MMS PRODUCTS

HP 70000 Modular Measurement System

Overview

- Optimized for RF and microwave automatic test systems
- Modular for easier system integration
- Wide variety of products and configurations available

HP developed and supplies an integrated rack of RF test equipment for communication satellite payload test. MMS signal generators, spectrum analyzers and power meters were selected for a compact, EMC-rugged, highly-accurate, 1 GHz to 20 GHz broadband system. The HP 70611A Attenuator/Switch Driver (an MMS system module) is included providing a convenient interface to a custom switch matrix.

Modular Measurement System

The Modular Measurement System (MMS) is an open, industry standard controlled by a consortium. The high-performance, modular platform is especially suited for RF, microwave, and lightwave text applications. It offers the lowest life-cycle cost when you integrate, support, or upgrade your system. The MMS offers system designers a number of advantages:

- A wide variety of over 50 modules offer low frequency, RF, microwave, and lightwave measurement capability.
- Easy system integration is aided by standard- and custom-switching modules, plus an open architecture with design tools that allow you to design and build your own specialized modules.
- Easy-to-use displays allow you to operate a system from local or remote locations, and mainframes and displays can be separated by up to 1.2 kilometers.
- Electromagnetic compatibility (EMC) design is optimized for microwave environments. Rugged mainframes, shielded enclosures, grounding, and a 40 kHz switched power supply reduce emissions and module-to-module interference.
- Automatic system control can be based on DOS, HP BASIC, or UNIX® operating systems.
- Compatibility with other open standards allows you to make use of new and existing hardware, software, and engineering expertise. MMS and VXI combine easily to solve complex measurement requirements. Both platforms continue to take advantage of their own internal high-speed bus, but can be tied to a common 10 MHz clock reference. Both use common trigger signal levels.

Maximize Your Investment

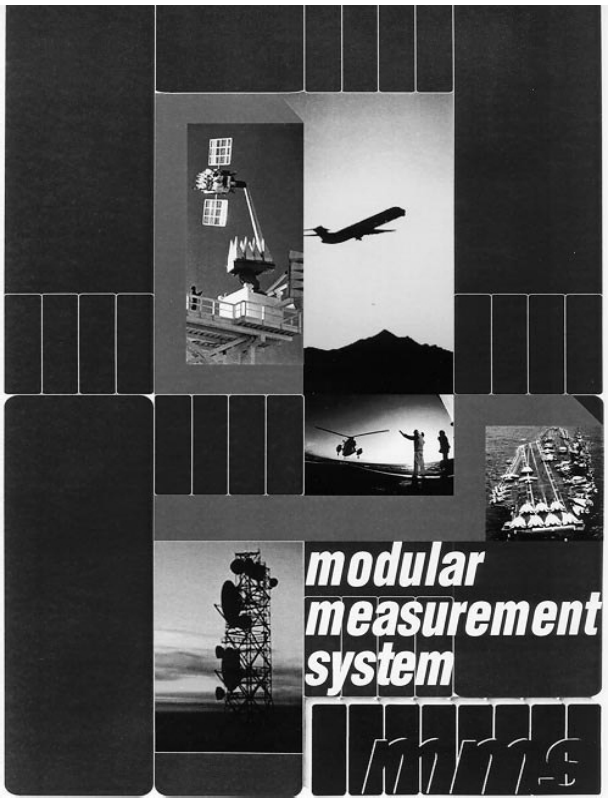
Several factors reduce MMS life-cycle costs:

- MMS integrates quickly, using off-the-shelf mainframes, components, and software packages.
- MMS allows system configuration to provide just the right amount of measurement capability.
- Downsizing enhances ATE systems by reducing rack space.
- A central, shared display allows operator focus and monitors up to four instruments at once in real time. This further reduces rack space. The system will even work without a display, saving more space and reducing cost.
- Built-in diagnostics and modularity team up to maximize system uptime, allowing you to make the best use of your investment.

HP 70000 Modular Measurement System

HP offers a variety of products and services to help you customize your entire system. Multiple support alternatives allow you to customize the logistics of each system to fit installation needs. With MMS, you are assured of the highest performance and best customer support—today, and in the years to come. Your HP sales representative can help you configure the best solution for your specific application.

