MTG-3901, ACO-3901 Master Timing Generator System

PRODUCT DETAILS

MTG-3901 Master Timing Generator

The MTG-3901, with its comprehensive array of analog and digital reference signals, leverages the inherent performance, reliability and density of the NEO platform and is the ultimate high-performance, reliable, feature-rich reference signal generator.

- High-density modular packaging for any application
- Operates in conjunction with the ACO-3901 automatic changeover module for enhanced reliability
- Harris Command and Control System (CCS™) enabled for remote configuration and monitoring
- Comprehensive array of reference signals
- Four independently timeable outputs configurable for analogue composite black burst or tri-Level Sync
- VITC and ATR on blackburst outputs
- DARS
- Two LTC timecode
- Impulse clock driver
- Available GPS time synchronization
- Onboard modem for synchronization to remote CSD-5300/3901/3902 and MTG-3901
- Onboard NTP server/client for synchronization of computer network

FEATURES

- Fully integrated modular reference signal system
- High-density modular packaging for any application
- Comprehensive array of reference signals
- Integrated automatic changeover module for enhanced reliability
- Command and Control System (CCS™) enabled

PRODUCT DETAILS

ACO-3901

The ACO-3901 is the next generation solution to the automatic changeover unit. Conventional automatic changeover units are typically packaged as a 1RU chassis that work in conjunction with standalone primary and redundant reference signal generators. The ACO-3901, by leveraging the inherent advantages of the NEO platform, offers superior performance and packaging density over conventional standalone automatic changeover units.

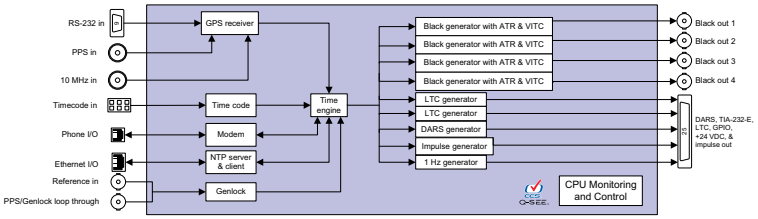
The ACO-3901 module when installed with 2 MTG-3901 master timing generators in a single NEO frame, offers enhanced reliability, performance and features when compared to any conventional reference signal generator system comprising of standalone reference signal generators and automatic changeover unit.

FEATURES

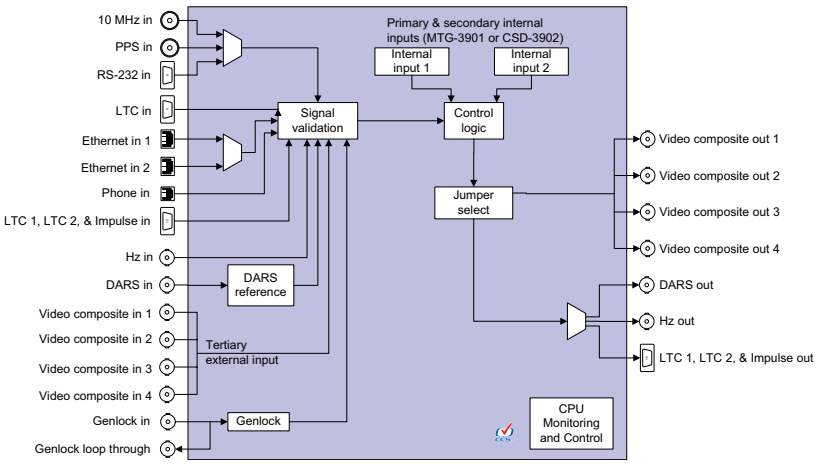
- Automatic changeover unit on a single module
- Installed with a primary and redundant MTG-3901 in a single frame for maximum density
- Switching of all MTG-3901 output signals for enhanced reliability
- Remote configuration and monitoring via Harris CCS
- Hot swappable front module with no loss of output signals

BLOCK DIAGRAMS

MTG-3901



ACO-3901



Applications
The MTG-3901 master timing generator system should be utilized in any installation requiring both master clock and SPG functionality. The MTG-3901 supplies all the core reference signals typically required by a broadcast facility.

