FEATURES

- Combines microwave tuner, demodulator, and radio demultiplexer in a single integrated 1U unit
- Tunes 0.5 to 20 GHz (1 kHz tuning resolution)
- Microwave tuner based on field proven SMR-5550i design
- Demodulator uses 140 MHz IF up to 57 MHz bandwidth
- Demodulates QPSK and 16, 32, & 64-QAM (2 to 46 Mbaud) using field proven demodulator
- Includes waveform analysis (auto ID)
- Two dedicated FPGAs for radio processing (decoding, descrambling, demultiplexing)
- Includes Development Kit for custom radio demultiplexing designs
- STM-1 optical & electrical outputs
- Narrowband IF and analog FM video outputs
- GUI with Ethernet control interface

DESCRIPTION

The DRX-5571 is the latest addition to our line of high-performance microwave set-on receivers. The proven RF to IF performance of the SMR-5550 series receivers is combined with FPGA-based demodulation and radio demultiplexing capability. This allows the receiver to fully process microwave signals having complex modulation and encoding schemes down to the underlying radio payload. Thus the DRX-5571 provides a completely integrated system solution for performing capture, analysis, survey, and collection of wideband digital radio RF signals.

Receiver

The DRX-5571 is ideally suited for the reception of signals using QPSK and QAM modulation. Phase noise, group delay, and gain linearity are all optimized to insure maximum fidelity of the IF signal before demodulation. Various analog outputs are provided externally for system flexibility.

Demodulator & Demultiplexer

The tuned 140 MHz analog IF output of the receiver is sent to a flexible FPGA-based demodulator and radio demultiplexer capable of processing up to 64-QAM signals. The radio demultiplexer functionality can be implemented using the included flexible design, or a custom design can be implemented using the provided RLP Development Kit.

Analysis

The DRX-5571 includes a host of analysis software to aid in identification of unknown signals.

An IF spectral plot is available for verification of the input signal. Modulation recognition software is provided to help identify all modulation parameters (type, baud rate, and center frequency).
**DRX-5571**

along with automatic configuration of the demodulator for hardware verification.

Radio level processing verification can be accomplished using a library of user pre-defined configurations. The waveform Auto ID software loads each compatible design and analyzes the result. A match is found based on successful overall processing. In addition, a tool is included that provides automatic TCM (trellis coded modulation) identification for demodulated symbols.

The included Trailmapper software provides standard SDH/PDH Mux ID for any system snapshot. A bit raster display (waterfall) has also been provided for viewing and analysis of processed data.

**Wideband Demodulator**

The DRX-5571 provides flexible wideband demodulation of QPSK and QAM signals for symbol rates up to 46 Mbaud. Signal distortion and interfering impairments are mitigated through filtering, robust timing recovery loops and adaptive equalization.

**Radio Level Processing**

The DRX-5571 has two large FPGAs dedicated solely to post-demodulator radio level processing (RLP). This provides sufficient resources to demultiplex any complex radio data structure down to the underlying payload for further analysis and processing.

RLP solutions can be switched at any time. Specific signal processing setups are stored to and loaded from both the unit and the host as editable text scripts. Four flexible RLP designs are included with the DRX-5571 targeting 2 and 3-level MLCM, TCM, and PDH radios containing various FEC algorithms such as BCH, Reed-Solomon and Viterbi.

**Flexible MLCM & TCM RLP Designs**

RLP solutions are provided for 2-level MLCM, 3-level MLCM, and TCM radios. See Figure 1. These three designs share a similar processing structure which includes FEC decoding for the specific signal type followed by flexible demultiplexing. The processing blocks such as frame synchronization, descrambling, and deinterleaving can be applied in a flexible order to allow for extraction of the underlying radio payload. Selected portions can then be remultiplexed where necessary for output or recording as a STM-1.

The PDH RLP processor provides three separate levels of frame synchronization controlling multiple rails and tributaries along with FEC decoding (BCH and Reed-Solomon), additive and feedthrough descrambling, and justification processing enabling complex payload extraction. The resulting payload tributaries can be multiplexed up to a STM-1 as appropriate for recording or output.

**User-Defined RLP**

A Development Kit is also included which, along with the appropriate FPGA vendor tool suite, provides everything necessary to implement custom RLP designs within the two dedicated FPGAs. The Development Kit also provides a custom GUI page for control and status of the user design using a simple text-based description. This provides a custom interface to the radio demultiplexing without requiring any additional software support.

**Snapshot**

Extensive internal snapshot capability is included to provide access to all levels of data, up to 128 Mbytes at native data rates.

**Real-Time Data Recording & Playback**

The real-time signal recording capability provides long duration recording direct to the host controller via the dedicated GigE data port. Real-time signal recording supports symbol data (hard and soft-decisions) and any single standard PDH tributary from the resulting STM-1 output (E1, E2, E3, E4 & STM-1).

The data file can also be used for generation of optical and electrical STM-1 outputs using an included PDH remultiplexer for lower-rate tributary data. Post-demodulator symbol data can also be sent to the radio demultiplexing resources on the DRX-5571 for extraction of underlying payload data.

**Compact Flash**

The DRX-5571 uses removable Compact Flash for storage of FPGA designs, embedded software, and configuration files. This allows the unit to be reconfigured remotely by modifying files on the flash card, or locally by simply changing flash cards. This also allows for quick sanitization of a unit by simply removing the Compact Flash card.

