COMMUNICATION ELECTRONICS TECHNOLOGY DIVISION

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WATKINS-JOHNSON

DEVELOPMENTAL SPECIFICATION

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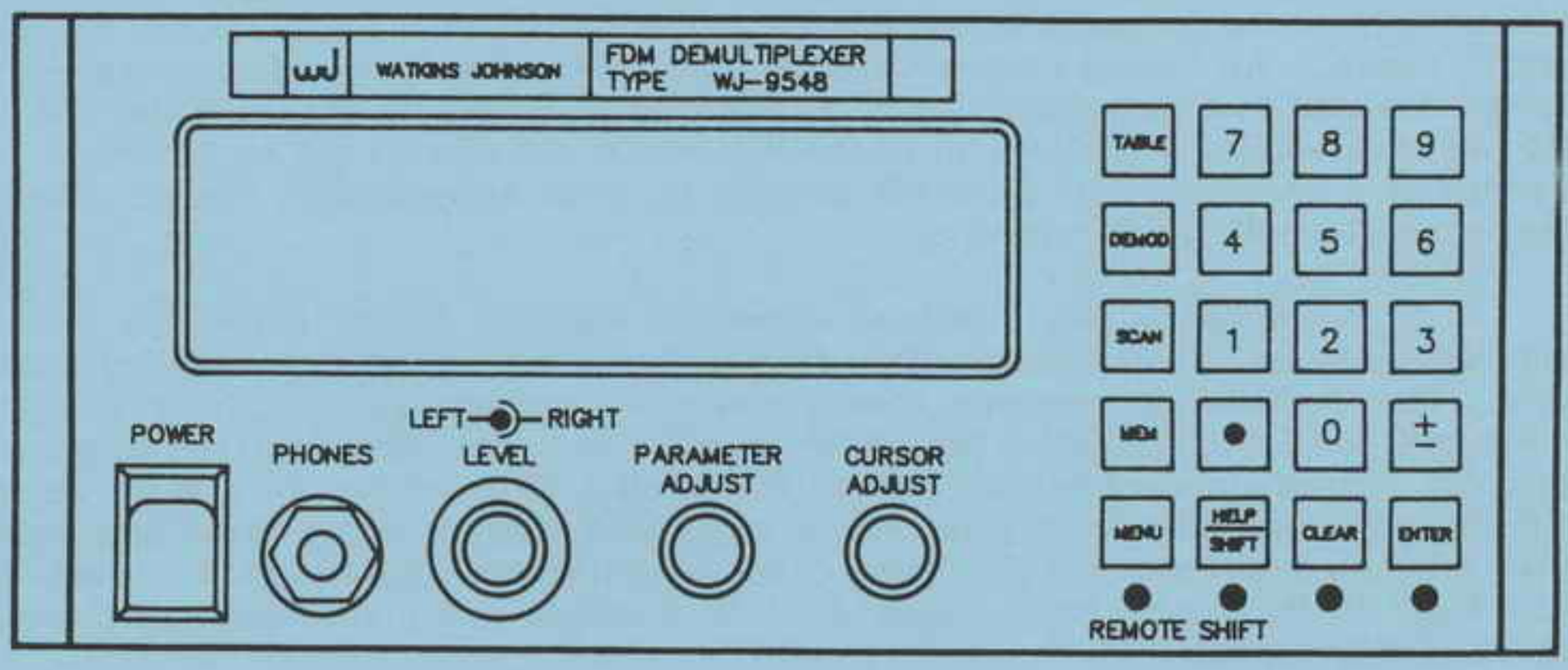
WJ-9548 DIGITAL FDM DEMULTIPLEXER