The MTG-3901 is also ideal for use in ENG, OB Van or mobile applications where space is at a premium. When installed in a 1RU configuration, the MTG-3901 occupies from 2RU to 5RU less space than conventional SPG and master clock systems. 3RU configurations of the MTG-3901 can also be used effectively in space-restricted environments by allowing any additional modules to be installed in the same frame.

A New Approach to Reference Signals
The MTG-3901/ACO-3901 master timing system's revolutionary integrated architecture offers additional enhancements when compared to conventional standalone reference signal generator systems.

The MTG-3901 features full integration of reference signal generation and autochangeover functionality. This facilitates enhanced reliability, functionality and lower costs.

The MTG-3901 is the only reference signal system with comprehensive network control and configuration via the Command and Control System, CCS™. CCS offers an enhanced level of control and monitoring when compared to conventional reference systems.

The MTG-3901 utilizes a modular form factor. The modular architecture facilitates packaging the MTG-3901 with additional NEO modules. This allows for more efficient use of equipment rack space and simplifies system design and installation.

Utilizing absolute time reference (ATR) technology, the MTG-3901 features a deterministic relationship between all of its reference signals. This simplifies installation and system timing issues. Conventional reference generator systems cannot be locked together deterministically, thereby adding additional cost, complexity and maintenance.

Utilizing nano-lock technology, the MTG-3901 and all NEO advanced reference systems are able to offer even greater precision, reaffirming Harris Corporation's industry leadership in reference systems.

When the MTG-3901 is locked via the GPS-3903 GPS receiver or via the onboard modem, the time difference between its own internal timing engine and the reference time is calculated. Using this information, the MTG-3901 updates its output time and slews its blackburst output timing to correspond with the new timing data. This ensures an accurate source of both time and blackburst.

Integrated reference systems that supply both timecode and black burst without Nano-Lock technology can experience blackburst phase discontinuities during time synchronization. This is the result of a sudden shift in blackburst phase when realigning to new timing information acquired during the synchronization. Blackburst discontinuities are a potential source for disruptions for all downstream equipment within a facility.

In addition, the MTG-3901 uses this new timing information to make minute adjustments to its own internal timing engine. After all timing adjustments are complete, the master frequency of the MTG-3901 module's timing engine is adjusted to compensate for variations from the reference source. The MTG-3901 module's ability to self-discipline its internal timing engine ensures that extended operation of the MTG-3901 will result in maximum precision.

The MTG-3901 Master Timing Generator System Utilizes Advanced Features for Maximizing Reliability.
Absolute reliability is a major feature of the MTG-3901 master timing generator. The integrated architecture of the MTG-3901 offers enhanced reliability when compared to conventional reference signal generators with standalone automatic changeover units. The MTG-3901 also leverages the inherent reliability of the NEO modular platform and sets a new standard for performance and reliability that has been unheard of in reference signal system platforms until now.

CCS — The MTG-3901 can be controlled and monitored via Command and Control System. In addition to remote configuration, the status of the MTG-3901 and ACO-3901 can be continuously monitored. If a fault or alarm is detected, it can be instantly reported to the operator for immediate action via the CCS network. This minimizes the time necessary to respond to any potential problem.

DejaView™ — The MTG-3901 can come equipped with the DejaView™ state recovery feature. This will significantly reduce the downtime associated with reconfiguring a new module.

Transparent Switching — The ACO-3901 features transparent switching between the primary and secondary MTG-3901.

Conventional autochangeover units will perform a non-synchronous switch from the primary to secondary SPG on detection of a fault. This "hard" changeover will be manifested as a discontinuity in the reference signals and result in a potential disruption to any downstream devices locked to the reference generator. With the MTG-3901 master timing generator system, switchover of the unaffected MTG signal outputs will be transparent with no discontinuities of the signal output. The ACO-3901 module's passive switching relays will also ensure a continuous signal in the event of a total failure of either the primary or secondary MTG-3901.

Switching of up to Three MTG-3901-FM Module's — The ACO-3901, in addition to being able to switch two frame internal MTG-3901-FM modules, can also switch a third external source through the external back module connections. In the event of a failure of the primary MTG-3901-FM, the secondary MTG-3901-FM will not be operating in failure mode without a backup. This is a considerable enhancement to overall system reliability.

