Enjoy Clear Digital Sound!
The quality of radio reception, especially in the shortwave bands, is greatly affected by the performance of the receiver, because the high density of the shortwave radio spectrum and its wide dynamic range (of small to large signals). The receiver's sensitivity, or its ability to detect weak signals, is controlled by the noise from the space or the atmosphere, and by the internal noise generated by the receiver itself, while the capacity of handling large signals is affected by interference between strong radio signals.

If it is required to reject intermodulation distortion over a wide dynamic range, then digital signal processing (DSP) achieves a remarkable advantage. Signal quantization (conversion of analog signals to digital quantities) is performed in a completely linear manner over the entire range, thus never generating any intermodulation distortion.

The NRZ-645 DSP Receiver consists of a 40-bit extended floating-point DSP IC (digital signal processor IC), a 16-bit 10-bit Analog-to-Digital converter, and a 18-bit Digital-to-Analog converter. The DSP IC performs signal processing in all the circuits after the intermediate frequency (IF) stage. The functions of 18 stages of circuits after the IF stage, which have previously been configured as analog circuits, are now handled by the DSP IC.

The digital IF filter, one of the DSP features, provides a steeper attenuation gradient and frequency characteristic than a crystal filter, thus allowing continuous bandwidth adjustment. All traditional crystal filters and mechanical filters that have previously determined the selectivity characteristics of receivers are eliminated from the new DSP receiver.

In addition to JRC's recognized receiver front end, complete digital signal processing in all the circuits after the IF stage has been realized. Thus, the new-generation NRZ-645 receiver has come into the world.

Digital signal processing views an analogic operation method for signal detection, generation, interference, processing, or transmission. Compared to analog signal processing circuits, digital signal processors are more advantageous: They require fewer precise components, they are robust against drift and interference, they are easier to integrate with high precision; and they offer greater flexibility with software processing.

The DSP IC consists of a multiplex, an adder/subtractor, and a memory (shift register). The digital signal processing algorithm is based on principles of operations such as data read from the memory, multiplication, addition, and subtraction.

**Digital Signal Processing by One-Chip DSP**

**GRS-AL Mode Detection**

The DSP IC performs signal detection in all the modes including LSB, USB, CW, RTTY, FM, AM, and EBC (Buddist Car's Selectable Skewless).

**Digital IF Filter**

Super-selectivity performance is achieved by a simultaneous Chebyshev type digital IF filter with an IIR (Irregular Impulse Response) filter configuration. Passband continuity is automatically adjustable by adjusting the IN/OUT Selector in 1-bit steps (400kHz). Default values can also be set for each mode in MB/MACK, INTERmode, and WIDE positions (except for AMS, FM, and WIDE models).

**Pass-Band Shift (PBS)**

Radios interference is pushed out of the band by shifting the center frequency of the digital IF filter upward or downward in the variable range of within ±3.5kHz (±10kHz steepness).

**Nyquist Filter**

The Nyquist filter is not included in the standard version. It is optionally available for the received signals in the LSB, USB, CW, and RTTY modes.

**RF Gain**

The RF gain is controlled by the RF GAIN control via the AGC converter and is entered into the DSP as the primary IF amplifier, then the gain of the primary IF amplifier is controlled by the RF gain control (FGC).

**AGC**

Digital AGC is applied to all modes except for the WIDE mode. An AGC loop is not only configured inside the DSP, but AGC is also applied to the primary IF amplifier to a loop converter. Although the discharge time constant is fixed for the PBS configuration, it can be set to 16 ms or 32 ms in 20 steps. When the notch blocking setting is on, the notch filter follows the range of 50Hz even when the tuning dial is rotated.

**Tone Control (TT/UE)**

The tone quality of the audio output can be continuously adjusted in a range of ±1kHz with a bandwidth of 1kHz or ±5kHz with the bandwidth of ±1kHz with ±5kHz in the AGC and RTTY WIDE modes.

**Meter**

The signal level is determined in reference to the input signal to the DSP, and the level is converted to an antenna input level, which activates the 5-meter.
By Digital Signal Processing

High Sensitivity & Wide Dynamic Range

A wide dynamic range and improved sensitivity is achieved by four section type FETs with low noise and superior cross modulation characteristics which are used in the first stage RF amplifier and the first mixer. The RF amplifier employs a high power gain circuit in which 4 PFTs are interconnected in parallel in order to improve the matching sensitivity. For the first mixer, a double-balanced mixer with 4 FETs in a quadrate connection is used in order to reduce odd-order intermodulation distortion (IMD).

Variable Tuning for Excellent Reception

A variable tuning system (electronic variable tuning by a capacitor diode) is employed in the front-end double tuning circuit. Continuous adjustment of the center frequency of the double tuning circuit is made by a CPU, depending on the received frequency. This enables unrestricted radio waves to be drastically attenuated, compared with the wide-band BPF, thereby fixing a fixed bandwidth. As a result, multi-signal characteristics are significantly improved, ensuring enhanced receiving performance.

High-Speed DDS IC

A one-chip DDS (direct digital synthesized) and a PLL phase-locked loop) circuit are combined to substantially improve synthesizer performance. High-speed frequency switching in 1Hz steps with 1% max. accuracy even without the PLL, and a high CM (common mode ratio) and simplified external circuit configuration are achieved. For frequency control in 1Hz steps, tuning operation can be made similarly to an analog type VFO.

