

DWRI6 – Digital Wideband HF Receiver

The DWRI6 provides simultaneous monitoring of the full HF spectrum and four independent digital drop receivers

Features and benefits

- Simultaneous monitoring and display of four independent narrowband HF channels and the full HF spectrum
- Software configurable digital drop receivers providing digitised bandwidths from 32kHz to 2MHz
- Narrowband channel filters ranging from 56Hz to 150kHz
- Compact package – ideal for portable applications
- Very low power consumption – 3.5W
- Low cost per channel
- 256K sample buffer capturing snapshots / strobos of the wideband spectrum
- Concurrent audio recording of all channels
- USB2.0 control
- Windows®-based Signal Monitoring Application software and API
- Commercial (DWRI6) and industrial (DWRI6I) temperature options available



Description

The DWRI6 employs state-of-the-art A/D conversion to directly digitise the entire HF spectrum. The digitised spectrum is fed to four digital down-converters / digital drop receivers (DDR) that simultaneously provide in-phase and quadrature (I/Q) base-band representations of four independently tuned narrowband channels. These channels are routed to a PC or laptop via an industry standard USB2.0 interface for further sub-band tuning, IF filtering, signal demodulation, spectrum display and audio routing. Together with the four DDR channels, rapidly updating snapshots of the digitised full HF spectrum are routed to the PC for wideband spectrum monitoring functions.

Advantages over conventional narrowband HF receivers

- Very low oscillator phase noise
- High linearity with low power consumption
- No images or interference from local analogue oscillators/mixers
- Excellent gain and phase matching when used in multi-receiver systems for beamforming and direction finding (see the LOCATE MCDWRI6 datasheet for more details)

Receiver functions

The DWRI6 is supplied with a Windows®-based Signal Monitoring Application software package providing a user-interface for receiver control and signal processing of the received signals. The user-interface displays and controls the following functions:

40MHz wideband channel

- Attenuator: automatic or manual mode (0dB to -31 dB in 1dB steps)
- Recording status of raw data stream
- Signal level

Narrowband channels

- Centre frequency: 0 to 40MHz with 1Hz resolution
- Bandwidth: 56Hz to 150kHz incremental
- Demodulation: I/Q, AM, USB, LSB, ISB, CW, FM
- Gain control: automatic (fast, medium, slow) and manual (6dB steps)
- Signal level
- Audio output level control: automatic or fixed
- Audio output
- Recording: I/Q or demodulated signal in .wav format

The Signal Monitoring Application software package enables the raw data stream from the receiver to be recorded in real-time and subsequently played back off-line using different narrowband channel bandwidths and demodulation modes.

A client / server version of the software is provided to enable the receiver hardware to be connected to a remote server PC that converts the USB traffic into TCP/IP protocol. The re-formatted data is then transferred over Ethernet to a client PC running the main control interface and signal processing functions.

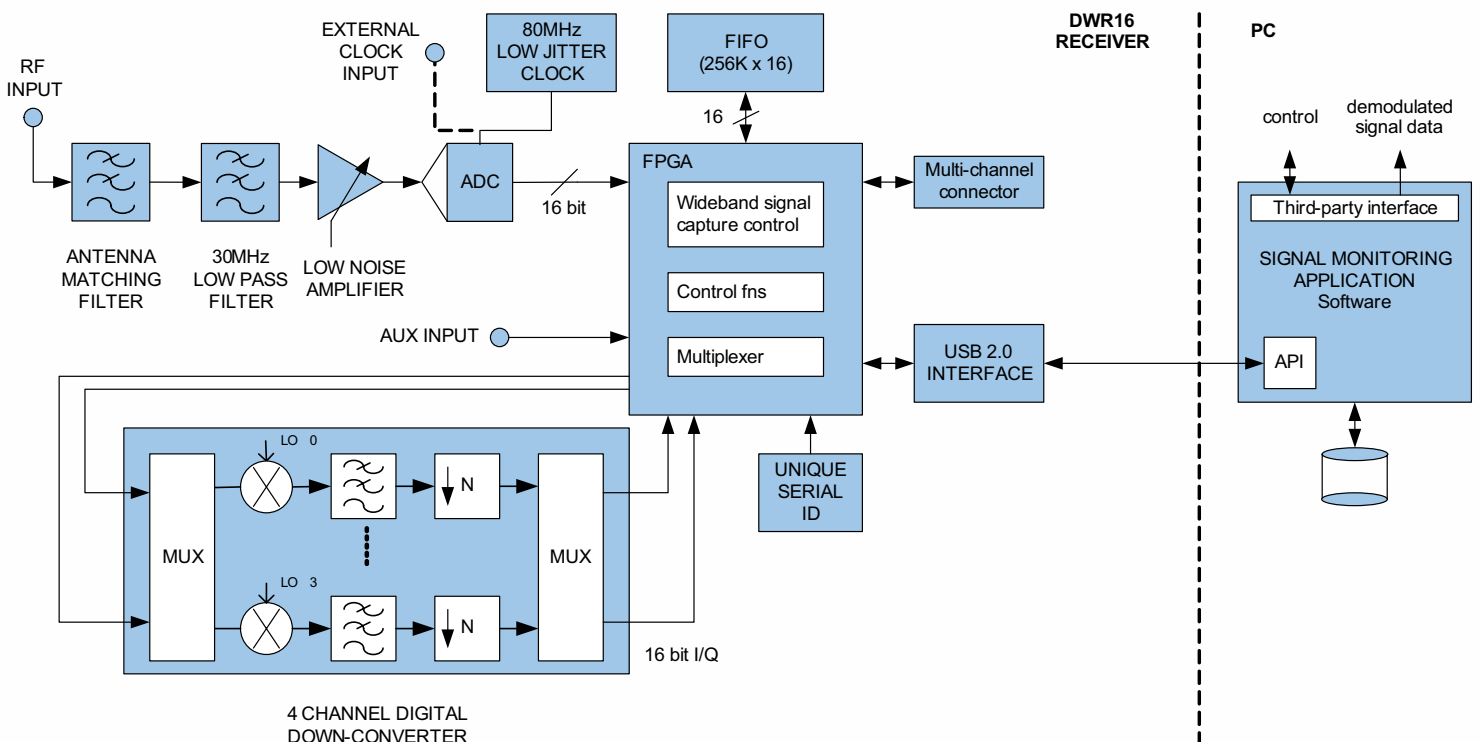
A control and data interface is provided to allow third-party software applications to control the receiver and access the demodulated signals for further processing (e.g. signal classification).

