

# 2023 PRODUCT CATALOG



AIR | LAND | SEA  
Control Systems

**KRATOS**  
UNMANNED SYSTEMS DIVISION

Registered to AS9100D: 2016 & ISO 9001: 2015



# COMPANY OVERVIEW

Micro Systems, Inc. is registered to AS9100D: 2016 & ISO 9001: 2015 and wholly owned subsidiary of Kratos Defense and Security Solutions (Nasdaq: KTOS), headquartered in Fort Walton Beach, Florida. Since 1976, we have been continuously exceeding our customers' expectations in engineering, production and field services.

Our principal business is the design, development, and manufacture of sophisticated systems used in a broad range of advanced defense applications primarily in the unmanned systems segment of the aerospace and defense industry. In our over 30 year history we have served the defense industry with a wide range of solutions and products for Command and Control, Flight Telemetry, Over-the-Horizon Communication, Electronic Warfare, Flight Line Test, and Range Safety.

We offer a broad range of products including Unmanned Vehicle Control Systems, Sophisticated Avionics, Radar Tracking and Datalink Transponders, Scoring

Systems, Custom Test Equipment, and Advanced Flight Termination Systems.

This catalog contains just a few of the many products that we offer to the industry. If you do not find a product that meets the exact needs of your requirements please contact us and we can discuss options to modify an existing product or design a new product.

Our experienced team of management, engineering, and production personnel are goal oriented, recognized leaders in the defense industry. They follow through from design, prototype, qualification, manufacturing, test to final delivery.

We are dedicated to providing total customer satisfaction and have a team in-place with the resources, commitment, and Total Quality mind-set necessary to provide high-performance, high reliability products to the Aerospace and Defense Industry.

***We are proud to serve you.***

*To be the premier global supplier of unmanned vehicle systems, software products, and engineering services by continuously exceeding our customer's expectations by providing the highest degree of quality and customer service.*

*Note to exporters: If this equipment is purchased for export, it will require an export license under International Traffic in Arms Regulations (ITAR) approved by the U.S. Department of State. An end user statement must be submitted to Micro Systems, Inc. with your purchase order for our review. The end user statement must be on company letterhead with an authorized signature and is to be either faxed or mailed (no e-mails). We will require that you supply our Contracts Department with a valid export license number and expiration date before any equipment will be shipped.*



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## Terms & Conditions of Sale









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**UNMANNED SYSTEMS DIVISION**



# UNMANNED VEHICLE CONTROL SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS



The Unmanned Vehicle Control System is a field proven C2 system based on the MONTAGE architecture used to control remotely piloted vehicles or target drones. The system can control multiple full and/or sub-scale fixed and rotary wing aerial targets and sea surface targets to a range of 200 nm line of site, or up to 330 nm with a minimum of 12dB of margin if using the optional relay system, using differentially corrected GPS position data.

Our unique modular systems approach allows the system to be tailored to the customer's specific needs by purchasing only as much capability as required.

Additional consoles and modules can be easily added in the field. Vehicle command and telemetry configurations, telemetry displays, and range maps can all be configured to the customer's preferences.

The system operates independent of Data Link types and can accommodate multiple data links and/or multiple frequencies simultaneously. The RF module can be connected directly via Ethernet, or remotely to network through a router (e.g. T1, ISDN, microwave, etc.).



# UNMANNED VEHICLE CONTROL SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Features

- ▶ Simultaneous Multi-vehicle control
- ▶ Modular "Plug and Play" System
- ▶ Vehicle Independent Datalink
- ▶ Interface to range infrastructure for mission information sharing
- ▶ Ruggedized Transportable System

### Modular Systems Approach

- ▶ Distributed Multi-processor System
- ▶ Configurable using "Building Blocks – Purchase only as much capability as needed
- ▶ Highly Cost Effective
- ▶ High Capability Configurations Available

### Vehicle and Datalink Independent

- ▶ Configure with multiple datalinks simultaneously
  - ▶ High Capacity – for full scale vehicle
  - ▶ Reduced Capacity (reduced cost) – for subscale vehicles (MQM-107, BQM-167, Medium size UAV, UGV, USV)
  - ▶ Simultaneous Vehicle Operation – for multi-vehicle missions

### Highly Integrated Consoles and Open System Architecture

- ▶ Fast and Easy Set-up (Typically less than 30 minutes)  
Minimal inter-module connections
- ▶ Choice of single or dual console Target Control
- ▶ Groups TCP/IP interface between consoles and modules
- ▶ Supports remote location of "Building Blocks" (location transparency)

### Applications

- ▶ Air, Land, & Sea Vehicle Command and Control (C2)
- ▶ Mission Planning
- ▶ Simulation

### Field Upgradeable

- ▶ Additional consoles and modules can easily be added (up to 8 vehicles)
- ▶ Temporary expansion for special mission requirements

### Range Independent

- ▶ No range specific functions for vehicle command and control
- ▶ Range interface available for collecting/monitoring mission data

**Fixed site system configurations are available.**



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# PORTABLE VEHICLE CONTROL SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Simultaneous Multi-vehicle control
- ▶ Modular "Plug and Play" System
- ▶ Vehicle Independent Datalink
- ▶ Interface to range infrastructure for mission information sharing
- ▶ Ruggedized Portable System

### Applications

- ▶ Vehicle Command and Control (C2)
- ▶ Mission Planning
- ▶ Simulation

The portable configuration of our Ground Control System (GCS) provides all of the capabilities of our fixed and transportable control systems. The GCS can control multiple full and/or sub-scale fixed and rotary wing targets and sea surface targets to a range of 200 nm line of site, or up to 330 nm with a minimum of 12dB of margin if using the optional relay system, using differentially corrected GPS position data.

