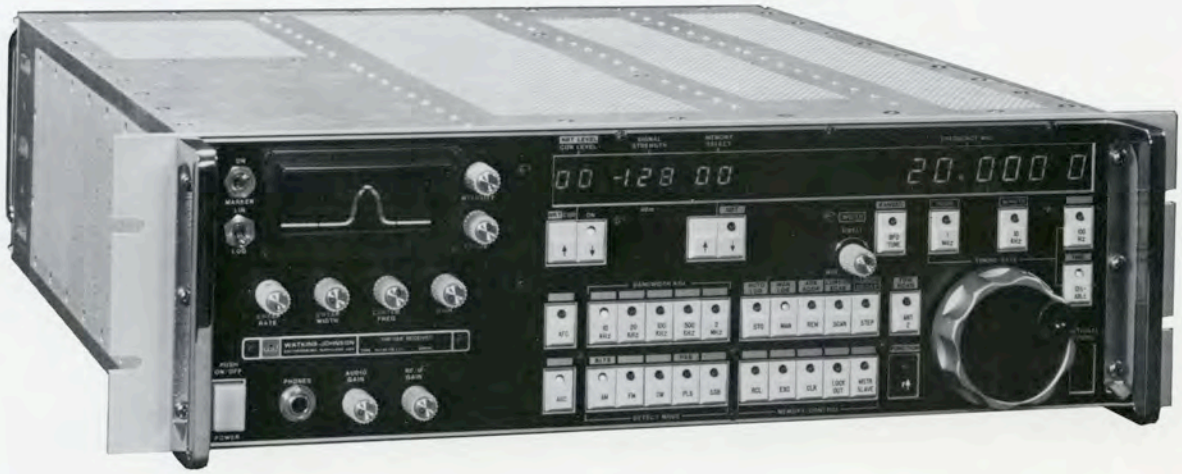
WJ-8617B(X) RECEIVER



FEATURES

- Frequency Range 20 to 500 MHz (1100 MHz With FE Option; 500 kHz With LFE Option)
- Fully Synthesized Tuning
  100 Hz Resolution
  5 msec typically between any two frequencies
  Low phase noise
- AM, FM, CW, and Pulse Detection Modes (SSB, Log Video, and Variable BFO Optional)
- Optional LOG/LIN Signal Monitor
- Modular Construction for Low MTTR
- Low RFI—Designed to MIL-STD-461A
- 5 or 10 Selectable IF Bandwidths (Optional)
- 96 Channels of Memory (Standard)
- Scan Lockout Capability (Standard)

DESCRIPTION

The WJ-8617B(X) is a general purpose, cost effective, digitally controlled VHF/UHF receiver. Mounted in a standard 19″ rack, this receiver offers built-in automatic preselection, internal microprocessor control, multiple remote control interface options, high dynamic range and low MTTR. The front panel permits complete control of the versatile microprocessor. The receiver will accept two selectable RF inputs and offers separate audio and video outputs as well as IF, Carrier Operated Relay (COR) and FM monitor outputs. Available options include wideband IF output, signal monitor, built-in test, and X, Y, Z outputs for an RF panoramic digitally refreshed display. The receiver may use a highly stable internal reference generator or accept an external 1 MHz reference.

MODES OF OPERATION

In the manual mode, the tuning and operation is as in any other receiver; however, it may store in its 96 channels of memory discrete parameters such as tuned frequency, IF bandwidth, detection mode, RF input selection, AFC and/or AGC on/off, and COR threshold. All local receiver functions and special remote modes may be controlled or queried via optional remote interface. The receiver may also be used in the optional Master/Slave mode with any one of a group of WJ-8617B's being designated the controller (Master)

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and have complete control over the operating parameters of the individually addressed slave units. (Slave units may also be WJ-8615 Receivers.)

These receivers may be used in a Step or Scan Mode. The parameters stored in each channel will be recalled as the unit steps through selected preset channels, stopping when a signal exceeds the COR threshold. In the scan mode, it will search between operator determined, ascending presets of frequency pairs again stopping when COR is exceeded. Dwell time may be varied by a front panel control from approximately a 1.0 msec minimum to 10 seconds maximum. Post dwell may be selected with an internal switch.