The following pages highlight selected components and systems in the HP 70000 family. A complete listing of all HP MMS products and most MMS products from other suppliers with full descriptions, specifications, and services is also available.



Key Literature

HP 70000 Modular Measurement System Catalog,
p/n 5965-2818E

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HP 70000 MMS Product Information

Mainframes and Displays

HP 70001A

HP 70004A

Product	Description
HP 70001A System Mainframe	• 8-slot mainframe for MMS plug-in modules • Provides cooling, power, digital communication interface buses (MSIB and HP-IB) • Compatible with standard EIA racks • Good EMC performance and rugged structural design make it suitable for sensitive measurements in tough industrial environments • Optional 400Hz power line operation
HP 70205A Display	• Compact, 3-slot module format • Menu-driven human interface • Provides manual interface and control for system of up to 31 MMS instruments or 255 MMS modules • High-resolution graphics including traces, text, and markers
HP 70207A PC Display for MMS	• PC board, cable and software • Provides the MMS display and user interface on a PC • Sends graphics directly to any PC peripheral printer or plotter • Provides mass storage to any PC peripheral disc or hard drive
HP 70004A Color Display and Mainframe	• Integrated mainframe and display with full system interface and control capabilities • Full-color CRT • 4 available module slots • Connects to HP 70001A mainframes for creating larger systems • Memory card and mass storage capabilities

Instruments

Choose from instruments that are single modules or multiple modules configured into a system.

Sources

Product	Description
HP 70330A Pulse Generator	• 300MHz timing with variable width and delay • Variable transitions down to 1 ns • 10ps timing resolution • Dual-channel timing • 5V amplitude into 50Ω • External trigger output • 4-slot width
HP 70332A Multiple Clock Generator	• Up to 100MHz pulses with independent width and delay • 2 channels, each with 16 differential ECL outputs • Skew of < 1 ns between all outputs of one channel • External input • 4-slot width
HP 70340A Microwave Synthesizer, 1 to 20GHz HP 70341A Frequency Extension Module, 10MHz to 1 GHz	• Synthesized signal generator with add-on frequency extension +13 to −90dBm amplitude range • Harmonic suppression above 55dBc; no subharmonics • ±2dB output power accuracy and ±0.5dB flatness • 4-slot width + 1-slot extension module

HP 70340A

HP 71708A

Product	Description
HP 71708B Microwave Source, 2.4 to 25.8GHz	• Excellent LO substitute for radar, phase noise measurement systems; test source for receiver test systems
HP 70428A Microwave Downconverter Module, 2.4 to 25.8GHz	• 600MHz frequency resolution (0.1 Hz option) • Up to +16dBm output power • 8-slot system includes mainframe display; 4-slot module

Signal Analyzers

HP 70100A

Product	Description
HP 70100A Power Meter, 100kHz to 50GHz	• Single-channel module with features, capability of HP 437B • ±0.5% accuracy in linear mode; ±0.02dB accuracy in logarithmic mode • −70 to +44dBm power range • 1-slot width
HP 70110A Digital Multimeter	• 1450 readings per second • 3½ to 6½ digits of resolution • Measures dc and ac volts, 2-wire and 4-wire Ω, dc and ac current, frequency, power • Basic dc accuracy of 5ppm and common-mode rejection >90dB • 2-slot width
HP 70120A Universal Counter	• 100MHz, 200MHz, 2.4GHz inputs • Minimum sensitivity of 100mV p-p • Built-in TCXO • Built-in functions: frequency, period, time interval, rise and fall times, ratios, totalize, pulse width, ac/dc voltage minimum and maximum • 1-slot width
HP 70700A Digitizer	• 20 megasamples per second, 10 bits • 256K memory • Waveform recorder and oscilloscope features • Up to 8 channels • Improves analyzer sweep times • 1-slot module

HP 70000 MMS Product Information

Signal Analyzers (continued)