Comprehensive Monitoring and Switching — The ACO-3901 can be configured to monitor and switch all of the output signals from its primary and secondary MTG-3901 module's. Conventional automatic changeover units typically do not offer switching of all of the outputs of their primary and secondary reference signal generators due to connector space limitations on the automatic changeover unit back panel. This represents a major compromise in reliability. The integrated architecture of the MTG-3901 does not have this limitation.

Standalone Power Supply — The MTG-3901 and ACO-3901 come equipped with an external DC power jack for use with the PWRSUPPLY-MTG external AC power adapter. When using the MTG-3901 in 1RU frame configurations, power redundancy can be achieved with the onboard frame power supply and external AC power adapter. This facilitates the use of the MTG-3901 in applications requiring both high-density and redundancy (mobile production trucks).

Simultaneous Configuration — The MTG-3901 offers simultaneous configuration of the primary and secondary MTG-3901 modules. Changes in configuration to the primary MTG-3901 will immediately be reflected in the secondary MTG-3901. Identically configured primary and secondary MTG-3901 module's will minimize the potential for discontinuities associated with switchover from a primary to secondary reference signal source and simplify setup and maintenance.

The MTG-3901 provides a unique and innovative approach to reference signal generation.

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SPECIFICATIONS

Specifications are subject to change without notice.

General

Power Dissipation	<20 W
Internal Battery Backup	3 V battery provides >8 hours of internal time keeping
External Power Supply Backup	24 V 1.0 A DC input powers entire module
Heartbeat	Heartbeat LED pulses periodically indicating internal timekeeping is alive

DARS

Electrical	Single-ended unbalanced
Mechanical	Pin 24

Impulse Drive

Electrical	Single-ended unbalanced
Mechanical	Pins 1 and 12
	12 V pulses (300 ms)

Can be configured to low-level voltage to work with the ACO-3901

EIA/TIA-232-E

Electrical	EIA-232 DTE

LTC

Input (TCI)

Electrical	Differential balanced
Mechanical	Pins 14 (LTC), 15 (LTC), 16 (GND)
Format	SMPTE/EBU LTC 24/25/30 drop/non-drop auto-sensing
Impedance	Hi-Z (>30 k ohms) or 600 ohms, jumper selectable
Input Sensitivity	500 mV pk-pk
CM Range	±10 V
CMRR	40 dB at 60 Hz

Output 1 and 2 (TC1, TC2)

Electrical	Differential balanced
Mechanical (Output 1)	Pins 17 (LTC), 18 (LTC), 19 (GND)
Mechanical (Output 2)	Pins 9 (LTC), 10 (LTC), 11 (GND)
Format	SMPTE/EBU LTC 24/25/30 drop/non-drop support
Impedance	Low-Z (<25 ohms per side) or 600 ohms, jumper selectable
Level	3.9 V pk-pk nominal into 1k ohms (Low-Z output)
Level	2.5 V pk-pk nominal into 1k ohms (600 ohms output)
Transition time	40 microseconds ± 4 microseconds measured at 10% and 90% amplitude

GPIO

IO1—Trigger Input

Electrical	5 V TTL-compatible HCT
Mechanical	Pin 21
Impedance	10 k ohms
Trigger Capture Accuracy	Better than 20 microseconds

IO2—HZ Output

Electrical	5 V TTL-compatible HCT
Mechanical	Pin 23

+24 V DC IN

Electrical	+24 V DC, 1 A backup power input
Mechanical	Pins 13, 25

PPS Input or Genlock Input Loop-back (PPS/Genlock Loop)

Mechanical	BNC connector
Termination	50 ohms if configured as PPS Input, not terminated if configured as genlock Input loop-back

PPS:

Level	TTL; Vih=2.0 V minimum, Vil=0.8 V maximum
Edge Transition	20 ns maximum
Return Loss	>45 dB to 20 MHz

Genlock Input (Genlock In)

