MDS Master Station

Exceptional Reliability for Protected Licensed or Unlicensed Communications

Narrowband communication networks are deployed to monitor, control and maintain critical industrial processes and distributed assets. Such applications require high reliability and availability especially at the access point, thus driving demand for high duty cycle solutions with built-in redundancy that are capable of continuous operation. The MDS Master Station is built to meet these demanding requirements.

The MDS Master Station offers two transceivers in a 1+1 redundancy, and dual power supplies to maximize network availability. In the event of a failure the controlling logic switches to the standby transceiver unit. Switchover can occur based upon transceiver error codes, loss of communication over a configurable time period or loss of power.

The MDS Master Station supports two types of transceiver modules.

- Orbit licensed or unlicensed transceiver modules enable the latest generation performance, networking, and security offered in the MDS Orbit platform.
- SD licensed transceiver modules enable the deployment of MDS SD Series networks. Additionally, they allow for backward compatibility with x710/x790 legacy networks.

Key Benefits

- Maximize network availability with 1+1 transceiver protection and hot-swappable components
- Range of backward compatibility and migration options to extend or evolve legacy networks and provide project budget flexibility
- Simple migration options with field upgradability from SD to Orbit radio modules
- The most comprehensive set of cybersecurity and networking capabilities offered by the Orbit platform provides protection from threats and ease of integration into modern networks
- Integration with the MDS PulseNET network management system

Applications

Oil & Gas
- SCADA communication for flow/metering devices, controllers and RTUs
- Data acquisition for well head production data and pipeline status

Energy
- SCADA communication for IEDs, controllers and RTUs at distribution substations
- Data acquisition for pole-top transformers and capacitor banks

Water & Wastewater
- SCADA communication for lift station controllers and monitoring devices
- Data acquisition for tank and reservoir levels, flow rates and pipeline valve status

Reliability and Modularity

- Support for Orbit Unlicensed 900MHz and Licensed 500MHz
- 1+1 transceiver redundancy with warm standby and fast radio switchover
- Various AC/DC power supply options with redundant operation
- Modular, in-service, hot-swappable components
- Operation from -30 to +60 °C
- Rated for continuous operation
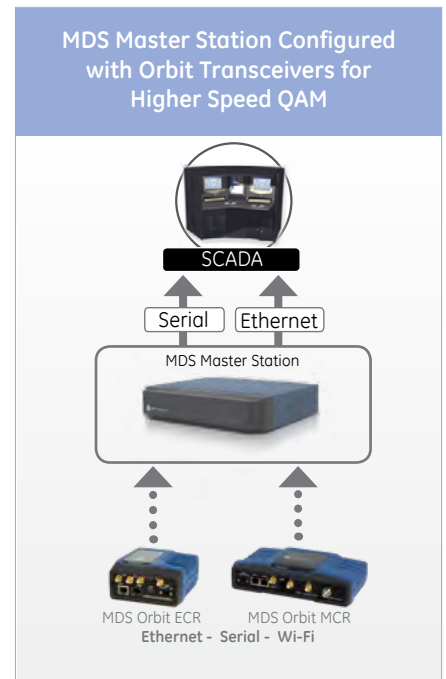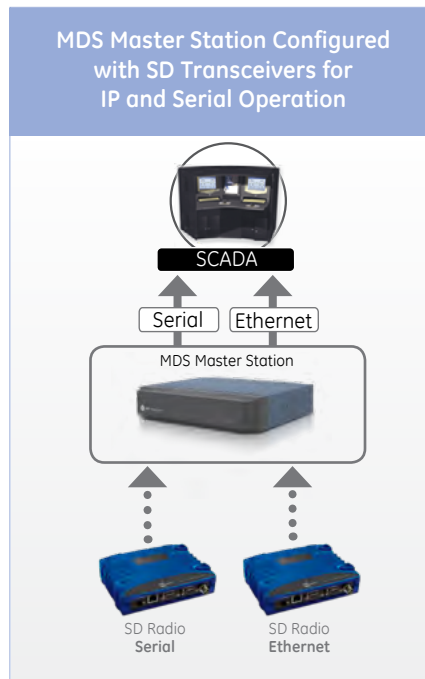- No moving parts or fans
- Battery backup option

Flexibility

- Support for GE MDS SD Series radio technology covering the 300-512 MHz and 880-960 MHz bands with backward compatibility to legacy X710/X790 systems
- Support for GE MDS Orbit unlicensed 900MHz[1] or licensed technology with QAM covering the 100, 200, 400, 500, 700, and 900 MHz bands
- MDS Orbit supports up to 50kHz bandwidth in 200, 700 and 900 MHz bands
- Optional internal duplexer, GPS, and WiFi
- Connectivity for additional notched filter

