

Master Clock System (M212)

User Manual

P/N: 900000178 Revision B

For Brandywine Communications products with the following Part Numbers: 0366003##

> 1 MANUAL P/N 900000178 REV B



Safety Warnings

WARNING:

This unit contains lethal AC voltages. Disconnect the unit from the AC supply before removing the cover.

WARNING:

This unit contains dual power supplies. Isolate BOTH power supplied from AC Power before removing the top cover.

WARNING:

The lightning flash with an arrowhead inside of an equilateral triangle is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure. The "dangerous voltage" may be of sufficient magnitude to constitute a risk of electrical shock to people. Do not attempt to repair the unit without first unplugging it.



The exclamation point inside of an equilateral triangle is intended to alert the user to the presence of important operation and maintenance instructions in the user guide. Only qualified personnel should repair this unit. Several board assemblies contain static sensitive devices. Appropriate procedures must be used when handling these board assemblies.



Revision History

Rev	Date	Comments	ECO Number
Α	12/7/2020	Initial release	11560
В	04/8/2021	Added Section 7 - Rear Panel Pinouts (pg 46)	11683



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1 Introduction



Figure 1. Master Clock System Front View

Brandywine's M212 Master Clock System represents the next generation of modular timing systems. Built as a commercial derivative of the highly successful ruggedized Modular Master Clock, the M212 provides assured timing capabilities using Brandywine's Timewall[™] technology.

At the center of the M212 system is Brandywine's powerful Master Clock Module (MCM). The MCM may be synchronized by a variety of reference sources and uses the selected reference to steer an embedded oscillator to provide stable and accurate time and frequency for the M212. Multiple references can be prioritized with automatic failover. Uniquely, the MCM's Timewall[™] algorithms validate the GPS reference based upon the inherent stability of the MCM oscillator, providing hardening against possible GPS spoofing.

Available input reference selections include GPS (both C/A code and SAASM receivers are supported), IRIG-B, and Have Quick/1PPS. In additional an MCM may be synchronized to up to 2 other M212 chassis using a fiber optic crosslink, this provides additional resiliency for the M212 time and frequency references.

The standard oscillator in the M212 is a high quality Temperature Compensated Crystal oscillator, but the M212 optionally can be ordered with other reference oscillator choices, including Rubidium, Chip Scale Atomic Clock (CSAC) and Ovenized Oscillator (OCXO)

The output signals for the M212 are generated by up to 6 Output Signal Modules (OSM), and are ideal for custom solutions or future expansion. Available modules include NTP, low-phase-noise frequency, time code modules such as IRIG A, B, G, H, and NASA 36, BCD, PPS, PPM, Have Quick, serial data (RS232/422) as well as optical crosslink.

The M212 status and control is via front panel display for basic configuration and status, a secure web browser, and via SNMPv3. Network protocols also fully support privacy and authentication.



1.1 Master Clock System Basic Concept

The Master Clock System is a master clock that can have its capabilities defined by the use of standardized modules, allowing custom solutions to be created from standard hardware.

Through the use of these standardized modules, distributed timing networks for high accuracy applications may be readily created.



1.2 **Specifications (Basic Unit)**

Signal Reference Inputs 1.2.1

1.2.1.1 C/A code GPS Receiver (standard)

GNSS multi constellation **Receiver Type** (GPS, GLONASS, Galileo1, Beidou) Sensitivity Tracking: -159 dBm Acquisition: -147 dBm Accuracy

15ns (1σ) (@ -130 dBm) BNC J8 Connector Type

1.2.1.2 SAASM GPS Receiver (optional)

GB-GRAM Type II Receiver Type Keyfill cable 5 pin Audio Keyfill port DS102 COM Port DB9-F connector

1.2.1.3 External 1PPS Input Per ICD-GPS-060B 1 pulse per second 50 ohm

Connector Type BNC J6B

1.2.1.4 External GPS Have Quick T/C Input

Signal Format

Connector Type

Signal Format

Impedance

Impedance

Rate

Rate

Per ICD-GPS-060A. STANAG 4246 HQ2A 1 frame per second 10k Ω DB9M J5A

1.2.1.5 External IRIG B Input

Signal Format Control Functions Modulation ratio Amplitude Impedance Connector Type

IRIG B Per IRIG 200-04 Per IEEE1344 2.5:1 to 3.3:1 1 Vp-p to 5Vp-p >600 ohm DB9M J5A

1.2.2 Environmental

AC Supply Voltage

90-265 VAC 50/60 Hz 100W Maximum

DC Supply , Voltage Connector 18-36VDC or 36-72 VDC

Barrier Terminal Block

17.00" Chassis Width

1.72" 1U chassis

-15 to 55degC

19.00" Front Panel Width

20.00"

10 lbs

Physical 1.2.3

Length (depth) Width

Height Weight

1.2.4 **Temperature**

Air Temperature **Altitude Conditions**

1.2.5 **Shock and Vibration**

Operating Shock Bench Handling Shock Vibration Structure-borne Noise

MIL-STD 810F 20g/11ms MIL-STD 810F MIL-STD-167-1 MIL-STD-740-2

-1500 ft to +11,000 ft

1 Requires firmware upgrade

1.2.6 EMC

FCC Part 15, Class A IEC CISPR 22 CE

1.2.7 Outputs

Pulse-per-second (1PPS) Output 1 Signal Format Per ICD-GPS-060B Rate 1 pulse per second **Rising Edge** On Time **Rise** Time <50ns Fall time <100ns Pulse Width 20 µs ±5% default. Amplitude 10V ±10% Output condition when TFOM<7 only Connector Type BNC Number of Outputs 2 Have Quick Time of Day Output Per ICD-GPS-060A, Signal Format STANAG 4430 Rate 1 pulse per second **Rising Edge** On Time Rise Time <100ns Fall time <100ns 1PPS coherence < 100ns of rising edge of 1PPS Amplitude 5V ±5% Accuracy to 1PPS <100ns Output condition when TFOM<7 only Connector Type 3 Pin **BCD Time Code Output** Signal Format Per ICD-GPS-060A Rate 50 bits/sec 1PPS coherence 1PPS Mark (logical 1) +2.5V ±1V (logical 0) -2.5V ±1V Space Output condition when TFOM<7 only IRIG B Time code Output Signal Format B122, B124, Control Functions B124 CF definition per IEEE1344 Rate 1kHz modulated sinewave Modulation ratio 10:3 ±10% Amplitude Output condition when TFOM<7 only Alarm Output 1 (wire-OR'd from 2 No of outputs

