



FEATURES

- Wide Frequency Coverage (100 MHz to 40 GHz)
- Wide IF Bandwidths Available—Up To 500 MHz
- “Configure Your Own System” With Up To 64 Receiver Channels
- Operator Friendly With Use Of Color, Menu Driven Controller
- Extensive Built-In-Test
- EMI Shielding
- High Performance—Low Differential Group Delay, Low SSB Phase Noise, and High NPR
- Available System Components Include Tuners, Demodulators, Displays, Switch Matrices

DESCRIPTION

SMR-1600 is a generic designation for a large variety of microwave receiving systems configurable in truly modular building-block fashion. System scope may be limited to a few tuners, or embrace as many as 64 tuners with associated demodulation and display components. Each system element is linked to one or more SMR-1611 System Controllers by Serial RS-422 data links, and each element contains an internal Motorola 68000 microprocessor addressable and controlled from the SMR-1611 via the RS-422 link.

Once set to a particular parameter condition, the various instruments will operate without further intervention from other system instruments. Each instrument in the system has nonvolatile memory in the event a power outage occurs. When power returns to normal, the system is immediately reset to its previous condition.

The functional elements from which the systems are configured are:

- SMR-1611** — Controller
- SMR-1615** — System Interface Unit
- SMR-1629, 1660** — Tuners (Available in octave and multioctave tuners with coverage from 100 MHz to 40 GHz).

SYSTEM OVERVIEW

The block diagram represents a typical configuration of the SMR-1600 System. The system includes a number of SMR-1629 and SMR-1660 Series Tuners and an SMR-1615 System Interface Unit located at an antenna site remote from the main site. The 160 MHz IF output of the tuners may be carried over coax to the operations site for further amplification, demodulation, processing, display and recording. The digitized video is also provided for distribution to the SMR-1651 Video Switch Matrix.

The SMR-1636 IF Demodulator Rack with SMR-1635 IF Demodulator Trays provides outputs of 160 MHz IF, simultaneous AM and FM video, switched AM/FM video, log video and 21.4 MHz IF for supplementary analysis processing and recording. The SMR-1651 Video Switch Matrix allows any of the 16 tuners to be digitally switched to any of the eight traces on the two SMR-1641 Digital Scan Displays. Further analysis may be accommodated by using the SMR-1638 Analysis Demodulator to provide audio demodulation or to utilize additional IF bandwidths.

Access to the full system capabilities is available via the SMR-1611 Controller. This controller allows several operators to readily identify system capabilities and provide full system control. The SMR-1611 Controller utilizes a full color, menu driven CRT to provide complete instructions to the operator without need for pull-out-cards or reference manuals. Changes to the system configurations may be made easily to add operational capability to meet specific needs. Additional tuners, demodulators, displays, etc. may be added without any need for modification to any of the units.

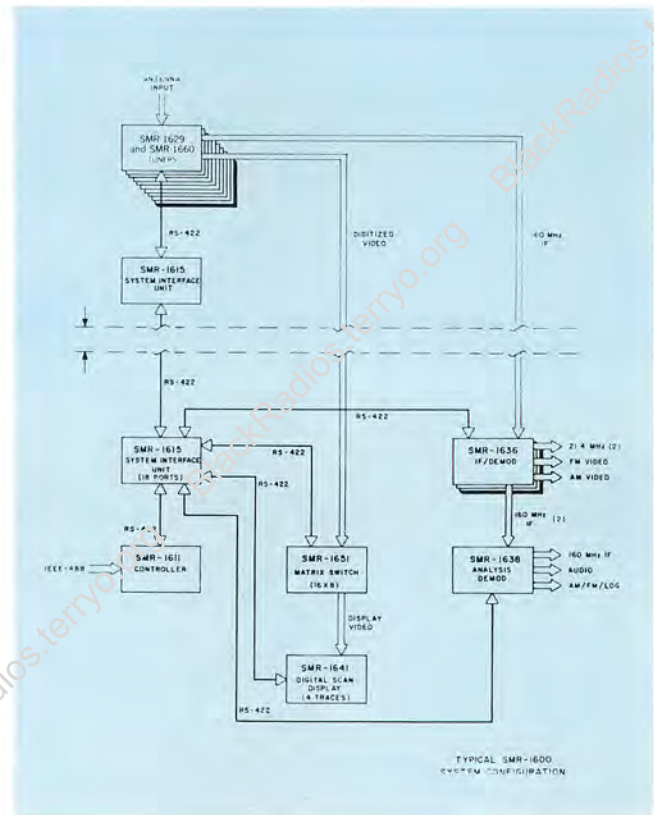
The system signal flow may be described from receiver channel "8" as follows:

