

CRYSTALLIZATION OF EVER-ADVANCING

Belcom

TECHNOLOGIES ON WIRELESS COMMUNICATIONS

Liner 15

**21MHz SSB
MOBILE
RIG**



OWNER'S GUIDE

Nihon Dengyo Co., Ltd.

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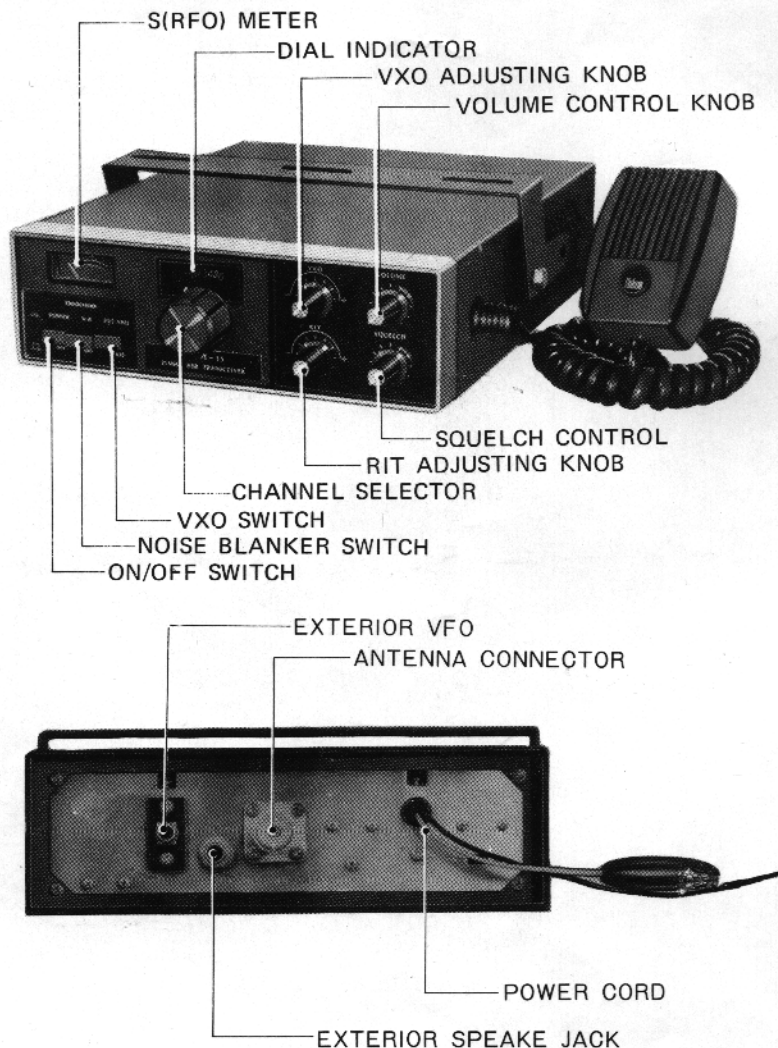
PHONE: 962-5087 TELEX: BELCOM J24523

CABLE ADDRESS: BELCOMDENGYO TOKYO

Thank you very much for your purchase of Belcom Model "Liner 15" which is manufactured by Nihon Dengyo Co., Ltd. on the basis of its high-level technical knowhows, long experience and severe inspection test, so as to meet ham's requirements satisfactorily. The Belcom products are proud of 90% share occupation in the SSB/CB transceiver market of the United States. In case you find damage or defective in the product, resulting from troubles during transportation, etc., please do not hesitate to contact our local dealer to that effect.