Signal Format

Normal Operation Connector Type **Reference Frequency Outputs**

9 MANUAL P/N 900000178 REV B < 100ns of rising edge of

 $3V_{p-p} \pm 20\%$ into 50Ω load

MCMs) Dry contact closure Normally closed **Relay Active** 15 Pin D-Sub Male



Management Viewer

Firmware upgrade

Signal Format Frequency	Sinusoid 5 MHz, and 10 MHz
Amplitude	$13 dBm/1V_{rms}$
Non-Harmonic	-70dBc 1-500MHz
NTP Output	
Signal Format	Ethernet 100BaseT
Protocols supported	NTPv3 (RFC-1305)
	NTPv4 (RFC-5905)
No of Outputs	1 (J7-B only)
Authentication	SHA-1, MD5, AutoKey
Management	
Front Panel	Full color touch screen
Remote	SNMP V3

Full color touch screen SNMP V3 MMCView Using GPNTSModule Update secure tool

Power and E	nvironmental Specifications
Power	
No of Inputs	1 standard, 2 redundant optional
Voltage	90-250VAC ±10% 50/60 Hz
Connector	IEC 320 standard, optional
	MS3102A-10SL-3P
Physical Dimension	าร
Length (depth)	20.00" (Chassis Depth)
Width	17.00" (Chassis) - 19.00" (Front
	Panel)
Height	1.75" (Chassis Height)
Weight	25 lbs nominal (slides not included)
Cooling Requireme	ents
Air Temperature	-15ºC to +53ºC
Altitude Conditions 1	500 ft to +11,000 ft.
Airflow	30 cfm
	Redundant Fans
Shock and Vibratio	n Requirements or Sensitivities
Functional (operating) Shock
	MIL-STD 810F Method 516.5
	Procedure I
Bench Handling Sho	ck
	MIL-STD 810F Method 516.5
	Procedure VI
Vibration, Functional	(operating)
	MIL-STD-167-1
EMI	EN55022, EN55024, FCC Part 15
Safety	CE Certified



1.2.8 **OSM Specifications**

1.2.8.1 Universal Output Signal Module

The Universal OSM provides the ultimate in flexibility. The Universal OSM has 4 outputs, each of which is user-programmable to a wide variety of time code or pulse outputs. This flexibility ensures that an M212 can be reconfigured as requirements change, and fewer modules are needed in comparison to designs where modules are single function. Each output is individually adjustable for propagation delay, ensuring that for high accuracy synchronization different cable lengths can be accommodated.

Available output formats per connector

- 1 PPS and 1PPM ٠
- . HaveQuick
- IRIG A, B, E, G, H •
- XR3, 2137 •

Specifications:

Pulse-per-second/minute Signal Format Per ICD-GPS-060B 1PPS Rate 1 pulse per second 1PPM Rate 1 pulse per minute **Rising Edge** On Time Rise Time <20ns Fall time <100ns 20 us ±5% default. Pulse Width 10V ±10% into 50Ω Amplitude Output condition when TFOM<7 only Have Quick Time of Day Output Per ICD-GPS-060A Signal Format **Rising Edge** On Time <100ns Rise Time 1PPS coherence < 100ns of rising edge Amplitude 5V ±5% Output condition when TFOM<7 only BCD Time Code Output Signal Format Per ICD-GPS-060B Rate 50 bits/sec 1PPS coherence < 100ns of rising edge Mark (logical 1) +2.5V ±1V (logical 0) -2.5V ±1V Space Output condition when TFOM<7 only Connector Type 3 Pin (Consult factory) IRIG Time Code Output B002, B122, B004, B124 Signal Format (Consult factory for other formats) Control Functions B124 per IEEE1344 Rate 1kHz modulated Modulation ratio 10:3 ±10% Amplitude 5V_{p-p}±20% when TFOM<7 only Output condition 2137 Time code Output Signal Format 2137 Carrier 1kHz modulated Modulation ratio 10:3 ±10% Amplitude 5V_{p-p}±20% Output condition when TFOM<7 only XR3 Time code Output Signal Format XR3 **Rising Edge** On Time <100ns **Rise Time** < 100ns of rising edge 1PPS coherence Amplitude 5V ±5% Output condition when TFOM<7 only

Propagation delay compensation

Applicability All 4 outputs individually ±0-1ms in 5ns steps Range

Low Phase Noise Analog OSM The Analog Low Phase Noise Module provides 4 low phase noise reference frequency outputs at 5, or 10MHz. The OSM incorporates a clean-up OCXO that is phase-locked to the MCM oscillator which must be OCXO, CSAC, or a Rubidium oscillator Specifications:

Waveform	Sinusoid
Amplitude	13 ±2 dBm/1V _{rms}
Harmonics	-40dBc
Non Harmonic	<-80dBc 10k - 500MHz
Connector Type	Coaxial, BNC
Accuracy	Locked to MCM oscillator

Phase Noise	10MHz	5MHz
dBc/√Hz		
1Hz	-90dBc	-95dBc
10Hz	-120dBc	-125dBc
100Hz	-145dBc	-148dBc
1KHz	-155dBc	-155dBc
10KHz	-158dBc	-158dBc

1.2.8.2 5MHz Output OSM

The 5MHz output OSM provides 4 reference frequency outputs at 5 MHz. The OSM buffers and distributes a 5MHz signal that is generated directly on the MCM. The stability and accuracy will reflect those of the selected MCM oscillator. Specifications:

Waveform	Sinusoid
Amplitude	13 ±2 dBm/1V _{rms}
Harmonic	-35dBc
Non Harmonic	<-65dBc 10k - 500MHz
Connector Type	Coaxial, BNC
Accuracy	Locked to MCM oscillator
Stability	Same as MCM oscillator

1.2.8.3 10 MHz Output OSM

The 10MHz output OSM provides 4 reference frequency outputs at 10MHz. The OSM buffers and distributes a 10MHz signal that is generated directly on the MCM. The stability and accuracy will reflect those of the selected MCM oscillator.

opecifications.	
Waveform	Si
Amplitude	13
Harmonic	-3
Non Harmonic	<-
Connector Type	C
Accuracy	Lo
Stability	Sa

inusoid 3 ±2 dBm/1Vrms 35dBc -65dBc 10k - 500MHz oaxial, BNC ocked to MCM oscillator ame as MCM oscillator

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1.2.8.4 NTP Server OSM

The NTP Server module enables the Master Clock System to act as an NTP server over an Ethernet network. Designed with security in mind, the NTP server module uses a custom network stack that enables it to ONLY act as an NTP server, and prevent it from being used as a gateway to compromise the entire system.