FEATURES

- Up to 24 Independently-Tunable FDM Channel Demodulators In a Single Unit
- Analog Input Tunable From 0 to 20 MHz In 1-Hz Steps -- Offsets Can Be Entered As PPM Errors Individually Assigned to Each Baseband Input
- Compact Size; High Functional Density -- 3.5 Inch Half-Rack Package (3.5 x 8.25 x 20 Inches)
- Very Low Differential Group Delay and Flat Amplitude Response
- Four Analog Baseband Inputs That Can Be Connected In a Non-Blocking Fashion To Any of the Individual Channel Demodulators -- Buffered Outputs of All Basebands Provided for Access By Multiple Units
- HDB3-Encoded Level 1 CEPT PCM Output Standard, Multiple Audio Outputs Optional -- Modular Output Interface Allows a Wide Variety of Other Analog and Digital Data Formats
- Up to Eight WJ-9548s Can Be Configured To Function As a Single Unit -- Up to 192 Channels Can Be Controlled As a Single Remote Device With Each Voice-Grade Channel Capable of Being Independently Directed to Any PCM or Audio Channel Output
- Independent Channel Control of Gain, Upright/Invert Detection and Output Routing
- Built-In Test Capability Detects Circuit Faults to the Module Level
- Full Local and IEEE-488 Remote Control With a Variety of Other Remote Control Interfaces Available
- Optional Activity Monitor Provides Sort Capability for Differentiating Among No Activity, CW Tones, Voice and Non-Voice Data Conditions On a Channel-By-Channel Basis

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DESCRIPTION

The WJ-9548 is a Multi-Channel Tunable FDM Demultiplexer that incorporates the accuracy and efficiency of a Digital Signal Processing (DSP) approach. Due to its modular design, the WJ-9548 can be easily configured as a 6, 12, 18 or 24 channel unit. The WJ-9548 accepts up to four 20 MHz analog FDM basebands and connects them in a non-blocking fashion to any one of the independently-tunable channel demodulators. A buffered version of each baseband input is also provided as an output allowing multiple units to access the same basebands.

The WJ-9548 combines analog and digital processing techniques in a scheme that significantly enhances the performance relative to demultiplexer implementations that are purely analog or digital. An analog tuner provides coarse filtering and frequency conversion prior to applying its output to a high-resolution A/D converter. The critical channel filter and 1 Hz fine tuning are then applied digitally with internal computations carried out to 24 bits of precision. The result is a compact, cost-effective solution to FDM demodulation characterized by high performance, flexibility, and reliability.

A modular output interface allows the WJ-9548 to be tailored to meet specific system requirements. The standard output format is an HDB3-encoded primary level CEPT PCM stream. The digitized voice-grade channels can be mapped into the thirty available PCM channels in a non-blocking fashion providing a flexible and redundant interface to external PCM equipments. Other standard outputs include the parallel TDM bus providing voice-grade data in 16-bit linear format and a front panel stereo headphone allowing an operator to simultaneously monitor any two selected audio channels. Other possible output data formats include D1 or D3 channel bank PCM, one or more analog monitor channels, and a repacked basic group (60 to 108 kHz) FDM baseband.

Control of the WJ-9548 can be performed either locally, via the front panel LCD display and keypad controls, or remotely, via the standard IEEE-488 interface. A variety of other remote control interfaces are available as drop-in, alternative options. Except for headphone volume control, all operator-selectable parameters, including programmable scan strategies, are controllable and accessible over the remote control interface. A thorough Built-In Test feature capable of quickly detecting circuit faults to the module level can also be initiated remotely.

The data and control architecture of the WJ-9548 allows up to eight units to be stacked in a master/slave configuration and function as a single unit. By connecting the parallel TDM buses of several units together, a voice-grade channel processed in one unit can be accessed by the output interfaces of any other unit. This allows up to 192 FDM channels to be independently mapped into the various PCM and audio outputs supported by the individual units. As a result, multiple thirty-channel CEPT streams can be loaded to their full capacity. To further support this master/slave configuration, one of the units, designated as the master, can be equipped with an auxiliary IEEE-488 interface. This interface is used as an internal control bus allowing an external computer to control the entire bank of demultiplexers connected only to the master unit's standard remote control interface.

