WATKINS-JOHNSON

137.00

WJ-8625-1 VLF RECEIVER

FEATURES

- 200 Hz to 1.5 MHz Frequency Coverage (tunable to 0 Hz)
- One-Quarter Rack, Modular Construction
- Low Power Consumption
- Fully Synthesized With 1 Hz Tuning Resolution
- Remotely Controllable
- Five Selectable IF Bandwidth Filters
- Low Phase Noise
- Synthesized Tunable BFO

DESCRIPTION

The WJ-8625-1 VLF Receiver is a one-quarter rack unit that is WJ-9040 System compatible and can be plugged into a suitably equipped EFR100 Equipment Frame. It is a fully synthesized unit that covers the 200 Hz to 1.5 MHz frequency spectrum in steps as low as 1 Hz (the unit can be tuned to 0 Hz). Remote control may be accomplished via either IEEE-488 or RS-232C interfaces. Control can also be achieved through the WJ-8628A-4 VHF/UHF or WJ-8626A-4 HF half rack receivers. This allows for a multitude of combinations in frequency coverage, all within a single WJ-9040 Equipment Frame. For example, a half rack VHF/UHF unit may be used to control a quarter rack HF and quarter rack VLF receiver to give 200 Hz to 1400 MHz coverage with up to 14 bandwidths in a single equipment frame with three completely independent receivers, optimized for each frequency range.

The unit uses low phase noise, fast tuning synthesizer circuits which have been divided down in frequency to yield very low phase noise and 1 Hz tuning steps. The IF section of the receiver allows for up to five bandwidth filters in the 100 Hz to 16 kHz range and will detect AM, FM, CW, and SSB reception. Outputs include audio, video, IF (455 kHz), SM (455 kHz), signal strength, and signal presence (COS).

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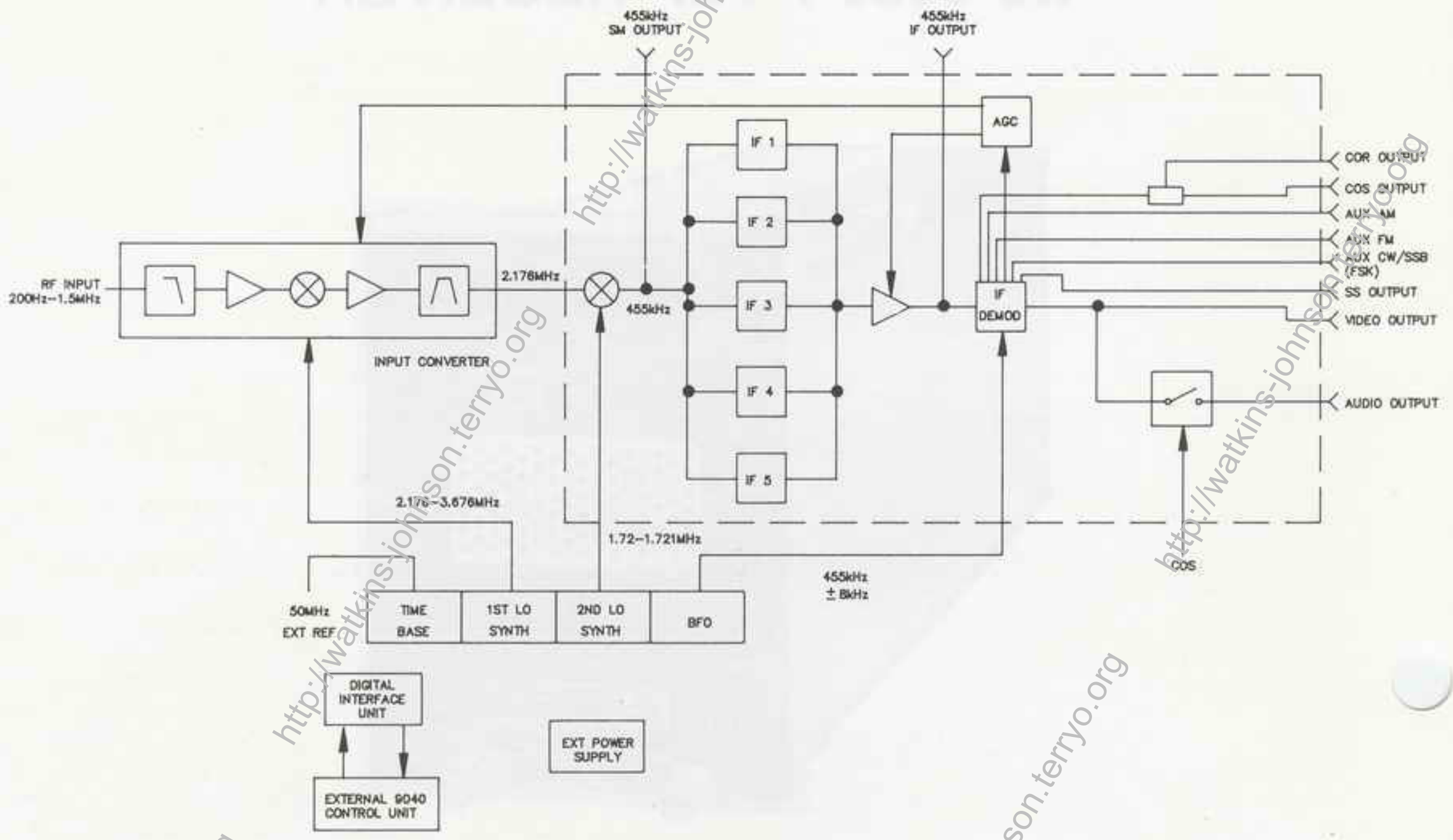
CAPABILITIES AND APPLICATIONS

