INSTRUCTION MANUAL
FOR
MODEL NRD-505 ALL WAVE RECEIVER

JRC

Japan Radio Co., Ltd.

Forword

The Model NRD-505 receiver is the highest-class all-wave receiver, which has been designed with full application of the latest solid-state elements and digital circuit design technology concepts, based on the JRC's long-year technical achievements and experiences.

You are recommended to carefully read this technical instruction manual before operation of this receiver and to properly use it.

This all-wave receiver has been manufactured under a rigorous quality control in the factory, however, if you should find any questionable or defective point in the receiver, immediately contact the sales store, where you bought or JRC Sales and Service Office.

NOTE: Specifications subject change without notice.

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SECTION 1

SPECIFICATIONS

1.1 Frequency Range for Reception

100kHz to 30MHz, continuously variable.

30 bands, each of 1MHz wide, selected by band selector switch.

1.2 Modes of Operation

AM, SSB (USB and LSB), CW, and RTTY.

1.3 Conversion system

Use up-convertion and double-superheterodyne system; first IF stage in 70.455MHz and second IF stage in 455 kHz.

1.4 Sensitivity at S/N of 10dB

	MODE	
	SSB, CW	AM
SENSITIVITY	less than 0.5μV	2μV
	in range of 1.6 to 30MHz.	
	less than 10μV	40μV
	in range of 100 to 1600kHz.	

1.5 Selectivity

MODE	BANDWIDTH of	
	6dB DOWN	60dB DOWN
AM(W)	4.4 to 7.0kHz	Less than 10kHz
SSB, CW(W), AM(N), RTTY	2 to 2.6kHz	Less than 6kHz
CW*(N)	0.5 to 1.0kHz	Less than 3kHz

NOTE: Filter for CW*(N) is available at your option.

1.6 Image Suppression

More than 70dB.

1.7 IF Interference Suppression

More than 70dB.

1.8 Frequency Stability

Less than 100Hz in frequency change per hour after warm-up.

1.9 Antenna Input Impedance

50 to 75 ohms, unbalanced.

1.10 AF Output Power

Speaker output: More than 1W; Distortion of less than 10%, impedance of 4 to 8 ohms.

Line and Record outputs: More than 1mW; distortion of less than 3%, impedance of 600 ohms; head phone output impedance of 4 to 8 ohms.

1.11 IF Output

Level: More than 50mV at antenna input level of 3 microvolts.

Frequency: 455kHz.

Impedance: 75 ohms.

1.12 Antenna Input Attenuator

Attenuation: 20dB, approx.

1.13 ΔF Control

Variable Range: In excess of $\pm$2.5kHz

1.14 BFO Control

Variable Range: In excess of $\pm$2.5kHz at CW reception

1.15 Automatic Gain Control

AF Output Change: Less than 10dB to antenna input voltage change of 3 microvolts to 100 milli-volts.

1.16 VFO Output

Voltage: In excess of 0.2 volts.

Impedance: 75 ohms.

Frequency: 2.455 to 3.455MHz.

1.17 VFO Input

Voltage: In excess of 0.2 volts.

Impedance: 75 ohms.

Frequency: 2.455 to 3.455MHz.

1.18 Power Requirements

Line Voltage: 100/115/200/230V AC; 50/60Hz.

Power Consumption: 50VA, approx.

1.19 Dimentions

340(W) × 140(H) × 300(D)mm.

1.20 Weight

10kg, approx.

1.21 Semiconductor Circuit Elements

ICs	66 ea.
FETs	19 ea.
Transistors	52 ea.
Diodes	118 ea.

1.22 Frequency Memory (Option)

Capacity: 4 frequencies

SECTION 2

FEATURES

2.1 PLL Type Digital Frequency Synthesizer

Provides a high stability in frequency. The PLL synthesizer circuit contains a frequency reference oscillator consisting of a high-stability-PTO type VFO, which is available in the professional use and belongs to the highest class equivalent to that used in the commercially available receiver.

Both VCO and VFO, the heart of the synthesizer, are housed in a die-cast case of aluminium.

2.2 Double-Superheterodyne in Up-Conversion System

The latest design has been adopted for providing a high performance of the receiver, and a drift-cancel type double-superheterodyne system is employed for conversion of a signal of 100kHz to 30MHz into the first IF of 70.455MHz.

The front-end circuit comprises a PIN diode attenuator, transistor push-pull high-frequency amplifier, FET balanced mixer, and crystal filter in the first IF stage.

The receiver provides a very high sensitivity and an excellent immunity to the cross- and inter-modulations and blocking.

2.3 Wide Frequency Range for Reception

The receiver is capable of continuously receiving an RF signal in a wide range of 100kHz to 30MHz.

2.4 All-Mode Reception

The receiver is capable of receiving any of RF waves emitted in modes of AM, CW, SSB (UBS and LSB) and RTTY (FS).

2.5 High Selectivity

The IF filter circuit comprises mechanical and ceramic filter elements, each having a center frequency of 455kHz and provides a high selectivity.

NOTE: The filter for CW(N) is available at option.

2.6 Full-Solid-State Circuit

The lastest solid-state circuit design concepts have been thoroughly applied and, in particular, low-power Schottky TTL and CMOS ICs are employed in order to save the power consumption on the whole.

2.7 Frequency Reading on Both Digital and Analog Indications

Both a digital frequency indicator for obtaining a direct reading in unit of 100Hz and an analog scale for reading a frequency in unit of 1kHz are provided to improve the precision in reading and easiness in operation.

2.8 Speedy and Simple Tuning Operation

Can be made with use of both MHz-band selector for selecting one out of thirty bands, each having a bandwidth of 1MHz and the double-speed tuning control, which changes a frequency of 100kHz or 33kHz per rotation.

An automatic selector of input filters is adopted to eliminate a tuning operation with use of a preselector.

2.9 Full-Modular Construction

Comprising the plug-in type glass-epoxy printed circuit boards to make easy the maintenance and checks of the receiver. The circuit elements are mounted on the printed circuit board in an automatic soldering process to form a plung-in module. All the modules are inserted into a mother board to interconnect circuits of the modules. Flexible printed circuit boards are mounted on the front panel to provide a high reliability.

2.10 Easy Operation and Compact and Light-Weight Structure

A good layout of the control panel is suitable for easy operation. The chassis and case made of aluminium constructs a compact, light-weight and robust structure.

2.11 Four-Channel Frequency Memory Circuit

Consisting of random-access memory ICs capable of storing desired frequencies in four channels. Desired frequencies can be memorized in the memory ICs of this unit and the receiver is operated in either of the stored frequency information in the one-touch operation of the pushbutton located on the front control panel.

Even if the power switch on the front panel is set to OFF, an electric cell is provided to continue the power feed to the memory ICs and to thereby maintain the memory performance of the circuit.

NOTE: The frequency memory unit is available at your option.

2.12 Provided with Accessory Circuits

The following circuits are provided as a standard model.

Accessory Circuits:

Antenna input attenuator, Noise Blanker, AF active filter, ΔF (receiver incremental tuning) circuit.
AGC switching circuit.
VFO overlap indicator circuit.
Synthesizer lock indicator circuit.
Circuit for correction of USB and LSB indications.
455kHz-IF output circuit.
Line output circuit.

2.13 Operable in Combination with Model NSD-505 Transmitter

Provided with INT-VFO/EXT-VFO circuit, anti-trip circuit, muting circuit, monitor circuit, and VFO selector circuit, all necessary for operation in an amateur radio station in combination with the Model NSD-505 transmitter.

The receiver is also available in transceive operation with other transmitters than the Model NSD-505, through the optional VFO converter unit.

NOTE: The VFO converter unit is available at option.

SECTION 3

PREPARATIONS FOR OPERATION

3.1 Accessories

The Model NRD-505 is provided with the following accessories. Check them.

(1) Instruction manual 1
(2) M-type coaxial plug for connection to Jack J25 ANT 1
(3) RCA type pin plug for connection to Jacks J22 SP, J23 LINE OUT, and J24 IF OUT 3
(4) US type plug, 8p for connection to Jack J21 TX 1
(5) Plug, for connection to Jacks J26 RECORD and J27 PHONES 2
(6) Pilot lamp for illumination of dial and S-meter 3
(7) Fuse, 1A 1

3.2 Installation Place

Select a ventilative place for installation of the receiver.

For full play of the performance and prolongation of receiver life, avoid any of such places as exposed to the direct sunshine and a hot wind blown from an air-heater, and a noisy, vibrational, and moist places.

Leave a wide space around the rear and upper sides of the receiver, as possible.

3.3 Connection to Ground

Connect a grounding line to Terminal E at the rear side of the receiver, along the shortest pass from the ground, in order to protect the user from electric shock and to prevent the receiver from interference with other equipments.

Employ a thick wire for the grounding line, if possible.

NOTE: Never use any of gas and electric wiring pipes for the ground.

3.4 Connection of Antenna

Assemble the furnished M-type coaxial plug with the antenna having an output impedance of 50 to 75 ohms and connect the plug to Connector ANT at the rear side of the receiver.

If an antenna having an output impedance different from 50 to 75 ohms is used, insert an impedance matching element such as antenna coupler, between the antenna and receiver.

The antenna mostly dominates the quality of performance of the receiver, and therefore an antenna having possibly desirable characteristics should be selected.

3.5 Connection of Speaker

Select a dynamic type speaker provided with a voice coil of 4 to 8 ohms and connect the speaker to SP jack through the furnished RCA type pin plug. The jack is located at the rear side of the receiver.

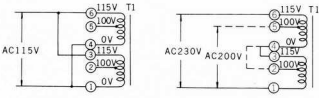
An exclusive speaker NVA-505 is available at your option.

3.6 Connection of Power Line

The primary winding of power transformer is wired to operate from a commercially available AC line of 100V, 50/60Hz.

NOTE: Be sure that the POWER switch is set at OFF , before connection of the plug of power cord to the AC source.

For operation from either of AC 115, 200, or 230V power line, the power transformer is provided with voltage changing taps at its primary winding and change them as illustrated below.



For AC 115V Operation For AC 200/230V Operation

Fig. 3-1 Connection of Power Line

3.7 Preparation for Operation

Make the following preparation before turning on the POWER switch.

3.7.1

Connect the furnished 8P US type plug to Jack TX at the rear side of the receiver, for operation without combination with other equipments.

Before connection of the plug, connect Pin #1 directly to Pin #8 in the connector, as shown below.

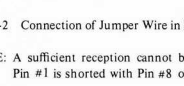


Fig. 3-2 Connection of Jumper Wire in 8P US Plug

NOTE: A sufficient reception cannot be made, unless Pin #1 is shorted with Pin #8 of the plug.

See Paragraphs 5.5 and 5.7 for operation in combination with a transmitter.

3.7.2

Use the furnished plug for listening through a head phone. Insert this plug into the PHONES jack located at the front panel, upon reception.

Select a head phone having a lower impedance.

Insertion of the plug into the PHONES jack cuts off the power of the speaker.

3.7.3

Use the foregoing plug or RCA type pin plug for recording in tape recorder. Insert the plug into the RECORD jack located at the front panel, or otherwise the RCA type pin plug into the LINE OUT jack located at the rear side.

Assemble both plugs with respective wires as illustrated below.

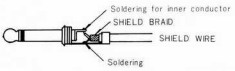


Fig. 3-3 Assembly of AF Plug to Wire.

NOTE: Neither can be connected to the microphone input connector of a tape recorder, since the signal level is too high to drive the tape recorder for recording an audio signal. Above plugs should be inserted into the AUX or LINE jack of the tape recorder.

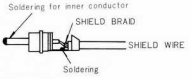


Fig. 3-4 Assembly of RCA Type Plug to Wire

3.7.4

Use the furnished RCA type pin plug for taking out the IF output signal of 455kHz. Insert the pin plug into the IF OUT jack located at the rear side.

3.7.5 Precautions

(1) Do not set the MHz selector switch at any position with no mark. If do, the receiver may malfunction.

(2) Do not turn semi-fixed resitrors, trimmer capacitors, and cores of transformers mounted on the printed circuit boards, without good reason.

(3) Full care should be taken for the maintenance and checks of the receiver, not to short-circuit any of semiconductor circuit elements, which abound in the receiver.

(4) Take care of operation in combination with a transmitter, not to induce an excessive RF power in the ANT input of the receiver due to transmission of a high power. It should be noted that a high RF power tends to be induced by a time lag in duplexing operation.

SECTION 4

DESCRIPTION OF CONTROL PANEL

4.1 Front Panel

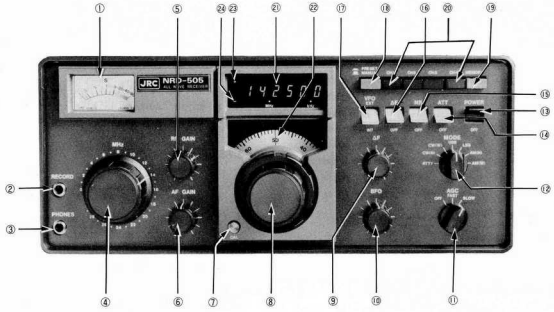


Fig. 4-1 Front Panel of Model NRD-505

(1) S-meter
(2) RECORD jack
(3) PHONES jack
(4) MHz selector knob
(5) RF GAIN control knob
(6) AF GAIN control knob
(7) CAL knob
(8) Main tuning knob
(9) ΔF control knob
(10) BFO control knob
(11) AGC switch
(12) MODE switch
(13) POWER switch
(14) ATT switch
(15) NB switch
(16) ΔF switch
(17) VFO switch
(18) PRESET•MANUAL switch
(19) MEMORY (pushbutton)
(20) CH switch (CH1 to CH4)
(21) Digital frequency indicator
(22) Analog frequency scale
(23) + overlap indicator
(24) − overlap indicator

Description:

(1) S-meter ..... For indication of the relative level of a signal under reception. The scale of the meter is linearly calibrated from 1 to 9 in the lower range and logarithmically calibrated in 20dB-step in the higher range.

(2) RECORD jack ..... For connection of the AF output to a recorder. An AF output signal at a fixed level is available, independent to the position of the AF GAIN control.

(3) PHONES jack ..... For connection of the AF output to a head phone. Insertion of the jack cuts off the output of the speaker.

(4) MHz selector knob ..... For changing a operating frequency in MHz-step.

(5) RF GAIN control knob ..... For controlling the gains of the RF and IF amplifiers.