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**Figure 1**

**Flexible PDH RLP Design**

The PDH RLP design is capable of descrambling, decoding and demultiplexing demodulated symbol streams for a wide range of digital radio formats. Specific implementations are defined by the user in the form of configuration scripts. See Figure 2.
GUI

An intuitive and easy to use GUI is provided that combines the tuner, demodulator, and radio demultiplexer processing in a single interface, along with access to all analysis applications. All flexible processing can be quickly and easily configured, and access to all status is provided including spectrum display, constellation plot, analysis results, and processing status.

Pan IF Output (Fixed Gain)
Frequency* 70 MHz, 140 MHz
Spectrum sense Selectable: upright/inverted
IF bandwidth (3 dB) 50 MHz, minimum at 70 MHz 95 MHz, minimum at 140 MHz
Gain 25 dB, nominal

Variable Gain IF Output
Frequency* 70 MHz, 140 MHz selectable
Noise figure 15 dB, maximum at ≥30 dB gain (at −20 dBm rated output level)
OIP3 +15 dBm, minimum at ≥20 dB gain (at −20 dBm rated output level)
Rated output level −20 dBm, −15 dBm, −10 dBm, or -5 dBm; user selectable
Absolute gain +60 dB to −10 dB (at −20 dBm rated output level)
Gain control (MGC) 0 dB to 70 dB of attenuation control in 1 dB steps
Gain control range (AGC) 70 dB, minimum
Bypass/Wideband bandwidths 50 MHz at 70 MHz IF 95 MHz at 140 MHz IF
Standard NBIF filter bandwidths (consult factory for other selections) 140 MHz IF filter BW’s: 4, 12, 24, 32, and 48 MHz

Analog demodulator FM video output Level (100%) ±0.5 V for ∆f = ±1/3 IF BW
Video Response (3 dB) 1/2 Selected IF bandwidth
Coupling DC
FM Video Gain Range 5% to 100%, 5% steps
Connector Type BNC, female
Impedance 75 Ω

Digital demodulator Modulation types QPSK, 16-QAM, 32-QAM, 64-QAM
Symbol rates 2 to 46 Mbaud
Equalization
Feed forward 24-tap, T/2 spaced
Decision feedback 3-tap
Modulation recognition
Auto-ID Symbol rate, carrier frequency, modulation type
Types recognized BPSK, QPSK, QOFSK, 8-PSK, 16 to 256-QAM, FM-FDM, MSK, 2/3/4-FSK

* 140 MHz IF center frequency must be selected for demodulator to function.
DRX-5571
RADIO DEMULTIPLEXING SPECIFICATIONS
Included Flexible Radio Demultiplexing Design

<table>
<thead>
<tr>
<th>Symbol Decoder</th>
<th>Arbitrary, absolute or differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol-to-Bit Mapping</td>
<td></td>
</tr>
<tr>
<td>Number of Rails</td>
<td>4</td>
</tr>
<tr>
<td>Rail Crossbar</td>
<td>Arbitrary</td>
</tr>
</tbody>
</table>

Deframing
Max Frame Length               32 kbits
Frame Definition               Arbitrary assignment of FAW, overhead, discard, justification control, and FEC parity bits in any combination

FEC Decoding
Types Supported                Viterbi, Reed-Solomon, & Trellis

Descrambling
Types supported                Additive feedthrough
Descrambling capabilities      Up to 8 independent rails, 32 taps per rail
Max length of additive pattern 32 Kbits
Additive pattern entry         Polynomial or arbitrary file
Feedthrough pattern entry      Polynomial

Dejustification
Justification processors       16
Justification control bits      5
Justification control algorithm Majority rule, positive or negative justification

Snapshot
Max Length                     128 Mbytes

Data Outputs
Optical STM-1
Data Rate                      155.52 Mbps
Power Level                    -9.5 to -3 dBm
Wavelength                     1270 to 1360 nm, single mode
Connector                      LC

Electrical STM-1e
Data Rate                      155.52 Mbps
Encoding                       CMI, 1.0 Vp-p nominal
Impedance                      50 Ω
Connector                      BNC

GigE Data
Rate                          1000 Base-T
Protocol                      UDP
Connector                      RJ-45

RECEIVER MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Size</th>
<th>1.75” H x 23.16” D x 17”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>22 lbs. (10.0 kg)</td>
</tr>
<tr>
<td>Control interface</td>
<td>10/100 Ethernet TCP/IP</td>
</tr>
<tr>
<td>Shock</td>
<td>Designed to meet or exceed MIL-STD-810E, method 516.4, Procedure VI</td>
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<tr>
<td>Vibration</td>
<td>Designed to meet or exceed MIL-STD-810E, method 514.4-1, Category 1</td>
</tr>
<tr>
<td>Temperature range, operating</td>
<td>0° to +50°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>90% non-condensing at +40°C</td>
</tr>
<tr>
<td>AC power</td>
<td>Universal input 100-240 Vac, 50-60 Hz, 130 watts</td>
</tr>
</tbody>
</table>

WARRANTY
All intelligentRFsolutions equipment is warranted for one year, except for damage caused by accident or misuse, provided the equipment is returned for repair to the plant in Sparks, Maryland U.S.A

intelligentRFsolutions
14600 York Road
Sparks, MD 21152 U.S.A.
Phone 443-595-8500
FAX 443-595-8506
e-mail: engage@irf-solutions
www.iRF-Solutions.com

intelligent RF solutions
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