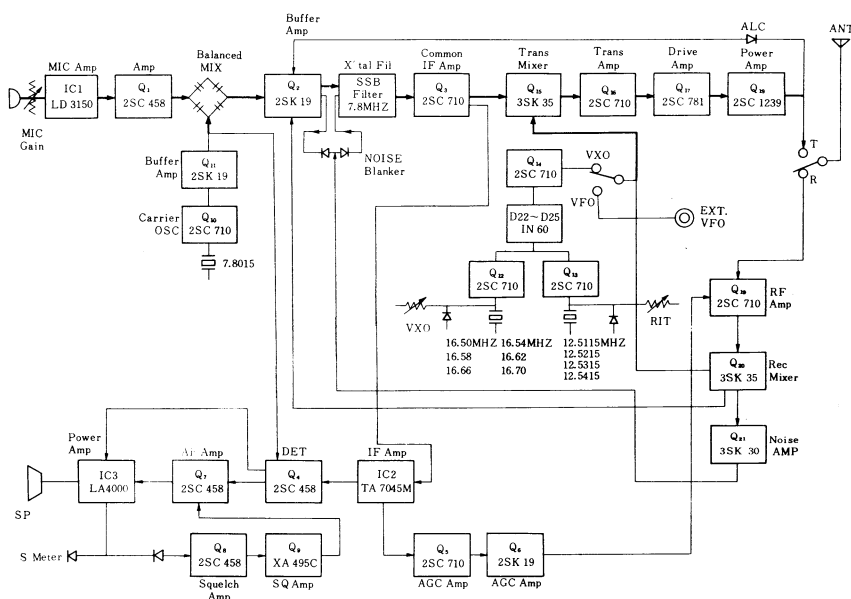
INTRODUCTION

- Due to the perfect solid-state circuits, your "Liner15" is designed to be so compact in construction, less in power consumption (2.2A at maximum) and light in weight (6.6 lbs)
- It can be used, without any remodeling, as the mobile station, or the Base Station if provided with an optional power supply.
- As it is of channel system employing a crystal oscillator of 24-channel synthesizer system, the operational stability is outstanding.
- As a crystal filter of the highest quality exactly meeting the industrial standard specifications is used, it is clear and sharp in tone quality.
- The built-in noise blanker perfectly eliminates ignition noises, etc. displaying overwhelming power.
- RIT circuit being built in the receiving frequency can be shifted a little for the transmitting frequency, resulting in extreme convenience for fine tuning of the reception.
- Handling is very simple, enabling even a novice to operate it easily. It requires no complicated adjustment.
- High output for its small-sized compact design, in combination with special frequency characteristics of 21 MHz, makes it easy to have overseas DX communications.
- Reading of S-meter is very simple, enabling to give the correct indication, because it is provided with superstabilized AGC circuit.



SPECIFICATIONS

| | |
|--|--|
| Operating Frequency Range : | 15m band, 21.210–21.440MHz |
| (Transmitter/Receiver) | |
| Mode of Operation : | SSB (A3J) |
| Channels : | 24 – all supplied |
| Final Input : | More than 20W (PEP) |
| Antenna Input Impedance : | 50–75Ω (50Ω standard) |
| Carrier Suppression : | Less than –40dB |
| Side Band Suppression : | Less than –40dB |
| Spurious Radiation Intensity : | More than 50dB |
| Microphone : | 600Ω or 2KΩ dynamic microphone |
| Transmitting Frequency Characteristics : | 300–2,700 Hz (–6dB) |
| Receiving Sensitivity : | 0.5μV, S/N more than 10dB |
| Selectivity : | –6dB (2.4KHz) –60dB (5.0KHz) |
| Image Ratio : | More than 60dB |
| AF Output : | More than 1W |
| Power Consumption : | 35W (13.8V DC) at maximum for transmission 13W (input) full for reception |
| Circuitry : | 17 transistors 3 ICs 6 FETs 43 diodes |
| Power Source : | 1 2 – 16V DC, 2.5A |
| Size : | 8.6" (W) × 2.7" (H) × 9.8" (D) |
| Weight : | 6.6 lbs. |



INSTALLATION

Liner-15 is desired to be installed at the dry and humidity-proofed place protected from direct sunlight. In case of mounting in the car, its case should be fixed to the car dashboard by using an accessory bracket. Thus you can enjoy the mobile ham communications.

POWER SOURCE CONNECTION

When operated as the Base Station, the optional power supply, R-114, for exclusive use will be used. In case of being used as the mobile station, it requires no special power supply. Red (+) and black(-) cords coming out of the main body will be connected to the cigarette lighter output or some other power available place.

ANTENNA CONNECTION

For the enjoyment of better QSO, it is important to use a high-efficiency antenna. When used in the car, it is recommended, for enjoying better communications, to use a 21MHz roof-side loading antenna manufactured specially by our company.

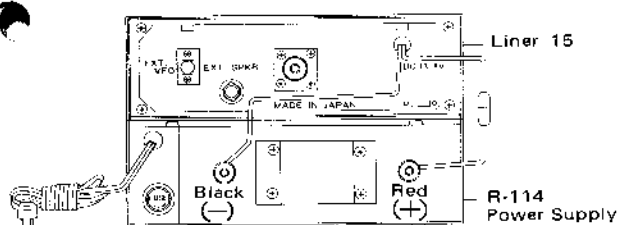
MICROPHONE

Use the microphone provided as an accessory, that is of dynamic type with 2K Ω impedance. A 600 Ω dynamic microphone, too, can be used.