(6) AF GAIN control knob ..... For adjusting the sound volume of the speaker.

(7) CAL knob ..... For setting the pointer of the analog indicator scale.

(8) Main tuning knob ..... For tuning the receiver into a frequency under reception, within a range of 1MHz.
The knob has a double speed tuning structure consisting of control sections for 100kHz- and about 33kHz- changes per rotation.

(9) ΔF control knob ..... For finely tuning the receiver in the operating frequency after setting this switch to ΔF. Note that the frequency indication remains unchanged.

This control knob may be used for the receiver incremental tuning or clarifier, when the receiver is operated in the transceive mode.

(10) BFO control knob ..... For adjusting the pitch of beat, when the MODE switch is set at either CW(W) or CW(N).

(11) AGC switch ..... For turning on and off the AGC circuit and selecting a desired time constant.
Position:

OFF	No AGC circuit operates.
FAST	Short release time.
SLOW	Long release time.

(12) The IF filters, detectors, AF active filter, and BFO circuits are interlocked automatically in accordance with the mode switch operation.
Position:
AM(W) and AM(N) ..... For AM reception.
CW(W) and CW(N) ..... For CW reception.
The filter for CW(N) reception is available at your option.
LSB ..... For LSB reception.
USB ..... For USB reception.
RTTY ..... For RTTY reception.

(13) POWER switch ..... For turning on and off the power supply.

(14) ATT switch ..... For turning on and off the 20dB-attenuator in the input of the receiver. Turn on this switch, when the receiver is under interference with a powerful undesired RF signal.

NOTE: In the usual operation, this switch should be set at off.

(15) NB switch ..... For turning on and off the noise blanker circuit.
Turn on this switch, when the receiver is jammed with much pulsive noises produced from cars or the like.

(16) ΔF switch ..... For turning on and off the frequency fine turning circuit in the first local oscillator. See 9 for corresponding control knob.
Set the switch at OFF, in usual.

(17) VFO switch ..... For selecting either of the internal or external VFO.
Position:
INT ..... For operation with the internal VFO.
EXT ..... For operation with an external VFO.
Set the switch at INT in usual.

(18) PRESET·MANUAL switch ..... For selecting either preset or manual tuning.
Position:
PRESET ..... For operation of the receiver in a frequency stored in the memory unit. The memory unit is available at your option.
MANUAL ..... For operation of the receiver in a frequency selected by turning the MHz selector knob and main tuning knob.

NOTE: Set the switch at MANUAL, unless the receiver is provided with the memory unit.

(19) MEMORY push-button ..... For storing a reception frequency in the memory unit.

(20) Channel switch ..... For selection of a memory channel, when a operating frequency is stored in the memory unit. Using this switch operating frequency is determined by an information stored in the memory unit. The switch can accommodate four channels CH1 to CH4.

(21) Digital frequency indicator ..... For indication of a frequency under reception in the minimum unit of 100Hz.
The indicator contains light emitting diodes for the digital indication of frequency.
Upon USB and LSB mode operations, the frequency of a suppressed carrier can directly be read on this indicator provided with an internal correction circuit.

NOTE: This indicator indicates a frequency different from that under reception in the following cases, however, this is not a fault of the equipment.

Case 1:
The VFO switch is set at EXT, without connecting an EXT VFO to the receiver.

Case 2:
The PRESET·MANUAL switch is set at PRESET, without connecting the memory unit to the receiver.

In these cases, no output signal of the VFO is applied to the input of the VFO counter, and the indicator indicates a frequency of 545.0kHz, if the MODE switch is set at CW.

In either of above cases, the lock-out detector circuit in Loop 2 operates to make the receiver "mute"

(22) Analog frequency indicator ..... Scale plate for reading a frequency under reception. The plate is calibrated with the minimum division of 1kHz and the maximum of 100kHz per rotation.

(23) ⊕ overlap indication ..... The overlap indicator lamp lights when the rotation of the tuning knob reaches the right extremity.
During lighting of the lamp, the receiver properly operates, however, the reading on the digital indicator is different from a true value of frequency under reception.
When the ⊕ indication lamp lights, the user should turn the MHz control knob by one MHz up corresponding to one band and again tune the receiver with main-tuning knob.

(24) ⊖ overlap indication ..... The overlap indicator lamp lights when the rotation of the tuning knob reaches the left extremity.
The user should turn the MHz control knob by one MHz down corresponding to one band and also again tune the receiver.

4.2 Rear Panel

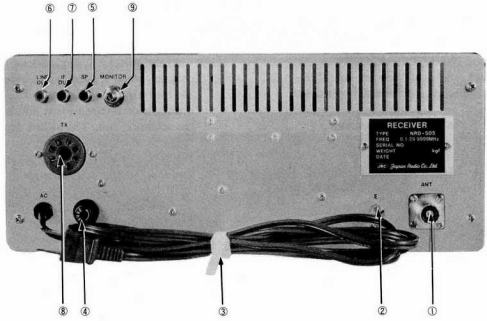


Fig. 4-2 Rear Panel of NRD-505

(1) ANT connector
(2) E terminal
(3) Power cord
(4) Fuse
(5) SP jack
(6) LINE OUT jack
(7) IF OUT jack
(8) TX connector
(9) MONITOR control

(1) ANT connector ..... For connection of an antenna of 50 to 75 ohms, unbalanced.
(2) E terminal ..... For grounding the receiver.
(3) AC power cord .... For feeding an AC power to the receiver.
(4) Fuse ..... Contained in a glass tube. Rating of 1A.
(5) SP jack ..... For connection of a speaker of 4 to 8 ohms.
(6) LINE OUT jack ..... For feeding an AF output signal to a recorder, for example. Having 600 ohms.
(7) IF OUT jack ..... For feeding an IF output signal of 455kHz. Having 75 ohms.
(8) TX connector ..... For operation in combination with a transmitter.
Accomodates VFO OUT, VFO EXT IN, VFO CONV. OUT, VFO CONV. EXT CONTROL, MUTE, SIDE-TONE, and ANTI TRIP lines.
(9) MONITOR control ..... For adjusting the monitor level of an RF wave transmitted from the self station upon operation in combination with a transmitter.

SECTION 5

OPERATION

After completion of the preparations described in SECTION 3, the POWER switch is turned to POWER and the following procedures are taken for reception.

5.1 Manual Reception

Control and switch settings:

VFO switch ..... at INT.
ATT switch ..... at OFF.
NB switch ..... at OFF.
ΔF switch ..... at OFF.

5.1.1 Reception of SSB

Switch and control settings:

(1) MODE switch ..... at USB or LSB.
(2) AGC switch ..... at SLOW.
(3) RF GAIN control ..... full clockwise
(4) Adjust the MHz and main tuning knob for tuning in to a frequency under reception.
(5) Set the AF GAIN control at a desired volume of sound.
(6) If the articulation is poor, then adjust finely the main tuning dial, or otherwise set the ΔF switch to ΔF, and adjust the ΔF control to obtain a suitable pitch for listening.

REFERENCE: SSB signals in the armateur radio bands are usually transmitted in LSB mode for 3.5/7MHz band, and USB mode for 14/21/28MHz band.

5.1.2 Reception of CW

Switch and control settings:

(1) MODE switch ..... at CW(W).
(2) AGC switch ..... at FAST or SLOW.
(3) BFO control ..... at one-division shift from the center to right or left.
(4) RF GAIN control ..... at any position for a desired noise level.
(5) Adjust the MHz and main tuning dial for tuning in to a frequency under reception.
(6) Adjust the AF GAIN control for a suitable sound level.
(7) Set the BFO control at a position for a suitable pith for listening.
(8) Set the MODE switch at CW(N). If the signal sound under reception is reduced or can not be heard with this setting, then turn finely the main tuning dial to obtain a maximum level of signal.

NOTE: The filter for CW(N) reception is optional.

NOTE: In the CW(W) and CW(N) receptions, the AF active filter is automatically connected to the AF circuit to reject undersired noises, thus ensuring a good quality of sound to the user. No sound is produced with setting the MODE switch to CW(N), if the CW(N) filter is not incorporated.

5.1.3 AM (Medium- and Short-Wave Broadcast) Signal Reception

Switch and control settings;

(1) MODE switch ..... at AM(W).
(2) AGC switch ..... at FAST.
(3) RF GAIN control ..... full clockwise.
(4) MHz selector and main tuning dial ..... at frequency under reception.
(5) AF GAIN control ..... at any desired.
(6) If the receiver is heavily jammed by the radio interference, set the MODE switch at AM(N) to reduce the interference, though the quality of sound is reduced a little, since a narrower filter is inserted.

5.1.4 Reception of RTTY Signals

Switch and control settings:

(1) MODE switch ..... at RTTY.
(2) AGC switch ..... at FAST.
(3) RF GAIN control ..... full clockwise.
(4) MHz and main tunign dial ..... at frequency under reception.
(5) AF GAIN control ..... at any for desired sound volume.
(6) The BFO has been set at 456.9kHz.
If you want to change the BFO frequency, see Paragraph 7.3.4(1)b.
(7) If an RTTY equipment requires an AF signal for its input signal, connect the LINE OUT of 600 ohms to a FS converter. If to obtain an IF signal of 455kHz, connect the IF OUT of 75 ohms to the FS converter. Both LINE OUT and IF OUT jacks are located at the rear side of the receiver.
(8) Note: set the NB switch at OFF during above operation.

5.1.5 Operation with Use of NB, ATT, and ΔF Switches

(1) NB switch ..... Set at NB to reduce the noise upon reception of SSB, CW, and AM signals, if the receiver is jammed by pulsive noises produced from cars or the like. When this switch is set at NB, the noise blanker circuit operates.
(2) ATT switch ..... Set at ATT for a favorable reception, if a wave under reception is interfered with an intensive undesired wave or if the receiver is receiving an extremely intensive wave.
(3) ΔF switch ..... Set at ΔF for turning the ΔF control, which is used for a clarifier upon reception of SSB signals, a fine tuning control upon reception of CW and RTTY signals and a receiver incremental tuning control in the transceive operation.

5.2 Preset Reception

NOTE: The optional frequency memory unit is required for preset reception.

Operating frequency informations are stored in the CH1 through CH4 of the frequency memory unit. Set the PRESET·MANUAL switch at PRESET.

Set the VFO switch at INT.

Depress a desired CH pushbutton switch of CH1 through CH4. Then, the frequency information stored in the memory is indicated on the digital frequency indicator, and the receiver starts to operate in this frequency.

NOTE: Once the preset button is depressed as described above, the MHz selector and main-tuning knob become free from the tuning operation.

Operation for reception is the same as described in Paragraph 5.1, except for the MHz control and main tuning knobs.

If the user wants to slightly change the operating frequency in preset mode, during reception, set the ΔF switch to ΔF and finely adjust the ΔF control for tuning. The adjustable range of this control is in excess of ±2.5kHz, approx.

See Paragraph 5.6 for use of the frequency memory unit.

5.3 Reading of Operating Frequency

The frequency can be read on both digital frequency indicator 21 provided with light-emitting diodes for optical indication and analog frequency scale 22, as illustrated in Fig. 4-1.

5.3.1 Reading on Digital Indicator.

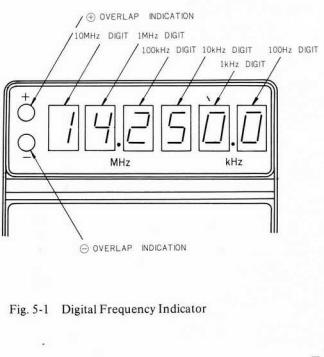


Fig. 5-1 Digital Frequency Indicator

The digital indicator can indicate an operating frequency in any mode of signals.

As illustrated in Fig. 5-1, six light-emitting diodes are provided to indicate a frequency under reception in the 10MHz-, 1MHz-, 100kHz-, 10kHz-, 1kHz-, and 100Hz-digits, for convenience of direct reading down to the 100Hz-digit.

If the lamp on the ⊕ overlap indication lights, turn clockwise the MHz selector by one band up. If the lamp on the ⊖ overlap indication light, turn counterclockwise the control by one band down. Tune in again to the frequency with main tuning knob every when the MHz control is turned.

5.3.2 Reading on Analog Frequency Indicator

The analog indicator is a scale for reading a fraction of operating frequency in the digits of less than 100kHz. The scale is calibrated in 1kHz-step up to 100kHz. Ten rotations of the scale cover one megahertz band.

Reading:

Read the upper fraction of frequency than 100kHz on the digital indicator and the lower than 100kHz on the analog indicator.

NOTE: Upon reception in SSB mode, calibrate the analog indicator scale, before reading the frequency. See Paragraph 5.4.1 for calibration of the scale.

The analog indicator is available for reference in the fine tuning with use of the main tuning knob.

5.4 Calibration of Frequency

The digital frequency indicator indicates the carrier frequency of an RF wave under reception in any of all modes, and therefore requires no calibration.

It is necessary to recalibrate the pointer of the analog indicator scale plate in each of the reception modes such as USB and LSB.

Switch settings for calibration of scale:

PRESET·MANUAL ..... MANUAL.
VFO ..... INT.
ΔF ..... OFF.
NB ..... OFF.
ATT ..... OFF.

5.4.1 Calibration of Pointer of Analog Indicator Scale

(1) For USB and LSB receptions:

a. Set the MODE switch at USB.

b. Turn the CAL knob to set the pointer to the digitally indicated frequency.

c. Set then the MODE switch at LSB, and calibrate the scale in the same procedures as described above.

(2) For CW, AM and RTTY Signals Reception

a. Set the MODE switch at either CW, AM or RTTY.

b. Calibrate the analog indicator scale in step b, (1).

Stoppers are disposed at both extremities of the tuning dial to stop the rotation of the dial.
If a strong force is applied to the rotary shaft of the tuning control, there is the possibility that the rotary mechanism of the control is destroyed.

5.4.2 Calibration of 10MHz Reference Oscillator

(1) Receive the standard waves in 2.5, 5, 10, and 15MHz, and select one of them, which can be received at a high sensitivity without radio interferences.

(2) Set the MODE switch at AM(N), and adjust RF, AF gain control for a desired sound volume.

(3) Remove the upper cover and connect a thin vinyl wire to Terminal TP4 of 100kHz output in the REF-VFO COUNTER unit, through a ceramic capacitor of 0.01 microfarads.
Hand down the other free and of the vinyl wire, put near to Transistors TR3 and TR4 in the RF AMP unit and adjust the coupling factor between both units to obtain a desired beat tone.