Specifications:

Signal Format Protocols

Authentication

No of Outputs

Connector Type

Ethernet 10/100BaseT NTPv3 RFC1305 NTPv4 RFC 5905 MD5, SHA-1 RJ45 2

1.2.8.5 PTP Grandmaster OSM

The PTP Server module enables the Master Clock System to act as a Precise Time Protocol (PTP) Grandmaster over an Ethernet network. The PTP OSM is fully compliant with the PTP protocol, and is capable of providing time synchronization for up to 256 clients. Designed with security in mind, the PTP server module uses a custom network stack that enables it to ONLY act as a PTP server, and prevent it from being used as a gateway to compromise the entire system.

Specifications: Signal Format Protocols Resolution Accuracy PTP Profiles

Management

No of Outputs

Max no of cards

Modes Connector Type 10/100/1000BaseT PTPv2 (IEEE1588-2008) 8ns packet timestamp resolution 20ns 3σ (crossover cable) Default, Telecom, Enterprise, Power Unicast, Multicast SFP Web GUI 2 3

1.2.8.6 Extended Performance PTP

Grandmaster OSM

The Extended Performance PTP Server module enables the Master Clock System to act as a Precise Time Protocol (PTP) Grandmaster over an Ethernet network. The PTP OSM is fully compliant with the PTP protocol, and is capable of providing time synchronization to up to 1024 clients. Designed with security in mind, the PTP server module uses a custom network stack that enables it to ONLY act as an NTP server, and prevent it from being used as a gateway to compromise the entire system.

Specifications:

Signal Format Protocols Resolution Accuracy PTP Profiles

Transmission

Management No of Outputs

Connector Type

10GbE PTPv2 (IEEE1588-2008) 8ns timestamp resolution 20ns 3σ (crossover cable) Default, Telecom, Enterprise, Power Unicast, Multicast SFP Web GUI

No of Outputs 2 Max no of cards 2

1.2.8.7 BCD Time Code Output OSM

The BCD time code OSM provides 4 BCD time code outputs. The OSM buffers and distributes a BCD signal that is generated directly on the MCM. The stability and accuracy will be those of the selected MCM. The propagation delay compensation feature is not available on this OSM.

Specifications:

Format Signal Format Rising Edge Rise Time 1PPS coherence Electrical ICD-GPS-060B Per ICD-GPS-060B 40 bits On Time <100ns < 100ns of rising edge Per RS422/485

1.2.8.8 T1/E1 OSM

The T1/E1 OSM provides 16 Framed T1/E1 outputs. Each output may be selected independently. The stability and accuracy will be those of the selected MCM oscillator. **Specifications:** Waveform (T1) DS1 framed all ones. SF.

Waveform (E1)

No of outputs Impedance Standards

Short/Long Haul User Connector Type 62pin Breakout Panel / Cable 1U Par Breakout connector RJ45 Accuracy Locke Stability Same

D4, ESF, SSM support E1 framed all ones, CRC4 and CAS multiframe SSM support 16 software selectable ANSI T1.102, T1.403 ITU-T G.703 User programmable 62pin D receptacle 1U Panel / 36" Cable RJ45 Locked to MCM oscillator Same as MCM oscillator



1.2.8.9 Optical Crosslink OSM

The Optical Crosslink Module is a unique feature of the M212. When installed, it allows a second M212 to be synchronized as a slave chassis. If both chassis have a primary reference installed (e.g. GPS) then the two MCM's operate as peers. Peering provides additional redundancy, as well as providing additional references to detect failures.

When a duplex cable is provided, the optical link provides seamless and automatic propagation delay compensation. A security mode allows the optical link to be operated in a single direction form Master to Slave over a single fiber.

 Specifications:
 LC

 Connector Type
 LC

 No of Outputs
 2 bi-directional per OSM

 Synchronization Accuracy
 Phase Measure Accuracy 1ns

 End to End Accuracy
 <5ns synchronization</td>

 Optical
 Wavelength
 Single Mode 1300nm

WavelengthSingle Mode TsounmSafetyClass 1 CDRH/IEC 825Range22000m 9/125um cable

1.2.8.10 1 PPS Distribution Module

The 1PPS Distribution Module provides 4 1PPS outputs. The OSM buffers and distributes a 1PPS signal that is generated directly on the MCM. The stability and accuracy will be those of the selected MCM. The propagation delay compensation feature is not available on this OSM.

Specifications:

Rising Edge Rise Time Fall time Pulse Width Amplitude Source impedance On Time <15ns <60ns 20 μs ±5% default. 10V ±10% into 50Ω link selectable 50Ω/lowZ

1.2.8.11 Octal Distribution Module

The Octal Distribution Module provides up to 8 RS232 or RS422 output ports that can be used to broadcast a time of day message. All output formats are identical, and selected at the MCM. One channel can be dedicated as an input channel to provide the MCM with a NMEA \$GGA message as an input timing reference. Selection of RS232/422 is available on a per channel using user-installed push on links

Specifications

No of channels Connector Type Electrical

Channel selection Input channel format 62pin D receptacle

RS232 RS422/485 push on link NMEA \$GGA

1.2.8.12 Have Quick Distribution Module

The Have Quick Distribution Module provides 4 Have Quick time code outputs. The OSM buffers and distributes a Have Quick signal that is generated directly on the MCM. The stability and accuracy will be those of the selected MCM. The propagation delay compensation feature is not available on this OSM. **Specifications:** Format ICD-GPS-060A

Signal Format

Rising Edge Rise Time 1PPS coherence Amplitude Per ICD-GPS-060A (Consult factory) STANAG 4430 HQ2A On Time <100ns < 100ns of rising edge Logic 1 2.4Vmin Logic 0 0.25V max

1.2.8.13 Modulated Time Code

Distribution Module

The Modulated Time Code Distribution Module provides 4 AC modulated time code outputs. The OSM buffers and distributes the same time code signal that is generated directly on the MCM. The stability and accuracy will be those of the selected MCM. The propagation delay compensation feature is not available on this OSM.