Our unique modular systems approach allows the system to be tailored to the customer's specific needs by purchasing only as much capability as required. Additional consoles and modules can be easily

added in the field. Vehicle command and telemetry configurations, telemetry displays, and range maps can all be configured to the customer's preferences.

The system operates independent of Data Link types and can accommodate multiple data links and/or multiple frequencies simultaneously. The RF module can be connected directly via Ethernet, or remotely to network through a router (e.g. T1, ISDN, microwave, etc.).



# PORTABLE VEHICLE CONTROL SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Common Console Design

- ▶ Range Situation Displays (option) and System Control Consoles are physically and electrically identical
- ▶ Fewer spares required

### Modular Systems Approach

- ▶ Distributed Multi-processor System
- ▶ Configurable using "Building Blocks – Purchase only as much capability as needed
- ▶ Highly Cost Effective
- ▶ High Capability Configurations Available

### Field Upgradeable

- ▶ Additional consoles and modules can easily be added (up to 8 vehicles)
- ▶ Temporary expansion for special mission requirements

### Range Independent

- ▶ No range specific functions for vehicle command and control
- ▶ Range interface available for collecting/monitoring mission data

### Ruggedized, Environmentally Protected Consoles





- ▶ Ruggedized Laptops, keyboards, and command panels
- ▶ Designed to meet MIL-STD-810 and MIL-STD-461 qualification

### Vehicle and Datalink Independent

- ▶ Configure with multiple datalinks simultaneously
  - ▶ High Capacity – for full scale vehicle
  - ▶ Reduced Capacity (reduced cost) – for subscale vehicles (MQM-107, BQM-167, Medium size UAV, UGV, USV)
  - ▶ Simultaneous Vehicle Operation – for multi-vehicle missions

### Highly Integrated Consoles and Open System Architecture

- ▶ Fast and Easy Set-up (Typically less than 30 minutes)
- ▶ Minimal inter-module connections
- ▶ Choice of single or dual console Target Control Groups TCP/IP interface between consoles and modules
- ▶ Supports remote location of "Building Blocks" (location transparency)

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# MULTI-PLATFORM APPLIQUÉ KIT (M-PAK®)

## DATA SHEET & TECHNICAL SPECIFICATIONS



The Multi-Platform Appliqué Kit (M-PAK®) is the next generation of Ground Vehicle automation. This system can be used to quickly and easily convert your existing fleet of standard human-driven vehicles into optionally-manned systems that can be driven in manned or unmanned modes. M-PAK® does NOT degrade ingress or egress characteristics for a driver when in manual driving mode and has been designed from the ground up with safety as a top priority when in automated modes of operation. It includes a vehicle control module, an innovative quick-install steering actuator, actuators for acceleration and braking, transmission controller, and an active safety system.

M-PAK® is a scalable system that can be used as a stand-alone vehicle mobility kit or sensors can be added to offer various levels of autonomy, and Leader/Follower (manned/unmanned teaming). M-PAK® allows for a semi-permanent installation in a vehicle, which releases the user from committing to one vehicle platform or a particular vehicle. It can move freely among a variety of vehicle types and enables optional dependable unmanned capabilities for a number of applications.

**KRATOS®**  
UNMANNED SYSTEMS DIVISION



# MULTI-PLATFORM APPLIQUÉ KIT

## DATA SHEET & TECHNICAL SPECIFICATIONS

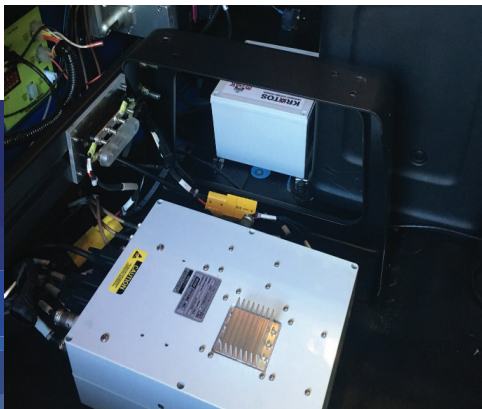
### Features

- ▶ Developed using proven technology
- ▶ Modular design
- ▶ Standard interfaces
- ▶ Field upgradeable
- ▶ Ruggedized portable system
- ▶ Vehicle Independent Datalink