Assume tuner "8" is sweeping the full band. Log video is digitized at the tuner and sent with horizontal information to the SMR-1641 Display, over a single coaxial cable. A second coaxial cable is utilized to carry the IF signal into the demodulator. Demodulator "8" receives the signals and processes the IF signal providing the various outputs described in the SMR-1635 IF/Demodulator or

SMR-1636 — IF/Demodulator Mainframe (Up to five SMR-1635 IF/Demodulators in each SMR-1636).

- SMR-1638** — Analysis Demodulator
- SMR-1641** — Digital Scan Display
- SMR-1651** — Video Switch Matrix

SMR-1638 Analysis Demodulator section. The digitized video signal from the tuner may be applied to an SMR-1651 Video Switch Matrix. The SMR-1651 then applies this signal to the SMR-1641 Digital Scan Display. Channel "8" display processes the information and presents the scan display, marker and data received from the SMR-1611 Controller and SMR-1615 System Interface Unit.





SMR-1638 ANALYSIS DEMODULATOR

- Simultaneous AM (Linear and LOG), FM, and Audio for selected channel
- Eight IF Bandwidths provided from 200 kHz to 40 MHz
- High Dynamic Range (70dB)
- Low Differential Group Delay



SMR-1641 DIGITAL SCAN DISPLAY

- Digital Storage
- Displays 4 Simultaneous Traces
- Full On-Screen Alphanumerics
- Flicker-Free Presentation
- Independent Sweep Rates and Variable Decay Times
- Two Operational Modes: "Multi-Tuner" or "Multi-Trace"



SMR-1651 VIDEO SWITCH MATRIX

- Extends SMR-1641 Display Ability to Observe Any Of 16 Channels
- Up To Two Independent 16×8 Matrices
- Electronic Switching
- 5 MHz Frequency Response



SMR-1615 SYSTEM INTERFACE UNIT

- Provides Control Interface to Other SMR-1600 System Devices
- Battery Back-Up RAM Eliminates Need to Reprogram System After Power Interrupt
- Maximizes Speed by Managing Communications Of All Devices Connected To It
- Communicates With Up To 18 Instruments In System

SMR-1629 TUNERS

- Wide Frequency Coverage
- Scan and Synthesized Tuning
- Expandable to 64 Tuners/System
- Large Assortment of Available Frequency Ranges
- Multiple Scan Capability

SMR-1660 TUNERS

- Wide Frequency Coverage
- Wide IF Bandwidths—Up To 500 MH
- Ultra-Low Phase Noise
- Multiple Scan Capability
- Small Size

SMR-1635 AND SMR-1636 IF DEMODULATORS

- Up to 5 SMR-1635 IF Demodulators per SMR-1636 Rack
- Simultaneous AM and FM on each channel
- Bandwidths available from 100 KHz to 50 MHz
- Field replaceable IF Demodulator Trays and Bandwidths
- Carrier Operated Relay (COR)
- High Dynamic Range (70dB)
- Low Differential Group Delay



SYSTEM OPERATION

A typical sequence of events begins with a system power-up condition. All devices in the system have battery back-up Random-Access-Memory (RAM) to provide for desired parameters to be retained in the event of a power failure. Upon initialization the SMR-1615s interrogate all system components and provide information to the system controller regarding all system components. This includes all system parameters such as tuner and IF frequencies and bandwidths as well as "Mapping" of assigned components to each reference channel.