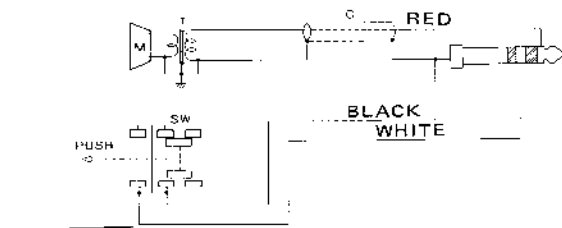
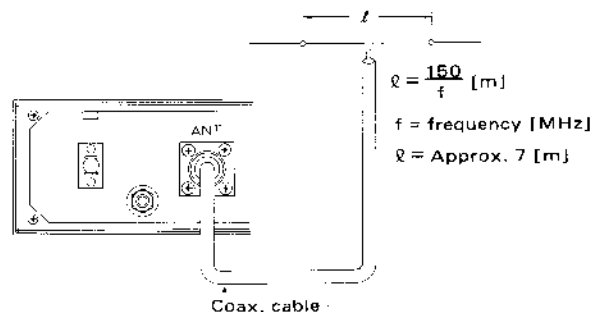
HOW TO OPERATE

When the preparations for antenna, power supply, etc. are over, start the manipulation in the following order.

| | |
|---|----------------------------------|
| POWER switch | ON |
| N.B. (noise blarker) switch | OFF |
| EXT. VFO \leftrightarrow VXO switch | at the side of VXO |
| VXO adjusting knob | at the center |
| CHANNEL switching knob | at the desired channel frequency |
| RIT adjusting knob | OFF |
| VOLUME control knob | at the suitable sound volume |
| SQUELCH control knob | at the extreme left |



CONNECTION FIGURE



POWER

When **POWER** is switched on, the meter and channel indicator are lighted, showing that the transceiver came to be in the state of operation.

VOLUME

When the **VOLUME** control knob is turned clockwise, noise or signal will come to be heard from the speaker. Adjust its volume adequately.

CHANNEL

Turn the large knob in the center for selection of station, and you will receive amateur radio signals.

VXO

Turn the **VXO** adjusting knob slowly so that the received sound from the selected station can be heard clearly. A station can be selected easily by turning the channel selector knob and the **VXO** knob alternately.

RIT

In the transceiver type communications, the same frequency is employed for both transmission and reception. The receiving frequency, however, can be shifted by using **RIT**, leaving the transmitting frequency as it is. If tuning is adjusted by using **VXO** when the frequency of other station shifted during **QSO**, your transmitting frequency, too, will shift simultaneously. In such a case, the receiving frequency alone can be shifted by availing of **RIT**, in order to have clear communications.

NOISE BLANKER (N.B.)

When the **N.B.** switch is suppressed, the noise blanker starts to operate. It displays special powerful effect for blanking receiving noises especially such as pulse noise, car ignition noise, etc.

EXT. VFO-VXO

This switch has no need of manipulation in the normal communications. It is used for switching an accessory **VFO** when it is employed.

SQUELCH

The **SQUELCH** control knob is set, as a rule, at the maximum counterclockwise position during **QSO**, but it ought to be availed of also in the case of "waiting-for **QSO**" or "stand-by" time when noises come out of the speaker.

Turn slowly the **SQUELCH** control knob clockwise up to the point where noises just fade away, and set it there. Care must be taken so that it is not turned clockwise too much because the excessive turning causes sometimes no working even when signals get in. Adequate manipulation of **SQUELCH** control knob leads you more quiet operation.

No transmitting manipulation is required for this transceiver. It is needless to adjust troublesome antenna circuits, and all that is necessary for enjoying **QSO** is to connect an antenna terminal of the transceiver with a 50 Ω or 75 Ω antenna.

CIRCUIT CONSTRUCTION

Your "Liner 15" is of perfect solid-state circuits employing 17 transistors, 3 ICs, 6FETs and 43 diodes, as seen in the block diagram.

TRANSMITTING SECTION

Voice signal coming in the microphone is sent to Balanced Modulator after being amplified at IC₁ (LD-3150) and Q₁ (2SC-458).

Q₁₀ (2SC-710) works as a Carrier Wave Oscillator that is of crystal oscillation system of 7.8015MHz. It works also as BFO in the reception. The oscillation is made highly stabilized in consideration of temperature characteristics. It passes through Buffer of Q₁₁ (2SK19), and is modulated at Balanced Modulator by voice signals.