Advanced Networking & Security

- Orbit Network Operating System with advanced routing, switching, Quality of Service and network management capabilities
- Cutting edge cyber security suite including firewalling, RF Encryption, end-to-end IPSec VPNs, X.509 certificates with key rotation, secure boot and firmware

MDS Master Station Configured with SD Transceivers for Backward Compatible Serial Operation	MDS Master Station Configured with SD Transceivers for IP and Serial Operation	MDS Master Station Configured with Orbit Transceivers for Higher Speed QAM
SCADA	SCADA	SCADA
Serial	Serial / Ethernet	Serial / Ethernet
MDS Master Station	MDS Master Station	MDS Master Station
x710 Radio / MDS Orbit ECR / SD Radio	SD Radio **Serial** / SD Radio **Ethernet**	MDS Orbit ECR / MDS Orbit MCR **Ethernet – Serial – Wi-Fi**

MDS Master Station Overview

The MDS Master Station is built on a cutting edge hardware framework to offer exceptional reliability for critical communications. It can be configured as a 1+1 system with redundant power supplies and transceivers that are hot-swappable to ensure always-on operation and maximize network availability. Other components such as duplexers and alarm cards are also modular and can be field replaceable for ease of maintenance.

The Master Station utilizes a variant of the GE MDS Orbit network Operating System (Orbit OS) offering future-ready security, networking and quality of service capabilities.

Enterprise-Class Security

The MDS Orbit OS offers a comprehensive cyber security framework to facilitate the deployment of highly secure networks. Orbit's firewall ensures protection at Layer 2 to 4 to permit only valid traffic through the network. Its RF encryption secures communication between remote and AP while its IPSec VPN and DMVPN capabilities enable end-to-end encryption between remotes and control center. RADIUS enforces a centralized authentication process where users are granted access based on pre-authorized roles and access level.

Flexible Networking and Quality of Service

MDS Orbit OS enables the Master Station to offer dynamic and static routing services as well as full managed switch capability for maximum flexibility in network design. In addition to 1+1 transceiver protection, Orbit OS offers other High Availability mechanisms when used with MDS Orbit remotes such as interface bonding, Spanning Tree, Layer 3 failover, VRRP as well as latency and packet-loss based failover. Quality of Service enables the granular classification and prioritization of traffic as well as the dedication of uplink throughput on a per-application basis to minimize latency and maximize bandwidth for critical applications.

MDS Master Station with SD Radio Modules

The MDS Master Station may be configured with SD transceiver modules in a non-redundant or redundant mode of operation. SD transceiver modules utilize a similar radio technology as the industry-leading MDS SD Series radios to enable communication with MDS SD remotes, as well as MDS x710 and 2310/4310 remotes. The MDS Master Station has been designed to replace MDS 2100 and x790B masters and to provide a seamless evolution path to an all SD network. This backward compatibility allows the seamless co-existence of legacy and SD based networks.

Furthermore, when operating in the CPFSK A modem, the Master Station with SD radio modules can communicate with MDS Orbit remotes operating in a legacy backward compatible mode to facilitate the migration of legacy networks to Orbit-based technology. Once all of the legacy remotes have been replaced with Orbit, a field conversion is possible utilizing the same firmware already on the master station along with swapping out the SD radio modules for Orbit radio modules.

This can allow for more flexibility and control over cost and schedule compared to alternative forklift or higher cost full master station migration options.

MDS Master Station with Orbit Licensed Modules

The MDS Master Station may be configured with the latest generation MDS Orbit licensed radio modules covering the 100, 200, 400, 700, or 900 MHz bands. Orbit radio modules enable communication with the MDS Orbit MCR/ECR remotes using its high-performance radio technology with up to 64-QAM of modulation and up to 50kHz of bandwidth. Its bi-directional adaptive modulation as well as IP header and payload compression maximize upstream and downstream throughput. Dynamic Forward Error Correction (FEC) boosts link sensitivity to maximize distance and operation in tough terrains.

Network Management and User Interface

The MDS Master Station with its Orbit OS supports standards-based SNMP and Netconf network and device management protocols for easy integration into MDS PulseNet and 3rd party NMS software. It can be configured and managed using Command-Line Interface (CLI) or an intuitive Graphical User Interface (GUI).

Migrating Legacy Networks with Master Station Evolution Technology

The MDS Master Station provides a solution for customers requiring the latest generation Orbit communication technology in parts of their network while maintaining an existing legacy network, either GE MDS or another vendor's radios.