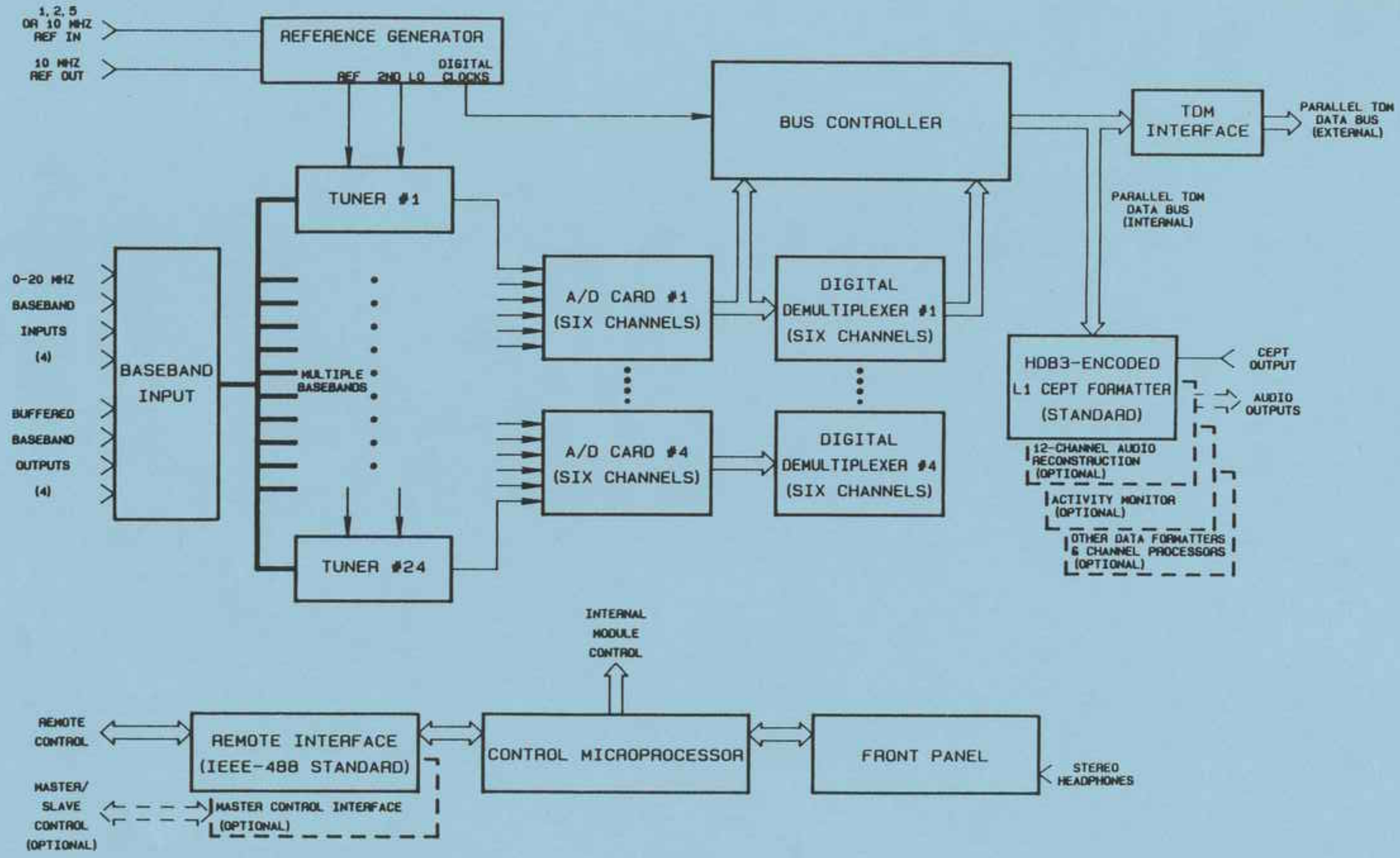
For all of its capability, the WJ-9548 FDM Demultiplexer is extremely compact. Two units, mounted side by side, fit into a standard 19-inch equipment rack, occupying only 3.5 inches of vertical rack space. The weight of the unit is approximately 20 lbs.