OPERATING PANEL AND DISPLAY

[Diagram of operating panel and display]

ECSS (Excited Carrier Selectable Sideband)

The ECSS mode reduces signal distortion due to fading and beat interference from adjacent broadcast stations. This feature enables the receiver to selectively receive either USB or LSB which is suffering interference, ensuring clear reception with less degraded sound quality. To reject distortion due to fading, the signal is synchronized with the carrier of the receiving signal is generated for signal detection. In fading, a phenomenon that sound becomes large or small, causing the audio to be weakened or drowned out, can be prevented. This is a difference in hardware configuration. After demodulating the DDS double sideband system is adopted in which the modulation signal is transferred to both USB and LSB. In many cases, however, beat interference due to adjacent stations appears even USB or LSB.

Multifunctional, Large Color LCD

The multifunctional LCD presents a digital bar-graph meter which can be seen in an analog S-meter. Various indications such as all-digit frequency (shown for the 10kHz digital), memory channel, mode and bandwidth are all presented on the large color LCD.

[Actual Size]
Remote Control by Personal Computer

Remote Control from a personal computer is available. All operations including receiving frequency setting can be remotely controlled by command from a personal computer. The data such as the receiver’s setting conditions and S-meter values are also read out on the display screen.

Computer control software to be run on Windows 95 is available only for reference. This software includes display of RTTY signals on a computer screen, and display of panoramic reception radio waves travelling in the air to be seen at a glance.

This feature is just an appendix. So, JRC will not take any responsibility against software failure and JRC may not take inquiry to PC operation.

Large Memory Capacity of 1,000 Channels

The receiver incorporates a memory of 1,000 channels with lithium battery backup. Each channel can store a receiving frequency, mode, bandwidth, AGC, ATT and time of timer on/off (channel 0 to 18).

Wide-Band Converter Unit (Option)

The CHE-100 converter unit is designed to receive a wide band of 300kHz to 2,000kHz in order to meet the need of advanced users to get various types of radio communication information. This optional board enables reception of aeronautical radio, FM broadcast, TV broadcast and other radio waves.

High-Stability Crystal Oscillator (Option)

All the internal synthesizers are controlled by a standard frequency oscillator. The frequency stability can be enhanced to ±0.5 ppm by the use of the CSO-007 TCXO (temperature compensated crystal oscillator) which is optionally available.

Plug-In PC Boards on Mother Board

All the PC boards installed in the receiver are plug-in type. All the units are interconnected on the mother board, eliminating wiring, and ensuring enhanced reliability and serviceability.

Refined Design and Superior Functionality

The operation panel is designed to minimize controls and switches, and to realize refined design and superior functionality.
### Versatile Accessory Functions

- **Scan**
  Designated memory channels can be scanned. The scanning time is user-defined.

- **Sweep**
  Designated frequencies can be swept. The sweep time is user-defined.

- **Automatic Scan/Sweep Stop**
  When squelch is activated during scan/sweep operation, the operation automatically stops and the frequency is received for a certain time-duration.

- **Micro Control**
  The AF output of the receiver can be muted according to external grounding information.

- **Clock/Timer**
  The receiver's power supply is automatically set to on/off by setting the timer. Relay contact output can also be turned on/off.

- **Sleep Timer**
  The sleep timer is provided to automatically turn the power off during bed time (180 minutes max).

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### Options

- **CHE-199**
  Wide-Band Converter Unit

- **6ZCD00350**
  RS-232C Cable

- **CGO-197**
  Temperature Compensated X'ed Oscillator (TCXO)

- **NVA-319**
  External Speaker
  - Impedance: 8 ohms
  - Mini-input: 3W
  - Dimensions: 165W×130D×2800 mm
  - Weight: Approx. 3kg

- **ST-3**
  Headphones
  - Weight: Approx. 300g
Specifications

Frequency range: 0.1 to 26.99999MHz
with option board (26.9 to 199.999MHz installed)
N56-4545: 100kHz to 1999.999MHz
NRF-5454: 100kHz to 823.5kHz
844.10kHz to 869.5kHz
894.10kHz to 919.5kHz
1397.10kHz to 1522.5kHz
1690.10kHz to 1815.5kHz
USB, LSB, CW, RTTY, AM, PM
Type of reception: USB, LSB, CW, RTTY, AM, PM
Frequency stability: ±4 ppm or less for 5cm to 30cm, after turning the power on, thereafter ±2 ppm or less per hour, and ±0.5 ppm or less (with option TCXO installed)
Adjustable Minimum tuning grid: 1kHz

Dimensions

Antenna input attenuator: Approx. 20dB
AGC characteristic: The AGC output varies 10dB or less for the antenna input of 2μV to 100μV
Release time: 0.01sec. to 5.1 sec. (20μsec. steps)
AF output: 1W or more (at 10kHz load) and 10% distortion
Speaker: 1W or more (8Ω 100° load), 10% distortion
RS-232C interface: 4650 baud (Character format: start bit, 8 data bits, non-parity, 1 stop bit)
Power supply: 100/105V±10% VAC ±10%, 40VA or less
12 to 16 VDC (13.8VDC standard), 30W or less
Dimensions: 330W×138H×35D (mm)

For further information, contact:

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Weight: Approx. 7kg

ISO 9001