MRX4000 Plus

High Dynamic Range
ENG Central Receiver
Demodulator & Decoder

HD DEFINED IP

Overview

The MRX4000 Plus is an advanced, full featured digital and analog Central Receiver that offers all features of the original MRX4000 Decoder – Demodulator, with the addition of new, high performance, RF and IF subsystems that can maintain ENG link integrity in the most demanding situations. The MRX4000 Plus is the ultimate choice for new ENG receive locations, and the perfect solution for upgrading existing sites with advanced digital capabilities.

The MRX4000 Plus meets both the current and the new 2 GHz BAS channel plans, and can integrate with most antenna control systems. Channel bandwidth, video deviation, and analog or digital modes can be locally and remotely switched between legacy and new band plans. ENG signal metrics as well as receiver alarms and diagnostics are available through a serial data port, or an Ethernet interface. User programmable pre-sets may be accessed via the front panel, or through the remote interface.

- Seamlessly integrated Digital and Analog Central Receiver in a 1RU shelf
- Full remote control via Ethernet or Serial interfaces to simplify remote management and troubleshooting
- Very high dynamic range that exceeds the tough demands of digital broadcasting
- Digital and Digital/Analog configurations available for all major broadcast applications
- SD and HD ready platform
- Works seamlessly with MRC's ENG and IP solutions

2 GHz BAS Optimized

The MRX4000 Plus provides these standard features for the BAS Transition:

- Analog FM Demodulation
- COFDM DVB-T Demodulation
- Standard 2K Carrier Mode
- Optimized LMS-T Demodulation
- Fully inter-operable with MRC Digital Transmitters
- MPEG-2 SD Decoding (HD Optional)

One Integrated System

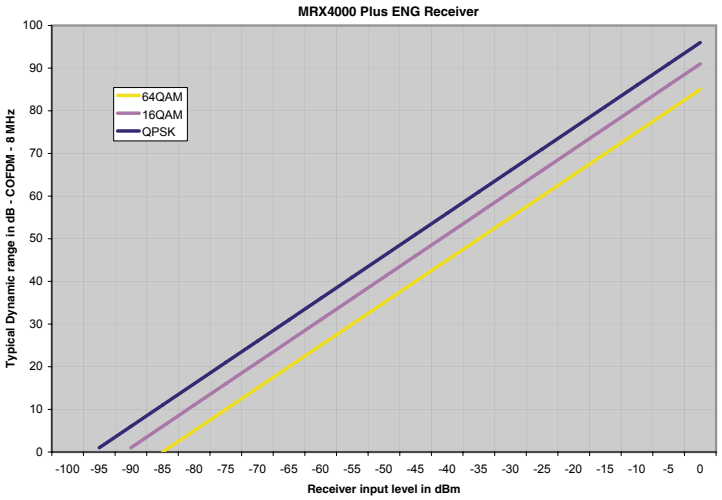
The MRX4000 Plus includes a wide selection of interface points that support integration into nearly any ENG central receive configuration. In addition to the RF input, we have included a 70 MHz IF input and output, and a 900 MHz IF output. Video signal outputs include analog, SDI, with analog or AES audio, and ASI. An integral HD decoder is available to provide HD-SDI output.

Four IF Filters – Standard Equipment

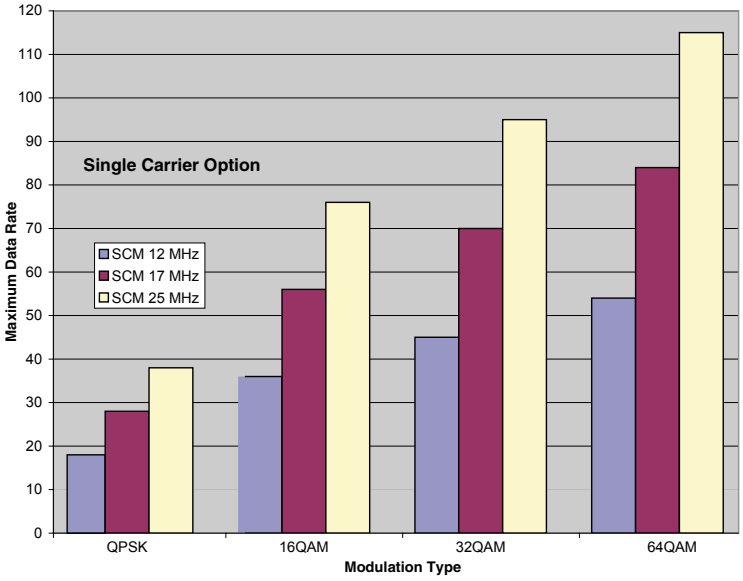
Being able to operate in analog mode and one or more digital modes requires more IF bandwidth choices than ever before. MRC has included four IF filters as standard equipment to optimize the selectivity for each mode.