SPECIFICATIONS

Input:	
Number of Inputs	Four analog basebands, connectable to any channel demodulator in a non-blocking manner
Input Range	150 Hz to 20 MHz (Reduced performance below 8 kHz)
Input Impedance	75 Ohms
Nominal Input Level	-25 dBm nominal test tone
Input Level Range	-30 to 0 dBm composite baseband
Baseband Gain Control	Long time-constant AGC that optimizes input gain for basebands in the -30 to 0 dBm level range
Digital Outputs:	
Type	Parallel TDM Voice-Grade Channel (VGC) Bus, standard; linearly-coded channel data with word and framing clocks. HDB3-encoded primary level CEPT PCM output, standard
Digital Gain Control Modes	Manual or AGC, applied to individual digital voice-grade channels
Digital Gain Range	36 dB
Output Frequency Response (3 dB)	150 to 3850 Hz
Bandpass Ripple	±0.25 dB maximum (600 to 3400 Hz)
Harmonic Distortion of Output	60 dB minimum below nominal output of 1 kHz test tone
Spurious Outputs	60 dB minimum below nominal 1 kHz test tone
Residual Noise	60 dB minimum below nominal 1 kHz test tone
Adjacent Channel Rejection (300 Hz Into Adjacent Channel)	60 dB minimum
Noise Power Ratio (NPR) (Specified Over the Input Noise Loading Range of -30 to 0 dBm)	50 dB minimum for up to 600 channels of noise load 45 dB minimum for up to 3600 channels of noise load
Differential Group Delay	100 microseconds maximum, 150 to 3850 Hz
Incidental FM	1 Hz maximum
Analog Outputs:	
Video Baseband Output:	
Number	Four; one for each baseband input
Level	Same as input (±0.5 dB)
Passband (1 dB)	150 Hz to 18 MHz minimum
Adjacent Baseband Crosstalk	-60 dB maximum
Audio Output (CODEC):	
Type (standard)	Stereo headphone with independent channel selection and volume control for each side
Output Impedance	600 Ohms
Output Level	Adjustable, up to 10 dBm minimum into 600 ohm load (separate adjustments for right and left sides)
Additional Analog Outputs	Up to 24 analog VGC audio monitor outputs (optional)

SPECIFICATIONS (Continued)

Control:	
Local Control	Alphanumeric LCD display, keypad and headphone volume controls
External Control	IEEE-488 interface standard; consult factory for alternate interfaces
Tuning:	
Local or Remote	0 to 20 MHz with 1 Hz resolution (Offset frequencies can be entered as PPM corrections for each baseband)
Scans	Selectable frequency step size or formatted tuning (SMG, MG, SG, G) based on CCITT 2700 and 960 channel frequency plans
Tuning Time	20 milliseconds maximum after receipt of tuning command
Detection Mode	SSB upright or inverted spectrum (selectable on channel-by-channel basis)
Frequency Reference:	
Stability	$\pm 1 \times 10^{-7}$ maximum, internal reference (5×10^{-8} option available)
Aging	$\pm 3 \times 10^{-9}$ drift per day maximum, internal reference (1×10^{-9} option available)
External Reference	Will accept 1, 2, 5 or 10 MHz ±1 PPM, 200 mV peak-to-peak minimum into a high impedance load. Automatically switches to external reference upon application of signal
Reference Output	10 MHz, 0 dBm nominal, 50 Ohms
Diagnostics:	
Built-In Test	Operator-initiated, detects circuit faults to the module level
Physical/Environmental:	
Temperature Range:	
Operating	0 to 50°C
Meets All Specifications	10 to 40°C
EMI/EMC	Designed to meet TEMPEST requirements
Power Requirements	115/230 VAC ±15%, 48 to 420 Hz
Power Consumption	
12 Channel Unit	50 watts maximum
24 Channel Unit	70 Watts maximum
Size	3.5 x 8.25 x 20 inches, excluding connections, and handles
Weight	20 lbs.



WJ-9548 Digital FDM Demultiplexer Functional Block Diagram