
C68 330
C67 330
L15 1μH
TR4 2SC382TM-W
TR5 2SC1164-0
R43 5.1
C43 1000
1st LOCAL
70.545~ 100.4549MHz
P7-9
C38 1000
C39 1000
L9 0.22μH
R29 220
R30 1k
R31 3.3k
R32 330
R33 22
C44 1000
C45 1000
CD8 HZ3A
L10 47mH
C40 1000
CD9 1S1926
C41 1000
C42 10μ
C46 1000
CD10 1S1588
P7-2~8, 10~12, 14
P8-2, 4~7, 11~14
E




| | |
|---|---|
| 5 | 1SV149B |
| 6 | WZ050 |
| | WZ065 |
| | WZ150 |

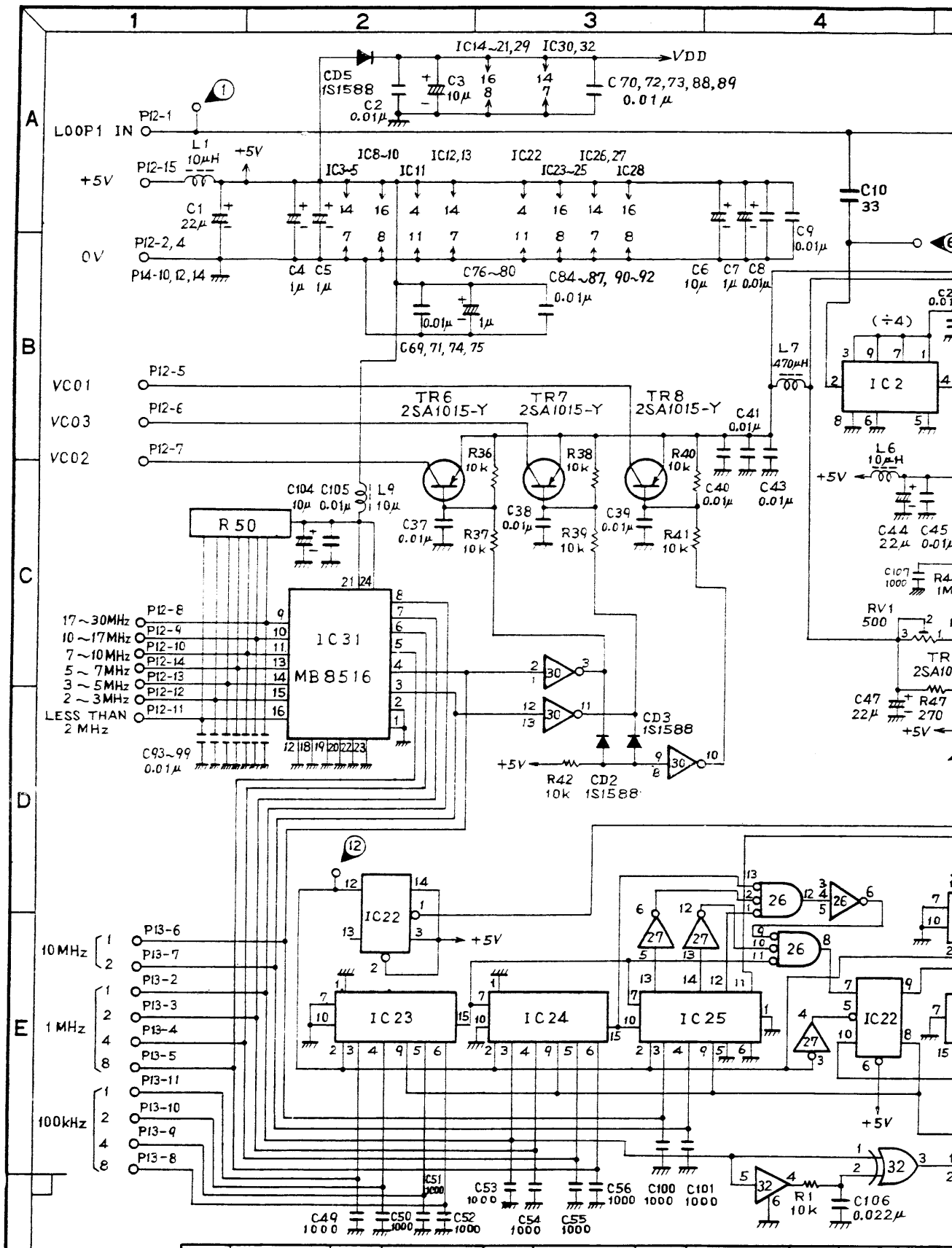
| | | | |
|---|---|---|---|
| | APPROVED | DATE | TITLE: CMH-379 IF, 2nd OSC CONNECTION DIAGRAM |
| | | SCALE | SHEET NO. 5/7 |
| CHECKED: Y. Ichiba | DESIGNED DRAWN: K. Koyama | A3 | DRAWING NO. ĐĐ00-NRĐ-91 |
| JRC Japan Radio Co., Ltd. | | | |