A GE MDS Master Station equipped with Orbit licensed radio modules and an embedded Evolution Module allows coexistence of both new and legacy networks by routing the traffic over the appropriate network. This solution supports legacy networks operating in non-continuously keyed switched carrier mode and utilizing a standard serial polling protocol such as DNP3,

Versatile Serial Server

Serial traffic from SCADA and telemetry data can be encapsulated in TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) for point-to-point or point-to-multipoint transport across wired and wireless networks. Serial protocols, such as Modbus and DNPv3 are fully supported to connect legacy PLCs, RTUs etc...

Modular Communication Platform

Ease of maintenance and serviceability are benefits of the modular communications platform of the MDS Master Station. All components are easily accessed from the front panel for simplified maintenance. Redundant transceivers and power supply modules are hot swappable to ensure continuous operation during service periods after a failover. The Relay and Alarm module provides connectivity for two sets of alarm contacts to externally signal radio switchover and alarm events.

The Master Station's Platform Manager is the main processor/brain of the system. It can be factory-configured with optional WiFi to simplify local management. It also supports 2 Ethernet and 2 Serial interfaces, and allows for single or multiple SCADA host systems.

Migrate legacy networks to next generation MDS Orbit performance and capabilities with the optional Evolution Module, embedded directly into the Master Station and available with or without internal duplexer.

Exterior View – Front Panel

AC Power Module
Transceiver Modules
Internal Duplexer Module
DC Power Module
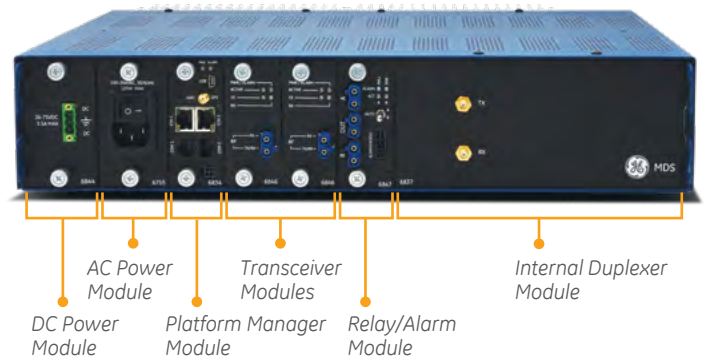Platform Manager Module
Relay/Alarm Module

Graphical User Interface (GUI)

The MDS Master Station utilizes an intuitive Device Manager GUI based on the Orbit Network Operating System. The Device Manager allows for easy configuration and maintenance of radios, networking, security and management functions with specialized wizards that speed up complex configuration tasks. The Master Station can also be managed using a CLI.

MDS Master Station Configuration Options

The MDS Master Station can be factory-configured as a system with the following radio technology types: SD, Orbit Licensed, or Orbit Unlicensed. The system can be configured with single or dual redundant radio modules of the same type. Components such as chassis, power supplies, platform manager (processor), alarm modules and duplexers are common between the types of systems to enable flexibility in field upgrades, maintenance and inventory stocking. Most of the hardware components listed above can be ordered as spares, please check the online store or with a GE Sales representative for more information.

MDS Master Station loaded with	Compatible with	Modulations	Max Raw Data Rate in 25KHz	Duplex Modes
SD RADIO MODULES	• MDS SD Series remotes • MDS x710/x790 remotes • MDS Orbit Licensed Narrowband remotes operating in 3FSK modulation	• CPFSK, Digital	38.4 Kbps in 25 kHz	Half Duplex Full Duplex
ORBIT LICENSED NARROWBAND RADIO MODULES	• MDS Orbit Licensed Narrowband Remotes	• QPSK, 16QAM, 64QAM • Bi-directional Adaptive Modulation	120 Kbps in 25 kHz	Half Duplex
ORBIT UNLICENSED 900MHZ RADIO MODULES[1]	• MDS Orbit Unlicensed 900MHz Remotes	• 2, 4-level GFSK	1.25 Mbps	Half Duplex

MDS Master Station

ORBIT LICENSED NARROWBAND RADIO MODULES

Modulation	QPSK, 16QAM, 64QAM
Adaptive Modulation	Per-packet, per-remote, bi-directional
Dynamic FEC:	Convolutional, Reed Solomon
Compression	IP Header and Payload with up to 30% efficiency improvement
Media Access Control	High performance MAC

ORBIT MODULE BANDS

L1B: 150-174 MHz	L4C: 450-520 MHz
L2X: 216-235 MHz	L4 E: 406.1-470 MHz
L4A: 330-406 MHz	L7A: 757-758 and 787-788 MHz
	L9C: 896-960 MHz

