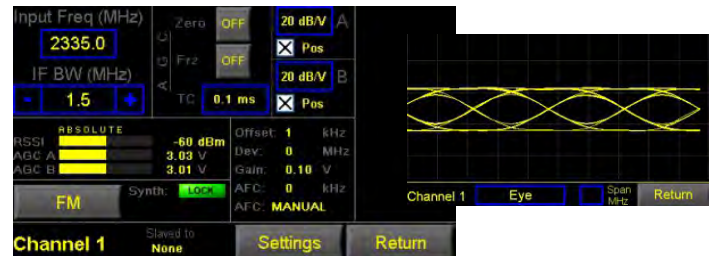
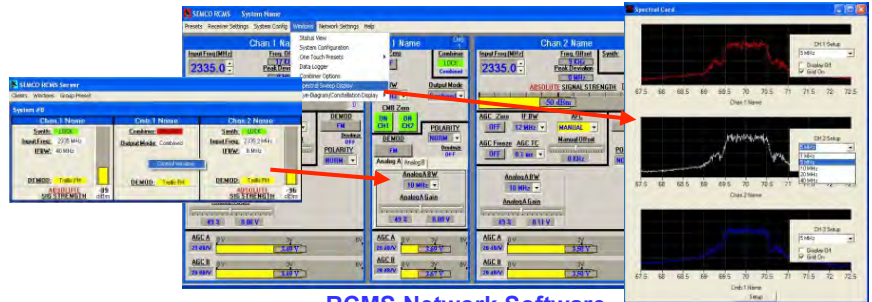




# R600A SERIES TELEMETRY RECEIVER



Front Panel Touch Screen Controls and Displays



RCMS Network Software

**DESCRIPTION** - SEMCO's R600 Series Telemetry Receiver product line consists of 6U rack-mount configurations designed for telemetry data reception and antenna tracking applications. Configurations include receivers with embedded PC processors and peripherals as well as non-PC Ethernet-controlled configurations. All R600 configurations are IRIG 106-15 Tier II phase noise compliant and offer state-of the art demodulation capabilities in RF tuning bands from 70 MHz to 5250 MHz.

Additional optional performance features include Adaptive Equalization, Data Quality Encapsulation (DQE), Data Quality Metric, Low Density Parity Check (LDPC), Space Time Coding (STC), CCSDS Spread Spectrum (Constellation program crew vehicle) Forward SS-UQPSK link and the Return DG1 Modes 1, 2 & 3 links.

### STANDARD CONFIGURATION

- Multi-Channel Receivers (Dual or Quad Channels)
- Dual & Quad CH Receiver Combiners (Pre-d & Post-d)
- Embedded PC and Ethernet Control
- 1415-1585, 1650-1850 or 2185-2485 MHz Tuning
- PCM/FM and NTSC Video Demodulation
- Embedded Bit Syncs with De-randomizer (all 3/6 CHs)
- Eye Pattern and Constellation Displays (all 3/6 CHs)
- 4 User-Configurable Analog/Digital Outputs per CH
- AM and scalable AGC Antenna Tracking Outputs
- Front Panel Removable Solid State Drive
- RCMS Network Software (Ethernet Remote Control)

### OPTIONS

- Embedded Stand-Alone Bit Sync/Frame Sync/BERT
- Built-In-Self-Test w/Internal RF BIT Source
- No embedded PC or Peripherals (Ethernet Control)
- 70 MHz, 200-1150 MHz or 4400-5250 MHz Tuning
- Multi-Channel Spectral Sweep
- GUI Selectable 70 MHz Playback

### OPTIONS (continued)

- Pre-d Record and Playback (75 kHz to 15 MHz)
- 70 MHz Playback
- IRIG Time Code A/B Generator
- AFC (CFO) Loop Stress Outputs
- 1415-1585, 1650-1850 and 2185-2485 MHz Tuning
- PM, BPSK & A/U/S/O/QPSK Demodulation
- IRIG 106-15 Trellis FM, SOQPSK-TG & Multi-h CPM
- PM/PSK (SGLS) and FM/FM S/C Demodulation
- Coherent AM Demodulation
- Adaptive Equalization
- Data Quality Encapsulation/Metric (DQE/DQM)
- CCSDS Spread Spectrum
- Low Density Parity Check (LDPC) Feature
- Space Time Coding (STC) Feature
- Viterbi Decoder (k=7 rate 1/2)
- TM over I/P
- Selective Turbo Coding