Within the control interface, multiple window layouts can be saved and recalled to suit operators' bespoke needs. In addition all receiver settings can be saved (in .xml format) and recalled to facilitate rapid configuration of the receiver.

Operating modes

The Signal Monitoring Application software enables the hardware digital drop receivers to be configured to send larger bandwidths (e.g. a single 2MHz channel) to the PC for processing. Software sub-band DDRs are then used to extract four narrowband channels from this wider bandwidth.

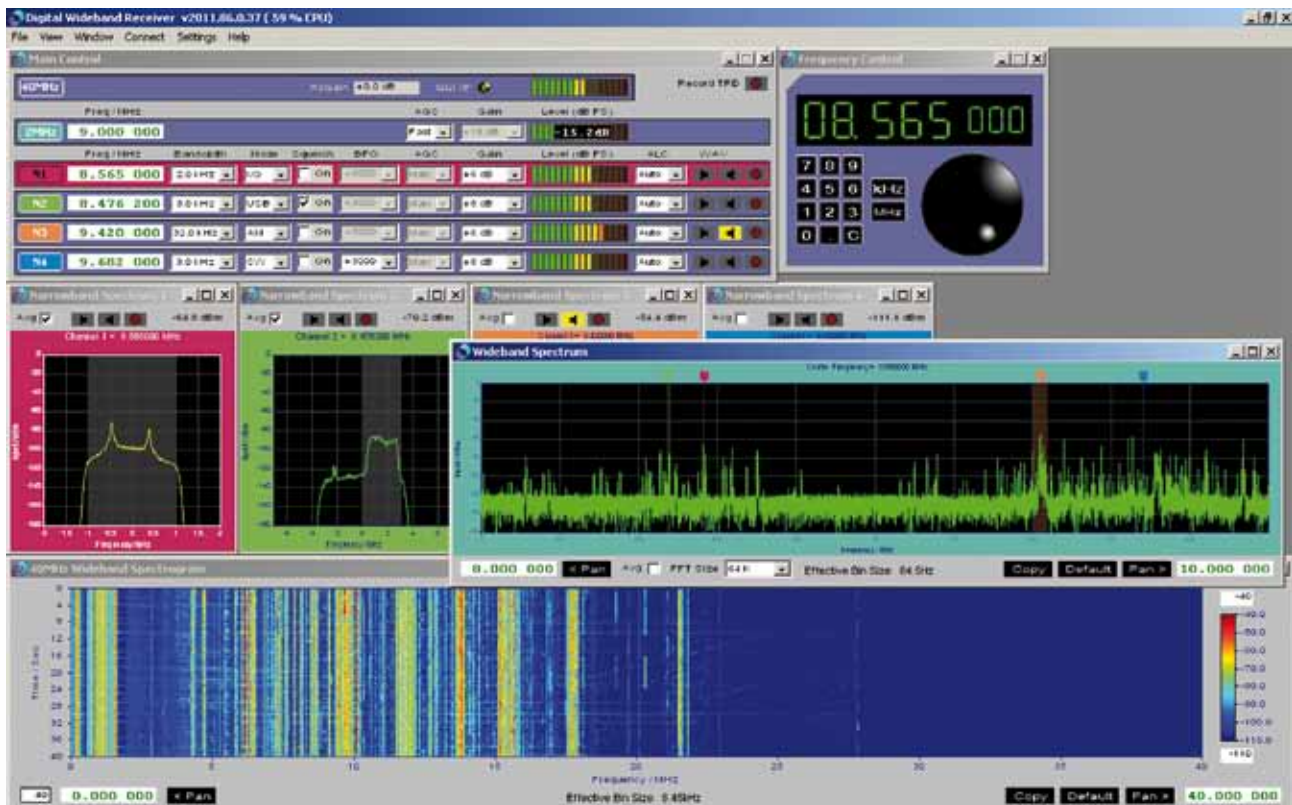
Block diagram



Signal Monitoring Application

In this example the receiver hardware DDRs are configured to extract a single 2MHz bandwidth channel (tuned to 9MHz) which is streamed to the PC together with snapshots of the full HF spectrum.

- 40MHz wideband waterfall display showing the full HF spectrum
 - Includes signal level scaling, time span adjustment, pan and zoom functionality
- Spectrum display of the 2MHz channel
 - Includes FFT resolution and averaging functions
- 4x sub-band digital drop receivers independently tuned and filtered to provide narrowband channels for demodulation
 - Channel power measurement
 - Record and audio functions
 - Manual handoff to HF Direction Finding system
- DDR control interface
 - 40MHz wideband signal level
 - Hardware DDR tuning and gain control plus signal level
 - Frequency, bandwidth, demodulation mode, squelch, BFO, AGC, audio and record options for each DDR
 - Live audio and recording hand-off
- Tuning frequency entry control



Specifications

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| Frequency range | 9kHz to 40MHz (reduced performance for <500kHz and >30MHz) |
| Frequency resolution | 1Hz |
| Frequency accuracy | +/- 1ppm typ, +/- 4.6 ppm over temperature and 20 year aging |
| External reference (option) | 80MHz |
| Phase noise | -135dBc/Hz at 1kHz offset |
| Antenna input | SMA, 50 Ω |
| VSWR | < 2.0:1 (max), <1.5:1 typ. |
