

Technical Data



WATKINS-JOHNSON

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HF/VHF/UHF Receiver WJ-8635



The WJ-8635 is a fully synthesized, general-purpose HF/VHF/UHF receiver tunable from 20 to 1000 MHz, and extendable down to 0.5 MHz or up to 2.4 GHz.

The unit is packaged in a module measuring 9 x 8.9 x 1.2 inches (22.86 x 22.6 x 3.05 cm). The standard configuration of the WJ-8635 supports frequency coverage from 20 to 1000 MHz with tuning to 2 MHz allowed with reduced performance. An HF-extended configuration of the WJ-8635 allows operation from 0.5 to 1000 MHz. The HF converter provides a +20 dBm third-order intercept point for signals spaced outside the 16-kHz first IF bandwidth. The HF converter mounts inside the WJ-8635 module. A UHF frequency extended configuration is also available and supports coverage from 20 to 2400 MHz. The 2400-MHz extender is housed in the WJ-8635 module.

The WJ-8635 features low-phase-noise frequency synthesizers with 100-Hz tuning resolution, in a low-power package. A high-performance tracking preselector filters incoming RF signals, and rejects undesired out-of-band signals. The narrowband configuration of the receiver supports installation of up to four 21.4-MHz selectable IF filters, ranging from 6.4 to 100 kHz. Two of the IF filters are included in the unit. This configuration also includes a 3.2-kHz filter for narrowband single-side-band (SSB) detection. An IF

Features

- Standard configuration frequency range: 20 to 1000 MHz
- HF-extended configuration frequency range: 0.5 to 1000 MHz
- UHF-extended configuration frequency range: 20 to 2400 MHz
- Narrowband configuration supports: 4 IFBWs between 6.4 & 100 kHz
AM, FM, SSB, CW & IFT Detection Modes
10-Hz tuning resolution in SSB mode
- Wideband configuration supports: IFBWs between 300-kHz & 12-MHz
AM & FM detection modes
- 5 dBm 3rd-order intercept, typical
- Tracking Preselector Filter
- Low phase noise
- RS-232 or RS-422 control

HEIGHT 9 in (22.86 cm)
WIDTH 1.2 in (3.05 cm)

DEPTH 8.9 in (22.6 cm)
WEIGHT <4 lbs (1.81 kg)

WATKINS-JOHNSON COMPANY

700 Quince Orchard Road, Gaithersburg, Maryland 20878-1794
Phone: (800) WJHELPS or +(301) 948-7550
FAX: +(301) 921-9479 Email: wj.helps@wj.com Website: www.wj.com

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translation (IFT) mode is available in the narrowband configuration, which allows an operator to use the receiver as a narrowband downconverter. An available wideband configuration supports the installation of up to four 21.4-MHz selectable IF filters ranging from 300 kHz to 12 MHz. In the wideband configuration, two IF filters are included in the unit.

The mechanical packaging design of the WJ-8635 receiver uses modern surface-mount technology. This design provides RF isolation by using multilayer PCBs fastened into a milled-aluminum chassis. All RF interconnections are available on the front panel of the unit. RF signals are passed in and out of the unit via SMA-type connectors.

The WJ-8635 Receiver supports three basic modes of operation:

- MANUAL (fixed-frequency operations)
- SWEEP (contiguous coverage from start to stop frequency)
- STEP (preprogrammed discrete frequencies)

The receiver is interactive in all of its modes of operation and is capable of alerting the controlling device of signal activity. While in SWEEP or STEP mode of operation, the receiver is capable of logging the COR status of the signals in the coverage area and only reporting changes to the controlling device. In the SWEEP mode of operation, the receiver can lock out bands or signals from the coverage area. The receiver includes non-volatile memory for storage of up to 200 sweep or step setups, and up to 200 lockout bands.