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# R600A SERIES SPECIFICATIONS

|                               |   |
|-------------------------------|---|
| <b>RF</b>                     |   |
| <b>Frequency (MHz)</b>        | 70, 200-1150, 1400-1600<br>1650-1850, 2185- 2485, 4400-5250<br>1415-2485 (continuous)   |
| <b>LO Tuning Resolution</b>   | 100 kHz (increments of 1 kHz in<br>AFC Manual Mode)   |
| <b>Internal Stability</b>     | ≤ +/- 1.0 ppm with internal 10 MHz<br>reference   |
| <b>AFC Resolution</b>         | 1 kHz   |
| <b>Dynamic Range</b>          | -10 dBm to Threshold  |
| <b>Noise Figure</b>           | ≤ 8 dB (maximum)  |
| <b>Phase Noise</b>            | IRIG 106-15 Tier II Phase Mask<br>Compliant   |
| <b>Maximum Safe Input</b>     | +10 dBm   |
| <b>VSWR</b>                   | < 2:1   |
| <b>ACI</b>                    | 40 dB (min.)/1 dB BER Degradation<br>with presence of interfering signal<br>at 2 times IFBW   |
| <b>Image Rejection</b>        | ≥ 60 dB (> 65 dB, typical)  |
| <b>Spurious Rejection</b>     | ≥ 60 dBc  |
| <b>IF Rejection</b>           | 70 dB minimum, 80 dB typical  |
| <b>IF SAW Filters</b>         | 8 from 0.3 to 40 MHz  |
| <b>IF FIR Filters</b>         | 15 user-selectable per data rate<br>entered + Auto-Set based on data<br>rate; 4 kHz to 37.3 MHz   |
| <b>Pre-d (70 MHz) Outputs</b> | Linear, - 10 ±2 dBm, 2 Outputs per<br>Channel   |
| <b>AGC TC</b>                 | 0.1, 1, 10, 100 and 1000 mS   |
| <b>AGC Outputs/Channel</b>    | 2 Scalable (± 10, 20 or 50 dB/V) or<br>User-selectable, hi/lo impedance   |
| <b>AGC Modes</b>              | Manual, Freeze, and Zero  |
| <b>AGC Dynamic Range</b>      | Up to 100 dB from a 6 dB C/N<br>threshold to -10 dBm  |
| <b>AGC Voltage Display</b>    | AGC voltages on Touchscreen, local<br>GUI, and Network GUI  |
| <b>AM Outputs/Channel</b>     | Normal and Inverted; 2 Vp-p into<br>50/75 Ω (50% AM)  |
| <b>AM Low Pass Filters</b>    | User-selectable 30 Hz–30 kHz<br>(Bessel Filters)  |
| <b>AM Frequency Response</b>  | User-selectable 0 – 30 kHz  |
| <b>AFC</b>                    | ±250 kHz  |
| <b>AFC TC</b>                 | 1, 5, 20 and 100 (Hz)   |
| <b>Record/Playback</b>        | Fixed 70 MHz Playback; Select<br>any Channel; Optional Pre-d<br>Record/Playback; 75 kHz to 15 MHz<br>(1 kHz steps)  |
| <b>RF Spectrum Analyzer</b>   | Up to 3 (RC600A-2) and 6 (RC600A-<br>4) RF spectral sweep displays with<br>CF measurement and selectable<br>span control; simultaneous<br>displays during receiver and<br>demodulator operation |

|                                       |   |
|---------------------------------------|---|
| <b>Diversity Combiner (RC600-2/4)</b> |   |
| <b>Combiner Type</b>                  | Post-d and Pre-d<br>frequency/polarization<br>diversity   |
| <b>Combiner Method</b>                | User Selectable AM/AGC<br>Optimal Ratio and Best<br>Source Select                                 |
| <b>Combiner Modes</b>                 | User selectable CH1, CH2<br>or Combined   |
| <b>Break Frequency</b>                | >50 kHz   |
| <b>Auto Adjust</b>                    | CH1/CH2 Balance feature   |
| <b>Combiner Improvement</b>           | >2.5 dB improvement<br>with equal signal input;<br>(10Log(C1/N1+C2/N2))–<br>0.5dB (unequal input) |
| <b>Loop Bandwidth</b>                 | selectable 0.5 to 50 kHz  |