Expanded Dynamic Range

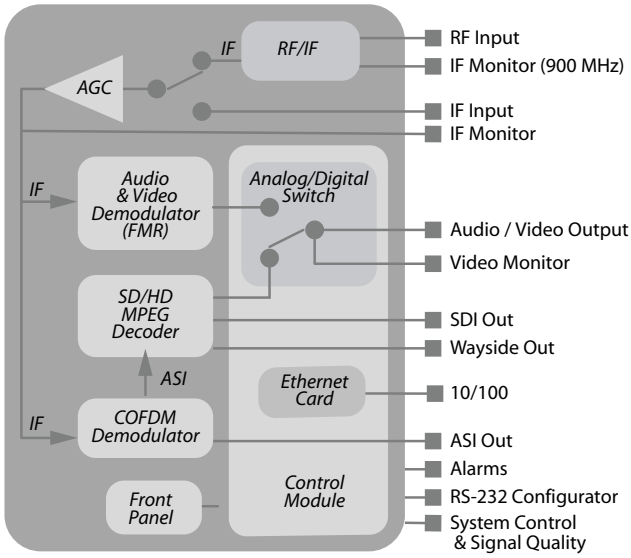
With a dynamic range approaching 100dB, the MRX4000 Plus is a true leader in link reliability. Careful selection of linear RF and IF components have been combined with a multi-stage AGC system that assures signal integrity from the strongest to the weakest signal level, and everywhere in between.



Single Carrier Throughput



MRX4000 Plus Functional Black Diagram



Key Features & Benefits

Standard Features

- Ideal replacement for all legacy central receivers
- Integrates with AccuScan, CommandScan, and Troll TouchStar remote control systems, and NSI systems
- "Link Quality" (LQ) measurement output for active display of signal integrity
- Industry leading MER and dynamic range
- Four IF filters
- Compact 1RU footprint
- Low Delay Decoder Mode
- AC or DC Power Inputs

RF Receiver

- A new 2/2.5 GHz RF with typical dynamic range of 95 dB
- Support for an antenna mounted LNC to cover other bands
- New IF section with a high MER design
- Standard receiver includes four switchable IF filters
- NTSC = 6, 8 , 10 & 15 MHz; PAL= 6, 8, 15 & 20 MHz
- COFDM and FM demodulators, and MPEG-2 SD Decoder
- Analog only versions available for NTSC or PAL
- Available HD decoder option upgrade

Remote Switching

- Analog / Digital Mode
- 12 / 17 MHz bandwidth
- 3 / 4 MHz deviation
- Legacy / BAS band plan
- IF Filter Bandwidth

Configurations

- Analog FM audio and video demodulation
- Analog FM and Digital COFDM Demodulation and MPEG-2 Decoding

Comm Ports

- RS-232 or optional ethernet remote control RJ-45 for slave controller
- Serial RS-232 - Laptop/PC for remote configuration

MPEG Decoding

- 4:2:2 or 4:2:0
- DVB-ASI Output
- SD/HD Option
- MPET-4/H.264

FM Demodulation

- Analog Audio/Video Modulation - NTSC or PAL
- Up to 4 Analog Audio Channels with selectable audio subcarriers
- User selectable presets for video deviation at 4 MHz or 3 MHz, locally or remotely controlled

COFDM Demodulation

- DVB-T Compliant
- 6, 7, 8 MHz Selectable Bandwidth
- Auto Bandwidth Detect: 6, 8 MHz
- QPSK, 16QAM, or 64QAM
- Guard Interval and FEC Auto Acquire

Antenna Systems

In a central receive environment, the incoming signal may be received by a directional antenna, a sector array, or an omni-directional antenna. Regardless of the antenna type, RF can be delivered to the MRX4000 Plus receiver at any level between zero and –96dBm. A sample of energy from the first IF at 900 MHz is made available at the rear panel for connection to a spectrum monitor. The key advantage of monitoring the first IF is the ability to widen the scan to several channels above and below the frequency of interest, providing a clear view of nearby congestion while observing your own signal at the same time.