Control

An asynchronous serial interface controls the WJ-8635. The receiver supports any one of the following interface standards, changeable by setting an internal DIP switch:

- Single-drop full-duplex RS-232
- Single-drop full-duplex RS-422
- Multidrop half-duplex protocol using RS-232
- Multidrop half-duplex protocol using RS-422
- Multidrop half-duplex RS-485

The single-drop interface allows the connection of a single receiver to a single controlling device. It supports interface protocols such as *XON-XOFF* and *ENQ-ACK/NAK*. The receiver may generate a service request by sending an *ESC* character followed by a status byte.

The multidrop RS-422 and RS-485 interfaces allow the connection of up to 15 receivers to a single controlling device. The multidrop RS-232 interface allows the connection of up to six receivers to a single controlling device. Each of the multidrop interfaces supports address commands that require proper protocol before communication with the controlling device. The multidrop interface supports an *ACK/NAK* verification protocol. Upon receipt of a completed message, the addressed receiver issues an *ACK* or *NAK* character that validates the data transmission.

The WJ-8635 Receiver supports the standard communication data rates from 150 baud to 38.4 K baud. The WJ-8635 supports high-level ASCII-command mnemonics similar to IEEE-488.2 messages. The receiver implements a *speak-when-spoken-to* protocol. Data is accepted in a format that is forgiving, while responses are always precise.

WJ-8635 Configurations

Model Number	Frequency Range (MHz)	IFBW Range	Comments
WJ-8635	20 to 1000	6.4 to 100 kHz	Narrowband
WJ-8635-1	20 to 2400	6.4 to 100 kHz	Narrowband/UHF Extender
WJ-8635-2	0.5 to 1000	6.4 to 100 kHz	Narrowband/HF Extender
WJ-8635-3	20 to 1000	0.3 to 12 MHz	Wideband
WJ-8635-4	20 to 2400	0.3 to 12 MHz	Wideband/UHF Extender

Inputs/Outputs

- Antenna Input (SMA)
- SW IF Output (SMA)
- Video Output (SMA)
- Signal Monitor Output (SMA)
- 10-MHz Reference (SMA)
- Auxiliary Control Port (Subminiature D)

The following signals are available on the Auxiliary Control Connector:

- Line Audio
- Switched Audio
- Received Signal Strength Indicator
- COR output

Specifications

Frequency Range (standard) 20 to 1000 MHz (tuning to 2 MHz allowed)
HF Extender 0.5 to 1000 MHz
UHF Extender 20 to 2400 MHz (tuning to 2 MHz allowed)
Tuning Resolution 100 Hz (10-Hz SSB)
Internal Reference Accuracy ± 2.5 ppm, max
Detection Modes
Narrowband AM, FM, CW, SSB, IFT
Wideband AM, FM
RF Input 50 ohm, 2.5:1 VSWR, typical
Preselection 20% nominal bandwidth, tracking

Noise Figure

Frequency Range (MHz)	WJ-8635 (dB)	WJ-8635-1 (dB)	WJ-8635-2 (dB)	WJ-8635-3 (dB)	WJ-8635-4 (dB)
0.5 to 30 preamp on	N/A	N/A	11 max	N/A	N/A
0.5 to 30 preamp off	N/A	N/A	16 max	N/A	N/A
20 to 500	10 max	13 max	11 max	10 max	13 max
500 to 1000	12 max	14 max	13 max	12 max	14 max
1000 to 2400	N/A	15 max	N/A	N/A	15 max