CAPABILITIES/APPLICATIONS

A high degree of flexibility is achieved in the WJ-8617B(X) primarily because of the Motorola 6809 Microprocessor. To make intelligent decisions possible within the receiver, analog and digital information is supplied from various receiver substations. This, in combination with complete control of the RF and synthesizer sections, allows sophisticated algorithms to perform complex functions such as SCAN and AFC without operator intervention once the command is initiated.

Lockout function permits the exclusion of selected signals from the scan to prevent the receiver from locking onto undesired signals. Lockout data is stored in the higher order memory channels, in ascending order, according to frequency (channel 95 will store the highest lockout frequency). The channel recall and deletion mode permits the recall and display of the information stored in the lockout channels. It also permits revision of lockout memory by permitting the deletion of channels where lockout is no longer desired.

The Master/Slave function permits the control of up to 14 additional Master/Slave equipped receivers, utilizing the front panel controls of one of the receivers. Each receiver must be equipped with an IEEE–488 Interface. Only one receiver can function as the master unit at a given time and the remaining receivers function as slave units when addressed.

The WJ-8617B(X) is capable of controlling other related enhancements such as a remote WJ-9073-2 Tracking Preselector or a WJ-9075 1 to 4.5 GHz Frequency Extender.

Available options include: several digital I/O possibilities, SSB, variable synthesized BFO and others. Please see "Options" descriptions beginning on page 6.

FUNCTIONAL DESCRIPTION

A simplified receiver block diagram is shown in Figure 1. Referring to Figure 1, the VHF portion of the receiver incorporates an eight-band suboctave preselector between 20 to 500 MHz, improving 2nd order intermodulation performance and spurious signal rejection. The 500 to 1100 MHz range is tuned with three additional preselectors and down-converted to 450 to 250 MHz and processed as VHF.

The first mixer converts the 20 to 500 MHz RF signal to 551.5 MHz with a first LO covering the frequency range 572 to 1052 MHz. This LO is synthesized in 1-MHz steps. Typical performances are depicted in Figure 2. The first IF Bandwidth is approximately 12 MHz wide. This allows wide IF Bandwidth responses while still providing good selectivity. The double-balanced first mixer holds intermodulation products to a minimum. The second mixer converts the 551.5 MHz IF to 21.4 MHz.

The second LO tunes 529.6 to 530.6 MHz in 100 Hz steps. The tuning speed of both the first LO and second LO is typically 5 ms (see Figure 2) allowing the receiver to quickly scan or step to each frequency.

Up to five IF bandwidths with matching frequency discriminators can be customer-selected ranging from 3.2 kHz to 8 MHz. The fifth IF bandwidth position must be configured with a bandwidth of 250 kHz or greater. The single sideband option may also be installed which adds USB and LSB filters to the receiver.

Processing after final IF filtering includes a 40 dB range log IF, AM detector with AGC range of 100 dB, and simultaneous AM and FM video processing.

SPECIFICATIONS

Frequency Range:	
WJ-8617B	20 to 500 MHz
WJ-8617B (With FE Option)	20 to 1100 MHz
Detection Modes	AM, FM, CW and Pulse standard; Variable BFO and SSB optional. (Other modes are available on special order.)
Tuning Scheme	Frequency synthesized local oscillators locked to internal reference
Reference Accuracy	1×10^{-7} over temperature (0 to 50°C) or external 1 MHz reference input (100 mV to 5 V RMS)
Tuning Resolution	100 Hz
Synthesizer Tuning Speed	3 msec typical, 10 msec maximum, to within 10 kHz
Input Impedance	50 Ω
Input VSWR	2.0:1 typical 3.0:1 maximum

(continued on page 5)