1
2
3
4
A
B
C
D
E
REVISIONS
IF IN
P11-15
+17V
P11-1
AGC OFF
P10-12
AGC FAST
P10-15
RF 1
P11-3
RF 2
P10-4
RF 3
P10-6
MUTE
P10-3
+BK
P10-1
-BK
P10-2
BK RELAY CONT
P10-7
CW
P10-9
SSB
P10-10
AUX
P10-11
70MHz OUT
P9-14
+5V
P9-15
GND
P9-1, 3~13
P11-2, 5
TR1 2SC1815-Y
IC1 MC1350P
TR3 TR4 TR5 2SC1815-Y
TR12 TLP531-GR
TR7 2SC1815-Y
TR8 2SC1815-Y
TR13 2SC1815-Y
TR14 2SC1815-Y
TR15 2SC1815-Y
TR16 2SC1815-Y
TR18 2SC1815-Y
TR19 2SC1815-Y
T1
T2
T5
T6
T7
RV1 2k
X1 5458kHz
X4 70MHz
L4 0.68μH
L7 10μH
L11 470μH
L12 56μH
L13 470μH
CD11 V07J
CD25 1SV69A
CD35
IC12
IC13
IC14
AUX
fcenter
X 3
FSK 456.7kHz 456.85kHz
FAX 456.9kHz 457.05kHz
IC 5 NJM2902N CD18~22,35 1SV149B
IC 6 NJM4558D CD8,26,36 WZ050
IC 7,8 TC4049BP CD31 WZ065
IC 9 TC4011BP CD37 WZ150
IC14 SN74H00N
CD1~5, 7, 9 12~17, 23, 24 27~30, 32, 33 34, 38~41 1S1588