Communication in this system is accomplished via RS-422 serial interface lines. The RS-422 is a balanced pair of wires with a 5 volt differential logic signal. Shielded twisted pairs provide good RFI protection while allowing the cables to be longer than would typically be possible with unbalanced lines. A "tree" structured communication system was selected to obtain the best possible reliability and speed. One instrument or one cable failure affects fewer instruments than is possible utilizing other techniques.

REMOTE OPERATION

The SMR-1600 system utilizes the RS-422 serial interface to provide maximum flexibility in physically separating components of the system. This allows for minimal system cabling as well as convenient interfacing to modems for data transmission over telephone lines. The tuner IF output may be carried over low-loss coax to the demodulators if so desired. The tuner contains 16 dB of excess gain which is typically padded for shorter runs but which will allow 1000 feet of separation if cable loss on the order of 1.6 dB/100 feet is used.

SERVICEABILITY

Each of the components of the SMR-1600 System incorporates Built-In-Test (BITE) ability to permit the

SMR-1611 CONTROLLER

- Full color menu driven display
- BITE Internal Testing optimizes up-time
- Control up to 64 Receiver Channels



operator to check operation of all the instruments in the system, and locate failures. This may be accomplished with the use of an external computer interfaced to the system via IEEE-488, RS-232 or RS-422 or with the use of the SMR-1611 Controller.

Automatic BITE testing is performed with serial polling of all of the instruments in the system and, in the event of failure, a red error message is displayed on the bottom two lines of the CRT display. The "TEST" special key accesses a table displaying the type of error (i.e. voltage, phase lock, high temperature, etc.) and the faulty device. A series of additional tests may then be performed with the controller to further isolate the nature of the failure.

The BITE capability designed into the SMR-1600 system includes the following tests, all of which may have results displayed in the manual mode:

TEST	UNITS TESTED
All Power Supply Voltages	All Units in System
Phase Lock Conditions	All Tuners and Demodulators
Battery Conditions	All Tuners, Demodulators, Video Switches, Displays, Interface Units
Internal/External Reference	All Tuners, Demodulators
Internal Temperature	All Tuners, Interface Units, and Controllers
Tuner First IF Test	All SMR-1629 Tuners, Demodulators,
Signal	Video Switches and Displays
System MAP	Communications of all Units in System

Another built-in feature provides the ability to monitor and log actual operation hours through the resident microprocessor. This permits easy verification of usage and system reliability data. Firmware updates and revision may also be verified with BITE. This insures the operator is utilizing the latest appropriate firmware for every instrument in the system to perform the mission.

SPECIFICATIONS

Frequency Range	0.1 to 40 GHz (See SMR-1629 and SMR-1660 specifications)
SMR-1611 Controllers per System	Up to 4
SMR-1615 System Interface Units per System	Up to 12
SMR-1629, 1660 Series Tuners per System	Up to 64
SMR-1635 IF Demodulators per System	Up to 64
SMR-1638 Analysis Demodulators per System	Up to 8
SMR-1641 Scan Displays Per System	Up to 16
SMR-1651 Log Video Switch Matrices per System	Up to 8
Remote System Control	IEEE-488, RS-232C, RS-422
Receiver First IF Frequency	160 MHz or 250 MHz
Maximum Remote Distance between Tuners and Demodulators	Up to 1000 feet with low loss cable (assumes coax with loss of 1.6 dB/100 feet is utilized)
AC Power	115/230 Vac \pm 10%; 47 to 420 Hz

NOTE: Please refer to individual equipment data sheets for detailed specifications.

WARRANTY

All Micro-Tel products are unconditionally warranted for a period of one year except for physical damage, provided the equipment is returned to the plant in Hunt Valley.



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