A sophisticated dual-loop AGC system maintains the MER and signal quality to the demodulator to minimize overload and provide the highest dynamic range on the industry.

Although most ENG receive sites pass ASI though to the studio via microwave or fiber optic downlink, an SD decoder is included as standard equipment for monitoring. For the ultimate in performance, MRC's optional MPEG Plus decoder provides high quality SD/HD decoding in full 4:2:0 and 4:2:2 profiles, and is the only decoder that is firmware upgradeable to MPEG-4/ H.264.

Preset Crontrols

- System Operating Parameters
- MPEG Decoder
- COFDM
- Analog Video & Audio
- RF & IF Settings

MRX4000 Plus Configurator

IP De-Encapsulation

In the Central receive site, an MRX4000 Plus receiver demodulates the DVB-T/ COFDM signal to the ASI level, so that the combined video and IP traffic may be passed through to the studio.

The MRX4000-PLUS also provides a local SDI signal at the central receiver, and an available HD-SDI output option.

Specifications

MRX4000 Plus – Central Receiver

General

Frequency Bands: ..... 1.99 to 2.5 GHz / 2.3 to 2.7 GHz
6.4 to 7.1 GHz (requires external LNC)
RF Input Range: ..... –96 to 0 dBm
IF Outputs: ..... 70 & 900 MHz
IF/AGC Level Output: ..... +0 dBm (±1 dB) – Analog
–10 dBm (±1 dB) – Digital
Stability (RF-IF): ..... ± 2.5 ppm
Standard IF Filter Bandwidths:

	NTSC	PAL
1)	6 MHz	6 MHz
2)	8 MHz	8 MHz
3)	10 MHz	15 MHz
4)	15 MHz	20 MHz

IF Linearity (IMR): ..... >40 dB @ 70 MHz
Squelch Adjust: ..... ON/OFF
Level (25 dB from threshold)

Analog Audio & Video Demodulator

IF Input:..... 70 MHz
Level Input: ..... (0 dBm to –2 dBm) 0 dBm nominal
Impedance: ..... 75 ohms
Composite Outputs: ..... Switched (Baseband/video)
Video Output: ..... 1 Vpp (75 ohms) 525 /625 line
Return Loss: ..... >26 dB
Plug In Video Low Pass Filters: ..... 4.2, 5.0, or 5.5 MHz
Video Response: ..... ±0.25 dB
@ within video filter bandwidth
Video Performance
(with 15MHz Filter)
Signal/Noise: ..... >68 dB (weighted per RS-250C)
Signal/Hum:..... >63 dB (weighted per RS-250C)
Differential Phase: ..... 1 degree
Differential Gain: 1%
Chroma/Luminance Gain: 4%
Chroma/Luminance Delay: ..... ±20 nS
Field Tilt: 1%
Output Level:
Baseband Response:.....10 KHz to 8 MHz +0.5 dB
8 MHz to 12 MHz < 2dB
Audio Channels:
Demodulation of 4 Independent Subcarriers
Subcarrier Frequency:
Input tune range: 4.5 MHz to 8.59 MHz
tunable in 5 Khz steps (local/serial control)

Audio Performance

Frequency Response: ..... (40 Hz to 15 KHz): ±1.0 dB
(40 Hz to 10 KHz): ± 0.5 dB
THD: ..... 0.5 % @ 1 KHz (75 KHz deviation)
2.0 % @ 1 KHz (200KHz deviation)
Signal/Noise: ..... 68 dB (min)
Output Impedance: .....600 ohms balanced
Output Level (adjust): .... +8 dBm – line level – nominal
(0 dBm to +18 dBm) – local/serial
Audio Channel Crosstalk: ..... 60 dB
De-emphasis:..... 50 uS/75 uS , flat