The WJ-8625-1 may be used as a scanning, remotely controlled, VLF receiver or as a handoff receiver controlled by either a WJ-8628A-4 VHF/UHF Receiver or a WJ-8626A-4 HF Receiver.

The unit operates in conjunction with an IOM108 I/O Module which will store up to 99 channels for later recall and execution.

The handoff mode of operation utilizes either a WJ-8628A-4 or a WJ-8626A-4 Master Receiver and results in extremely compact handoff systems due to the small size of the WJ-8625-1 Receiver.



WJ-8625-1 VLF Receiver
Simplified Block Diagram

FUNCTIONAL DESCRIPTION

A simplified block diagram is shown in Figure 1. RF signals between 200 Hz and 1.5 MHz are input to the receiver through an eleven-pole low pass filter. The signal is then amplified and mixed up to 2.176 MHz by the first LO.

The first LO tunes from 2.176 to 3.676 in 1 kHz steps; therefore, the first IF frequency may fall anywhere between 2.175 and 2.176 MHz. The first IF is then band-limited by a 17 kHz wide crystal filter and applied to the second mixer where the signal is converted to 455 kHz by the second LO which tunes from 1.72 to 1.721 MHz in 1 Hz steps.

The 455 kHz final IF frequency is then amplified and passed through one of the five selectable IF bandwidths. One of these is used in conjunction with offset synthesizers to demodulate SSB. The 455 kHz SM output is taken directly after the second conversion and is therefore 17 kHz wide. A predetected IF output is also available and has a bandwidth equal to that of the bandwidth selected.

The signal is then passed through a selected demodulator and an AGC Amplifier. Demodulation modes are either AM, FM, CW, USB, or LSB. In all modes, the AM detector output is used by the AGC, COS, and signal strength circuits. In the CW and SSB mode, the signal is mixed down to baseband via a phase-locked oscillator tuning 455 ± 8 kHz in 100 Hz steps.

All detection modes pass their signals to either a video output which has a bandwidth equal to one-half the IF bandwidth selected, or to an audio output. Auxiliary AM, FM, and CW/SSB outputs, as well as a front panel phone output, are also available.

The time base circuitry converts an external 50 MHz reference input from the WJ-9040 System to 2 MHz for use by the synthesizers.

All receiver power is supplied by the WJ-9040 EPS100A switching power supply which is mounted in the WJ-9040 EFR100 Equipment Frame.