NOTE: Do not strip the vinyl wire, including its free end. Take great care of above operation not to short-circuit in the units.

(4) Adjust the trimmer capacitor CV1 in the REF-VFO COUNTER unit to obtain the zero beat.

5.5 Operation in Combination with JRC's Transmitter

The receiver is available in combination with the Model NSD-505 transmitter.

5.5.1 Connection to Transmitter

The Model NRD-505 receiver is connected to the Model NSD-505 transmitter, as illustrated below.

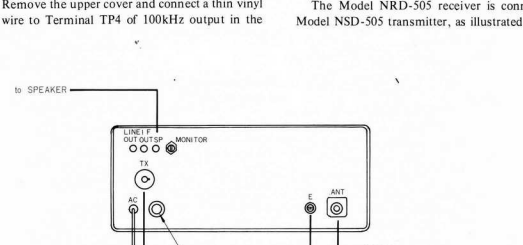


Fig. 5-2 Connection of Model NRD-505 to Transmitter

Connection of TX Connector on Rear Side Panel

a. VFO OUT (1) (Pin 2 of J21)
For providing an output signal of the internal VFO in the MANUAL operation mode and that of the memory VCO in the PRESET operation mode.

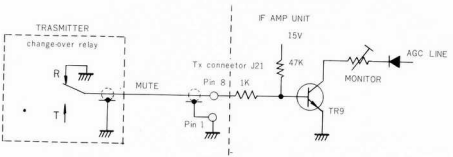
b. VFO EXT IN (Pin 4 of J21)
Input terminal of VFO in a range of 2.455 to 3.455 MHz.
Connected to the transmitter when the receiver is operated in the transceive mode with the VFO in the transmitter.

c. TONE (Pin 6 of J21)
Input terminal of a side tone fed from the transmitter. Connected to the transmitter for keying monitor in the CW mode.
In this operation, the MONITOR control located on the rear side is set at minimum position fully counter-clockwise position and the monitor level is adjusted with turning the RV3 control of the BFO & AF amplifier unit.

d. ANTI TRIP (Pin 7 of J21)
AF output terminal for VOX operation.

e. MUTE (Pin 8 of J21)

For control of MUTE operation in the receiver. When the Pin #8 is connected to ground, the receiver becomes ready for reception. When this pin is opened from the ground, it goes to the MUTE operation mode. The degree of mute can be adjusted with turning the MONITOR control located on the rear side panel, and, in addition, an RF attenuator of 20dB is inserted to the receiver input circuit. This connector is connected to the transmitter for the case where the receiver is operated in combination with the transmitter.



When the change-over relay is turned to transmitting side, the bias voltage is supplied to the base of TR9. Thereby, TR9 is turned on causing the AGC line to be grounded. Thus, the receiver ceases to operate.

f. It is noted that no connection is required between the VFO OUT 1 and VFO EXT IN connectors for the case where neither transceive nor cross operation is performed.

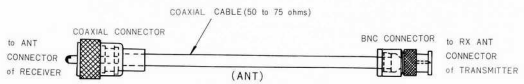


Fig. 5-3 Assembly the Cable 1

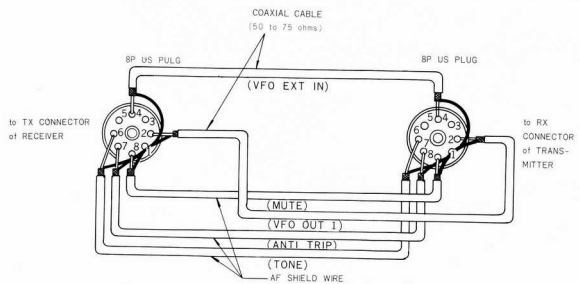


Fig. 5-4 Assembly of Cable 2

Table 5-1

	PRESET·MANUAL switch at			
	MANUAL		PRESET	
	VFO switch at			
	INT	EXT	INT	EXT
OPERATING FREQUENCY	with INT VFO	with EXT VFO	from OUT of memory unit*	with EXT VFO
MHz SELECTOR	Available	Available		
MEMORY OPERATION	Enable*	Enable*		
VFO OUT 1	INT VFO	INT VFO	OUT of memory unit*	
RX/TX COMBINATION	Separate or transceive	Transceive or cross	Separate or transceive*	Transceive or cross

REMARKS: The mark "*" indicates the case where the frequency memory unit is incorporated in the receiver.

NOTE: The receiver operates in a fixed frequency under reception when the frequency memory unit is operated.

When no signal is applied from the VFO circuit to the receiver, which is alive, the following readings are obtained.

Reading:

○○.545.0 for AM(N), AM(W), CW(N), CW(W), and RTTY mode.

○○.543.5 for USB mode.

○○546.5 for LSB mode.

5.5.2 Operational Procedures

(1) Operate both PRESET·MANUAL and VFO switches, as shown in Table 5-1.

(2) ΔF control: If ΔF switch is set at ΔF, the operating frequency can be changed in excess of ±2.5kHz.
The scale of the ΔF control is not calibrated but only provides an approximate indication of frequency. If the user wants to accurately read the reception frequency, set the ΔF switch at OFF, then adjust the main tuning dial for tuning in to the frequency, and read frequency on the digital frequency indicator.

(3) MONITOR control: For adjusting the monitor out put level transmitted from the self station.
If the frequency of the receiver is different from that of the transmitter, it can not be monitored.

(4) Monitoring of Signal fed from transmitter in self station:
Set RV3 on BFO & AF AMP unit to minimum and adjust MONITOR control to obtain sound volume.
Side-tone: Set MONITOR control to minimum and adjust RV3 to obtain adequate sound volume.

5.6 Operation of Frequency Memory

The optional frequency memory unit is available for storing the operating frequency information.

This unit is capable of storing four channels frequencies, which have been received and indicated on the digital frequency display. Each frequency is stored in the memory unit in the minimum step of 100Hz. The contents in the memory unit can be easily changed only by redepressing the MEMORY push-button.

5.6.1 Specifications

(1) Memory IC
C MOS random-access non-destructive memory

(2) Capacity of memory
Four channels, with BCD 22 bits code.

(3) Output frequency range
2.455 to 3.4549MHz, phase locked in 100Hz step.

(4) Operation of memory
At any time.

5.6.2 Precautions for Operation

(1) Do not turn the core of each transformers in the memory unit. Take care of handling the unit not to short circuit. Great care must be, in particular, taken not to apply an electrostatic charge to ICs.

(2) Before insertion of the memory unit into the main frame of the receiver, set the POWER switch to OFF, without fail. Remove, then, the upper cover of the receiver. Insert fully the unit

into a section indicated as CDD-48, without taking a wrong position of the unit.

(3) Do not depress two or more pushbuttons CH1 to CH4 at the same time, but depress either.

(4) Frequency informations once stored in the unit will be erased after turning off the power.
If you wants to store them for a long time, insert an electric cell into the BT1 battery holder of the unit.
Use a silver oxide cell of 6V for the power supply of the memory unit. Carefully insert the cell into the unit, without taking a wrong polarity of electrode.
Silver oxide cell available for camera:
No. 544, 6V made by Sony Ever Ready Co.
4G13/6V made by Hitachi Maxcell Co.
or equivalent.
Either of above may be used for the memory unit. The electric cell is not furnished.

5.6.3 Writing in Memory

(1) Set the PRESET•MANUAL switch at MANUAL.

(2) Depress a desired CH switch.

(3) Set for a desired frequency on the digital indicator.

NOTE: No overlap indication lamp is allowed to light in this setting.
If the frequency is written in the memory under lighting of either overlap indication lamp, the reading on the digital frequency indicator will be different from the true value of a frequency under reception.

(4) Depress the MEMORY pushbutton. Thus the writing is completed.

(5) The VFO switch may be set at either INT or EXT for writing the frequency.
Set this switch at INT, in usual.

(6) If you want to change thus loaded channel for another, repeat steps 2) through 4). If you want to change the frequency thus stored in one channel, repeat also steps 2) through 4) for a desired frequency.

5.6.4 Reception with Use of Memory Unit

See Paragraph 5.2 for Preset Reception.

5.7 Operation in Combination with Transmitter in Different VFO Frequencies

It is necessary to use an optional VFO converter unit.

The transceive operation can be performed with a transmitter having a VFO, whose frequency is different from that of the internal VFO in NRD-505, with use of the converter unit.

Note that neither transceive nor cross operation from the transmitter side can be performed.

5.7.1 VFO Converter Unit

A PLL type of VFO converter for conversion of the VFO frequency of 2.455 to 3.4549MHz in the receiver, into either of frequencies in ranges of 5.2 to 4.7001, 5.5 to 5.0001, or 9.2 to 8.7001MHz. This unit starts to operate only by inserting two crystal oscillators into the unit.

The digital frequency display of NRD-505 is shifted automatically by −1.5kHz at USB mode and +1.5kHz at LSB mode from the display of CW/DSB modes. Therefore, when the receiver is tuned to the same carrier frequency in each reception mode, the oscillating frequency of VFO is shifted by +1.5kHz at USB and −1.5kHz at LSB from the oscillating frequency of CW/DSB modes. For details, please refer to the attached pamphlet of the VFO Converter Unit.

(1) Rating:

a. Input Frequency: 2.455 to 3.4549MHz

b. Output Frequency: One of bands in the ranges of 5.2 to 4.7001, 5.5 to 5.0001, and 9.2 to 8.7001MHz.

c. Crystal oscillator: Two elements in pair necessary for local oscillators.

CRYSTAL ELEMENTS		OUTPUT FREQUENCY RANGE
X2	X1	
7.655MHz	8.155MHz	5.2 to 4.7001MHz
7.955MHz	8.455MHz	5.5 to 5.0001MHz
11.655MHz	12.155MHz	9.2 to 8.7001MHz

Send in orders for crystal oscillators corresponding to the VFO frequency of a transmitter under operation.

d. Output level: In excess of 0.2V at load of 75 ohms.

(2) Precautions for Operation

a. Do not unreasonably turn the core of any transformers and trimmer capacitors mounted on the printed circuit boards.

b. Select two crystals in accordance with the specifications of Paragraph 5.7.1 1) c, insert them into the mounting holes, marked X1 and X2 on the VFO converter unit, and solder the leads of the crystals at the rear side of the printed circuit board.

c. Make the following connections.

1) Output Frequencies of Oscillators:
Connect TP2 to TP3 and TP5 to TP6 to cover a range of 5.2 to 4.7001MHz.
Connect TP2 to TP3 and TP5 to TP6 to cover another range of 5.5 to 5.0001MHz.
Connect TP1 to TP3 and TP4 to TP6 to cover another range of 9.2 to 8.7001.

2) Control of Output Signal:
Connect TP8 to TP9 to turn on and off the signal in response to an external control signal.

Connect TP7 to TP9 to turn on the signal always.

d. Control of Output Signal by External Information
Apply a control voltage between Pins 5 and 1 of the TX connector located at the rear side panel. (5 ... control voltage, 1 ... ground)
The control information must provide a voltage of +5 to +12V for turning on the output signal, and open-circuit for turning off the output signal.

e. NOTE: Never forget to set the POWER switch to OFF, before insertion of the VFO converter unit into the receiver. Then, remove the upper cover. Fully insert the converter unit into a section indicated as CGA-26, without taking a wrong position of the unit.

g. The light-emitting diode CD11 on this unit is a lock indicator and lights when the loop is phase unlocked condition.

Table 5-2

f_{TX}	f \ f_R	○○.000MHz	○○.4999MHz	○○.500MHz	○○.9999MHz
(1) 5.2 4.7001MHz	f_{VFO}	2.455MHz	2.9549MHz	2.955MHz	3.4549MHz
	f_L	7.655MHz (X2)		8.155MHz (X1)	
	f_{OUT}	5.200MHz	4.7001MHz	5.200MHz	4.7001MHz
(2) 5.5 5.0001MHz	f_{VFO}	2.455MHz	2.9549MHz	2.955MHz	3.4549MHz
	f_L	7.955MHz (X2)		8.455MHz (X1)	
	f_{OUT}	5.500MHz	5.0001MHz	5.500MHz	5.0001MHz
(3) 9.2 8.7001MHz	f_{VFO}	2.455MHz	2.9549MHz	2.955MHz	3.4549MHz
	f_L	11.655MHz (X2)		12.155MHz (X1)	
	f_{OUT}	9.200MHz	8.7001MHz	9.200MHz	8.7001MHz

Symbols:

f_{VFO} VFO frequency of receiver
f_R reception or transmission frequency.
f_L frequency of local oscillator in VFO converter.
f_{OUT} output frequency of VFO converter.
f_{TX} frequency of VFO in transmitter combined.

REMARKS: Parts No.s of the crystal oscillators are indicated in parenthesis.
Fractions of a reception frequency f_R in both 10MHz- and 1MHz-digits are not directly related with the VFO frequency.

REMARKS: The transceive operation is allowed in combination with a transmitter, so long as the frequencies f_R and f_{TX} satisfy the relations tabulated in Table 5-2.
It should be noted that there is a transmitter, which cannot meets these relations in a certain band, and the transceive operation can not be performed in this band, only.
For example,
f_{TX} = 5.5 to 5MHz vs. f_R = 1.8 to 2.3MHz

(3) Operation

a. The VFO converter unit will operate if the preparations are completed as described in Paragraph 5.7.1, (2).

b. The reception frequency f_R relates to the VFO oscillation frequency f_{VFO}, converter output frequency f_{OUT}, and local oscillator frequency f_L, as tabulated in Table 5-2. The "f_{OUT}" in Table 5-2 is slightly changable in the rage of ±1.5kHz to match the co-operative transmitter.

5.7.2 Connection of Receiver to Transmitter

Connect the receiver to the transmitter, as illustrated in Fig. 5-5.