Electrical	Single-ended unbalanced
Mechanical	BNC connector
Termination	Not terminated if loop-back BNC is available; otherwise terminated
Format	NTSC/PAL with VITC and ATR, or TLS input
Level	1 V pk-pk +6 dB/–4 dB NTSC/PAL, 0.6 V pk-pk +6 dB/-4 dB TLS (SMPTE 274M)
Return Loss	>40 dB to 20 MHz
Lock Range	± 6 ppm (NTSC fSC ±21 Hz, PAL fSC ±26 Hz)

Video Output (Black Out)

Electrical	Single-ended unbalanced
Mechanical	BNC connector
Termination	75 ohms
Format	NTSC/PAL-B/PAL-M Blackburst with VITC and ATR or TLS output
Level (into 75 ohms)	1 V pk-pk NTSC/PAL, 0.6 V pk-pk TLS (SMPTE 274M)
Return Loss	>40 dB to 20 MHz

10 MHz Input (10 MHz)

Termination	50 ohms
Mechanical	BNC connector
Level	2 V pk-pk ± 3 dB

10 Base-T Ethernet

Mechanical	RJ-45 connector
Network Interface	IEEE 802.3 (Ethernet) 10 base-T interface for NTP application

Telephone Line (Telco Line)

Mechanical	RJ-11 connector
Telephone Interface	FCC-68 and Industry Canada CS-03 compliant
Signaling	Bell 103 (300 bps)
REN	0.2 "A"

NEO MI REF and REFD

LVDS and proprietary single-ended signal on NEO MI

ORDERING INFORMATION

MTG-3901-SYS-1	MTG-3901 system with FR-3901 frame, includes 2 MTG-3901-FM modules, 1 ACO-3901 module, FR-3901 frame with blank front panel, power supply, detachable power cord, PWRSUPPLY-MTG standalone external secondary power supply, back modules (as required), fan module, alarm interconnect module, accepts any combination of up to 1 additional NEO series module
MTG-3901-SYS-1E	MTG-3901E system with FR-3901-E frame, includes 2 MTG-3901-FM modules, 1 ACO-3901 module, FR-3901-E frame with blank front panel, power supply, detachable power cord, PWRSUPPLY-MTG standalone external secondary power supply, back modules (as required), fan module, 3901RES-E resource communication module, accepts any combination of up to 1 additional NEO series module
MTG-3901-SYS-1P	MTG-3901E-P system with FR-3901-E frame, includes two MTG-3901-FM modules, 1 ACO-3901 module, FR-3901-E-P frame with local control panel, power supply, detachable power cord, PWRSUPPLY-MTG standalone external secondary power supply, back modules (as required), fan module, 3901RES-E resource communication module, accepts any combination of up to 1 additional NEO series module
MTG-3901-SYS-3	MTG-3901 system with FR-3923 frame, includes 2 MTG-3901-FM modules, 1 ACO-3901 module, FR-3923 frame with blank front panel, power supply, detachable power cord, PWRSUPPLY-MTG standalone external power supply, back modules (as required), fan module, alarm interconnect module, accepts any combination of up to 9 additional NEO series module
MTG-3901-SYS-3E	MTG-3901 system with FR-3923 frame, includes 2 MTG-3901-FM modules, 1 ACO-3901 module, FR-3923 frame with blank front panel, power supply, detachable power cord, PWRSUPPLY-MTG standalone external power supply, back modules (as required), fan module, alarm interconnect module, accepts any combination of up to 9 additional NEO series module
MTG-3901-SYS	MTG-3901 system module set, includes 2 MTG-3901-FM modules, 1 ACO-3901 module, PWRSUPPLY-MTG standalone external power supply, requires 3 available slots in NEO frame; NEO frame not included
MTG-3901	NEO modular master reference signal generator for standalone use in NEO module; BB, tri-level sync, timecode, NTP, DARS output. Includes front module and double height back module; requires 2 unused slots for installation in 1RU or 3RU NEO frame
PWRSUPPLY-MTG	Standalone external secondary power supply for MTG-3901 systems
MTG-3901-FM	NEO modular master reference signal generator. BB, tri-level sync, timecode, NTP, DARS output. Includes front module only. Two MTG-3901s must be installed with ACO-3901 in same frame, no standalone operation. Requires installation in 1RU or 3RU NEO Frame
ACO-3901	NEO automatic changeover module for MTG-3901, includes single slot front module and three slot back module; operates in conjunction with 2 MTG-3901 module's only; requires installation in 1RU or 3RU NEO frame
GPS-3903	GPS receiver for time synchronization
GPS-1600-S	GPS receiver for genlock applications; includes, rooftop antenna, 75 feet of coaxial cable, receiver 100-240 V AC power adapter and cable set (no rack mount)
GPS-1600	GPS receiver for genlock applications; includes, rooftop antenna, 75 feet of coaxial cable, receiver 100-240 V AC power adapter and cable set includes 2RU mount tray)