3rd-order Intercept (20 to 1000 MHz) -5 dBm, typical (-10 dBm, min)
HF Extender (0.5 to 30 MHz) +20 dBm, min
UHF Extender (1000 to 2400 MHz) -15 dBm, min
2nd-order Intercept (20 to 1000 MHz) +45 dBm, typical (+25 dBm, min)
HF Extender (0.5 to 30 MHz) +40 dBm, min
UHF Extender (1000 to 2400 MHz) +20 dBm, min
Maximum RF Input without Damage +20 dBm
HF Extender +15 dBm
UHF Extender +15 dBm
1st Image Rejection 80 dB, typical (70 dB, min)
2nd Image Rejection 65 dB, typical (60 dB, min)
IF Rejection 80 dB, typical (70 dB, min)
Phase Noise -60 dBc/Hz @ 1 kHz
 -98 dBc/Hz @ 20 kHz, max (20 to 500 MHz)
 -96 dBc/Hz @ 20 kHz, max (500 to 1000 MHz)
HF Extender (at HF-extender output) -115 dBc/Hz @ 20 kHz, max (0.5 to 30 MHz)
UHF Extender -90 dBc/Hz @ 20 kHz, max (1000 to 2400 MHz)
Tuning Time (SWEEP) 2 msec, typical to within 1 kHz of final frequency
Tuning Time (MANUAL 20 to 1000 MHz) 15 msec, max to within 1 kHz of final frequency
HF Extender (0.5 to 30 MHz) 20 msec, max to within 1 kHz of final frequency
UHF Extender (1000 to 2400 MHz) 20 msec, max to within 1 kHz of final frequency
LO Level at RF Input -90 dBm, max
Internally Generated Spurious -110 dBm equivalent RF input, max
Gain Control Modes MGC/AGC, 90-dB typical range
AFC Selectable
Signal Monitor Output Nominally 6-dB gain above the RF input
Selected IF Output Centered at 21.4 MHz, -40 dBm nominal output level
IF Bandwidths 4 selectable (2 supplied & 2 optional) plus 3.2-kHz BW
 SSB filter in narrowband configuration
Video Output Level 0.5 V peak-to-peak into 600 ohms
 (30% deviation in FM or 50% AM modulation)

Video Frequency Response	dc to 1/2 the IF bandwidth, -3 dB
Audio Output	ac-coupled multipin connector
Sensitivity	See Table for Standard Narrowband/Wideband IF Bandwidths
COR/ Squelch (TTL output)	55 dB range, min
RSSI Output	0 to 5 V into 10k ohms multipin connector
Power Requirements	<u>+12V</u>
Narrowband	6.0 W
Wideband	6.5 W
HF Extender (add to narrowband)	3.5 W
UHF Extended (add to narrowband or wideband)	2.5 W
Temperature	
Operating Range	-20 to +55°C Case
Non-operating Range	-40 to +70°C Case
Full Specification Compliance	+20 to +30°C Case

Sensitivity* Level In -dBm for Standard WJ-8635 IF Bandwidths**

IF Bandwidth		WJ-8635 (MHz)		WJ-8635-1 (MHz)			WJ-8635-2 (MHz)			WJ-8635-3 (MHz)		WJ-8635-4 (MHz)		
Size (kHz)	Shape Factor 60:3 dB	20 to 500	500 to 1000	20 to 500	500 to 1000	1000 to 2400	² 0.5 to 30	20 to 50	500 to 1000	20 to 500	500 to 1000	20 to 500	500 to 1000	1000 to 2400
6.4	3:1	-107	-105	-104	-103	-102	-106	-106	-104					
10	3:1	-106	-104	-103	-102	-101	-105	-105	-103					
20	3:1	-103	-101	-100	-99	-98	-102	-102	-100					
30	3:1	-101	-99	-98	-97	-96	-100	-100	-98					
50	3:1	-99	-97	-96	-95	-94	-98	-98	-98					
¹ 100	3:1	-96	-93	-93	-92	-91	-95	-95	-95					
300	5:1									-90	-88	-87	-86	-85
500	5:1									-88	-86	-85	-84	-83
1000	4:1									-85	-83	-82	-81	-80
2000	4:1									-82	-80	-79	-78	-77
4000	4:1									-79	-77	-76	-75	-74
6000	4:1									-77	-75	-74	-73	-72
8000	4:1									-76	-74	-73	-72	-71
12000	4:1									-74	-72	-71	-70	-69

***Sensitivity Conditions:**

AM - An input signal AM modulated 50% by a 1-kHz tone will produce a minimum video output S+N/N ratio of 10 dB

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

** Consult the factory for other bandwidth sizes

¹ FM discriminator limited to 75-kHz max bandwidth

² Sensitivity levels are with HF preamp turned on. Add 5 dB to this column with preamp off.