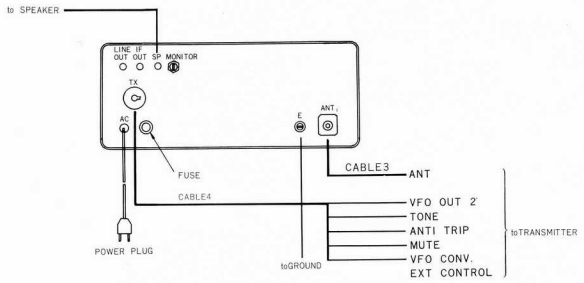


Fig. 5-5

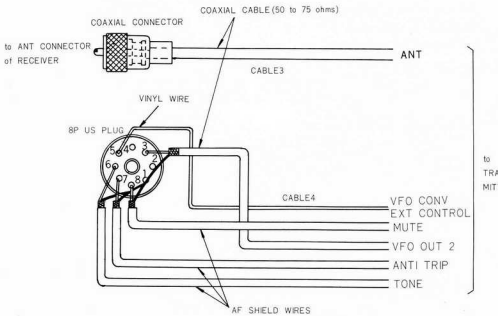
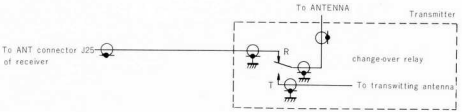


Fig. 5-6 Assembly of Cables

(1) Connection of Antenna



(2) Connection of TX Connector

a. VFO OUT 2
For connection to a transmitter for the transceive operation with feeding the output of the VFO converter to the transmitter.

b. VFO CONV. EXT CONTROL
For control of the output level of the VFO converter from outside.
See Paragraph 5.7.1.(2)d for use.

c. TONE, ANTI TRIP, and MUTE
See P.11

NOTE: There is no need to connect the VFO OUT 2 to VFO CONV. EXT CONTROL for the case where no transceive operation of the transmitter is performed in the VFO frequency in the NRD-505 all-wave receiver.

5.7.3 Operating Procedures

(1) Set the PRESET·MANUAL and VFO switches, as tabulated in Table 5-3.

(2) Operate as instructed in steps (2) through (4), Paragraph 5.5.2.

(3) When either ⊕ or ⊖ overlap indication lamp is lighting, the output signal of the VFO converter is cut off. Turn the MHz control by one MHz in either direction, and tune in again.
If, in addition, the operating frequency is set at the boundary between 499.9 and 500.0kHz corresponding to the center of each band, the output signal is also cut off. Do not set the frequency at this boundary.

Table 5-3

	PRESET·MANUAL switch at			
	MANUAL		PRESET	
	VFO switch at			
	INT	EXT	INT	EXT
OPERATING FREQUENCY	with INT VFO		from OUT of memory unit*	
MHz SELECTOR	Available			
MEMORY OPERATION	Enable			
VFO OUT 2	VFO CONVERTER OUTPUT	VFO CONVERTER OUTPUT	VFO CONVERTER OUTPUT*	VFO CONVERTER OUTPUT*
RX/TX COMBINATION	Separate or transceive		Separate or transceive	

REMARKS: Mark "*" indicates that the optional frequency memory unit is incorporated. Transceive operation is performed only from the receiver side.

SECTION 6

DESCRIPTION OF CIRCUIT

6.1 Functional Block Diagram

A block diagram of the receiver is illustrated Appendix 1.

6.2 Description of Units

6.2.1 RF Input Filter Unit CFL-66

The RF input filter unit consists of an RF attenuator of 20dB, highpass filter of 1.6MHz, and other six filters. Either of these six filters is selected in accordance with the operating frequency.

6.2.2 RF Amplifier Unit CAF-69A

The RF amplifier units consists of another lowpass filter of 35MHz, PIN diode attenuator for AGC, wideband RF push pull amplifier comprising transistors TR1 and TR2, first balanced mixer comprising FETs TR5 and TR6, crystal filter FL1 for the first IF frequency of 70.455MHz, first IF amplifier comprising Transistor TR7, second mixer comprising TR8, second IF amplifier comprising TR12 for the second IF frequency of 455kHz, and noise blanker circuit. In the noise blanker circuit, a signal of 455kHz is amplified in Transistors TR13 and TR14, detected in Transistor TR15. DC voltage proportional to the level of this signal is amplified in another amplifier of TR16 and TR17 and applied to the bases of Transistors TR13 and TR14, as an AGC signal. Pulsive noises exceeding the average level of the signal are rectified through TR18, amplified in TR19 and applied to a gate circuit of TR20 to prevent inplusive noises from transmission.

6.2.3 IF Amplifier Unit CAE-56A

The signal of 455kHz is passed through one of filters FL1 – FL3 and amplifiers of TR1 – TR4 and applied to a detector circuit. The output signal from the detector circuit is fed into a switching circuit and then an amplifier of TR8 to produce an AF signal. A part of signal amplified in TR5 is detected through CD22, and amplified in another amplifier of TR6 to produce IF AGC signal and RF AGC signal. A control circuit for mute consists of TR11, 12 and 13.

Filter FL1 is made of a ceramic filter, and each of Filters FL2 and FL3 is made of a mechanical filter.

Filter FL3 is an optional one.

6.2.4 BFO & AF Amplifier Unit CGD-26A

The AF output signal from CAE-56 is passed through an AF active filter switching circuit of CD11 and CD12, then amplified in IC1 and IC2, and applied to the speaker. The AF active filter circuit consists of TR5 and TR6 is automatically inserted into the AF circuit by setting the MODE switch to either CW(N) or CW(W).

The BFO circuit consisting of TR1 – TR4 produces a frequency of 455kHz±2.5kHz in CW mode, fixed 456.5kHz in USB mode, 453.5kHz in LSB mode and fixed 456.9kHz in RTTY mode.

6.2.5 Reference Signal & VFO Counter Unit CDB-49A

The reference signal generator circuit comprises IC20 for generation of the reference frequency signal of 10MHz, and frequency dividers of IC1 – IC5, and IC24 for generation of frequency signals of 5MHz, 500kHz, 100kHz, 500Hz, and 100Hz.

The basic gate signal generator circuit consists of IC6, IC22, and IC23 for producing various difference gate pulses necessary for the VFO counter circuit.

The VFO counter circuit consists of a VFO buffer amplifier of TR1 and TR2, VFO counter of IC7 – IC12, ratching circuit of IC13 – IC17, and overlap detecting circuit of IC18 and IC19.

6.2.6 Indicator Unit CDE-74

A BCD frequency information is code-converted in a BCD-to-7 segment decoder of IC1 – IC6 to light the light emitting diodes CD1 – CD6 in the digital indicator. The overlap information fed from the VFO counter is applied to either-emitting diode CD7 or CD8.

6.2.7 VFO Selection Circuit and Local Oscillator Unit CHC-4A

The VFO selection circuit consisting of TR1 – TR3, CD1 – CD5, and IC2 operates to select outputs of the internal and external VFOs and memory unit through CD1 – CD5 and to feed the signals to the synthesizer, VFO counter, and external VFO output, respectively.

In the local oscillator circuit, an oscillator of TR7 and buffer amp of IC5 produce a second local frequency of 70MHz, and the same frequency signal is fed into a mixer of TR4, while the reference frequency signal of 5MHz is applied to TR4 and mixed with the signal of 70MHz to produce another frequency signal of 65MHz, which is amplified in TR5 and TR6 and fed into Loop 2.

A 13MHz-oscillator circuit of IC1 operates when the ΔF switch is set at ON, and a harmonic wave of 65MHz from the fundamental of 13MHz is amplified in TR5 and TR6 and fed into Loop 2. Circuits of IC3 and IC4 are provided to convert the levels of USB and LSB Mode informations.

6.2.8 Loop 1 Unit CGA-23A and Loop 2 Unit CGA-24A

The loop 1 and loop 2 units compose a major part of the frequency synthesizer and operate as follows.

In the loop 2 circuit, the 65MHz-signal fed from CHC-4 is mixed with an output signal of 67.455 to 68.455MHz fed from the loop 2 VCO (TR1), in TR2 to produce and output signal of 2.455 to 3.455MHz and the

latter signal is fed to a phase detector of IC4. A reference signal fed from the output of the VFO is applied to IC4 to detect a phase difference between both signals. The output of IC4 is coupled with varactor diodes in the loop 2 VCO through a lowpass filter to control VCO frequency. When the phase of the signal fed from TR2 agrees with that of the reference signal in IC4, the loop 2 becomes locked and the light-emitting diode CD4 turns off.

In the loop 1 unit, both frequency signals of 67.455 to 68.455MHz from loop 2 and 70.455 to 100.455MHz fed from loop 1 VCO (A1) are applied to a balanced mixer of CD1 to CD4 to produce an output signal of 3 to 32MHz, while the output signal of the loop 1 VCO is amplified in TR1 to produce the first local frequency signal. The output signal of 3 to 32MHz fed from the mixer is passed through a lowpass filter of 35MHz, amplified in IC2 and TR4, and then is divided by 2 through IC16. The divided output is supplied to a variable frequency divider of IC19 and IC20 in the loop 2 unit.

The output signal of 500kHz fed from the variable frequency divider and another reference frequency signal of 500kHz are applied to the phase detector of IC4 in the loop 1 unit to detect a frequency and phase difference. The output of phase detector is passed through a lowpass filter to control the loop 1 VCO.

When the loop 1 is out of lock, a light-emitting diode CD6 lights. A circuit of IC7 and TR5 to TR7 in the loop 1 unit is provided to switch the power supply for oscillating-circuits in VCO unit (A1).

A decoder circuit consisting of IC7 to IC15 is incorporated in the loop 2 unit to select either of the RF input filters and either of oscillating circuits in VCO (A1) in accordance with the BCD information of operating frequency.

6.2.9 Power Supply Circuit

The power supply circuit consisting of T1, CD4 to CD11, IC1, IC2, and IC3 feeds the powers of +5 and +15V to the circuits in the receiver. Each of IC1, IC2 and IC3 is a three-terminal voltage regulator.

6.2.10 Frequency Memory Unit (Optional)

The frequency memory unit stores a BCD code information of the reception frequency. A part of the code information, corresponding to a fraction of the reception frequency in the MHz- and 10MHz-digits, is directly applied to both the digital frequency indicator and variable frequency divider in Loop 2, and the other part, corresponding to another fraction of the reception frequency in digits below 1MHz is applied to the phase lock loop to control their frequency division ratios and to thereby produce a frequency of 2.455 to 3.4549MHz same as that of VFO. IC1 − IC3 are for memorize the information and IC8 and IC9 are for control of the fraction above MHz-digit.

The output of TR1, VCO, is fed to a variable frequency divider circuit of IC10 to IC14, which is controlled with the information stored in the memory ICs. The output signal of the frequency divider and the reference frequency signal of 500Hz are compared with each other in IC23, with respect to the phase of the signals. The output of the phase comparator is applied to the VCO to control its frequency. The output signal of the VCO is amplified in TR2 and TR3, then the frequency of this signal is divided by a factor of 5 in IC28, and the signal is further amplified in TR4 to produce the output signal of the memory unit.

6.2.11 VFO Converter Unit (Optional)

The output signal of 2.455 to 3.455MHz fed from VFO is applied to a phase detector of IC9 as a reference, while the output signal fed from either local oscillator X1 or X2 and the output signal of the VCO are applied to the mixer of CD1 to CD4. The output of the mixer is fed to IC9 and its phase is compared with that of the output signal of VFO. The output signal of the IC9 is passed through a lowpass filter to control the VCO. The output frequency of VCO is a difference between the frequencies of X1 or X2 and VFO. A light-emitting diode CD11 lights, when the loop is out of lock. The output signal of the VCO is amplified in TR5, TR8, and TR10 to produce and output signal of the VFO converter. An output control circuit consists of TR11, TR12, IC7, and K1 is provided for an external control of the VFO converter. While K1 is actuated, the output signal of the VFO converter is not supplied to the TX connector.

6.3 Description of Drift Cancel System

When the frequency of the 70MHz-crystal oscillator for generating the second local frequency signal drifts, the loops 2 and 1, first mixer, and second mixer operate to cancel a drift of the frequency so that the operating frequency is kept unchanged.

If the frequency of 70MHz fed from the second local oscillator drifts by 10Hz up, for example, in the functional block diagram of Appendix 1, for a operating frequency of 7.100 MHz, then the frequency deviation of 10Hz is cancelled as follows:

70MHz + 10Hz in second local oscillator ..... 65MHz + 10Hz in mixer output ..... 67.555MHz + 10Hz in VCO output of Loop 2 ..... 77.555 + 10Hz in VCO output of Loop 1 ..... 70.455MHz + 10Hz in first mixer output of first IF circuit ..... 455kH in second mixer output of second IF circuit.

SECTION 7

MAINTENANCE AND CHECKING

Although the Model NRD-505 at your hand was thoroughly adjusted and inspected when it was shipped from the factory, the following maintenance and checks will be effective to maintain the performance of the equipment for a long time.

7.1 Preparation for Maintenance and Checks

This receiver is constructed of the main chassis, rear side panel, front side panel, receiving circuit section, synthesized oscillator section and power supply.

The front side panel can be removed by pulling three connectors off from the main frame.

The power supply circuit is assembled on the rear side panel section.

(1) Removing the Upper and Lower Covers of Frame

Remove two right and two left black screws fixing the upper cover and also two right and two left black screws fixing the lower cover, as shown below.

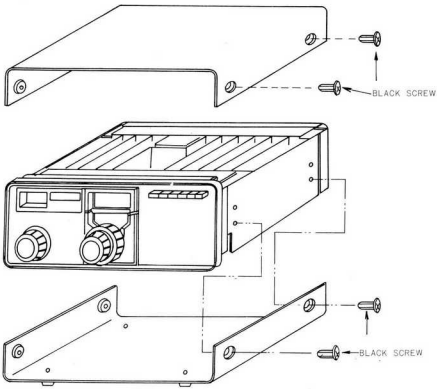


Fig. 7-1 NRD-505, General Arrangement

(2) Removing the Front Panel

Remove two knobs of the main tuning control, then remove two right and two left screws, which fix the front panel, and pull three connectors off from the main frame. Then, the front panel will be domounted.

NOTE: Each of these connectors is mounted on the flexible printed circuit board. Do not apply an excessive force to the circuit board, when the connector is pulled. Take care of removing the connector not to scratch the circuit board.

(3) Precautions

a. Take care of handling each unit not to injure any parts on the unit.

b. Do not turn the core of transformers, trimmer capacitors, and variable resistors, without a good reason.

c. Skilled techniques and adequate measuring instruments are required for adjustment of the receiver section and synthesizer section, since the circuits in both sections operate in frequencies of VHF band.

d. The synthesizer relates to operations of the other units. Check it in a reasonable order in relation to the units.

e. Never remove either cover or case from the VFO section, since it has been adjusted finely with a high technique.

f. Great care must be taken for removing the front panel, not to scratch of flaw the 100kHz-scale plate and smoke acrylic resin plate.