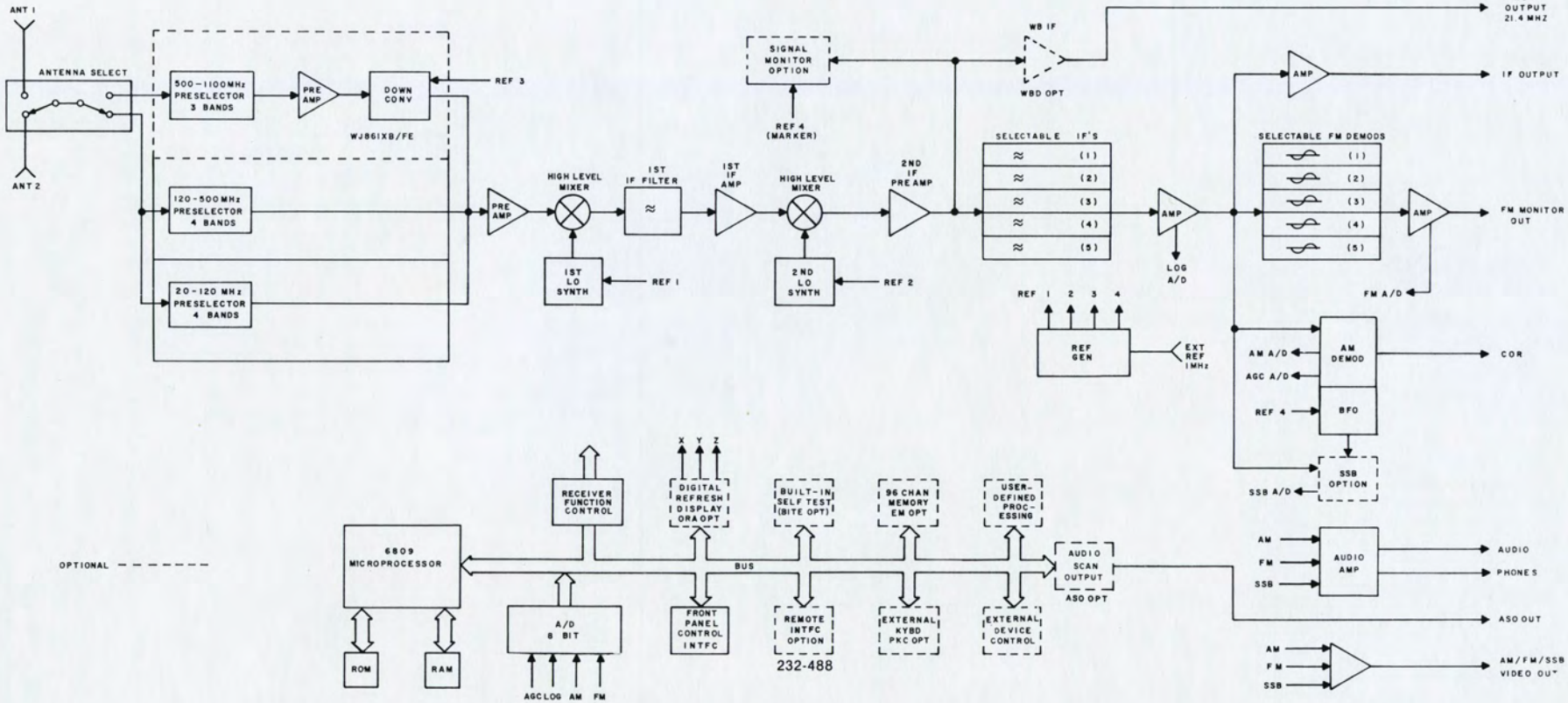

Figure 1
WJ-8617B(X) Receiver
Simplified Block Diagram

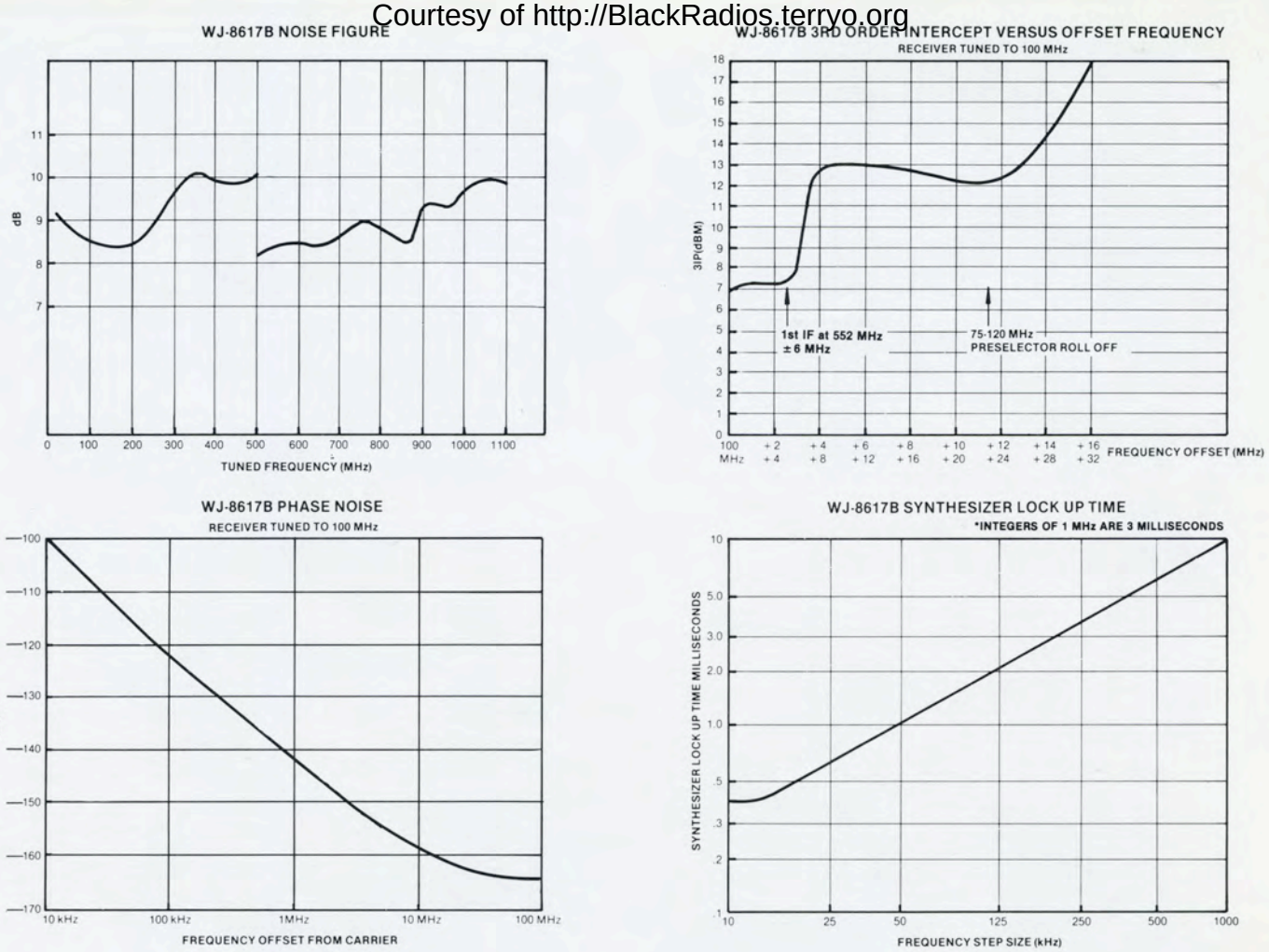

Figure 2
Typical Performances

TABLE 1

IF Bandwidth (kHz)*	Max Shape Factor 60:3 dB BW	20-1100 MHz Sensitivity (dBm)**
3.2***	3:1	–105
6.4***	3:1	–105
10***	3:1	–104
20***	3:1	–101
50***	3:1	–97
75***	3:1	–95
100***	3:1	–94
250	4:1	–90
300	4:1	–89
500	4:1	–87
1000	4:1	–84
2000	4:1	–81
4000	4:1	–78
8000	4:1	–75

*Other IF bandwidths available on special order include: 1.5, 4.0, 15, 25, 30, 40, 60, 150, 400, and 800 kHz.

**Sensitivity Conditions:

AM - Input signal AM modulated 50% by a 1 kHz tone, will produce a minimum video output (S + N)/N ratio of 10 dB.

FM - Input signal FM modulated at a 1 kHz rate with a peak deviation equal to 30% of the selected IF BW, will produce a minimum video output (S + N)/N ratio of 17 dB. (Note: A 400 Hz modulation rate is required for IF bandwidths of 10 kHz and less.)