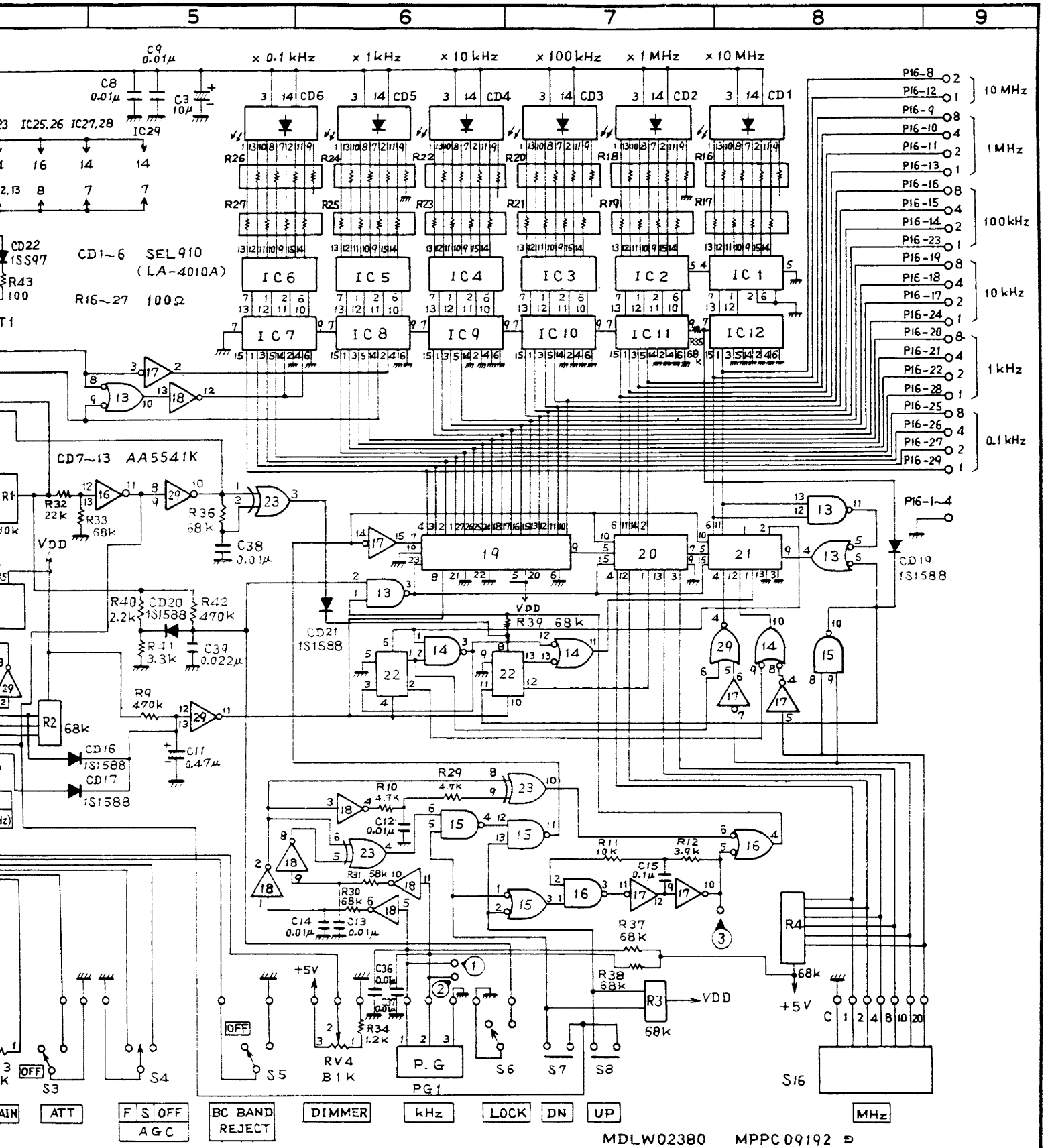


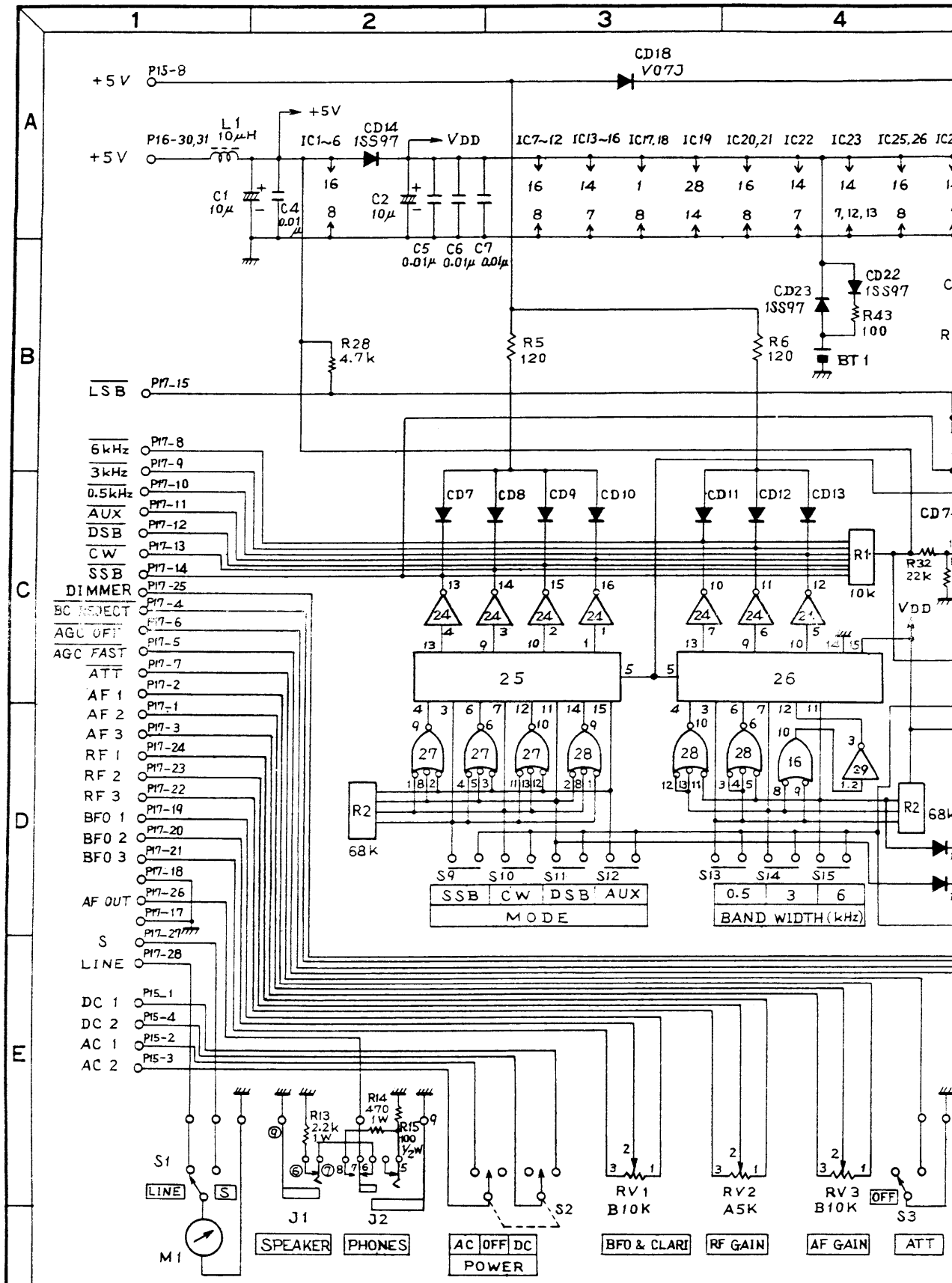

| | |
|---|---|
| 4LS168PC | IC32 TC4030BP |
| D74LS27P | |
| D74LS04P | |
| 4LS168AN | |
| C4560BP | |
| C5029BP | |

| | | | |
|---|---|---|---|
| | APPROVED | DATE | TITLE: CGA-98 LOOP 1 CONNECTION DIAGRAM |
| CHECKED: Yohida | DESIGNED DRAWN: K.Koyama | SCALE: / | SHEET NO.: 6/7 |
| JRC Japan Radio Co., Ltd. | | A3 | DRAWING NO.: ĐĐ00-NRD-91 |