TSG-3901 Test Signal Generator

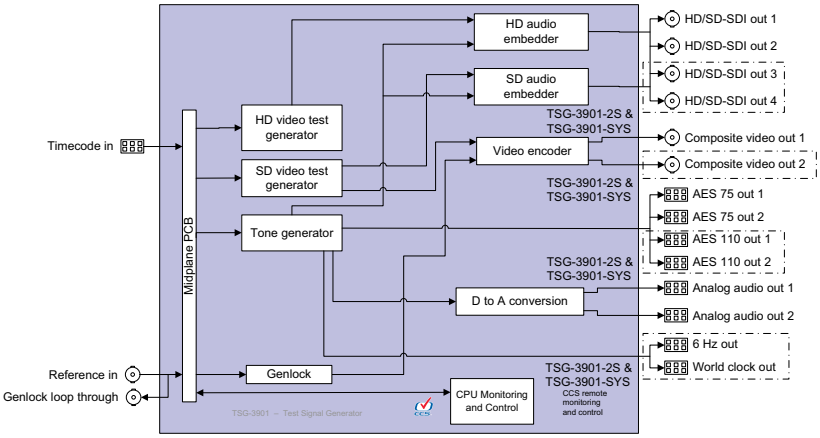
The revolutionary TSG-3901 modular test signal generator is the reinvention of the test signal generator. The TSG -3901 can generate HDTV, SDTV, analog video test signals, AES, analog audio, 10 Mhz and 6 Hz test signals on a single module. Used in conjunction with the MTG-3901 reference signal generator, the TSG-3901 provides all of the test signals used in an analog, digital, HDTV or hybrid facility. For enhanced reliability, the TSG-3901 features an integrated automatic changeover, installed directly on the module itself. The TSG-3901 is the only test signal generator to combine HD-SDI, SDI, analog video and audio with redundancy in only two slots. Conventional redundant test signal generators typically require up to 3RU of space.

All modules in the NEO family can be controlled locally by means of an intuitive card edge interface or remotely, using the NUCLEUS™ network control panel or CCS Navigator™.

FEATURES

- HDTV, SDTV, analog test signal generator module
- Integrated automatic changeover (optional) for maximum reliability
- User-configurable test signals with source ID and timecode window
- Four SDI/HD-SDI independent test signal outputs with embedded tone or silence
- Two AES balanced tone outputs
- Two AES unbalanced tone outputs (linked to balanced outputs)
- Analog video test signals
- Two independent analog audio tone channels
- 10 MHz output
- 6 Hz output
- Word clock

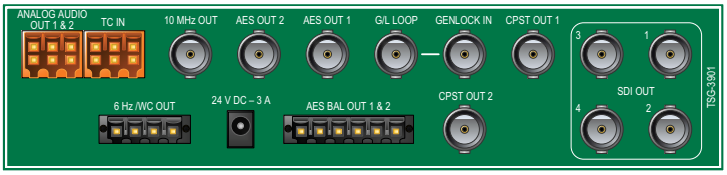
BLOCK DIAGRAM



BACK MODULES

TSG-3901 Single Slot

TSG-3901 Double Slot



SPECIFICATIONS

Specifications are subject to change without notice.