The output here is the perfect DSB, and it becomes SSB after passing through Q₂ (2SK19) and SSB Filter. It is then IF-amplified at Q₃ (2SC710). As its frequency is SSB of 7.8MHz, it is mixed at Q₁₅ (3SK39) in order to be converted into 21MHz amateur band.

The 2nd OSCILLATOR is a synthesizer oscillation unit unique to our company. The oscillation output for 24 channels are obtained at Q₁₂ and Q₁₃ by using 10 crystal oscillation elements. The 2nd oscillation is amplified at Q₁₄ (2SC710) and sent to MIXER. It becomes the expected 21MHz band at Q₁₅. After it is amplified at Q₁₆ and Q₁₇, the proposed output is taken out at POWER AMPLIFIER, Q₁₉ (2SC1239).

The antenna circuit is of general 3-stage π -matching system. It is adjusted at the plant, resulting in no need of adjustment by the operator.

ALC circuit detects an output side of the final-stage Q₁₉ and feeds it back to Q₂. This ALC works concurrently as a protector of final transistor, constantly preventing overdriving and spluttering.

RF output meter detects with diodes high frequency at the antenna terminal, and reads its current.

RECEIVING SECTION

Signal received by antenna is amplified at Q₁₉, and converted firstly at the following stage Q₂₀. This converted output is 7.8 MHz, and the signals are amplified at Q₂, SSB FILTER and Q₃ that are common to the transmission and reception.

A part of conversion output is noise-amplified at Q₂₁. This circuit operates when NB switch on the panel connected with NOISE BLANKER is ON. When noise input (pulsatile input) takes place, the pass circuit of IF signal is opened and closed according to the said input. In this case, only the part with noise composition is cut, constituting the circuit where noise does not pass.

SSB CRYSTAL FILTER is common to the transmission and reception. As it has ideal characteristics, it enables the ham operator to enjoy QSO in the super tone quality.

Q₃ IF AMPLIFIER, too, is common to the transmission and reception, and the following stage of IF AMPLIFIER employs IC, perfectly satisfying gain and S/N characteristics.

Q₄ is PRODUCT DETECTOR, and BFO is used commonly to the transmitting carrier wave oscillation.

A part of IC's IF output is IF-amplified at Q₅ for the use of AGC. Its output is detected and rectified, and added to the gate of Q₆ FET, and power voltage change is taken out as AGC and applied to Q₃ and Q₁₉.

AF, a part of product detection output is amplified at Q₇ and further amplified at IC₃ for output, and AF output of approximately 1.5W is taken out. Other AF of detection output is amplified at PRE-AMPLIFIER of IC₃, and its pre-amplification output is detected and rectified, and is taken out as current for S-meter.

SQUELCH circuit is employed as one of special features of this transceiver. It is DC-amplified at Q₈ and Q₉, and AF circuit is opened and closed at the emitter side of Q₇.

| Channel (MHz) | | Synthesizer oscillation frequency (MHz) | | Synthesizer output f_2 frequency | $f_2 - f_1 = F$ $f_1 = 7.8015 \text{ MHz}$ |
|------------------|--------|--|----------|--|---|
| 1 | 21.210 | 16.500 | +12.5115 | 29.0115 MHz | 21.210 MHz |
| 2 | 21.220 | " | +12.5215 | 29.0215 | 21.220 |
| 3 | 21.230 | " | +12.5315 | 29.0315 | 21.230 |
| 4 | 21.240 | " | +12.5415 | 29.0415 | 21.240 |
| 5 | 21.250 | 16.540 | +12.5115 | 29.0515 | 21.250 |
| 6 | 21.260 | " | +12.5215 | 29.0615 | 21.260 |
| 7 | 21.270 | " | +12.5315 | 29.0715 | 21.270 |
| 8 | 21.280 | " | +12.5415 | 29.0815 | 21.280 |
| 9 | 21.290 | 16.580 | +12.5115 | 29.0915 | 21.290 |
| 10 | 21.300 | " | +12.5215 | 29.1015 | 21.300 |
| 11 | 21.310 | " | +12.5315 | 29.1115 | 21.310 |
| 12 | 21.320 | " | +12.5415 | 29.1215 | 21.320 |
| 13 | 21.330 | 16.620 | +12.5115 | 29.1315 | 21.330 |
| 14 | 21.340 | " | +12.5215 | 29.1415 | 21.340 |
| 15 | 21.350 | " | +12.5315 | 29.1515 | 21.350 |
| 16 | 21.360 | " | +12.5415 | 29.1615 | 21.360 |
| 17 | 21.370 | 16.660 | +12.5115 | 29.1715 | 21.370 |
| 18 | 21.380 | " | +12.5215 | 29.1815 | 21.380 |
| 19 | 21.390 | " | +12.5315 | 29.1915 | 21.390 |
| 20 | 21.400 | " | +12.5415 | 29.2015 | 21.400 |
| 21 | 21.410 | 16.700 | +12.5115 | 29.2115 | 21.410 |
| 22 | 21.420 | " | +12.5215 | 29.2215 | 21.420 |
| 23 | 21.430 | " | +12.5315 | 29.2315 | 21.430 |
| 24 | 21.440 | " | +12.5415 | 29.2415 | 21.440 |