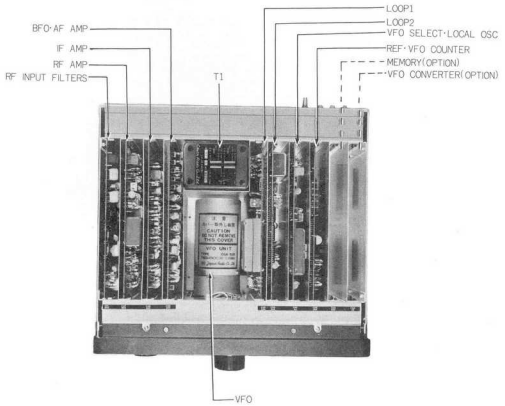


Fig. 7-2 NRD-505, Top View

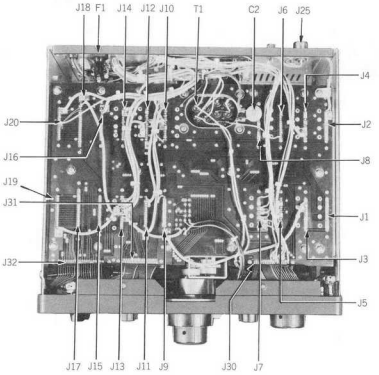


Fig. 7-3 NRD-505, Bottom View

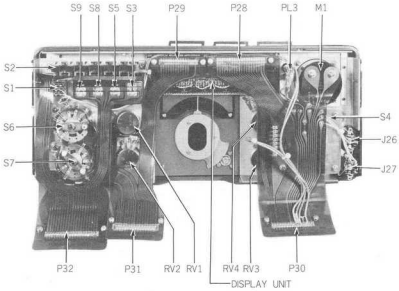


Fig. 7-4 NRD-505, Front Panel, Rear View

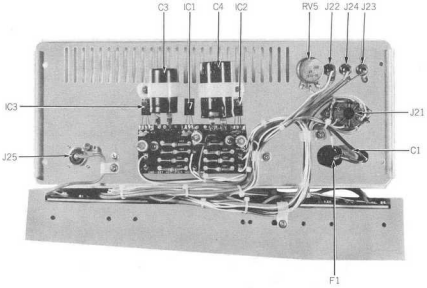


Fig. 7-5 NRD-505, Rear Panel, Rear View

7.2 Maintenance

(1) Cleaning

Wipe softly the panel faces, control knobs, and upper and lower covers, with soft cloth or silicone oil to remove dirt. Clean the equipment with a brush not containing oil or with electric cleaner, to remove dust.

No lubrication is required in any section.

(2) Units and Flexible Printed Circuit Boards

Remove dust from the units and printed circuit boards, using an unoiled brush or electric cleaner.

If ends of each printed circuit boards rust, grind them with use of a fine-mesh sand paper or file so that the surface of printed circuit board completely contacts with the grounding springs, when the unit is inserted into the chassis in place.

(3) Fuse

When the power fuse is blown, thoroughly investigate the cause of blowing, then repair, and replace with a furnished glass fuse of 1A in rating.

(4) Pilot Lamps

If a pilot pamp is burnt out, replace with a new furnished one of 12V, 0.16A in rating (BA 7S/13 Base type).

(5) Circuit Elements

CAUTION: Be carefull when making checks of ICs and transistors. They may be damaged by a very instantaneous short-circuiting.

Visually check: resistors, capacitors, coils, and transformers to find a discolored or burnt one in each unit. Replace a defective circuit element, if found, with a new one having the same value, withstand voltage, and tolerance, as the defective element.

7.3 Checking and Ajustment

In this paragraph, procedures will be described for finding a defective unit among related units. A particular inter-connecting extension and a pair of levers pulling out a printed circuit board from the main chassis are required for check and adjustment of the unit.

NOTE: Insert the 8P US plug shown in Fig. 3-2 into the TX connector located at the rear panel, without fail. The Pin #1 is shorted with Pin #8 of the plug before insertion.

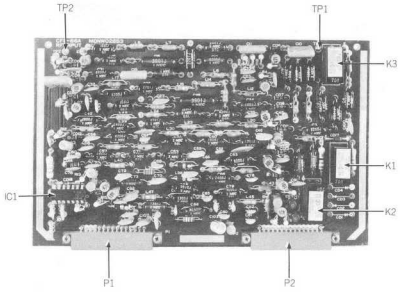


Fig. 7-6 RF Input Filter Unit (CFL-66A)

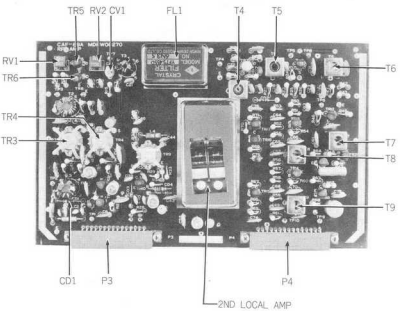


Fig. 7-7 RF Amplifier Unit (CAF-69A)

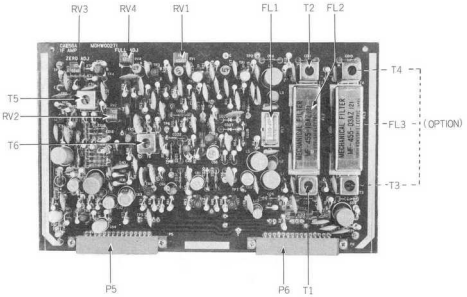


Fig. 7-8 IF Amplifier Unit (CAE-56A)

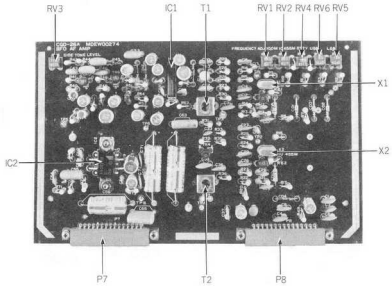


Fig. 7-9 BFO & AF Amplifier Unit (CGD-26A)

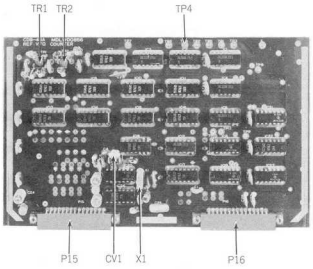


Fig. 7-10 Reference Signal and VFO Counter Unit (CDB-49A)

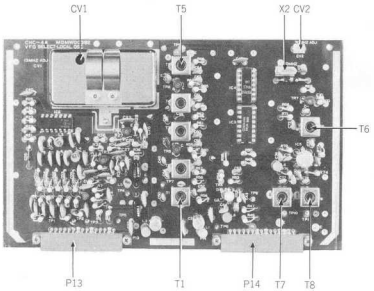


Fig. 7-11 VFO Selection and Local Oscillator Unit (CHC-4A)

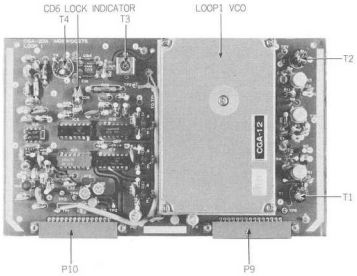


Fig. 7-12 Loop 1 Unit (CGA-23A)

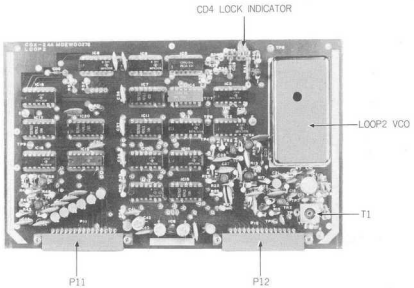


Fig. 7-13 Loop 2 Unit (CGA-24A)

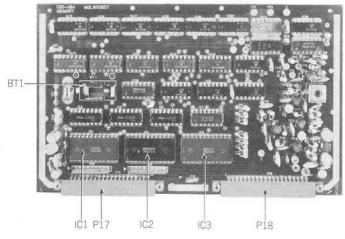


Fig. 7-14 Frequency Memory Unit (Option) (CDD-48A)

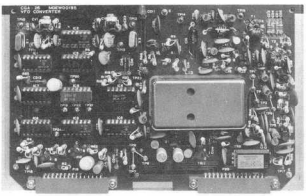


Fig. 7-15 VFO Converter Unit (Option) (CGA-26D)

7.3.1 Power Supply Circuit

Measure DC voltages between pins of connectors and ground in each unit. The connectors are located at the rear side of the chassis.

The standard voltages are as follows:

+15V between J10 #15 and ground.
+5V between J9 #1 and ground.
+15V between J7 #15 and ground.

7.3.2 Digital Indicator Circuit (CDE-74)

Checking of frequency indication and overlap indication:

Set the following switches.
PRESET/MANUAL ..... MANUAL
VFO ..... INT.

Turn the MHz selector and main tuning control knobs.

If an erratic indication is found in either indicator, check the frequency informations in BCD code of J30 and J31 located in the rear side of the chassis.

The frequency information is transferred in the TTL positive logic level, and the overlap information in the negative logic level.

If each frequency information is found proper, then remove the front panel, and check ICs and light-emitting diodes in the indicator unit CDE-74.

7.3.3 Control Circuits for Front Panel Controls

Measure DC voltages at pins of J30, J31 and J32 located in the rear side of the chassis to check the following control voltage.

(1) RF GAIN ..... 1.3V – 9.1V DC, approx.
(2) ΔF control .....3.3 – 9.0V DC, approx.
(3) BFO control ...12.3 – 3.8V DC, approx.
(4) AGC selector, ATT selector, NB selector, ΔF selector, VFO selector, PRESET/MANUAL switch, and MEMORY ..... Ground potential.
(5) MODE selector ..... +15V, typical.
(6) CH selector ..... +5V, typical.

7.3.4 Receiver Section

The synthesizer feeds the first local frequency signal of 70.555 – 100.455MHz, second local of 70MHz, six RF input filter selecting informations, and MUTE information to the receiver section.

When the synthesizer is out of phase lock, a light emitting diode in the lock indicator of either loop 1 unit or loop 2 unit lights to indicate this unlocked condition, and the muting circuit in the IF amplifier unit operates in response to the MUTE information, to make the receiver section stop its operation.

If the lock indication lights, check the synthesizer section.

(1) BFO & AF Amplifier Unit (CGD-26)

a. AF Amplifier Circuit

1) Connecting:
AF oscillator of 600 ohms, 1kHz ..... between J7 #1 and J7 #2 located in the rear side of the chassis.
Load of pure resistor of 10 ohms ..... to SP jack on rear panel.
Circuit tester ..... across the load.

2) Set the AF GAIN control fully clockwise and MODE switch at AM. When the output level of the oscillator is set at about – 31dBm, a reading of 1.0V AC will be obtained on the circuit tester.

3) Connect a level meter of 600 ohms to the LINE OUT jack located at the rear panel. When the output level of the oscillator is set at about –9dBm, a reading of 0dBm will be obtained on the level meter.

4) The semi-fixed variable resistor RV3 is provided for adjustment of the sound level of side tone.

b. BFO Circuit

1) Set the MODE switch at CW (W) and BFO control at the center.
Connect an RF voltmeter between J7 #14 and J7 #13. A reading of more than 0.40V rms will be then obtained on the voltmeter.

2) Controls are provided for adjustment of frequencies:
RV4 for 456.9kHz at RTTY.
RV5 for 453.5kHz at LSB.
RV6 for 456.5kHz at USB.

(2) IF Amplifier

1) Connect the following test instruments:
RF Voltmeter ..... to IF OUT jack at the rear panel.
SSG of 75 ohms ..... between J6 #15 and J6 #14.
The SSG settings:
Frequency ..... at 455kHz.
Modulation ..... at zero.

2) Receiver settings:
MODE ..... at AM(W).
RF GAIN ..... Full clockwise.
AGC switch ..... at OFF
When the output level of SSG is set at 33dB, approx., a reading of 0.1V rms will be obtained on the RF voltmeter.

3) Set the MODE switch at AM (N), and check as instructed in the foregoing steps.

4) Adjust Transformers T5 and T6 to obtain a maximum reading on the RF voltmeter frequency of 455kHz. Transformers T1 and T2 and optional T3 and T4 are provided to match the impedances of the mechanical filters.
Variable resistors RV1, and RV2 are provided for adjustment of AGC and RV3 and RV4 for adjustment of S meter.

(3) RF Amplifier Unit

a. RF Amplifier Circuit

1) Connect a RF voltmeter between J3 #13 and J3 #12, and between J4 #3 and J4 #4 to check the first and second local frequencies local, respectively. The first and second local signals should have the respective levels of more than 0.3 and 0.38V rms.
See Paragraphs related to the synthesizer section, for their oscillation frequencies. The jacks J3 and J4 are located at the rear side panel.

2) Turn the RF GAIN control full clockwise. Connect a circuit tester between J4 #8 and J4 #9 located at the rear side of the chassis. Reading of 5.5V DC, approx. will be obtained on the tester.

3) Connect the following instruments:
RF voltmeter ..... between J4 #15 and J4 #14.
SSG of 75 ohms set at 2.4MHz, non-modulated ..... between J3 #1 and J3 #2.

4) Receiver settings:
Frequency for reception ..... 2.4MHz.
MODE switch ..... at AM (W).
RF GAIN ..... Full clockwise.
NB switch ..... OFF.
AGC swich ..... OFF.
Wen the output level of the SSG is set at 70dB, approx., a reading of 0.1V rms will be obtained on the RF voltmeter.

5) Set Transformers T4 and T5 at a frequency of 70.455MHz and Transformer T6 at another frequency of 455kHz.

(4) RF Input Filter Unit

1) Connect the following test instruments:
SSG of 75 ohms, set at 70dB, nonmodulated ..... to ANT connector at the rear side panel.
RF voltmeter ..... between J4 #15 and J4 #14 located in the rear side of the chassis.

2) Receiver settings:
MODE switch ..... AM (W).
RF GAIN ..... Full clockwise.
ATT switch ..... OFF.
NB switch ..... OFF.
AGC switch ..... OFF.
Check whether a reading of more than 0.1V rms is obtained or not on the RF voltmeter,

with changing the receiver and SSG frequencies. Note that if these frequencies are less than 1.6MHz, the output level of the SSG is set at 83dB.