Specifications: Time Code Output

Signal Format

Control Functions Rate Modulation ratio Amplitude B122, B124 2137 (Consult factory for other formats) B124 per IEEE1344 1kHz modulated $10:3 \pm 10\%$ $5V_{p:p} \pm 20\%$ Load impedance >500hm

² Consult Factory for longer range or multimode



2 Setup

Remove the Master Clock System from the shipping carton. The following items should be included in the shipment: 1x Master Clock System 2x Power supply cables 1x CD-ROM containing User Manual and Utility Software

2.1 Installation

2.1.1 Mounting

The Master Clock System can be installed into a 19" rack mount cabinet using rack slides. Slides are installed using 10-32 UNF-2B hardware. Optional Rack Mount Slides:

P/N 002000123, SLIDE, RACK, 24", 21" TRAVEL, 85 LB P/N 002000150, SLIDE, RACK, 28", 27" TRAVEL, 80 LB

Original Manufacturer: General Devices Chassis Trak Type C300.

2.1.2 Power

Insert the power cord of the Master Clock System into an electrical socket to power up the unit.

If dual redundant power is required, connect both power sources to independent power sources

Note that the Master Clock System uses a custom power cable designed to lock in place. Be sure to only use power cables made by Brandywine Communications

Power Cable Part Number:

2.1.3 Ethernet

Connect one end of an Ethernet patch cable to the Master Clock System Ethernet located on the Master Clock Module. Connect the other end of the Ethernet cable to the network with an Ethernet hub or switch.



3 Configuration

3.1 Status Page

Upon connecting to the M212's web interface, the first screen that will be displayed is the M212 Status page (Figure 2).



Figure 2. M212 Status Page.

The fields listed in this window and their explanation are listed in Table 1 below.

FIELD	DESCRIPTION	
Firmware	The name of the firmware installed on this system.	
Version	The current firmware version	
Runtime	The amount of time that the system has been powered on	
Date	The current system date and time	
Web Version	The current version of the web interface	
PLL Status	The current status of the Phase Locked Loop (PLL)	
Current Ref	The current input reference	

Table 1. M212 Status Page Descriptors



FIELD	DESCRIPTION
ТЕОМ	Time Figure of Merit (TFOM), a numerical rating of the
	reliability of the current time output, with 1 being the highest.
	and 9 being the lowest
System Time	The current year, day of year, and time that the system is using.
Sys Time Last Set	The timing source that last set the system time.
By	
Sys Time Last Let	The time that the system time was last set by an external source
at	
Leap Second	The date and time of an impending leap second if one is
Epoch	pending.
Leap Second State	Will say whether or not a leap second is pending. Leap second
	state can be:
	Not Pending - No Future Leap Second has been announced by
	International Earth Rotation and Reference Systems Service
	(IERS).
	Pending - A leap second has been announced by IERS but it has
	not happened yet.
	Past Pending - A leap second was announced and has already
	occurred.
Leap Sec Info Last	Displays the reference source that a leap second was last set up.
Set By	
Stratum	The current reference stratum that the M212 is operating in.
Ref Phase Error	The reported phase error of the reference source.

Table 1. M212 Status Page Descriptors



3.2 System Page

The System page on the M212 is broken down into two tabs, the Inventory tab and the settings tab.

3.2.1 System Inventory

The System Inventory tab (Figure 3) shows system inventory information.



Figure 3. System Inventory Tab

The fields on the system inventory tab are listed in Table 2 below.

Table 2. M212 System Inventory Tab Descriptors.

FIELD	DESCRIPTION
System Serial Number	The serial number of the M212 system.
System Hardware Revision	The hardware revision of the M212 system.
Chassis Serial Number	The serial number of the M212 chassis.
Chassis Hardware Version	The hardware version of the M212 chassis.



3.2.2 System Settings

The system settings tab is used to change global settings with the M212, such as the system password, time zone and daylight saving time offset.

randywine			M212 Mod	lular Clo	ck Syste
969 Dec 31	16:17:52	Unit: Unit 1	Part #: HWV	Serial #	SN SN
	Sy	stem Settings			STATUS
Inventory	Settings				SYSTEM
	Clock Type: MGU		HaveQuick Output: 0 IRIG-B-124 Output: 0 1st 1PPS Output: 0 BCD 40-Bit Output: 0		
		Local Time			
	Time-Zone DST Offset	(min): -480 t(min): 60			
	DST Start Month: March DST Start DOW: Sunday DST Start DOWOM: Second		DST End Month: Nov DST End DOW: Sun DST End DOWOM: Firs	rember iday t	

Figure 4. M212 System Setting Tab in View Mode

The fields of the system settings tab are listed below in Table 3.

FIELD	DESCRIPTION
General	
Disable All	Indicates if all outputs from the M212 have been disabled for
Outputs	diagnostic purposes.
IA-Mode	Indicates if the M212 is currently running in Information
	Assurance (IA) mode or not.
Clock Type	Indicates if the M212 is currently operating as a Master
	Generation Unit (MGU), or as a Secondary Distribution Unit
	(SDU).

Table 3. M212 System Settings Tab Descriptors.