HP 71500A

HP 71707A

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Product	Description
HP 70703A Digitizing Oscilloscope	• 4-input, 2-channel operation • 500MHz repetitive bandwidth • 20megasamples per second for single-shot measurements to 2MHz • Up to 40dB isolation between channels • Accuracies >1.5% • 2-slot width
HP 71500A Microwave Transition Analyzer, DC to 40GHz HP 70820A Microwave Transition Analyzer Module, DC to 40GHz	• 2-channels, sampler-based, internal trigger • Time-domain measurements with FFTs • Up to 1 ps delta time accuracy • Magnitude and phase measurements on pulsed RF signals to 100ps pulse widths and 25ps edges • Analysis of AM, FM, and PM on RF carriers • Stepped frequency and power sweeps, magnitude and phase • System includes mainframe/color displays, 4-slot microwave transition analyzer module
HP 71707A Microwave Downconverter, 2GHz to 26.5GHz HP 70427A Microwave Downconverter Module, 2GHz to 26.5GHz	• Translates microwave signals to RF frequencies for phase noise measurements • AM noise detection • Specified spurious performance • System includes mainframe/color display, 4-slot microwave downconverter module

Spectrum Analyzers and Receivers

Product	Description
All HP 70000series spectrum analyzers offer the following:	• 10Hz minimum bandwidth • 90dB calibrated display range • 0.1 ppm frequency stability • Color display with digital persistence • Wide range of optional performance and features by adding other MMS modules and mainframes
HP 71100C RF Spectrum Analyzer, 100Hz to 2.9GHz HP 71100P RF Spectrum Analyzer, 100Hz to 2.9GHz	• Synthesized, high performance RF spectrum analysis • –134dBm sensitivity, –156dBm with preamplifiers • AC or dc coupled RF input • 2-mainframe system with 6 slots available or 1 mainframe with PC display
HP 71200C Microwave Spectrum Analyzer, 50kHz to 22GHz HP 71200P Microwave Spectrum Analyzer, 50kHz to 22GHz	• Microwave spectrum analysis with optional preselection • 2-mainframe system with 5 slots available or 1 mainframe with PC display

HP 71209A

Product	Description
HP 71209A Microwave Spectrum Analyzer, 100Hz to 26.5GHz HP 71209A Option Z40 Spectrum Analyzer, 100Hz to 40GHz HP 71209P Microwave Spectrum Analyzer, 100Hz to 26.5GHz	• Continuous sweeps from 100Hz to 26.5or 40GHz • –138to –128dBm sensitivity across the frequency range (HP 71209A/P); –107dBm at 40GHz (Option Z40) • Built-in external mixer interface for mm applications • Rugged 2.4mm input connector (Option Z40) • 2-mainframe system with 5slots (HP 71209A) or 3slots (Option Z40) available or 1 mainframe with PC display
HP 71210C Microwave Spectrum Analyzer 100Hz to 22GHz HP 71210P Microwave Spectrum Analyzer, 100Hz to 22GHz	• Fundamentally mixed, highest microwave performance • –139dBm sensitivity at 1GHz; –133dBm at 22GHz; –155dBm at 22GHz with HP 70620B preamplifier • Dynamic tracking preselector keeps analyzer peaked under all environmental conditions • +10dBm TOI from 10MHz to 22GHz • 2-mainframe system with 5slots available or 1 mainframe with PC display
HP 71910A/P Wide Bandwidth Surveillance Receiver	• Includes HP 71209A/P • Adds 10MHz to 100MHz linear bandwidth capability • See page 245

HP 70000 MMS Product Information

Lightwave and Communication

Product	Description
HP 71400C Lightwave Signal Analyzer, 100Hz to 22GHz HP 71401C Lightwave Signal Analyzer, 100Hz to 2.9GHz HP 70810B Lightwave Signal Analyzer Module	• Calibrated measurement of intensity modulation from 100kHz to 22GHz • 1200to 1600nm operation (750to 870nm option) • RIN measurements to –165dB/Hz • Interferometer for laser line width and chirp measurements • Systems based on HP 71210C spectrum analyzer • 2-mainframe systems with 4slots available
HP 71450B Optical Spectrum Analyzer HP 71451B Optical Spectrum Analyzer HP 71452B Optical Spectrum Analyzer	• Spectral measurements from 600to 1700nm • Unique double-pass monochromator • Real-time sweep rates • –90dBm sensitivity and 60dB dynamic • Wavelength and amplitude calibration across full measurement range • Optional current source and white light source • 5modes of operation (HP 7145B) • 1 mainframe system with color display