LINER SERIES ACCESSORIES

The following accessories are available for the better enjoyment of Liner Series transceivers.

MOBILE ANTENNA

Roof-side loading antenna with 58/U cable (4m) and RF connector.

It is able to be fixed very easily, and serves the ham to enjoy better QSO.

Power Supply for Base Station, Model R-114:

Input voltage: 117/220V AC, 50/60Hz.

Output voltage: 13.8V DC, 3A max.

AC power supply is designed for the use of Liner Series transceivers. It is the same in dimensions with the transceiver so that they can be used in pile and highly stabilized in performance, resulting from the use of stabilized circuits employing silicon transistors.

LINEAR AMPLIFIER LA-102:

LA-102 is designed for 21MHz single band, but it can be used for 14--30MHz by means of adjustment. It is able to obtain the maximum transmission input of 100-120W. Various new devices are adopted for each unit for the better QSO. It is super in linear distortion characteristics.

EXTERIOR VFO:

Highly stabilized exterior VFO designed to match Liner 15 transceiver. It enables to have nice QSO, if used in combination with channel oscillation of Liner 15. Power supply is 12V-16V in parallel with the main body.

VOX UNIT:

Liner-15 is so designed as able to be fixed with VOX. How to remodel is stated in the explanation sheet of VOX Unit. It is a unit to put the main body in the state of "Stand-by" by means of voice coming in the microphone. It consists of VOX amplifier circuit and anti-VOX circuit that are print-circuited on one base board. The former operates a switching relay of transmission and reception, and the latter prevents VOX from operation due to the voice from the speaker in case of reception. It can be used as VOX by fixing it to Liner-15.

TROUBLE SHOOTING

No adjustment is required for Liner-15 because it is the completely adjusted finished product. For the precise adjustment of each unit and component, high-performance measuring instruments and measurement knowledge are necessary, so it is requested not to turn or fumble about adjustment points without instruments.

Following conditions are not real troubles of equipment itself. They should be checked and disposed according to the instructions in the table. In case that trouble still exists even after the countermeasure has been taken, please contact our dealers.

TROUBLE SHOOTING GUIDE

| Condition | Cause | Disposition |
|--|--|---|
| No output | A switch for EXT. VFO-VXO is on the side of the former, resulting in disconnection of VFO. | Set the push switch on VXO. |
| No output, no swing of RF meter. | Poor insertion or connection of microphone plug or jack. | Make perfect the insertion and reception. Correct the connection of microphone as shown in the instruction manual. |
| In spite of power supply having been switched on, a lamp is not lighted and sound is not produced. | (1) Poor connection of power supply cord. | (1) In the case of the fixed station, insert perfectly a plug of AC power supply into the receptacle. |
| | (2) Fuse is broken. | (2) Connect perfectly red/black cord from the main unit with terminal. |
| | | (3) Replace a fuse after confirming + and - . (If the replaced one is broken, it means a trouble.) |
| Signal can not be received even if antenna is connected. | (1) Antenna cable is short or open-circuited at the connector. | (1) Check if antenna cable is short-circuited or open-circuited, and repair it if necessary. |
| | (2) Push switch for EXT. VFO VXO is on the side of EXT. VFO, in other words, VFO is not connected. | (2) If the switch is on the side of EXT. VFO, the oscillator of main body does not operate. Therefore, switch on VXO. |
| S-meter is swinging, but the receiving sound is not produced. | Squelch knob is turned in the maximum clockwise direction. | Turn the Squelch knob counterclockwise to the full. |

WARRANTY

Nihon Dengyo establishes "Warranty Service" policy with our designated Distributors or Sales Agents in local area in various countries. Please ask for your local Distributors or Agents where this equipment is purchased when the service is required. The warranty shall only be available at our authorized service contractor including the Distributors and Agents above. For your prompt service, we will suggest your warranty registration at early time at your stores.