|                                   |   |
|-----------------------------------|---|
| <b>DEMODULATOR</b>                |   |
| <b>Number of Demods</b>           | Up to 3 (RC600A-2)<br>Up to 6 (RC600A-4)<br>User-switchable to any<br>selected Channel                                  |
| <b>Demodulator Modes</b>          |   |
| PCM/FM                            | 10 kbps to 23 Mbps  |
| PM/PSK                            | 2 kbps to 20 Mbps   |
| S/O/QPSK                          | 30 kbps to 40 Mbps  |
| Trellis FM                        | 20 kbps to 23 Mbps  |
| SOQPSK-TG                         | 50 kbps to 40 Mbps  |
| Multi-h CPM                       | 100 kbps to 37 Mbps   |
| GMSK                              | 10 kbps to 40 Mbps  |
| FM/FM                             | 5 kHz to 12 MHz   |
| FM Sub-Carrier                    | 100 bps to 256 kbps   |
| <b>Differential Decoding</b>      | Per IRIG and the CCSDS<br>Standards   |
| <b>Sub-carrier Demodulators</b>   | 2 per Demodulator   |
| <b>Sub-carrier Modulation</b>     | Up to 1.8   |
| <b>Index</b>                      |   |
| <b>Loop Bandwidth</b>             | User-selectable 0.1 - 3%  |
| <b>Spread Spectrum</b>            | SS-UQPSK, SQPN  |
| <b>Acquisition/Tracking</b>       | +/- 1 kHz to +/- 500 kHz;   |
| <b>Adaptive Equalization (AE)</b> | AE option mitigates harsh<br>multi-path environments<br>using CMA and Decision<br>Equalization                          |
| <b>Data Quality</b>               | DQE/DQM option  |
| <b>Encapsulation/Metric</b>       | Source Selection by<br>embedding data quality<br>information within the<br>PCM/FM and SOQPSK-<br>TG demodulator formats |







# R600A SERIES SPECIFICATIONS *(continued)*

## DEMODULATOR (cont)

**Low Density Parity Check** 6 SOQPSK-LDPC FEC Codes and de-randomization per IRIG 106-15 and CCSDS

**Space Time Coding** SOQPSK-STC Per IRIG 106-15 Appendix S

**TM over I/P** 3/6 CH10 Compatible Channels and in accordance with IRIG 218-07

## ERROR CORRECTION

**IRIG Time Code Displays** IRIG A/B Time Code Stamping Eye-Pattern and Constellation Displays; simultaneous displays without interference with demodulator function

## BASEBAND VIDEO

**Number of Outputs** Four outputs per Channel User-selectable Analog or TTL clock & Data

**Output Voltage Coupling** Analog 0 to  $\geq 4V_{pp}$ , 75 $\Omega$  AC or DC

**FIR Filtering** 15 user-selectable per data rate entered + Auto-Set based on data rate; 2 kHz to 18.7 MHz + Bypass

## PROGRAMMABLE BIT SYNCHRONIZER

**Number of Embedded Bit Synchs** Up to 3 (RC600A-2)  
Up to 6 (RC600A-4)  
User-switchable dual channel bit synchs to any selected Channel plus up to 3/6 user-switchable external inputs