HP 71400C with HP 70810B

HP 71604B

HP 71451B

Product	Description
HP 71501C Jitter and Eye-Diagram Analyzer	•Expanded measurement range: 50Mb/s to >12Gb/s •Jitter transfer, tolerance, output/generation •Test systems, networks, modules or components, MUX/DEMUX •Eye-diagram and analysis capability
HP 71603B Gigabit Error Performance Analyzer HP 71604B Pattern Generator	•100Mb/s to 1Gb/s pattern generation and error performance analysis •Low-phase-noise clock source •User-programmable patterns up to 4Mb with screen-based editor •Ability to trigger anywhere in pattern •Variable clock/data delay •Automatic setting of threshold and decision point •True complementary outputs •2-mainframe systems with color display
HP 71612A Series Gigabit Error Performance Analyzers and Pattern Generators	•100Mb/s to 12Gb/s pattern generation and error performance analysis •8Mb programmable pattern •Fast transition times, low jitter •Burst-mode capability for fiberloop testing •Four sub-rate outputs •Location of specific errored bits •2-mainframe systems with color display
HP 70875A Noise Figure Measurement Personality	•Swept noise figure and gain •Microwave measurement range: 10MHz to 26.5GHz •Calibrated measurements •Selectable bandwidths •Marker functions and limit lines •Menu-driven interface

HP 70000 MMS Product Information

System Building Blocks

Configure an instrument or system for unique applications using off-the-shelf modules.

HP 70860A

Product	Description
HP 70300A Tracking Generator, 20Hz to 2.0GHz HP 70301A Tracking Generator, 2.7 to 18GHz	• Use with spectrum analyzer for scalar and spectrum analysis • Use as RF or microwave source for CW and swept signals • Stimulus response capability to measure gain, frequency response, return loss • 2-slot width (HP 70300A) • 3-slot width (HP 70301A)
HP 70310A Precision Frequency Reference	• 10MHz to 100MHz precision reference signals phase-locked to ovenized oscillator • Lock to 1, 2, 5, or 10MHz external reference • Optional precision distribution amplifiers, reference locked outputs • 1-slot width
HP 70620B Preamplifier, 1GHz to 26.5GHz 100kHz to 26.5GHz HP 70621A Preamplifier, 100kHz to 2.9GHz	• Boost sensitivity of analyzers by 15 to 25dB • –156dBm sensitivity at 2.9GHz • –150dBm sensitivity at 22GHz • Optional 100kHz low-end frequency coverage (HP 70620B) • Provide drive signal for excess noise source • Built-in switches for preamplifier bypass
HP 70820A Microwave Transition Analyzer	• Measurement engine for HP 71500A microwave transition analyzer system • DC to 40GHz input bandwidth • 2-channel, sampler-based time-domain measurements • 4-slot width
HP 70900B Local Oscillator	• Master control module for spectrum analyzers, lightwave signal analyzers, other systems • Synthesized local oscillator for excellent phase noise, stability, frequency accuracy • Adds processing power, markers, trace math, other features • 2-slot width
HP 70860A Upgrade Kit	• High-speed controller board doubles speed of analyzers containing HP 70900A local oscillator • Firmware upgrades HP 70900A with features of HP 70900B, including compatability with HP 70004A color display/mainframe