| Input level | ≤ -12 dBm at max sensitivity (typ) $\leq +18$ dBm at min sensitivity (typ) |
| Max input level (non destructive) | +30dBm |
| Preselection | 30MHz low-pass filter |
| Input attenuation | Automatic or manual, 31dB range, 1dB step |
| ADC resolution | 16 bits |
| Number of narrowband receiver channels | 4 |
| DDC aliasing suppression | >90dB, 110dB typ. |
| Spurious signals | < -92dBm typ. (input: -14dBm tone, max sensitivity) |
| 2nd order intercept point (at max sensitivity) | > +60dBm, $f \geq 1$ MHz > +50dBm, $500\text{kHz} \leq f < 1$ MHz |
| 3rd order intercept point (at max sensitivity) | $\geq +22$ dBm, $1\text{MHz} \leq f \leq 30\text{MHz}$ $\geq +17$ dBm, $500\text{kHz} \leq f < 1$ MHz |

| | |
|-------------------------------|---|
| Noise figure | ≤ 14 dB at max sensitivity |
| Demodulation modes | AM, FM, CW (IF bandwidth ≤ 16 kHz), USB, LSB, ISB, I/Q |
| Narrowband IF bandwidths | 56Hz to 150kHz |
| Shape factor (3dB/60dB) | $\leq 1:1.2$ (typ) |
| Gain control | Automatic (fast, medium, slow) manual (-18dB to +72dB in 6dB steps) |
| Wideband spectrum update rate | 1.15Hz (302Hz resolution) (typ) |
| Analogue audio | Audio output from PC/laptop |
| Control and data interface | USB2.0 (High Speed) |
| Operating temperature range | 0°C to 50°C (DWR16) -20°C to +60°C (DWR16I) |
| Storage temperature range | -40°C to +70°C |
| Humidity | < 95% non-condensing |
| Power supply | +5.0V DC (DWR16) +12.0V DC (DWR16I) |
| Power consumption | 3.5 W |
| Size | 98 x 218 x 38mm (W x D x H) |
| Weight | 750g |
| PC/laptop requirements | 1.7GHz Intel® P4 or better; Windows® XP, Vista, Win 7 USB2.0 (High Speed) |
| Software | Signal Monitoring Application software package |
| Accessories | AC Universal input power supply, USB2.0 cable |



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Ordering Information
DWR16 part number: X72/1/2233/502
DWR16I part number: X72/1/2233/504

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