Change System	Change the login password to access the web interface
Password	
Delay Output Ty	pes
HaveQuick	Indicates the delay compensation adjustment on the M212's
Output	HaveQuick output
IRIG-B Output	Use this dropdown menu to select the type of IRIG-B signal
Туре	format the M212 should output
IRIG-B-Output	Indicates the delay compensation adjustment on the M212's
	IRIG-B output
1 st 1PPS Output	Indicates the delay compensation adjustment on the M212's
_	1PPS output
BCD 40-Bit	Indicates the delay compensation adjustment on the M212's 40-
Output	bit Binary Coded Decimal (BCD) output
Local Time	
Time Zone (min)	Indicates the time zone offset from UTC in minutes
DST Offset (min)	Indicates the Daylight Savings Time (DST) offset from standard
	time in minutes
DST Start Month	Indicates the month that DST starts on.
DST Start DOW	Indicates the Day of Week (DOW) that DST starts on.
DST Start	Indicates the Day of Week of Month (DOWOM) that DST starts
DOWOM	on
DST End Month	Indicates the month that DST ends on.
DST End DOW	Indicates the Day of Week (DOW) that DST ends on.
DST End DOWOM	Indicates the Day of Week of Month (DOWOM) that DST ends on

Table 3. M212 System Settings Tab Descriptors.

Click the Change Settings button to switch the system settings tab into edit mode (Figure 5).

To save any settings adjustments, click on the "Submit" button.



made			
tennesicalias		M212 Modula	ar Clock System
1969 Dec 31 16:18:02	Unit: Unit 1	Part #: TFC Chassis	Serial #: TFC Chassis
Chan	ge System Setting	5	STATUS
General	6 - C - C - C - C - C - C - C - C - C -	Delay Output Types	
Disable All Outputs: 2 Mute	Hav	eQuick Output: a	SYSTEM
System Security: 1A-Mode	IRIG-	B Output Type: B124	CONFIGURE
Clock Type: MGU		IRIG-B Output: 0	
	15	t 1PPS Output: o	
	BCD	40-Bit Output: 0	
Change System Password			
	Local Time		
Time-Zo	me(min): -450		
DST Off	set(min): 60		
DST Start: Second	Sunday 🧧	March .	
DST End: Frat	Sunday	November	3
	Cancel		
	ALCONOMIC .		

Figure 5. M212 Settings Tab in Edit Mode



3.3 Module Status and Configuration Pages

Clicking on the option for "Configure" from the right hand menu will open the module configuration windows, and underneath the configure menu will be the configuration webpages for each module installed.



Figure 6. M212 Configuration Menu



3.4 Master Clock Module (MCM) Configuration Page

Clicking the button labeled "MCM" will open the MCM status and configuration pages, from here the inventory, status and settings for the MCM are available for viewing and editing.

3.4.1 MCM Inventory Page

The MCM Inventory page shows the MCM's serial number, hardware revision, software version and FPGA version.



Figure 7. MCM Inventory Page



3.5 MCM Status Page

3.5.1 MCM Faults

The MCM Faults page (Figure 8) displays the current fault status with the MCM, as well as the fault status of any connected input references.

→ C 0	Not Secu	re 192.1	68.1.209		_	_		\$	۰	⊴ €		£	4
~						_							
andywine	ications					M	1212 M	lodu	ıla	r Cle	ock	Sy	st
NOW THE REAL PROPERTY.							TEC	Chass	eie		TE	C Ch	ace
969 Dec 31 16	5:18:46			Unit	: Unit 1	10	Part #: HW	V	910	Serial	#: SN		
			MCM F	aults	- Slot(02)						STAT	ius:
Inventory	Status	Settin	gs								C	5YS1	EM
MCM Faults	HQ 4	PPS Ph	ase/Freq Fa	ults	Alarms	MCM	Status				0	ONFIGU	JRE
										-	C.		
	IRIC	Q In: Ye	S				FPGA Cor	nms: N	10				
	100	PS In: Ye	5			Cr	ossl ink R	of-A: N	lo				
	10M	Hz In: No				Cr	ossLink R	ef-B: N	lo				
Fi	st 1PPS	Out: No	5			0	scillator B	pard: N	lo				
Seco	nd 1PPS	Out: No				Oscill	ator PLL L	imit: N	lo				
	HC	Out: No	>			c	Dscillator L	ock: N	lo				
	IRIG-E	Out: No	5			Tem	perature L	imit: N	10				
	BCD	Out: No)				GPS I	nput: Y	'es				
	5MH	Out: No	0										
	10MH	e Out: No	0										
This MCN	vs CLF	RefA HQ	+PPS Phase	Mism	atch: No								
This MCN	VS CLF	RefB HQ	+PPS Phase	Mism	atch: No								
CLRefA	vs CLF	RefB HQ	+PPS Phase	Mism	atch: No								
This MC	M vs Cl	RefA H	+PPS Fred	Mism	atch: No								
This MC	M vs Cl	RefB H	2 +PPS Free	Mism	atch: No								
CLRe	fA vs Cl	RefB H	+PPS Free	Mism	atch: No								
			Slot N	lumber	502 📴 🌘	Oet Info							
3544 (4		****		0.2211100	027102101000				20053				

Figure 8. MCM Faults Status Page



3.5.2 HQ+PPS Phase/Freq Faults

The MCM HQ+PPS Phase and Frequency Faults page (Figure 9) displays the current fault status of any connected HaveQuick and 1PPS input references.

randywine	cications			M212 Modul	ar Cloc	k Syster
1969 Dec 31 1	6:19:00	Un	it: Unit 1	Part #: HWV	Serial #:	SN SN
		MCM Statu	s - Slot(02)			STATUS
Inventory	Status	Settings	interest			SYSTEM
MCM Faults	HQ +	PPS Phase/Freq Faults	Alarms	MCM Status		CONFIGURE
	HQ HQ	+PPS CLRefA vs Initial O +PPS CLRefB vs Initial O HQ +PPS Freq Ir	sc Freq: No sc Freq: No flection: No			

Figure 9. MCM HQ+PPS Phase/Freq Faults Status Page



3.5.3 Alarms

The MCM Alarms page (Figure 10) displays the current active alarms that the MCM is reporting. If the M212 is currently producing a buzzer alarm, the "Turn Off Buzzer" button can be used to temporarily disable the alarm buzzer.

969 Dec 31 1	6:19:04		Unit: Unit 1	Part #: TFC Chassis HWV	Serial #: TFC Chassis
		MCM Ala	rms - Slot(02	2)	STATUS
Inventory	Status	Settings			SYSTEM
MCM Faults	HQ +	PPS Phase/Freq Fau	ts Alarms	MCM Status	CONFIGURE
		Slot Nur	nber: soz 📴	Get Info	

Figure 10. MCM Alarms Status Page



3.5.4 MCM Status

The MCM Status page (Figure 8) displays the current status of the MCM. Displayed fields include the current input reference, Time Figure of merit, and the leap second state, for a more complete listing of these status fields and what they mean, see Table 4 below.