CODFM Demodulation

IF Input: ..... 70 MHz
Input Range: .... –10 dBm nom. (–10 dBm to –20 dBm)
Bandwidth (Selectable): ..... 6 MHz, 7 MHz, 8 MHz
Threshold:..... C/N-within 2 dB of ETSI 300 744 Std.
COFDM Acquisition Speed: ..... 100 mSec (typical)
Modulation Type: ..... QPSK, 16QAM, 64QAM
Output:..... DVB-ASI
Packet Length: ..... 188 bytes
Forward Error Correction (FEC)-Auto Detect:
1/2, 2/3, 3/4, 5/6, 7/8
Guard Intervals-Auto Detect: 1/32, 1/16,1/8,1/4

MPEG Decoder

Output:..... SDI, Composite Video
Chroma Profile: ..... 4:2:2 / 4:2:0
Line Standard: 525/625
GOP Structures: ..... Variable GOP
Horizontal Resolution (Selectable):..... 720,704,544,352
Vertical Resolution: ..... 576 (625 line), 480 (525 line)
Bit rates: ..... 4:2:0 – 1.5 Mbits – 15 Mbits
4:2:2 – 2.0 Mbits – 50 Mbits
Decoding Type: ..... MPEG II layer 2
Bit Rates: ..... 384 K/Stereo Pair
Sampling: ..... 48 KHz
Composite Video Output: .... NTSC (w/wo pedestal) /PAL

Wayside Channel

Embedded data channel on MPEG Module:
(uses the RS-232 port for DCE Data Path)
Supported Data Rates:
1200, 2400, 4800, 9600, 19200, 38400

Physical

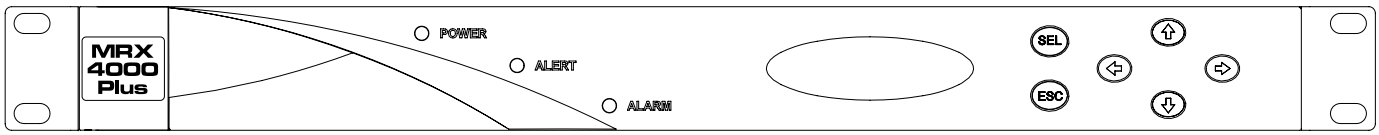
Weight: ..... 7.0 lbs (3.2 kg)
Operating Temperature Range: ..... –10o C to +50o C
Operating Relative Humidity: ... 95% @+10o C to +40o
Operating Altitude:
15,000 feet above sea level (4,572 meters)

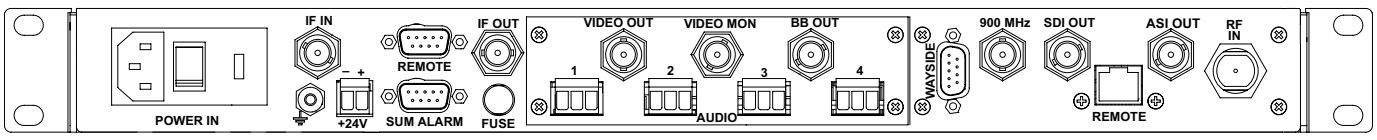
Connections

Video Output: ..... BNC
Video Monitor: ..... BNC
Baseband Output: ..... BNC
Audio (4 Channels):..... 3-pin Weidmuller
ASI Output: ..... BNC
SDI Output: ..... BNC
900 MHz Monitor Output: ..... BNC
Wayside Channel: ..... 9-pin "D"
IF Input: ..... BNC
RF Input: ....."N" Type
70 MHz IF Output: ..... BNC
Remote / LQ (standard): ..... 9-pin "D"
Remote / LQ (optional): RJ45
Summary Alarm: ..... 9-pin "D"
+24 Vdc Output @ 100mA: ..... 2-pin Weidmuller
Configurator (front panel): ..... 9-pin "D"
Front PANEL Controls & displays
Selection Buttons:..... SEL (Select), ESC (Escape)
Navigation Buttons:..... Left ,Right, Up, and Down
LEDs:..... Power, Alert, and Alarm
LCD Display: ..... 4 line

Power requirements

Input: ..... 90 to 264 Vac, 47 to 63 Hz
+/–24Vdc to +/–48Vdc
Power Connector:..... IEC320-C14
Power Consumption:..... 26 Watts





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