***Cannot be used in 5th bandwidth position.

SPECIFICATIONS *(continued from page 2)*

Noise Figure	9.5 dB typical, 11 dB maximum
Input Third Order Intercept Point	+7 dBm typical, +3 dBm minimum (20 to 500 MHz) 0 dBm typical, −5 dBm minimum (500 to 1100 MHz)
Input Second Order Intercept Point	+50 dBm minimum
Ultimate FM (S+N)/N	40 dB minimum in 50 kHz BW
Oscillator Phase Noise (20 kHz from the Carrier)	−105 dBc typical
Preselection	Automatically switched, suboctave (1.66:1) bandpass filters
LO Radiation	−100 dBm typical
Image Rejection	90 dB minimum
IF Rejection	90 dB minimum above 30 MHz
Internal Spurious	Equivalent to −115 dBm maximum at the RF input*
Reciprocal Mixing	With an input signal at rated sensitivity level; an out-of-band signal removed 350 kHz in the 20 kHz IF bandwidth at a level of 70 dB above rated sensitivity will not degrade the desired output signal to noise ratio (S+N)/N by more than 3 dB
Final IF	21.4 MHz, −30 dBm Nominal Output Level at sensitivity
IF Bandwidths	5 IF bandwidths. At least one IF bandwidth must be installed for receiver operation. (To be selected from Table 1.) Note: 5th IF BW position must be 250 kHz or greater. Ten IF bandwidths optional
IF Shape Factor	See Table 1
AM Stability	6 dB maximum from AGC threshold to a level 100 dB above AGC threshold (maximum input −8 dBm)
Switched Video Output	1 volt peak to peak; nominal, into 91 ohm load for FM with peak frequency deviation at 30% of the IF bandwidth and AM with 50% modulation. DC coupled for FM and AM
FM Monitor	DC coupled FM output, 1 volt peak to peak minimum, into 91 ohm load
Video Amplifier Frequency Response	DC to ≈½ IF Bandwidth for FM Monitor; DC to ≈½ IF Bandwidth for AM/FM switched video output
Line Audio Output	10 mW, minimum, into 600 ohms for 50% AM, or FM peak frequency deviation equal to 30% of the IF bandwidth
Audio Amplifier Distortion	2.5% typical, 3% maximum
COR/Squelch	Adjustable threshold from noise level to approximately 40 dB above noise. COR provides 100 mA current "sink-to-ground" for switching; +24 Vdc maximum external voltage. (External current limiting must be provided.)
Signal Monitor: (optional)	
Sweep Width	0 to 4 MHz continuously adjustable
Resolution	10 kHz
Sweep Rate	Adjustable to 15 to 25 Hz
Marker	Center frequency (locked to receiver frequency standard)
Display	Lin/Log
CRT	1 × 3 inches nominal dimensions
PAN	Provides pan display during SCAN mode with optional digitally refreshed display (DRD)
Temperature Range:	
Operating	0°C to 50°C
Non-Operating	−20°C to 80°C
Power Requirements	110/120/220/240 Vac, 47 to 400 Hz
Power Consumption	100 watts nominal
Dimensions	19 inch rack mount, 18 inch depth, excluding connectors and handles, and 5.25 inch panel height
Weight	50 pounds, approximately
Maximum RF Input Without Damage	+20 dBm

*With LFE or HFE options, spurious is equivalent to −110 dBm.

Receiver Inputs/Outputs:

- Antenna Input (Type N)(2)
- External Reference Input (BNC)
- Optional Tuning Input (Front Panel)
- Optional Remote Control In/Out (IEEE-488, RS-232C, MIL-STD-188C)
- Optional Wideband 21.4 MHz IF Output (BNC)
- Selected Bandwidth 21.4 MHz IF Output (TNC)
- COR (BNC)
- Optional 60 dB Log Video Output (BNC)
- FM Monitor Output (BNC)
- Switched Video Output (BNC)
- Audio Output (600Ω BNC, Rear Panel Adjustable)
- Phone Output (Front Panel, Front Panel Adjustable)
- Optional Display X-Y-Z Outputs (BNC) with DRD
- AC Input
- Connectors as required for options ASO/DFC/RLOG

OPTIONS:

WJ-8617B/ASO — Audio Scan Output

The Audio Scan Output option (ASO) provides an audio frequency output that is representative of the tuned frequency of the WJ-861X Receiver. The output frequency varies linearly from 200 Hz (at scan start) to 11 kHz (at scan stop). An audible tone one hundred thousandth of the tuned RF frequency is provided in manual control. A varying DC level is also provided via an internal switch.