SPECIFICATIONS

Tuning Frequency	200 Hz to 1.5 MHz
Tuning Resolution	1 Hz
Synthesizer Tuning Speed	15 ms, typical
Antenna Conducted Local Oscillator Radiation	-95 dBm, maximum
Antenna Input Protection	The antenna input will withstand the effects of RF power to +27 dBm and static build-up. The protection circuit automatically resets
Input Impedance	50 ohms, unbalanced, nominal
IF Bandwidths (3 dB)	2.85 kHz or 3.2 kHz recommended for SSB; plus any four of the following: 0.1, 0.2, 0.5, 1, 2, 3, 4, 6, 8, 12 or 16 kHz; USB, LSB
Detection Modes	Standard: FM, AM, CW, LSB and USB
Gain Control Modes	Manual, AGC
AGC and Manual Range	87 dB, minimum
AGC Threshold	2.25 microvolt, typical
AGC Attack Time	15 ms, maximum
AGC Release Time	AM, FM = 100 ms, maximum CW, SSB = 2 to 4 seconds, nominal
Synthesized BFO	±8.0 kHz in 100 Hz steps
IF Rejection	Greater than 65 dB
Image Rejection	Greater than 80 dB
Sensitivity	See IF options, Sensitivity Table, and sensitivity curves
IF Output	455 kHz, 20 mV into 50 ohms, minimum, at 2.25 microvolt input level, IF BW limited
Signal Monitor Output	455 kHz, center frequency, 17 kHz bandwidth, 50 ohms output impedance
Third Order Input Intercept Point	+10 dBm, minimum for signals separated by 20 kHz minimum
Video Amplifier Response	Within 3 dB from 20 Hz to 1/2 IF Bandwidth.
Video Output Level	350mVrms into 75 ohms
Video Distortion	Less than 5% total Harmonic Distortion in AGC or Manual Gain modes
Phones Output	10 mW minimum into 600 ohms phones
Signal Strength Output	Shaped DC AM Detector output, 0 to +10 Vdc
Squelch/COR	Adjustable threshold from noise level to 80 dB above noise. COR holds a nominal 4 seconds after carrier disappears
Digital Control	80 bit serial word (W-9040 System compatible)
Environmental Conditions:	
Temperature, Operating	0 to +50°C
Temperature, Non-operating	-40 to +70°C
Size	5.2 inches (132 mm) high, 8.0 inches (203 mm) wide, 14.38 inches (365 mm) deep
Weight	Approximately 15 lbs.
Power Consumption	14 watts, maximum

IF OPTIONS AND SENSITIVITY LEVELS

	3 dB IF Bandwidth	IF Shape Factor (Typical) 50 dB:3 dB	RF Input Microvolts	Level dBm
WJ-9926A/100		Contact W-J		
WJ-9926A/200	200 Hz	10:1	0.35	-115
WJ-9926A/500	500 Hz	7:1	0.45	-114
WJ-9926A/1K	1 kHz	5:1	0.58	-112
WJ-9926A/2K	2 kHz	3:1	0.70	-109
WJ-9926A/3K	3 kHz	3:1	1.0	-107
WJ-9926A/4K	4 kHz	3:1	1.2	-106
WJ-9926A/6K	6 kHz	3:1	1.4	-104
WJ-9926A/8K	8 kHz	3:1	1.6	-103
WJ-9926A/12K	12 kHz	3:1	2.0	-101
WJ-9926A/16K	16 kHz	2:1	2.2	-100
WJ-9926A/USB	2.85 kHz	1.8:1	0.5	-113
WJ-9926A/LSB	2.85 kHz	1.8:1	0.5	-113
WJ-9926A/SSB (Uses offset LO)	2.85 kHz	1.8:1	0.5	-113

SENSITIVITY

Over the frequency range of 200 Hz to 1.5 MHz, the RF input levels and IF Bandwidths specified above will:

1. Produce a minimum AM (S + N)/N ratio of 10 dB at the audio for 50% AM modulation at a 400% Hz rate (kHz and wider IF Bandwidths).
2. Produce a minimum CW (S + N)/N ratio of 16 dB at the audio output.
3. Produce a minimum FM (S + N)/N ratio of 17 dB at the audio output (10 kHz and wider IF Bandwidth). Peak deviation = 1/3 IF BW.
4. Produce a minimum USB/LSB (S + N)/N ratio of 10 dB at the audio output (SSB Filters only).

Note: The IF BW must be less than 20% of the tuned frequency.