Interface

Input (TCI)

Electrical . . . . . Differential balanced
Mechanical . . . . . Weidmuller, 3 pins [(1 (TC), 2 (TC), 3 (GND)].
Format . . . . . SMPTE/EBU LTC 24/25/29.97 drop/29.97 non-drop/30 fps auto-sensing
Impedance . . . . . Hi-Z (>30 k ohms) or 600 ohms, jumper selectable
Input Sensitivity. . . . . 500 mV pk-pk

+24 VDC IN

Electrical . . . . . +24 V DC, 3 A backup power input
Mechanical . . . . . Power jack

Genlock Input (GENLOCK IN)

Electrical . . . . . Single-ended unbalanced
Mechanical . . . . . BNC connector
Termination . . . . . Loop through
Format . . . . . Same as TSG-3901
Level. . . . . 1 V pk-pk +6 dB/–6 dB NTSC/PAL
0.6 V pk-pk +6 dB/–6 dB TLS
Return Loss. . . . . > 40 dB to 35 MHz
Lock Range . . . . . ± 6 ppm (NTSC Fsc ±21 Hz, PAL Fsc ±26 Hz)

Composite Video Output

Electrical . . . . . Single-ended unbalanced
Mechanical . . . . . BNC connector
Termination . . . . . 75 ohms
Format . . . . . NTSC/PAL-B with VITC and ATR,
TLS 1080i60/1080i59.94 with VITC
TLS output (1080i50/1080sf24/1080sf23.98/1080p30/1080p29.97/1080p25/1080p24/1080p23.98/720p60/720p59.94/720p50)
Level (into 75 ohms) . . . . . 1 V pk-pk NTSC/PAL, 0.6 V pk-pk TLS (SMPTE 274M, SMPTE 296M)
Return Loss. . . . . > 40 dB to 35 MHz

SDI Output

Electrical . . . . . Single-ended unbalanced
Mechanical . . . . . BNC connector
Termination . . . . . 75 ohms
HD and SD, user selectable
Level (into 75 ohms) . . . . . 800 mV ±10%
DC Offset . . . . . 0 V ± 0.5 V
Return Loss. . . . . >15 dB typical

Analog Audio output

Frequency Response . . . . . ±0.1 dB (20 to 20 kHz)
Linearity . . . . . ±1.0 dB to -100 dB
SNR . . . . . >100 dB (20 to 20 kHz)
Full-Scale Level . . . . . +12 dBu to +28 dBu

AES Unbalanced

Sample Rate . . . . . 48 kHz
Output Impedance . . . . . 75 ohms
Output Connector . . . . . BNC
Output Return Loss . . . . . 40 dB to 6 MHz
Output Signal Level . . . . . 1 V pk-pk (75 ohms terminated)

AES Balanced

Sample Rate . . . . . 48 kHz
Output Impedance . . . . . 110 ohms
Output Connector . . . . . Weidmuller
Output Level . . . . . 3.5 to 5.0 V pk-pk into 110 ohms load
Output Coupling . . . . . Transformer coupled

Word Clock and 6 Hz Outputs

Electrical . . . . . 5 V TTL-compatible HCT
Word Clock. . . . . Pins 1 (WC), 2 (GND)
6 Hz . . . . . Pins 3 (6 Hz), 4 (GND)
Mechanical . . . . . DHBM
Weidmuller . . . . . 4 pins
Mechanical . . . . . SHBM
BNC (multiplexed with 10 MHz)

10 MHz Outputs

Termination . . . . . 50 ohms
Level. . . . . 13 dBm into 50 ohms (+/- 2 dBm)
Mechanical . . . . . DHBM
BNC
Mechanical . . . . . SHBM
BNC (multiplexed with 6 Hz and word clock)

ORDERING INFORMATION

TSG-3901-1S	Standalone single-height non-ACO version, includes TSG-3901-FM and single height TSG-3901-BM back module; requires 1 available NEO slot
TSG-3901-2S	Standalone double-height non-ACO version, includes TSG-3901-FM and double height TSG-3901-BM-DH back module; Rrquires 2 available NEO slots
TSG-3901-SYS	Full TSG-3901 system complete with 2 TSG-3901-FM and double height TSG-3901-BM-ACO back module with integrated automatic changeover; requires 2 available slots positioned vertically in a NEO frame