7.3.5 Synthesizer Section

The synthesizer section relates to circuits in the other units, and should be checked in the following order.

If the phase lock is failed in the synthesizer, either or both light emitting diodes light, which are disposed in the lock indicators of the loop 1 and loop 2 units.

Locate a defective unit with reference to the following table.

Table 7-1 Trouble-Shooting for Synthesizer

LOCK INDICATOR in		POSSIBLE DEFECTIVE UNIT
LOOP 1 UNIT	LOOP 2 UNIT	
Lighting	Lighting	Reference signal and VFO counter unit.
Lighting	Not lighting	VFO selector and local oscillator circuit unit and loop 2 unit.
Not lighting	Lighting	Loop 1 unit and Loop 2 unit.

NOTE: When the MHz selector knob is turned, the lock indicator in the loop 1 may light for an instant.

(1) Reference Signal and VFO Counter Unit

a. Reference Signal Circuit

1) Set the ΔF switch at OFF. Connect a frequency counter between J16 #9 and J16 #14, between J16 #13 and J16 #14, and between J16 #12 and J16 #14 to check the frequencies of 5MHz, 500kHz, and 500Hz, respectively.

2) Variable capacitor CV1 is provided to adjust the reference oscillator frequency of 10MHz, in accordance with the instructions in Paragraph 5.4.2.

b. VFO Counter Circuit

1) Control settings:

PRESET·MANUAL ..... at MANUAL.

VFO switch ..... at INT.

Connect a RF voltmeter between J15 #1 located in the rear side of the chassis and the ground.

A reading of 0.20V rms or higher should be obtained on the voltmeter, as a output voltage of the VFO.

2) Check the VFO counter circuit in the same manner as instructed in Paragraph 7.3.2.

(2) VFO Selector and Local Oscillator Unit

a. Local Oscillator Circuit

1) Connect a RF voltmeter between J14 #15 and J14 #14 located in the rear side of the chassis to check the output voltage of the 70MHz-oscillator. A reading of more than 0.4V rms should be obtained on the voltmeter. Capacitor CV2 is provided to adjust the oscillator frequency of 70MHz.

2) Set the ΔF switch at OFF, and connect the RF voltmeter between J14 #6 and J14 #7 to check the 65MHz-circuit output.

A reading of more than 1.0V rms should be obtained on the voltmeter. Tune Transformers T1 − T5 at the frequency of 65MHz.

3) Set the ΔF switch to ON, and check the output voltages of above circuit as instructed in step (2).

Variable capacitor CVI is provided for adjustment of the oscillator frequency of 13MHz.

b. VFO Selector Circuit

Set the PRESET·MANUAL and VFO switches at respective poistions in various modes of operations in the receiver,and check readings on the digital frequency indicator in any mode of operation.

(3) Loop 2 Unit

a. RF Input Filter Decoder Circuit

Connect a circuit tester between the J12 #2 through #7 and the ground. The jack 12 is located in the rear side of the chassis. Change the reception frequency and check the TTL logic level in the output of each decoder. The logic level should become "0" in response to corresponding reception frequency.

b. Loop 2 Circuit

1) Connect a RF voltmeter between J12 #9 and J12 #10, and between J12 #12 and J12 #13 to check the output voltage of VFO and input voltage of 65MHz-circuit, respectively.

Readings of more than 0.14 and 1.0V rms should be obtained for the VFO output and 65MHz-circuit input voltages, on the voltmeter, respectively.

2) Connect the RF voltmeter between J12 #15 and J12 #14 to check the VCO output voltage in the loop 2. A reading of more than 0.12V rms should be obtained on the voltmeter. The jack 12 is located in the rear side of the chassis.

3) Disconnect the RF voltmeter and connect a frequency counter, instead of the voltmeter. Turn the main tuning knob to change the frequency from 000.0 to 999.9kHz, and check the VCO oscillation frequency in the loop 2.

Loop 2 VCO Frequency (MHz) = (67.455MHz) + (Fraction of Reception Frequency of Less than 1MHz (MHz).)

c. Variable Frequency Divider for Loop 1

1) Connect a test RF voltmeter between J11 #1 and J11 #2 to check the input voltage of the frequency divider in a range of 3 to 32MHz.

A reading of more than 0.32V rms should be obtained on the voltmeter. The jack J11 is located in the rear side of the chassis.

2) Set to a reception frequency of 100kHz. Connect a frequency counter between J11 #1 and J11 #2, and be sure a reading of 3MHz is obtained on the counter. Reconnect the counter between J11 #14 and J11 #13 and read the counter. A reading of 500kHz should be obtained.

(4) Loop 1 Unit

1) Connect a circuit tester between J10 #11, #13, and #12 and ground to check an information for selecting the VCO. The jack J10 is located in the rear side of the chassis.
See the following table.

Table 7-2 Logic Level for Selection of VCO

CHECK POINT BETWEEN	TTL LOGIC LEVEL FOR RECEPTION FREQUENCY OF		
	100kHz to 9.9999MHz	10 to 19.9999MHz	20 to 29.9999MHz
J10 #11 and GND.	1	0	0
J10 #13 and GND.	0	1	0
J10 #12 and GND.	0	0	1

REMARKS: TTL Logic level "1" equal to reading of 4.2 V DC, approx. on the tester.
TTL logic level "0" equal to reading of OV DC, approx.

2) Connect a frequency counter between J10 #7 and J10 #6 to check the reference pulse of 500kHz.

3) Connect the frequency counter between J10 #3 and J10 #2 to check the frequency of the loop 2 in the same way as instructed in step (3) in Paragraph 3) b.

4) Connect the frequency counter between J9 #15 and J9 #14 to check the loop 1 VCO oscillation frequency for various reception frequencies.
Loop 1 VCO Frequency (MHz) = 70.455MHz + Reception Frequency (MHz).
Disconnect the counter, and then connect an RF voltmeter, instead of the counter. A reading of more than 0.2V rms should be obtained on the voltmeter.

7.3.6 Frequency Memory Unit (Option)

(1) Set the PRESET·MANUAL switch to MANUAL and VFO switch to INT. Change the reception frequency to check BCD code frequency informations between J17 #4 through #16 and J18 #5 through #13, located in the rear side of the chassis.

(2) Check the PRESET·MANUAL informations in accordance with Table 7-3.

Table 7-3 TTL Logic Level for PRESET MANUAL Information

CHECK POINT BETWEEN	TTL LEVEL for PRESET MANUAL SWITCH SET AT	
	MANUAL	PRESET
J17 #18 and ground	0	1
J17 #2 and ground	0	1

REMARKS: "0" and "1" are TTL logic levels. They are measured when the VFO switch is set at INT.

(3) Check the information for selection a desired channel out of CH1 − CH4 between J17 #19 and #29 and between J18 #1 and #2. When either CH switch is depressed, a voltage of +5V should be applied to corresponding channel information line.

(4) Connect the frequency counter between J18 #15 and J18 #16 to check the reference pulse of 500Hz.

(5) Memorize a frequency information in each channel of CH1 − CH4, in accordance with instructions in Paragraph 5.6. Then, operate the receiver in the preset reception. If an erratic indication of the reception frequency is found in its fraction over 1MHz, check the circuits IC3, IC7 − IC9. If an erratic indication in the other fraction of less than 1MHz, check the loop circuits such as variable frequency divider, VCO and phase comparator circuits.

(6) The VCO output frequency f_M at J18 #20 should be as follows:

f_M(MHz) = 2.455MHz + Fraction (MHz) of Reception Frequency, less than 1MHz.

7.3.7 VFO Converter Unit (Option)

(1) Set the PRESET·MANUAL switch at MANUAL and the VFO switch at INT. For various reception frequencies, check the BCD code frequency informations in the 100kHz-digit at J19 #14, J20 #2 − #4, and VFO signal of 2.455 to 3.4549MHz at J19 #1.
The output level of the VFO signal should be in excess of 0.2V rms.

(2) Check the oscillators frequencies of X1 and X2 in accordance with the attached pamphlet of the VFO Converter Unit.

(3) Connect a frequency counter between J20 #15 and J20 #14 to check the output frequency.

(4) The light emitting diode CD11 is provided for the lock indicator and lights when the loop is out of phase lock.

7.3.8 VFO CGA-26D

(1) Set the PRESET·MANUAL switch at MANUAL and the VFO switch at INT. Check the VFO frequency f_{VFO} on the digital indicator, with turning the main tuning knob. Note that the VFO frequency corresponds to a fraction of reading below 1MHz-digit.
i.e.,

f_{VFO}(MHz) = 2.455MHz + Fraction (MHz) of Reception Frequency, below MHz-Digit.

Ten rotations of the analog frequency indicator scale change the frequency from 2.455 to 3.455MHz.

(2) Connect an RF voltmeter between TP3 at the rear side of the chassis and the ground to check the output voltage of the VFO.
A reading of more than 0.3V rms should be obtained.

SECTION 8

OPTIONAL EQUIPMENTS

The following optional unit or components are provided for operation of the Model NRD-505 at more high level of performance.

8.1 Speaker NVA-505

Note that the Model NRD-505 contains no speaker.

The Model NVA-505 speaker is provided for exclusive use in this receiver and has an excellent appearance, dimentions, and performance adaptive to the receiver.

Fig. 8-1 Speaker NVA-505

Specifications:

Input impedance:	4 ohms
Input power:	2W, maximum
Dimentions:	215(W) × 140(H) × 300(D) mm
Weight:	2kg, approx.
Accessories:	Connection cable MPKCO1190 one ea.

8.2 Mechanical Filter 5NMAA00006 for CW (Narrow) Reception

The mechanical filter 5NMAA00006 provides a sharp selectivity in the CW signal reception and very effective for rejection radio interferences.

This filter is operable only by mounting it on the IF amplifier unit.

Fig. 8-2 Mechanical Filter for CW(N)

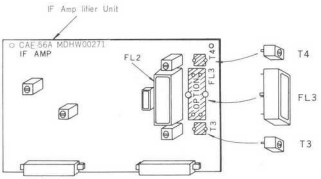


Fig. 8-3 IF Amplifier Unite

REMARKS;

1. Remove the jumper wires which short the transformer circuit.

2. Mount the filter and two transformers on an area of the IF Amplifier unit, marked down as OPTION, and solder them from the rear side of this area.

3. Mount the filter so that the position of letters marked face of the filter is arranged as illustrated in Figure 7-8 in p.24. Mount two transformers in such order as contained in the bag.

4. There is no necessity to readjust the filter after mounting it, since it has been adjusted in the factory.

Specifications:

Input/output impedance:	1 kiloohms
6dB-bandwidth:	0.5 to 1kHz
60dB-bandwidth:	Less than 3kHz.

8.3 Frequency Memory Unit CDD-48A

The frequency memory unit CDD-48 is capable of storing four reception frequencies in the memory circuits, as desired, and greatly widens the application of the receiver, thus ensuring a high-class operation.

An operating frequency information stored in this memory unit is reloadable at any time only by depressing the MEMORY pushbutton located on the control panel. The memory unit is a plug-in type and operates only by inserting the unit into the receiver.

See Paragraph 5.6.1 for its specifications.

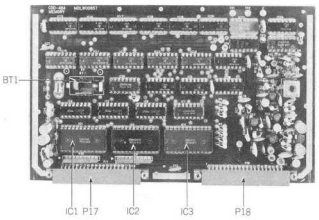


Fig. 8-4 Frequency Memory Unit

8.4 VFO Converter Unit CGA-26D

The VFO converter unit is available for a transceive operation from the receiver to a transmitter provided with a VFO, whose frequency is different from that of the VFO in the receiver.

This unit is a plug-in type, and readily operable only by inserting the unit into the receiver and adjusting the local oscillator frequency of the converter unit.

See Paragraph 5.7.1 for the specifications of the converter unit.

NOTE: Depending on a combined transmitter, the transmitter may not be operable in the transceive mode in a certain frequency range. Please inform to JRC about the frequency of VFO in your transmitter when you order this unit.