RAW DATA RATES

Channel	QPSK	16QAM	64QAM
6.25 KHz	9.6 Kbps	19.2 Kbps	28.8 Kbps
12.5 KHz	20 Kbps	40 Kbps	60 Kbps
25 KHz	40 Kbps	80 Kbps	120 Kbps
50 KHz[2]	80 Kbps	160 Kbps	240 Kbps

TRANSMITTER CHARACTERISTICS

Frequency Stability	+/- 0.5ppm	
Peak Power*	330-470MHz	896-960MHz
- Radio Module	39.28	38.8
- Non-Redundant, no duplexer	38.93	38.05
- Non-Redundant, with duplexer[3]	37.73	35.95
Power Range	+20dBm to +40dBm	
Output Impedance	50 Ohms	

RECEIVER CHARACTERISTICS

Type	Direct Conversion				
Adjacent Channel Rejection	60 dB nominal				
Receiver Sensitivity[5]		Frequency Bands			
	L1B	L2X	L4E	L7A	L7A
Redundant, no duplexer	-114.7	-113.6	-112.4	-110.7	-110.7
Redundant, with duplexer	N/A	N/A	-111.2	-109.2	-109.2

ORBIT UNLICENSED 900MHZ RADIO MODULES

Frequency	902-928 MHz
Modulation	2, 4-level GFSK, Dwell Time 10-300 msec
Spreading method	FHSS, DTS
Occupied Bandwidth	152 to 1320 kHz, up to 80 channels
Data Rates/Sensitivity	

- 125 Kbps/-104 dBm
- 250 Kbps/-102 dBm
- 500 Kbps/-98 dBm
- 1.0 Mbps/-94 dBm
- 1.25 Mbps/-94 dBm

Peak Power	29dBm +/-0.5dB
Latency	tunable to <5 msec one-way
Output Impedance	50 Ohms

SD RADIO MODULES

Module	Digital, CPFSK
Radio Mode	Packet-with-MAC, Transparent
Compatibility	MDS X710 Series
	MDS SD Series
	MDS Orbit in CPFSK A Modem

SD MODULE BANDS

SDM4 D	300-360 MHz
SDM4 B	400-450 MHz
SDM4 C	450-512 MHz
SDM9 C	928-960 MHz
SDM9 K	TX 926-960 MHz
	RX 880-915 MHz

RAW DATA RATES

Channel	300-512 MHz	880-960 MHz
6.25 KHz	4.8 Kbps	-
12.5 KHz	19.2 Kbps	19.2 Kbps
25 KHz	38.4 Kbps	38.4 Kbps
50 KHz	-	-

TRANSMITTER CHARACTERISTICS

Frequency Stability	+/- 0.5ppm	
Peak Power	300-512MHz (dBm +/- 0.5dB)	928-960MHz (dBm +/- 0.85dB)
- Radio Module	40.5	40.25
- Redundant, no duplexer	39.4	38.7
- Redundant, with duplexer[3]	38.2	36.6
Power Range	+30dBm to +40dBm	
Duty Cycle	Continuous	
Output Impedance	50 Ohms	

RECEIVER CHARACTERISTICS

Type	Double Conversion Superheterodyne	
Adjacent Channel	60 dB Nominal Rejection	
Receiver Sensitivity @1x10-6BER, Modem 9600	400-512MHz	928-960MHz
Redundant, no duplexer	-110.9	-112.5
Redundant, with duplexer	-109.7	-110.4

ELECTRICAL

Power Required	< 80 Watts (based on redundancy)
DC Power	+/- 12-36V, +/- 36-75V, +/- 75-140V
AC Power	100-240V, 50/60 Hz

MECHANICAL

Dimensions	3.5 H x 17.2 W x 16 D in
	8.9 H x 43.8 W x 40.6 D cm
Weight	24 lbs., 10.9 kg

ENVIRONMENTAL

Temperature	-30° to +60°C (-22° to 140°F)
Humidity	95% at 40°C (104°F) non-condensing
Cooling	Heat sinks, no fans, no moving parts

WI-FI OPTION

- Frequency 2.4GHz with IEEE 802.11 b/g/n
- Operating Modes: Access Point, Station
- Scalability Up to 2 SSIDs, up to 7 clients/stations
- SSID hiding Yes | VLAN mapping Yes
- Carrier Power 20dBm adjustable