WJ-8625-1 VLF RECEIVER CONNECTIONS

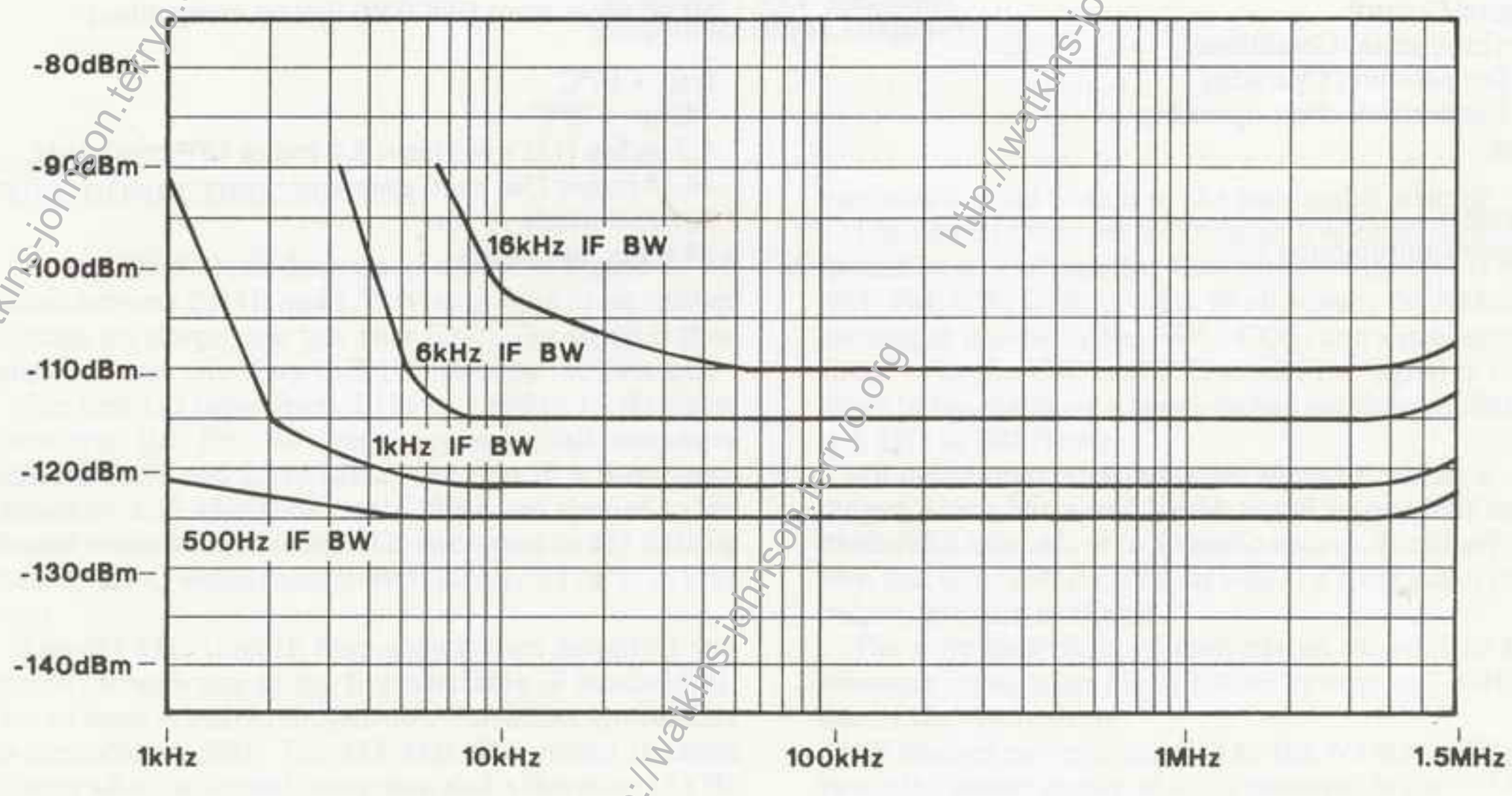
Twenty-five (25) Pin D Series Connector supporting the standard WJ-9040 Equipment Frame control I/O, DC input voltages and Polled I/O structure.

RF Input . . . . . SMA Female Connector
SM Output . . . . . SMA Female Connector
Selected Video Output . . . . . SMA Female Connector
IF Output . . . . . SMA Female Connector
50 MHz Reference Input . . . SMA Female Connector
Auxiliary I/O Connector . . . . . 9 PIN SRE Female

Pin Assignments:

- A Ground
- B FM Audio Output
- C AM Audio Output
- D Signal Strength Output (Analog 0 to +10 V)
- E Carrier Operated Relay Control (open collector, 30 mA sink to ground for switching +24 Volt maximum external voltage)
- F Carrier Operated Squelch (0 to 5 V)
- H CW/SSB Audio Output, (FSK option)
- J Squelched Audio Output
- K AM Slideback Option

WJ-9040 I/O (option) . . . . . BNC Female Connector



TYPICAL SENSITIVITY CURVES FOR 10dB CW (S+N)/N RATIO