Figure 11. MCM Status Page

FIELD	DESCRIPTION
PLL Status	The current status of the Phase Locked Loop (PLL)
Current Ref	The current input reference
TFOM	Time Figure of Merit (TFOM), a numerical rating of the
	reliability of the current time output, with 1 being the highest,
	and 9 being the lowest
System Time	The current year, day of year, and time that the system is using.
Sys Time Last Set	The timing source that last set the system time.
Ву	
Sys Time Last Let	The time that the system time was last set by an external source
at	



FIELD	DESCRIPTION
Leap Second	The date and time of an impending leap second if one is
Epoch	pending.
Leap Second State	Will say whether or not a leap second is pending. Leap second
	state can be:
	Not Pending - No Future Leap Second has been announced by
	International Earth Rotation and Reference Systems Service
	(IERS).
	Pending - A leap second has been announced by IERS but it has
	not happened yet.
	Past Pending - A leap second was announced and has already
	occurred.
Leap Sec Info Last	Displays the reference source that a leap second was last set up.
Set By	
Stratum	The current reference stratum that the M212 is operating in.
Ref Phase Error	The reported phase error of the reference source.

Table 4. M212 MCM Status Page Descriptors



3.6 MCM Settings Page

Click the Settings tab to open the MCM Settings pages. The first settings subtab that will be opened is the MCM IP settings

3.6.1 IP Settings

The MCM IP settings subtab (Figure 12) enables the user to enable or disable the Ethernet ports on the MCM. In addition, this page is used to change the IP Address, Gateway address, and subnet mask of each port. Please note that DHCP is not supported, and the IP must be set manually.

NOTE

If the IP Address of the M212 is changed, the existing connection to the previous IP address will no longer work, to reconnect to the M212 web page, connect to it at the new IP address.

Con the Conn	exicalizar		M212 Modul	ar Clock Syste
1969 Dec 31	16:19:22	Unit: Unit 1	Part #: TFC Chassis	Serial #: TFC Chassis
	MCM	IP Settings - Slot(02)	STATUS
Inventory	Status Settings			SYSTEM
IP Settings	NTP SNMP Settings	Reference Settings	Time Settings	CONFIGURE
Serial Setti	ngs			
	PORT 1		PORT 2	
	Enabled: Yes	Enable	d: Yes	
	IP: 192.168.1.209	Cataura	P: 100.100.101.31	
	Mask: 255.255.255.0	Mas	k: 255.255.255.0	
		Change Settings		

Figure 12. MCM IP Settings Subtab



3.6.2 NTP | SNMP Settings

The NTP and SNMP Settings subtab (Figure 13) enables the user to set the NTP Authentication method, key ID and hex key for use with secure NTP. The SNMP settings are used to adjust the authentication settings for SNMP and the SNMP trap IP address.

randywine communications		M212 Modul	ar Clock Syste
969 Dec 31 16:19:27	Unit: Unit 1	Part #: TFC Chassis	Serial #: TFC Chassis
	MCM NTP SNMP Setting	s - Slot(02)	STATUS
Inventory Status S	Settings		SYSTEM
IP Settings NTP SN	MP Settings Reference Set	ttings Time Settings	CONFIGURE
Serial Settings			
NTP		SNMP	
NTP Auth: Si	HA-1	User Name: username	
NTP Key ID: 1 NTP Key (HEX): 12	345	Auth + Privacy SHA-1 + AES Context Name: contextname	
		SNMP Trap IP: 192.168.1.12	9
		SNMP Trap Port: 162	
	Change Settings		

Figure 13. MCM NTP and SNMP Settings



3.6.3 Reference Settings

The Reference Settings subtab is plit into two pages (Figure 14) and it allows the user to select and prioritize input references for the M212.

3.6.3.1 Reference Settings Page 1

andywing	estention			M212 Modu	lar Clock Syste
969 Dec 31	16:20:08		Unit: Unit 1	Part #: TFC Chassi	Serial #: TFC Chassis
-		MCM Referen	nce Settings Page1 -	Slot(02)	BTATUS
Inventory	Status	Settings			SYSTEM
IP Settings	NTP	SNMP Settings	Reference Settings	Time Settings	CONFIGURE
Serial Setti	105				
CONTRACTOR OF	in the		Available Refs	And the second sec	_
Cr	ossLink F	Ref-A: No		IRIG-B: 124	
Cr	HaveC	Ref-B: No Juick: Yes GPS: Yes		10MHz: No	
Crossi	ink Ref-A	Slot: 3	Crosslink R	ef-A Rx: 1	
Crossi	ink Ref-B	Slot: 3	CrossLink R	ef-B Rx: 2	
			Properties		
Re	ference S	elect: Automatic	Manual Re	f Select: HaveQuick +PP	s
		Referen	nce AutoSwitch Prioritie	s:	
Cr	ossLink F	Ref-A: 3	CrossLin	k Ref-B: 4	
Ha	VeQuick 4	PPS: 2	IRIG	-B Only: 6	
	ING B	GPS: 1		TOTALL ?	
			Contractor Contractor		

Figure 14. MCM Reference Settings Page 1

SETTING	DESCRIPTION					
	Available Refs					
CrossLink Ref-A	Displays Yes when the M212's MCM is receiving time via the optical crosslink over port A.					
CrossLink Ref-B	Displays Yes when the M212's MCM is receiving time via the optical crosslink over port B.					
HaveQuick	Displays Yes when the M212's MCM is receiving time via HaveQuick.					
GPS	Displays Yes when the M212's MCM is receiving time via GPS.					
IRIG-B	Displays the IRIG-B Signal format the M212 is receiving if it is receiving time of day via IRIG-B					

Table 5. MCM Input Reference Settings Page 1 Setting Descriptors



SETTING	DESCRIPTION
1PPS	Displays Yes when the M212's MCM is receiving pulses via the 1PPS port.
10MHz	Displays Yes when the M212's MCM is receiving frequency via the 10MHz input connection.
CrossLink Ref-A Slot	Displays the slot that optical CrossLink input reference A is installed in.
CrossLink Ref-B Slot	Displays the slot that optical CrossLink input reference B is installed in.
CrossLink Ref-A Rx	Displays the port that optical CrossLink input reference A is connected to.
CrossLink Ref-B Rx	Displays the port that optical CrossLink input reference B is connected to.
	Properties
Reference Select	Switch the MCM between automatic and manual reference selection.
Manual Ref Select	If the MCM is set to manual reference selection, this selects which source is used.
Reference AutoSwitch Priorities	For each of the input references listed, select a numerical value to assign each input source's priority, with 1 being the most important.
	Once set, the MCM will try to use the input reference source listed as 1, but if that fails, it will automatically switch to input reference 2 if it is valid. If the lower-priority input reference is not valid, the M212 will iterate down to a
	lower priority input reference until a higher priority input reference is restored.