WJ-8617B/BITE — Built-In Test Equipment

The Built-In Test option (BITE) performs operational tests on the receiver and compares the test results with limits contained in the BITE memory. If the results of any of the tests are outside of the specified limits, the test sequence will stop and an "F" will be displayed on the front panel of the receiver. The number of the failed test will be displayed in the COR window, and a number representing the results obtained from the test will be displayed in the SIGNAL STRENGTH window. When applicable, the frequency and bandwidth where the failure occurred will also be displayed. If all of the tests are within the specified limits, the word END will appear in the FREQUENCY window, indicating that the receiver is fully operational. BITE is fully remote controllable. It must have either a 100, 250, 300, or 500 kHz IF bandwidth installed for one of the five bandwidths.

WJ-8617B/DFC — Direction Finding Control

Provides a TTL output indicating the inversion of the IF output spectrum.

WJ-8617B/DRD — Digitally Refreshed Display

With this option incorporated, the receiver microprocessor is capable of providing a signal strength-versus-frequency display on the signal monitor (with SM option installed) or an external display. The horizontal and vertical information is made available to the external equipment via the X, Y, and Z output BNC connectors on the receiver rear panel.

Cursor is an optional mode of operation that is available when the Digitally Refreshed Display option is installed. In this mode, a portion of the RF spectrum can be scanned with a signal strength vs. frequency display of the scanned frequencies on the signal monitor of the receiver. The tuning knob can then be used to position a cursor over any of the signals displayed on the signal monitor. When the cursor is positioned over the signal, the frequency of that signal is displayed in the frequency window of the digital display.

WJ-8617B/FE — 500 to 1100 MHz Frequency Extender

The UHF Frequency Extender option (FE) will extend the frequency range from 500 to 1100 MHz. The option consists of a UHF preselector, UHF preamp/mixer and a 4 band LO module.

WJ-8617B/FEX — 500 to 1200 MHz Frequency Extender

The UHF Frequency Extender option (FEX) extends the frequency range from 500 to 1200 MHz. Option consists of UHF preselector, preamplifier/mixer, and an LO module.

WJ-8617B/FP — Fan Attachment

This option provides cooling for the receiver in installations where a rack blower is not possible. It contains two fans which blow air directly onto the receiver rear panel. This unit attaches to the rear of the receiver and adds three inches to the overall length.

WJ-8617B/HFE — 2 to 500 MHz Frequency Extension

The HF Frequency Extension extends the low frequency tuning limit of the receiver down to 2 MHz. It consists of software changes to extend the tuning range of the first local oscillator and a preselector capable of passing signals down to 2 MHz. Noise figure is typically 15 dB at 2 MHz, third order intercept point is 0 dBm, and second order intercept point is + 15 dBm.

WJ-8617B/IFBW — IF Bandwidth

IF Bandwidths with matching discriminators available are: 3.2 kHz, 6.4 kHz, 10 kHz, 15 kHz, 20 kHz, 25 kHz, 30 kHz, 50 kHz, 75 kHz, 100 kHz, 250 kHz, 300 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, and 8 MHz. Up to five bandwidths can be selected. Bandwidth number 5 must be 250 kHz or greater. Special group delay equalized filters are also available. Consult factory for available bandwidths.

WJ-8617B/ISB — Independent Sideband

The Independent Sideband option (ISB) provides simultaneous upper and lower sideband outputs at the receiver rear panel. The lower or upper sideband selection will be shown in the display window when the SSB pushbutton is pressed, and the ISB output will be activated. It is recommended that a 6.4 kHz IF bandwidth be installed in the receiver when this option is incorporated for optimum sideband operation.