**Input Level** 0.2 to 20 Vp-p Single-Ended  
0.2 to 10 Vp-p Differential

**Input Impedance** 4K/75  $\Omega$  Single-ended or 150  $\Omega$  Differential

**DC Offset** 20 Volts

**Input/Output Codes** NRZ-I/L/M/S  
Bi-Phase- L/M/S  
DBiphase-M/S  
DM-M/S  
MDM-M/S  
RNRZL-L

**De-Randomizer** RNRZ-9/11/15/17/23;  
Forward and Reverse

**Data Rate Range** 8 bps to 40 Mbps NRZ  
8 bps to 20 Mbps (all other codes)

**Tuning Resolution** 0.1% of Data Rate

**Capture Range** 3 times Programmed Loop Bandwidth

**Tracking Range** +/- 12% of Data Rate

**Loop Bandwidth Range** 0.1 to 3% of Data Rate

**Acquisition Threshold** 0 dB Eb/No (NRZ);  
3 dB Eb/No (Bi-Phase)

**BER/Code Degradation** < 0.5 dB (all codes)

**Static Offset** 0-100% for 0-10 Vp-p

**Dynamic Offset** 80% (max.) for oscillating frequency offset

**Dynamic Freq Offset** 0.1% of Data Rate

**Data Outputs** 2 Outputs: 3.3 V  
TTL/CMOS and RS-422 Levels

**Output Impedance** 50 ohms

**Clock/Data Phase** 0°, 90°, 180°, and 270°

**Data Polarity** Normal/Invert

**Forward Error Correction** Viterbi (k=7, Rate 1/2);  
Optional Turbo Codes per customer requirements

**Viterbi Options** Differential Decoding;  
V.35 Descrambling; G2  
Invert

**Symbol Formats** Serial, Parallel, and Staggered Parallel

## FRAME SYNCHRONIZER OPTION

**Number** Up to 6 User-selectable to any selected Channel

**Format** Programmable Frame Length and Sync Word

**Auto-Detect** I/Q Ambiguity and Polarity

**Frame Length** Programmable up to 65k Words

**Word Length** Up to 32 Bits

**Frame Sync Length** Up to 32 Bits

**Frame Sync Mask** Up to 32 Bits

## BIT/BERT OPTION

**RF Internal BIT Source** Modulated S-Band Source for Internal BIT/BERT Loop Testing (all demod formats)

**Sequence Generator Patterns** PN7, PN9, PN11, PN15, forward and reverse





# R600A SERIES SPECIFICATIONS *(continued)*

## **BIT/BERT OPTION (cont.)**

|                                |  |
|--------------------------------|--|
| <b>BER Sample Periods</b>      | Programmable $1 \times 10^{-3}$ to $1 \times 10^{-6}$ bits or cumulative average |
| <b>Pattern Synchronization</b> | Automatic with polarity and bit slip detection                                   |
| <b>Error Insert</b>            | Single Bit or $10^{-3}$  |

## **PCM DECOMMUTATOR OPTION**

|                    |   |
|--------------------|---|
| <b>Formats</b>     | Up to 40 Mbps IRIG 106 Type I and Type II; concatenation and asynchronous data capability   |
| <b>Decom Modes</b> | IRIG A/B/G time code read and generation; programmable PCM simulation; raw and Decommutated time tag data output and recording<br>Programmable Normal or Inverted |

## **ADDITIONAL OPERATING FEATURES**

|  |   |
|--|---|
| <b>System and AGC Data Logging</b>           | Time tags and stores all system and AGC parameters and readings during a mission into a user-named file; outputs both System and AGC data logging files as Comma-delineated text files  |
| <b>Mission Presets</b>                       | Virtually infinite number of receiver settings can be named and stored to a file for recall; one touch presets provides for 10 presets to be displayed on Touch Screen and GUI for instant recall   |
| <b>Channel Slaving and Naming</b>            | User ability to separately name receiver and channels as well as slave receiver settings between channels   |
| <b>TM Receiver Operation without Host PC</b> | System operation is independent of host PC and uses PC for serial communications only; provides for ability to bypass host PC and use any PC com port; provides for instant restoration of TM operation after power is lost and then restored |

## **Operating Environment**

RCMS Network Software; Win7/10; 7" Touch Screen; Integrated display, Keyboard, and Mouse

## **POWER**

|                    |  |
|--------------------|--|
| <b>Power Input</b> | 100-264 VAC, 47-63 Hz; Auto-ranging; 1000W single power supply |
| <b>Options</b>     | Dual 460W, 'hot-swappable' redundant power supplies            |

## **PHYSICAL AND ENVIRONMENTAL**

|                    |  |
|--------------------|--|
| <b>Dimensions</b>  | 17" W x 10.5" H x 20" D (19", 6U Rack Mount)   |
| <b>Weight</b>      | 86 lbs. (RC600A-2)<br>97 lbs. (RC600A-4)       |
| <b>Temperature</b> | 0 to 50°C (operating)<br>-20 to 70°C (storage) |
| <b>Humidity</b>    | Up to 95%, non-condensing                      |
| <b>Altitude</b>    | Up to 30,000 feet                              |
| <b>EMI</b>         | Designed to meet MIL-STD-461                   |