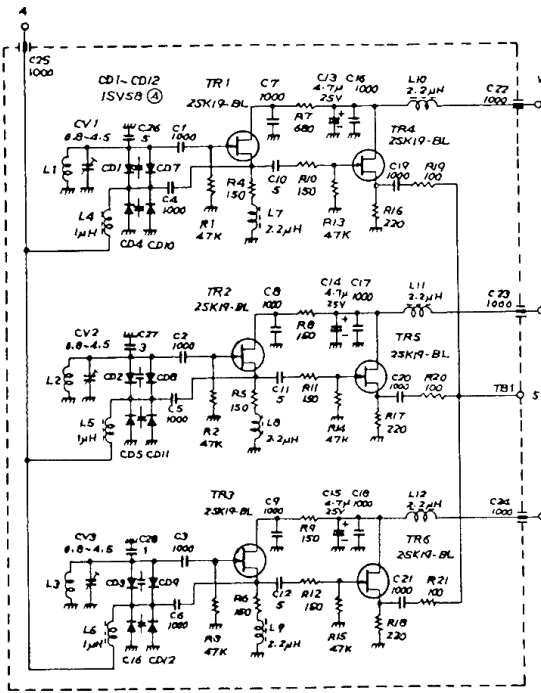



| IC 1 | HA17723G | IC 7 | HA17555PS | IC 13 | HD74LS26P | IC 19 | TC4560BP | IC 25 | 74LS168PC | IC |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | TD6102P | 8 | 74LS168AN | 14 | TC40174BP | 20 | 〃 | 26 | HD74LS27P | |
| 3 | HD74LS04P | 9 | 〃 | 15 | 〃 | 21 | 〃 | 27 | HD74LS04P | |
| 4 | MC4044P | 10 | 〃 | 16 | TC4560BP | 22 | HD74LS73P | 28 | 74LS168AN | |
| 5 | HD74LS26P | 11 | HD74LS73P | 17 | 〃 | 23 | 74LS168AN | 29 | TC4560BP | |
| 6 | TC4016BP | 12 | HD74LS27P | 18 | 〃 | 24 | 〃 | 30 | TC5029BP | |


5
6
7
8
9
C9 0.01μ
C8 0.01μ
C3 10μ
IC29
IC25,26 IC27,28
CD22 1SS97
R43 100
T1
CD1~6 SEL910 (LA-4010A)
R16~27 100Ω
× 0.1 kHz
× 1 kHz
× 10 kHz
× 100 kHz
× 1 MHz
× 10 MHz
CD6
CD5
CD4
CD3
CD2
CD1
R26
R24
R22
R20
R18
R16
R27
R25
R23
R21
R19
R17
IC6
IC5
IC4
IC3
IC2
IC1
IC7
IC8
IC9
IC10
IC11
IC12
R35 68K
P16-8
P16-12
10 MHz
P16-9
P16-10
P16-11
P16-13
1 MHz
P16-16
P16-15
P16-14
P16-23
100 kHz
P16-19
P16-18
P16-17
P16-24
10 kHz
P16-20
P16-21
P16-22
P16-28
1 kHz
P16-25
P16-26
P16-27
P16-29
0.1 kHz
CD7~13 AA5541K
R32 22k
R33 68k
R36 68k
C38 0.01μ
VDD
P16-1~4
CD19 1S1588
R40 2.2k
CD20 1S1588
R42 470k
R41 3.3k
C39 0.022μ
CD21 1S1588
R39 68k
R9 470k
R2 68k
CD16 1S1588
CD17 1S1588
C11 0.47μ
R29 4.7k
R10 4.7k
C12 0.01μ
R31 68k
R30 68k
C14 0.01μ
C13 0.01μ
R11 10k
R12 3.9k
C15 0.1μ
R37 68k
R38 68k
R3 68k
R4 68k
C36 0.01μ
C37 0.01μ
R34 1.2k
RV4 B1K
P.G
PG1
+5V
VDD
OFF
S3
S4
S5
S6
S7
S8
S16
C 1 2 4 8 10 20
AIN
ATT
F S OFF
AGC
BC BAND REJECT
DIMMER
kHz
LOCK
DN
UP
MHz
MDLW02380 MPPC09192 Đ
APPROVED
CHECKED
DESIGNED DRAWN
K. Koyama
DATE
SCALE
A3
CĐE-328 ĐISPLAY CONNECTION DIAGRAM
TITLE
SHEET NO. 7/7
DRAWING NO.
ĐĐ00-
N.R.Đ.-91
JRC Japan Radio Co.,Ltd.




| | | | | | |
|---|---|---|---|---|---|
| IC1~6 | HD74LS47P | IC20,21 | TC4510BP | IC27,28 | TC4073BP |
| IC7~12 | TC4560BP | IC22 | TC4013BP | IC29 | TC4001BP |
| IC13~16 | TC4011BP | IC23 | TC4030BP | | |
| IC17,18 | TC4049BP | IC24 | TD62003P | | |
| IC19 | TC5010P | IC25,26 | TC4044BP | | |




注) 特記a外の抵抗は全てΩ および1/4Wを示し
容量はPFを示す。

MDEW00216
MPPC04995A
(MS-RA293)

| 改訂 | 検認 | 検図 | 設計・製図 | 尺度 | 名称 | 図番 | 頁数 |
|---|---|---|---|---|---|---|---|
| | | | | | CGA-12 | | 15/15 |
| | | | | | VCO回路接続図 | | |
| | | | | A4 | DD00- | | |
| JRC 日本無線株式會社 | | | | | NRD-75 | | |