Table 5. MCM In	put Reference Se	ettings Page 1	Setting Descri	ptors
	pat merer entee be	Julings I uge I	Setting Besen	P.013



3.6.3.2 Reference Settings Page 2

Page 2 of the MCM Reference settings subtab contains the settings for input reference delays, enabling the system to account for cable propagation delay, and AutoSwitch prevention.



Figure 15. MCM Reference Settings Page 2

Table 6.	MCM Refere	nce Settings P	age 2 Setting	Descriptors
----------	------------	----------------	---------------	-------------

SETTING	DESCRIPTION			
Delays				
HaveQuick Ref	Adjust the delay compensation for the HaveQuick input			
	reference in nanoseconds			
IRIG-B Ref	Adjust the delay compensation for the IRIG-B input			
	reference in nanoseconds			
1PPS Ref	Adjust the delay compensation for the 1PPS input reference			
	in nanoseconds			
GPS Ref	Adjust the delay compensation for the GPS input reference			
	in nanoseconds			



SETTING	DESCRIPTION				
	Reference AutoSwitch Prevention				
CrossLink Ref-A	Prevent the MCM's autoswitching system from selecting				
	this reference automatically in the event of a reference				
	failure				
CrossLink Ref-B	Prevent the MCM's autoswitching system from selecting				
	this reference automatically in the event of a reference				
	failure				
IRIG-B + 1PPS	Prevent the MCM's autoswitching system from selecting				
	these references automatically in the event of a reference				
	failure				
GPS	Prevent the MCM's autoswitching system from selecting				
	this reference automatically in the event of a reference				
	failure				
IRIG-B Only	Prevent the MCM's autoswitching system from selecting				
	this reference automatically in the event of a reference				
	failure				
10 MHz	Prevent the MCM's autoswitching system from selecting				
	this reference automatically in the event of a reference				
	failure				

Table 6.	MCM Reference	Settings Pag	e 2 Setting	Descriptors
Table 0.	Wielwi Merci chice	Jettings i ug		Descriptors



3.6.4 Time Settings

The Time Settings subtab (Figure 16) allows the user to manually enter UTC time when the M212's MCM is operating in holdover mode or if it is only receiving frequency or pulse input references. The Manual Leap Second option is used when the input reference to the M212 does not support a leap second and the leap second must be entered manually.

andywing				M212 Modu	lar Clock Sy	ste
969 Dec 31	16:20:23		Unit: Unit 1	Part #: TFC Chase	sis Serial #: TFC C	hassis
		MCM Ti	me Settings - Slot(0	2)	57/	ATUS
Inventory	Status	Settings				STEM
IP Settings	NTP	SNMP Settings	Reference Settings	Time Settings	CONFI	GURE
Serial Settin	ngs			AND CAPACITY OF		
		N	Anual UTC Time		_	
			570.001.00.00.00			
		Ma	Inual Leap Second			
		Leap Se	c State: Not Pending			
			Change Settings			
		23				

Figure 16. MCM Time Settings



3.6.5 Serial Settings

The Serial Settings subtab (Figure 17) allows the user to select the baud rate and output message format for the serial timecode output.

anoywine	sicalizar		M212 Modula	ar Clock Syste
969 Dec 31 1	6:20:29	Unit: Unit 1	Part #: TFC Chassis	Serial #: TFC Chassis
	MCM	Serial Settings - Slot(0	12)	STATUS
Inventory	Status Settings			SYSTEM
IP Settings	NTP SNMP Setting	s Reference Settings	Time Settings	CONFIGURE
Serial Settin	95			
	E Output	Baud Rate: 115200 Message: ZDA		
		Change Settings		
		Slot Number: 502 📴 📴	anfo	

Figure 17. MCM Serial Settings



3.7 Universal Output Signal Module (OSM) Configuration Page

Clicking the button labeled "Universal" will open the Universal OSM status and configuration pages, from here the inventory, status and settings for the Universal OSM are available for viewing and editing.

3.7.1 Universal OSM Inventory Page

The Inventory page (Figure 18) shows the Universal OSM's serial number, hardware revision, software version and FPGA version.

brandywin	C			M212 Modula	ar Cloc	k Systen
1969 Dec 31	16:21:01		Unit: Unit 1	Part #: TFC Chassis	Serial #:	FFC Chassis
-		Universa	I Inventory - Slot	10)		STATUS
Inventory	Status	Settings				SYSTEM
		Serial N Firmware V FPGA V Hardware V	umber: ####################################	#### 2019 15:14:33) 9 13:8) ####	8	CONFIGURE

Figure 18. Universal OSM Inventory Page



3.7.2 Universal OSM Status Page

The Status page (Figure 19) shows the fault status for all four outputs for the Universal OSM.

brandywine		M212 Modula	r Clo	ck	Syst	ten
1969 Dec 31 16:21:06	Unit: Unit 1	Part #: TFC Chassis	Serial #	TFC	Chas	sis
	Universal Status - Slot(1	0)			STATUS	
Inventory Status S	Settings				SYSTEM	
	J1-Output Fault: Yes J2-Output Fault: Yes J3-Output Fault: Yes J4-Output Fault: Yes			CO U	NFIGURI	8
	Slot Number: 510 📴 🧔	at info				

Figure 19. Universal OSM Status Page



3.7.3 Universal OSM Settings

Each output jack on the Universal OSM can be independently configured to output different formats of time or frequency, depending on the requested application. The Universal OSM Settings tab (Figure 20) is used to configure each jack.