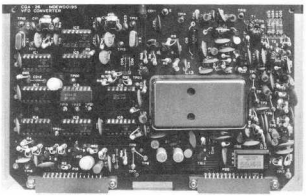
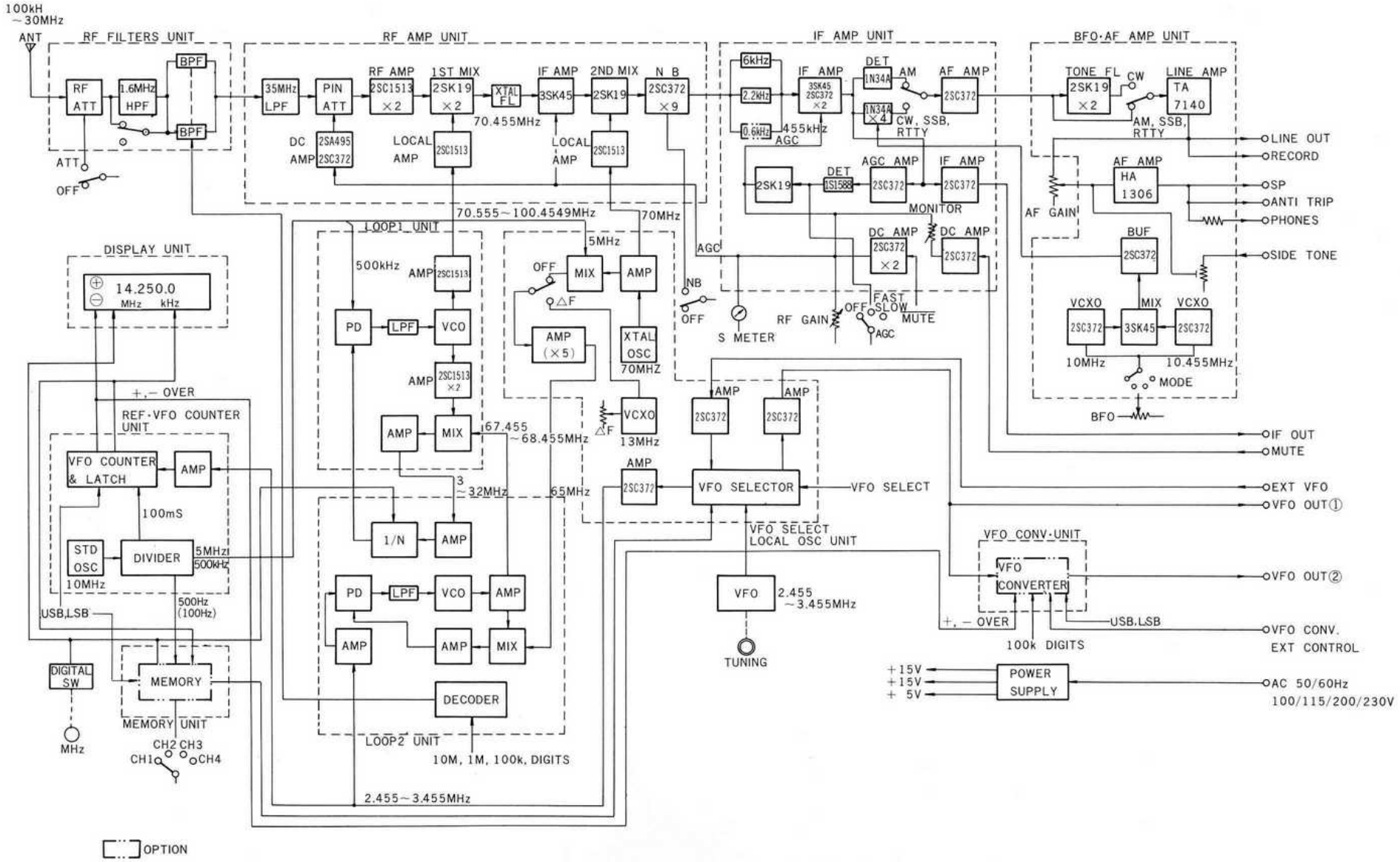
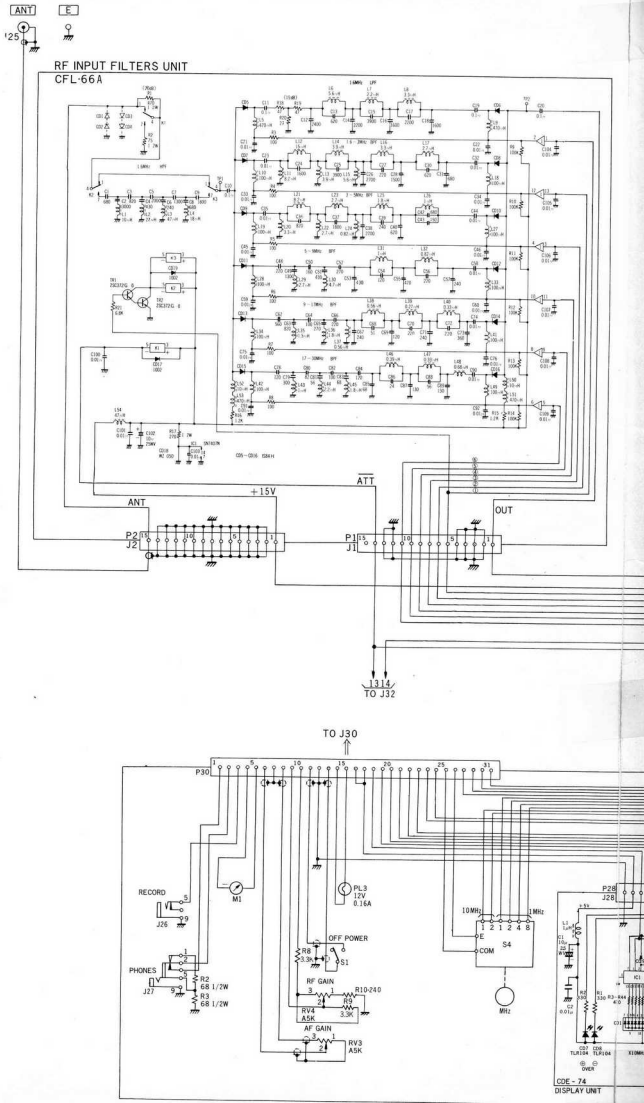
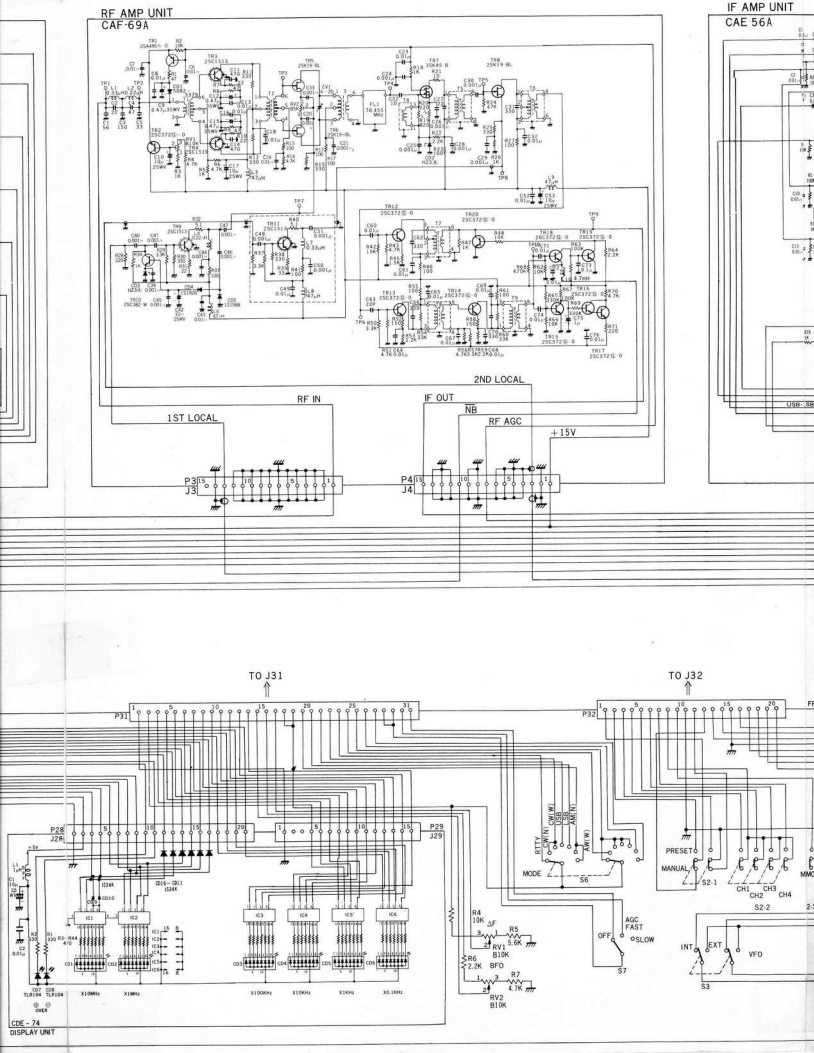


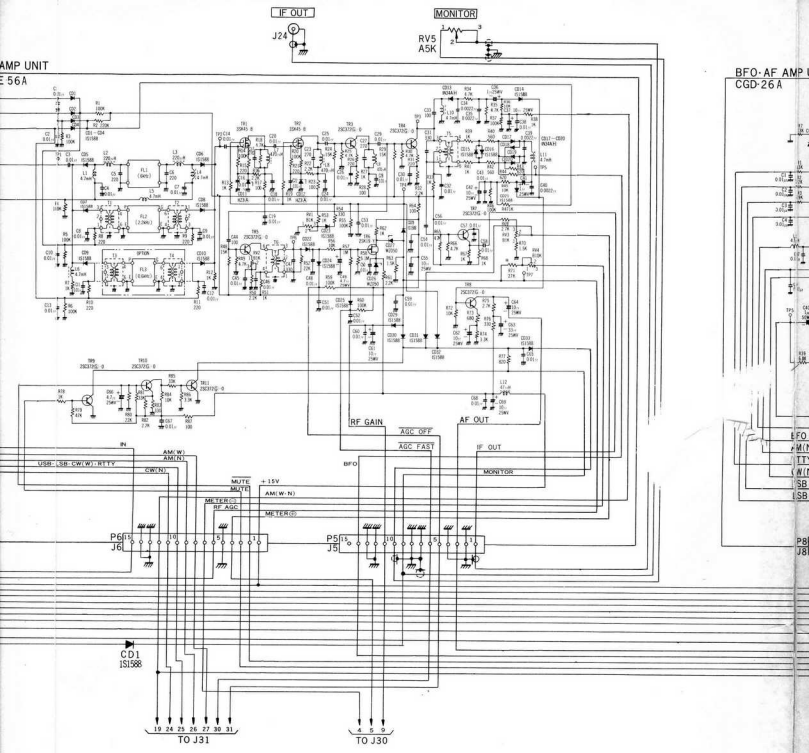
Fig. 8 VFO Converter Unit

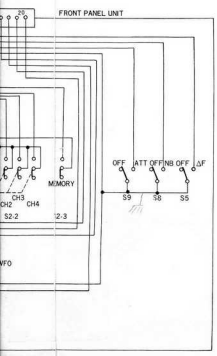


APPENDIX 1 MODEL NRD-505 ALL-WAVE RECEIVER FUNCTIONAL BLOCK DIAGRAM


ANT
E
J25
RF INPUT FILTERS UNIT
CFL-66A
ANT
+15V
ATT
OUT
P2
J2
P1
J1
J14
TO J32
TO J30
P30
RECORD
J26
M1
PL3
12V
0.16A
OFF POWER
S1
R8
3.3K
PHONES
J27
R2
68 1/2W
R3
68 1/2W
RF GAIN
R10-240
RV4
A5K
AF GAIN
RV3
A5K
10MHz
1MHz
S4
COM
MHz
P28
J28
CDE - 74
DISPLAY UNIT

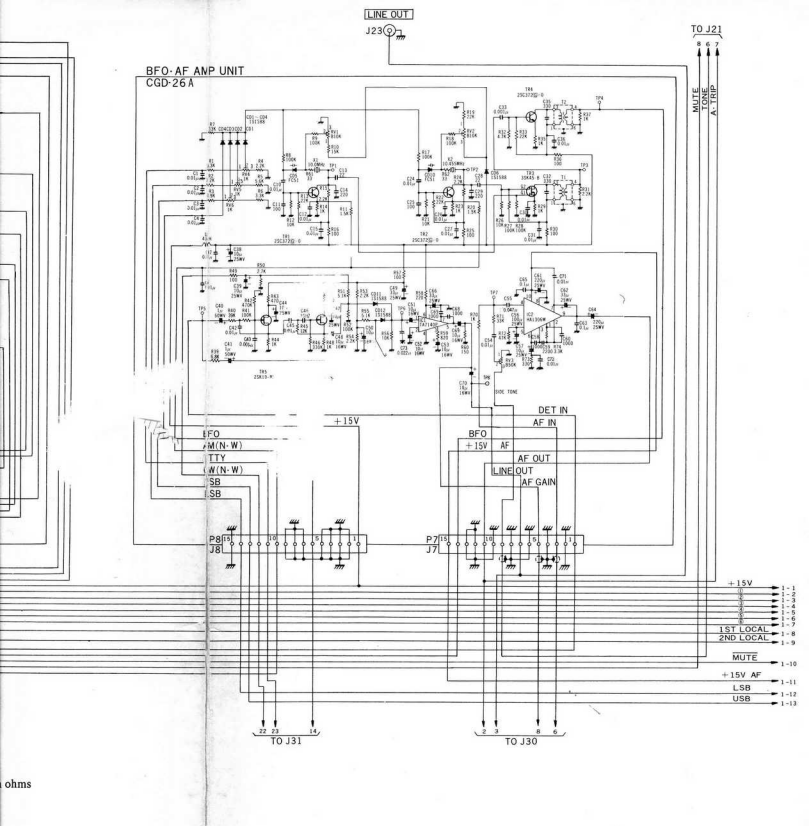

RF AMP UNIT
CAF-69A
IF AMP UNIT
CAE 56A
2ND LOCAL
RF IN
IF OUT
1ST LOCAL
NB
RF AGC
+15V
P3
J3
P4
J4
TO J31
TO J32
P31
P32
P28
J28
P29
J29
MODE
S6
AGC
FAST
SLOW
OFF
S7
PRESET
MANUAL
S2-1
S2-2
CH1
CH2
CH3
CH4
INT
EXT
VFO
S3
R4
10K
AF
R5
5.6K
RV1
B10K
BFO
R6
2.2K
R7
4.7K
RV2
B10K
X10MHz
X1MHz
X100KHz
X10KHz
X1KHz
X0.1KHz
CDE - 74
DISPLAY UNIT





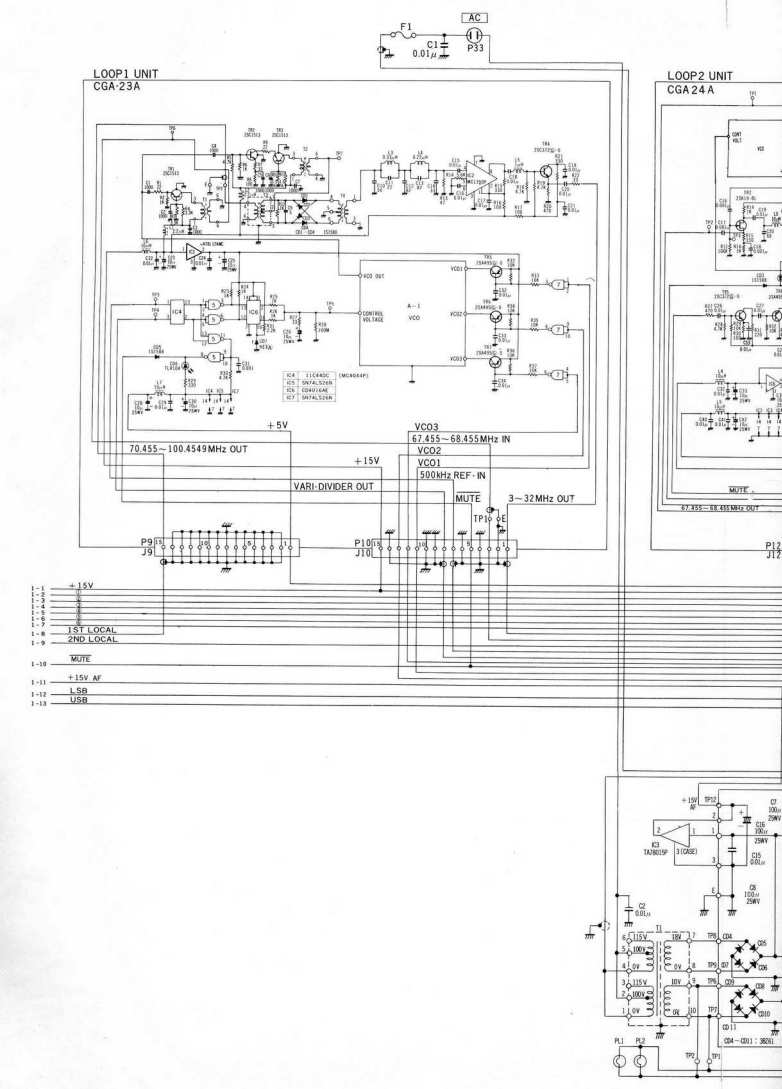
NOTES 1. Unless otherwise indicated resistances are in ohms capacitances are in micro-micro farads.
2. Values selected in manufacture.