WJ-8617B/LFE — 0.5 to 500 MHz Frequency Extension

The LFE option extends the low frequency tuning limit of the receiver down to 0.5 MHz. It consists of software changes to extend the tuning range of the first local oscillator and a preselector capable of passing signals down to 0.5 MHz. Noise figure is typically 18 dB at 0.5 MHz, third order intercept point is –5 dBm, and second order intercept point is + 10 dBm.

WJ-8617B/LOGV — Log Video

The 60 dB Log Video option (LOGV) provides a log video output at the receiver rear panel. It supplies a DC voltage of from + 0.4 Vdc to approximately + 7.7 Vdc that varies with the strength of the received signal.

WJ-8617B/MFS — Main Frame Spares

The Main Frame Spares Kit (MFS) contains all the plug-in modules of the WJ-861XB, less options, and includes power supply spare parts. Option spares must be ordered separately. This list typically supports receiver operation for a one year period.

WJ-8617B/NRT — Noise Riding Threshold

Noise-Riding-Threshold (NRT) measures the ratio of a signal carrier level with the RF background noise and activates the audio and COR outputs when the operator selected threshold is exceeded. This circuitry has a threshold adjustment range of 20 dB that is set using the COR Up/Down pushbuttons on the receiver front panel. The NRT option is usable only in the 10 kHz, 20 kHz, 50 kHz, and 100 kHz IF bandwidths.

WJ-8617B/PKC — Plug-In Keyboard Control

The Plug-In Keyboard Control option (PKC) provides a means of rapidly inputting frequency information into the receiver. The keyboard plugs into the receiver front panel and permits receiver tuning, memory programming, and the initiation of lockout channels.

WJ-8617B/PSM — Panoramic/Sector Marker Display

The Pan/Sector Marker option provides digitally refreshed X, Y, and Z outputs for display of two traces on an external CRT. The PAN trace displays frequency vs. amplitude information for the entire scanned frequency spectrum. The SECTOR trace includes frequency vs. amplitude information obtained by alternately rescanning a portion of the PAN spectrum using a narrower receiver IF bandwidth. A SECTOR marker is present on the PAN trace to identify the portion displayed on the SECTOR trace. Center frequency and width of the SECTOR are adjustable while scanning. When the scan is interrupted, a marker may be moved across the displayed SECTOR trace by using the receiver tuning knob. Handoff to another receiver may be performed using this marker (requires the 488/MS Option). Signals handed off cause the marker to remain on the SECTOR trace (up to 14 markers). The PSM option includes the DRD option.

WJ-8617B/RCS — Rotating Chassis Slides

Slides attach to sides of receiver to allow unit to slide out from equipment rack and be tilted up or down.

WJ-8617B/RLOG — Record Logging

The RLOG option extends the capabilites of the Scan and Step modes of operation by permitting all signals, in excess of the programmed COR level, to be automatically logged. Whenever the Scan or Step mode is initiated, the logging function is automatically activated to provide signal data to an external RS-232 device (terminal or printer). When first activated, the receiver will output data giving the receiver parameters stored in each of the memory channels programmed for the Scan or Step operation. In the Step mode, one line is printed for each programmed memory channel. In the Scan mode, one line is printed for each pair of memory channels. Each time a signal greater than the programmed COR level is detected, a line will be printed giving the signal frequency, signal strength, time of day, and the percent of AM and FM modulation present on the signal. The RLOG option includes the RTC option.

WJ-8617B/RTC — Real Time Clock

This option provides time of day in hours, minutes and seconds, using a 24-hour format. It permits the time to be accessed via the receiver front panel, the remote interface (with RS-232C or IEEE-488 option installed) and permits the time to be printed on the RLOG printout (with RLOG installed).

WJ-8617B/SCS — Straight Chassis Slides

Slides attach to sides of receiver to allow unit to slide straight out from equipment rack.

WJ-8617B/SM — Signal Monitor

The Signal Monitor (SM) allows the operator to see spectrum activity ± 2 MHz around the tuned frequency. A marker locked to the reference frequency is provided for center tuning. The sweep rate is adjustable and the resolution is 10 kHz. The display is 1 by 3 inches and has a 40 dB range.