POWER SUPPLY OPTIONS

- 110/220 VAC
- 12-36 VDC
- 90-260 VAC
- +/- 36-72 VDC
- 75-140 VDC

INTERNAL DUPLEXER OPTIONS

- 9 MHz (932.0-932.5) / (941.0-941.5) MHz
- 24 MHz (928.0-929.0) / (952.0-953.0) MHz
- 31 MHz (928.0-929.0) / (959.0-960.0) MHz
- 39 MHz (896.0- 898.0) / (935.0 -937.0) MHz
- 350-512MHz / 5-10MHz SP (INT)
- TX high or low duplexer options available for each band
- No Internal Duplexer

NETWORKING

- IPv4 Routing OSPF, EBGP, RIPv2 with performance-based route failover, IPv6 Routing[1]
- Full managed switch capability, IEEE 802.3, 802.1Q/VLANs, 64 VLANs, STP
- Concurrent Bridging & Routing
- GRE Tunneling with Layer 2 (Ethernet) and Layer 3 support
- Route/path failover between any two wireless/Ethernet interfaces based on link loss, latency degradation or packet loss thresholds
- Quality of Service 16 egress queues, Priority Queuing, Fair Queuing, Traffic Shaping, Classification based on DSCP, 802.1p and Layer 2-4 classifiers
- IP Protocols TCP, UDP, ARP, DHCP, ICMP, NTP, FTP, SFTP, TFTP, DNS, configurable HTTP and HTTPS, SSH
- Serial TCP server, Modbus/TCP, Modbus RTU, TCP client, UDP Unicast and Multicast, BSAP, and DNP3

SECURITY

- IPSec VPN Server (responder) and Client (initiator) with DMVPN
- Authentication Public Key, EAPTLS, Pre-Shared, Ike 1-2
- Encryption : 3DES, AES 128/192/256, CBC, CTR, CCM, GCM, SHA 256/384/512 HMAC, WiFi WPA/WPA2 PSK
- Firewalling: Stateful Layer 3-4 Firewall with MAC Filtering, NAT, Source NAT (Masquerading), Static NAT, Port Forwarding
- Device Security : Secure Boot, Secure Firmware, Digitally Signed Hardware and Software, Magnetometer Tamper Detection
- Certificate Management: X.509, SCEP, PEM, DER, RSA
- User Authentication: Local RBAC, AAA/RADIUS, 802.1x
- FIPS 140-2 (Level 2) certification in progress

MANAGEMENT

- GE MDS PulseNET NMS support with device management and auto-configuration
- GUI configuration wizards to simplify operation
- Secure device management via a web-based GUI and/or CLI
- Event logging, Syslog-over-TLS, SSH, Console
- Iperf throughput diagnostic, NETCONF
- SNMPv1/v2c/v3, MIB-II, Enterprise MIB

INTERFACES

Serial COM1	RS232, RJ45
Serial COM2	RS232/485, RJ45
USB	2
Ethernet 1	10/100 BaseT, RJ45
Ethernet 2	10/100 BaseT, RJ45
Wi-Fi	RP-SMA connector
GPS	SMA Female
Antenna	N Female

AGENCY APPROVALS

Master Station with SD Radio Modules
- Industry Canada and ENTELA
- FCC Part 101: 820 to 960 MHz
- FCC Part 90: 928 to 960 MHz
- FCC Part 24: 820 to 960 MHz
- FCC Part 90: 300 to 512 MHz
- CE, ETSI: 300 to 512 MHz
- UL 60950-1 Safety approval

Master Station with Orbit Licensed Narrowband Radio Modules
- Industry Canada, Anatel
- FCC Part 90: 896-960 MHz
- FCC Part 90: 406-470 MHz
- FCC Part 27: 757-758 & 787-788 MHz
- CE, ETSI: 330-406 MHz, 406-470 MHz
- CSA General Safety approval

Master Station with Orbit Unlicensed Radio Modules
- FCC Part 15, ICRSS-210
- CSA General Safety approval

WARRANTY

Standard 2-year manufacturer warranty applies to all MDS Master Station models

1. Check with local sales representative for availability.
2. 200, 700, and 900 MHz Orbit band options support 12.5, 25, and 50 kHz. 200 MHz 5 kHz option also available. Other band options support 6.25, 12.5, and 25 kHz.
3. With GE MDS standard 400MHz notch or 900MHz bandpass duplexers. Internal duplexers are not available for 100 and 200MHz versions.
4. dBm +/-0.5dB, QPSK Average Power is 5dB less than Peak, QAM Average Power is 7dB less than Peak. Power may vary for other frequency bands. Please consult GE for specs on your exact configuration.
5. Shown @ 1x10-6 BER, QPSK, 12.5kHz, No FEC. FEC enabled improves sensitivity between 3-6dB. Sensitivity reduced by -6dB in 16QAM and -13dB in 64QAM.

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