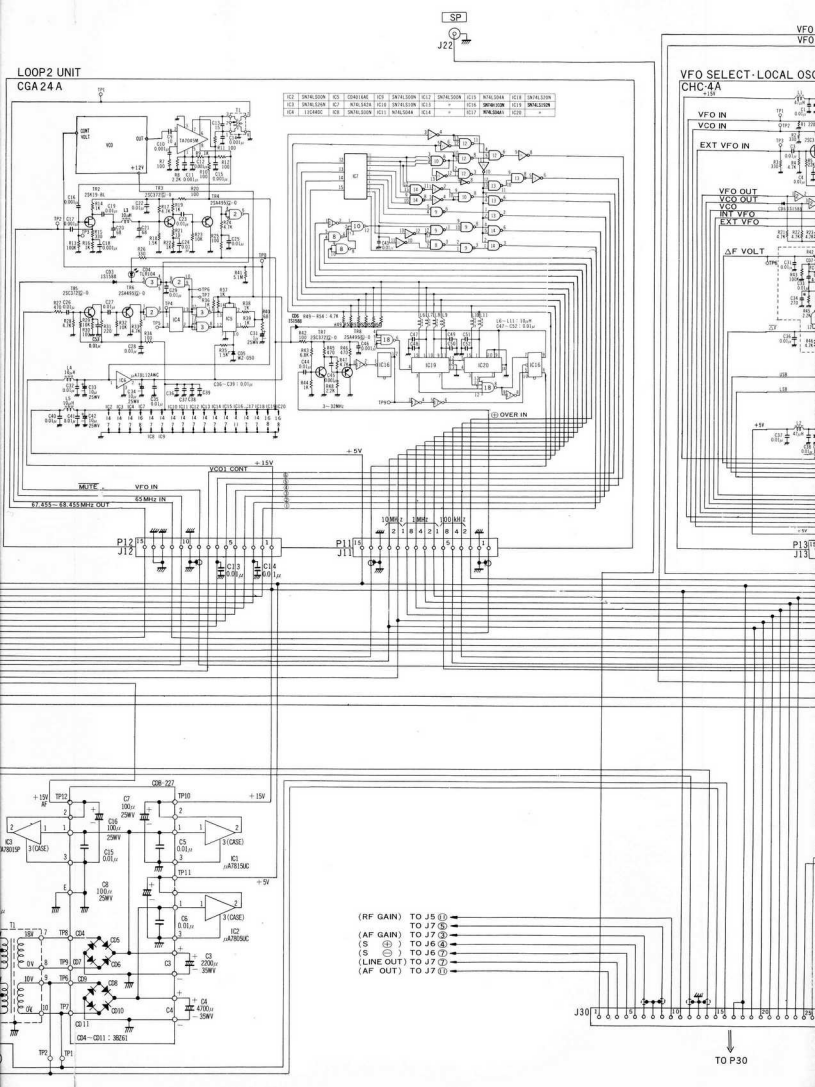
APPENDIX 2 RECEIVING SECTION AND FRONT PANEL CIRCUIT CONNECTI OF MODEL NRD-505 ALL-WAVE RECEIVER

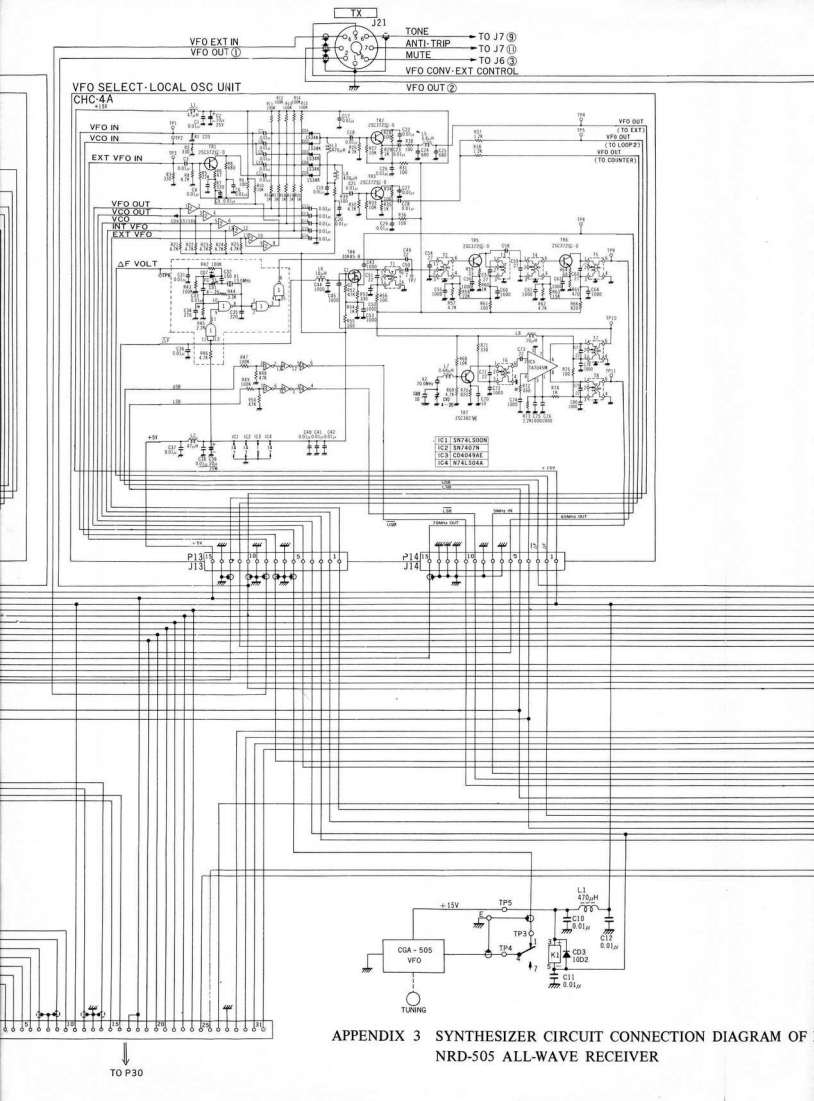


ohms

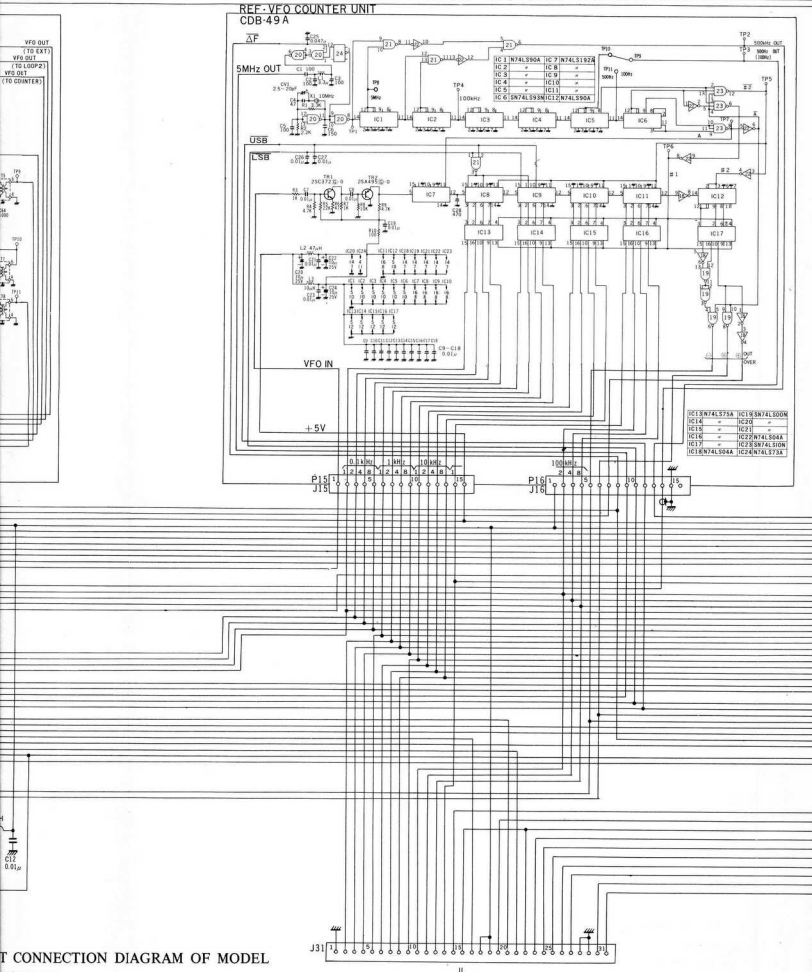
ONT PANEL CIRCUIT CONNECTION DIAGRAM
E RECEIVER


AC
F1
C1
0.01μ
P33
LOOP1 UNIT
CGA-23A
LOOP2 UNIT
CGA24A
VCO OUT
CONTROL VOLTAGE
A-1 VCO
VCO1
VCO2
VCO3
IC4 TC4420C (MC4044P)
IC5 SN74LS26N
IC6 CD4016AE
IC7 SN74LS26N
+5V
70.455~100.4549MHz OUT
VCO3
67.455~68.455MHz IN
VCO2
+15V
VCO1
500kHz REF-IN
VARI-DIVIDER OUT
MUTE
3~32MHz OUT
TP10
P9
J9
P10
J10
1-1 +15V
1-2
1-3
1-4
1-5
1-6
1-7 1ST LOCAL
1-8 2ND LOCAL
1-9
1-10 MUTE
1-11 +15V AF
1-12 LSB
1-13 USB
+15V AF
TP12
IC3 TA7805SP
3(CASE)
C7 100μ 25WV
C16 100μ 25WV
C15 0.01μ
C8 100μ 25WV
C2 0.01μ
11
18V
0V
10V
0V
4 115V
5 100k
6 0V
3 115V
2 100k
1 0V
7
8
9
10
TP8
TP9
TP6
TP7
CD4
CD5
CD6
CD7
CD8
CD9
CD10
CD11
CD4~CD11 : 3B261
PL1
PL2
TP2
TP1


SP
J22
LOOP2 UNIT
CGA24A
VFO SELECT·LOCAL OSC
CHC-4A
VFO IN
VCO IN
EXT VFO IN
VFO OUT
VCO OUT
INT VFO
EXT VFO
ΔF VOLT
OVER IN
VCO1 CONT
+15V
+5V
MUTE
VFO IN
69MHz IN
67.455～68.455MHz OUT
10MHz
1MHz
100MHz
P12
J12
P11
J11
P13
J13
(RF GAIN) TO J5
TO J7
(AF GAIN) TO J7
(S +) TO J6
(S −) TO J6
(LINE OUT) TO J7
(AF OUT) TO J7
J30
TO P30

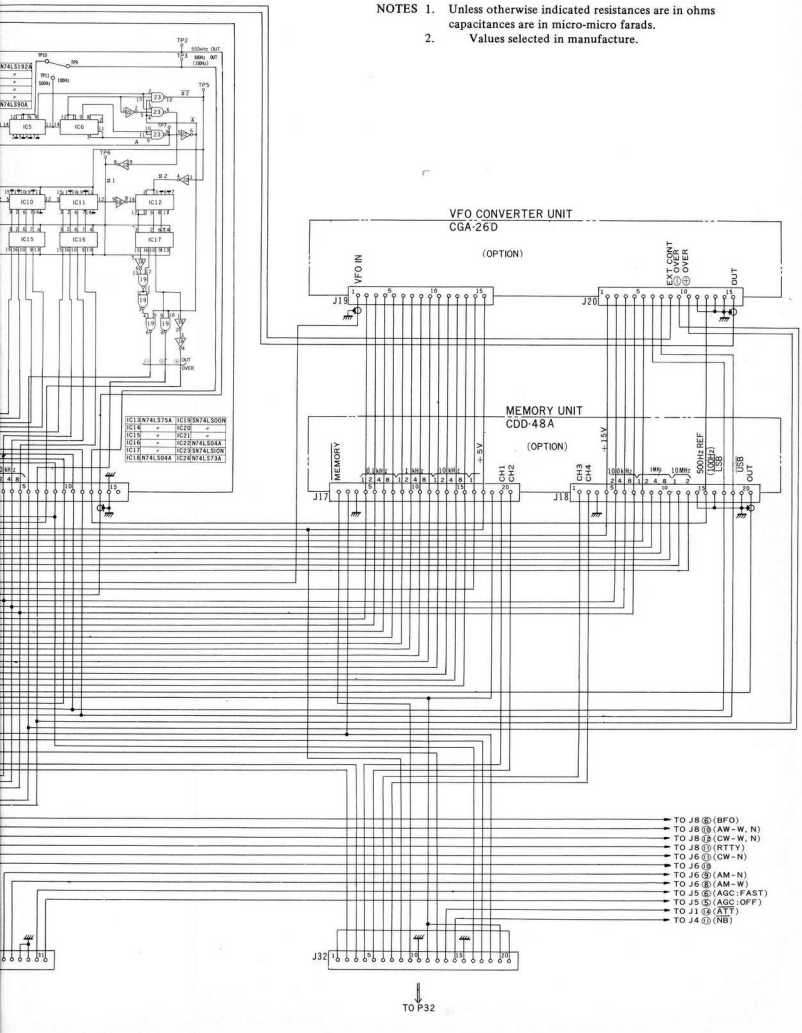


APPENDIX 3 SYNTHESIZER CIRCUIT CONNECTION DIAGRAM OF NRD-505 ALL-WAVE RECEIVER



T CONNECTION DIAGRAM OF MODEL
ECEIVER

NOTES 1. Unless otherwise indicated resistances are in ohms capacitances are in micro-micro farads.
2. Values selected in manufacture.



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