WJ-8617B/SSB — Single Sideband

This optional module provides both upper sideband and lower sideband detection along with individual 10.7 MHz sideband filters and special AGC characteristics. When SSB is selected, the 21.4 MHz IF signal is routed through the narrowest IF filter available in the range of 6.4 kHz to 20 kHz. At least one IF bandwidth in this range is required for proper SSB operation.

WJ-8617B/TUN — Tuning Rate

The TUN option provides front panel selection of the tuning step size of the tuning knob in six consecutive decade rates from 100 Hz to 10 MHz. The position of a blinking digit in the frequency display window indicates which decade rate has been selected.

WJ-8617B/VBFO — Variable BFO

This option installs in place of the standard BFO subassembly and provides an operator controllable BFO frequency during CW or SSB operation. The frequency can be varied by ± 7.99 kHz in 10 Hz steps about a 21.4 MHz center frequency for CW operation, and ± 3.995 kHz in 5 Hz steps about 10.7 MHz for SSB operation.

WJ-8617B/WBO — Wideband IF Output

The WBO option module provides an output to a WBO connector (J20) mounted on the receiver rear panel. With this option incorporated, a 21.4 MHz IF signal is provided to the rear panel for use by external equipment. The WBO module contains its own AGC circuitry which provides a constant –30 dBm signal level with a 4 MHz bandwidth. A gain control and an AGC control on the WBO circuit board permit adjustment of the output level and the AGC threshold. The WJ-861XB/WBO-2 provides a 6-MHz bandwidth.

WJ-8617B/10IF — 10 IF Bandwidths

The 10 IF Bandwidth option (10 IF) permits installation of up to 10 IF bandwidth filters in the receiver. Each of the IF bandwidth cards (up to five maximum) accommodates two IF filters instead of the usual one. Each dual IF bandwidth has an associated frequency discriminator card whose detector gain is normalized for the particular bandwidth selected. The ratio of IF bandwidth pairs must be less than 3. Consult factory for details regarding bandwidths available and required groupings.

WJ-8617B/232 — RS-232C Asynchronous Interface

The RS-232C Asynchronous Interface bus is a standardized interface used to interface with computer peripheral equipment, such as computer terminals. It is available as an option for all of the receivers in the WJ-861XB Series. The RS-232C option provides remote capabilities for the WJ-861XB Receiver and permits the receiver to be operated remotely by providing TALK/LISTEN capabilities.

WJ-8617B/488 — IEEE-488 Interface

The IEEE-488 Interface option (488) provides remote capabilities for the receiver by interfacing with a large array of compatible instruments. The 488 option provides talk and listen capabilities between the receiver and external equipment such as calculators, microcomputers, or other IEEE-488 equipped receivers. The data is transferred between units in bit-paralleled, byte serial form, permitting rapid data transfer.

WJ-8617B/488/MS — 488/Master/Slave

The Master/Slave function is part of the IEEE-488 interface and permits the control of up to 14 additional Master/Slave equipped receivers, utilizing the front panel controls of one of the receivers. Each receiver must be equipped with an IEEE-488 interface. Only one receiver can function as the master unit at a given time and the remaining receivers function as slave units when addressed.

WJ-8617B Options Cross Reference

Chosen Option	TUN	488MS	10IF	RLOG	BITE	VBFO	PKC	DRD	PSM	488	232	WBO	ASO	FE	SSB	SM	NRT	DFC	IFBW	LOGV	HFE	LFE	RTC	FEX	ISB
TUN	X																								
10 IF			X														C								
RLOG				X									E										I		
BITE			C		X														C						
VBFO						X																			
PKC							X																		
DRD								X																	
PSM								I	X																
488										X	E														
232										E	X														
WBO												X													
ASO				E									X												
FE														X										E	
SSB			S												X				S						E
SM																X									
NRT			C														X		C						
DFC																		X							
IFBW			E												S		C		X						
LOGV																				X					
HFE																					X	E			
LFE																					E	X			
RTC																							X		
FEX														E										X	
ISB			S												E				S						X
488/MS		X								R	E														

F = Consult factory to use cross reference option
E = Chosen option excludes cross reference option
I = Chosen option includes cross reference option
R = Chosen option requires cross reference option
S = Chosen option requires at least one IF BW of 6.4 to 20 kHz
C = Consult option description for required IF BW