0	vieleotions			M212	Modu	lar (Cloc	ck Sys
969 Dec 31	16:20:39		Unit: Unit 1	Part #: TF	C Chass	is Se	rial #:	TFC Cha
		Univers	al Settings - Slot(10)				STATU
Inventory	Status 5	Settings						SYSTI
J1 Output	J2 Output	J3 Output	J4 Output					CONFIGU
	DST Start DST Sta DST Start D	DST Offs Month: Janua rt DOW: Mond OWOM: First	et(min): 0 iry ay	DST End Mo DST End D DST End DOW	nth: Jan OW: Mor OM: Firs	uary nday t		
			J1 Output Type					
J1 Output	Type: HaveQ	uick	AC		D	elay: 0		

Figure 20. Universal OSM Settings

SETTING	DESCRIPTION
	JX Local Time
Use Master MCM Local	Instruct the OSM to use the same local time settings as the
Time	МСМ
Time Zone (min)	Indicates the time zone offset from UTC in minutes
DST Offset (min)	Indicates the Daylight Savings Time (DST) offset from
	standard time in minutes
DST Start Month	Indicates the month that DST starts on.
DST Start DOW	Indicates the Day of Week (DOW) that DST starts on.
DST Start DOWOM	Indicates the Day of Week of Month (DOWOM) that DST
	starts on



SETTING	DESCRIPTION
DST End Month	Indicates the month that DST ends on.
DST End DOW	Indicates the Day of Week (DOW) that DST ends on.
DST End DOWOM	Indicates the Day of Week of Month (DOWOM) that DST
	ends on
	JX Output Type
JX Output Type	Sets the output format for the selected output jack.
Delay	Adjust the cable delay in nanoseconds (μ s) to compensate
	for cable propagation delay

Table 7. Universal OSM Setting Descriptors



3.8 Network Time Protocol (NTP) OSM Configuration Page

Clicking the button labeled "Ntp" will open the NTP OSM status and configuration pages, from here the inventory, status and settings for the NTP OSM are available for viewing and editing.

3.8.1 NTP OSM Inventory Page

The Inventory page (Figure 21) shows the NTP OSM's serial number, hardware revision, software version and FPGA version.

brandywine			M212 Module			eter
1969 Dec 31 16:2	1:18	Unit: Unit 1	Part #: TFC Chassis	Serial #	TFCC	hassis
and the state of the second	Koras	NTP Inventory - Slot(09	1			
NTP Inventory	NTP Status	NTP Settings	· · · · ·		-	ATEM
	S Firm Hard	Solot Number: NTP-OSM SN Ware Version: 1.2.0 (Aug 27 PGA Version: 6 05/17/2018 Ware Number: NTP-OSM HV	2014 09:18:36) 15:57 VV		CONFIG	p P

Figure 21. NTP OSM Inventory Page



3.8.2 NTP OSM Status Page

The Status page (Figure 22) shows the fault status for both ports on the NTP OSM, as well as showing the IPv6 Addresses of each port.

brandywine	Vear		M212 Modula	ar Cloc	k Sys	ten
1969 Dec 31 16:21	1:22	Unit: Unit 1	Part #: TFC Chassis HWV	Serial #:	TFC Char SN	ISIS
-		NTP Status - Slot(09)			BTATU	
NTP Inventory	NTP Status	NTP Settings			SYSTE	-
		Port 1 Fault: No Port 2 Fault: No		1	CONFIGUR Ntp	•
	J1 Ethernet J2 Ethernet	IPv6 Address: fe80::221:34ff;fr IPv6 Address: fe80::221:34ff;fr	e00:5315%7 e00:5316%8			
		Clai Number an D				

Figure 22. NTP OSM Status Page



3.8.3 NTP OSM Settings

The NTP OSM Settings Page enables the user to configure the IP address, gateway address, subnet mask, and authentication method, key ID and hex key for each port of the NTP OSM independently.

randywine	liear		N	1212 Modul	ar Cloc	k Syste
1969 Dec 31 16:2	7:54	Unit: Unit 1		Part #: TFC Chassis Serial #: TFC C		FFC Chassi SN
		NTP Settings -	Slot(09)			STATUS
NTP Inventory	NTP Status	NTP Settings				SYSTEM
EI IP A G NT NTP NTP Key	thernet: Enabled ddress: 192.168: ateway: 192.168: Mask: 255.255. P Auth: SHA-1 Key ID: 1 / (HEX): 12345	1.183 1.1 255.0 Change Setting	Ethi IP Add Gati NTP NTP Koy (ernet: Enabled dress: 192.168.1.184 eway: 192.168.1.1 Mask: 255.255.255.0 Auth: SHA-1 ey ID: 1 HEX): 12345		Ntp

Figure 23. NTP OSM Settings Page



4 Support Information

All Brandywine Communications products come with a one-year warranty.

If the unit is still exhibiting problems not covered by the above troubleshooting guide, contact us for technical support at <u>support@brandywinecomm.com</u> or call us at 714-755-1050.

If it becomes necessary to return the unit to the factory for repairs, call us at 714-755-1050 extension 113 to arrange an RMA.



5 Front Panel Drawing





6 Rear Panel Drawings



Figure 25. M212 Rear Panel Drawing



7 Rear Panel Pinouts

M212 MCN	1 Module
Rear Pane	Pinouts
Connector Ident	Function
J6-A	10Mhz Output
J6-B	1PPS Input
J7-A	Ethernet Port 1
J7-B	Ethernet Port 2
J8	GPS Antenna Input
J5-A	
9 way 'D' Type Male	
Pin	Function
1	Relay Alarm NC
2	Relay Alarm COM
3	1PPS DC Output
4	IRIG B DCLS Output
5	Ground
6	Relay Alarm NO
7	Ground
8	Havequick Input
9	IRIG Input
	1
J5-B	
9 way 'D' Type Female	
Pin	Function
1	Ground
2	RS232 TX
3	RS232 TR
4	Ground
5	Ground
6	RS422 TX+
7	RS422 TX-
8	
9	