MMS PRODUCTS

HP 70908A

HP 70907B

Product	Description
HP 70861A Upgrade Kit	• RAM/ROM board upgrades firmware to HP 70900B capabilities, including compatibility with HP 70004A color display/mainframe
HP 70902A IF Section, 10Hz to 300kHz HP70903A IF Section, 100kHz to 3MHz	• Adds signal processing elements for spectrum analyzers, lightwave signal analyzers, other systems • 10% incremental bandwidth steps • Calibrated logging amplifiers • 1-slot width
HP 70911A IF Section, 10MHz to 100MHz bandwidths	• Used in HP 71910A wide bandwidth surveillance receiver • 10% incremental bandwidth steps • Up to 70dB IF step gain • Linear detection • Standard AM and pulse demodulation • Standard 321.4MHz IF output • Optional FM demodulation, analog I/Q, 70MHz IF, 140MHz IF, and Chebyshev channel filters • 2-slot width
HP 70904A RF Section, 100Hz to 2.9GHz	• Broadband input conversion for spectrum analyzers, lightwave signal analyzers, other systems • Broadband, low noise mixer for high dynamic range • 70dB, 10-dB step attenuator (5-dB step option) • 1-slot width
HP 70905A RF Section, 50kHz to 22GHz HP 70905B RF Section, 50kHz to 22GHz	• Broadband input conversion for analyzers • Broadband, low noise mixer for high dynamic range • 70dB, 10-dB step attenuator for use without preselector (HP 70905A) • No attenuator version for use with preselector (HP 70905B) • 2-slot width
HP 70908A RF Section, 100Hz to 22GHz	• Fundamentally mixed broadband input conversion for analyzers • Highest sensitivity for greater dynamic range • Continuously peaked, dynamically tracking preselector • 70dB, 10-dB step attenuator (5-dB step option) • 2-slot width
HP 70909A RF Section, 100Hz to 26.5GHz HP 70910A RF Section, 100Hz to 26.5GHz	• Diode-pair mixing, built-in preamplifier for improved sensitivity • Switchable bypass filter around YIG tuned filter (HP 70910A) • Internal switching for connection to external mixers • 2-slot width
HP 70907B External Mixer Interface Module	• Interface for external mixers, including HP 11974 preselected mixers and HP 11970 harmonic mixers • Provides swept LO and tune/span signals • 1-slot width

HP 70000 MMS Product Information

System Integration

Quickly integrate your test system using these resources and tools.

Product	Description
HP 70611A Attenuator/Switch Driver	• Controls up to 31 electromechanical switches or attenuator switch sections • Add HP 84940A driver cards to control up to 248 devices through the MSIB or HP-IB • Up to 8 driver cards may be located remotely at end-user's test station • Includes interface for manual measurements • 1-slot module
HP 70612A Interface Module, 1 x 6 Matrix, DC to 6.5GHz HP 70612C Interface Module, 2x 5 Matrix, DC to 26.5GHz	• Off-the-shelf solution to interconnection problems • 1 x 6 and 2x 5 common highway switch matrixes • Available in frequency bands covering dc to 26.5GHz • MSIB, HP-IB, and manual control
HP 70613A Interface Module, 1 x 6 Matrix, DC to 26.5GHz HP 70613C Interface Module, 2x 5 Matrix, DC to 26.5GHz	• Attenuator options for adjusting signal strength • Rack-mount and other custom interface modules available • 2-slot modules • Custom configurations available

MMS System with HP 70612A

System Accessories

System accessories for the MMS include standard and optional rack cabinets, testmobiles, probes, transmission/reflection test sets, memory cards, external monitors, HIL keyboard, power line frequency option, external power pack, and cabling. See the MMS catalog (described on page 66) for more details.

Custom Engineering

Hewlett-Packard offers engineering and integration services to help you meet your system goals. Our team of experts will ensure that your job is done correctly and cost-effectively. HP can modify existing MMS products, tailoring their functionality to your needs. These enhanced MMS products come with complete operating and service documentation, and are supported at HP service facilities worldwide.

If you need a new functionality, HP offers consulting services to assist in the development of modules or systems. In addition, experienced software and systems engineers can help you develop system software. Partial or full system integration services are also available.

These services are available through your local HP sales representative. See page 600.

Service and Support

The MMS offers many support alternatives. The sytem design allows modules to be exchanged in the field without loss of system calibration. For multiple-module systems, you can add new modules or replace existing ones and run the one-button internal calibration routine. Spares can be stocked based on the MTBF of individual modules — often greater than 15,000 hours. Many MMS instruments have built-in or downloadable diagnostic routines for locating faults. And HP provides for return-to-factory repair and calibration of systems, and offers MIL-STD-45622A certification that is valid for up to three years.