### Applications

- ▶ Training
- ▶ Weapons Evaluation
- ▶ Tactical Operations
- ▶ Route and Range Clearance
- ▶ Equipment Transportation
- ▶ Mining/Construction
- ▶ Security/Perimeter Patrol
- ▶ Commercial Use

### Vehicle Control Module



### Actuators



### Safety System



### Vehicle Installation Kit General Specifications

- ▶ Quickly converts most human-driven vehicles into unmanned systems
- ▶ Operates in Leader/Follower Modes
- ▶ Compatible with Micro Systems C2 Systems (fixed site and man-portable)
- ▶ Designed with standardized components for easy upgrade and extended lifecycle
- ▶ No driver ingress or egress interference
- ▶ Includes Active Safety System
- ▶ Multiple configurations available
- ▶ Scalable to application
- ▶ User Interfaces include: Ethernet, CAN/J1929, RS-232/422, and USB
- ▶ Datalink Independent (UHF, WiFi, standard military datalinks)
- ▶ Quick and easy installation
- ▶ Power: 12VDC

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# UNMANNED VEHICLE MISSION COMPUTER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ Modular Design
- ▶ High Performance Processing I/O
- ▶ Ruggedized Aluminum Chassis
- ▶ Qualified to MIL-STD-461E (EMI), MIL-STD-810G (Env), MIL-HDBK-781A (Reliability)
- ▶ Hi-speed Mission Data Recording
- ▶ Compatible RTOS's: MQX, Linux, Wind River, Green Hills

The Unmanned Vehicle Mission Computer (UVMC) is a modular, high performance system that provides maximum flexibility for easy integration into multiple platforms. It was developed with high-level mission planning capabilities and vehicle sensor integration as key feature capabilities.

The field proven UVMC is designed with an advanced parallel processing architecture that utilizes a 760 MIPS main processor for computationally intensive autopilot control algorithms and an FPGA based processing module for Input/Output signal control requirements.

This unique architecture allows the core autopilot

software to remain separate from the I/O software, thus offloading I/O functions from the main processor.

The UVMC includes interfaces for external GPS and IMU modules as well as RS-232/485/422, CAN, HDLC, 10Base100 Ethernet, JTAG, and ITCS. A removable Compact Flash module is also available to support high speed data recording requirements.

The UVMC utilizes a Common Interface Bus architecture that provides expansion capability for additional I/O and additional communication interfaces.



# UNMANNED VEHICLE MISSION COMPUTER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Applications

- ▶ Vehicle Control System
- ▶ Autopilot
- ▶ Command and Telemetry
- ▶ Vehicle Payload Interface
- ▶ Remote Data Terminal

### Characteristics

- ▶ CPU Module: Freescale MPC5200B Main Processor (760 MIPS)
- ▶ Serial Interfaces: RS-232/485/422, CAN, HDLC, 10Base100 Ethernet, JTAG, Integrated Target Control System
- ▶ Data Recording: Compact Flash
- ▶ Standard I/O Module: Xilinx Spartan 3A with MicroBlaze 32 bit processor (60 MIPS)
- ▶ Discrete Outputs: 10 Type 1, 28VDC/Open, 1A | 8 Type 2, GND/Open, 500ma | Type 3 Open Collection
- ▶ Discrete Inputs: 8 Type 1, 28VDC/Open | 6 Type 2, GND/Open | 4 Type 3, TTL
- ▶ Proportional Inputs: 4 Type 1, 0 to +40VDC | 3 Type 2, 0 to +10VDC | 2 Type 3, -8mV to +54mV

### Available Real Time Operating Systems

- ▶ Compatible with: MQX, Linux, Wind River, Green Hills

### Environmental (MIL-STD-810G) / EMI (MIL-STD-461E)

- ▶ Temperature: Operating: -40°C to +70°C
- ▶ Cooling: Passive Conductive (no moving parts)
- ▶ Vibration: Random, 11.5g's RMS from 20Hz to 2000Hz
- ▶ Altitude: 50,000 ft
- ▶ Shock: 20 g's, half sine, 11 milliseconds
- ▶ Humidity: Up to 95% @ 40°C (all boards are conformal coated)
- ▶ EMI/RFI: CE102, RE102, CS101, CS114, CS115 and RS103

### Physical





- ▶ Size: 5.00" W x 3.50" T x 7.25" D
- ▶ Weight: 6 pounds
- ▶ Connectors: 44 and 62 pin D-Sub connectors, RJ45 connector, Compact Flash Interface
- ▶ Finish: Powder Coat
- ▶ Installation: Flange Mount Base Plate

### Power Requirements

- ▶ DC Power: 22 to 32VDC (28VDC Nominal)
- ▶ Consumption: 20 Watts max (standard unit)
- ▶ Protection: Surge, Reverse, and Over Voltage protected

### Additional Options

- ▶ I/O Expansion Module with additional Input and Output Signal Capability
- ▶ Inertial Navigation Module that includes a MEMS IMU and GPS Module

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# MULTI-SERVICE DATA LINK TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ Modular Design
- ▶ Up to 99 Available Frequency Channels in the range of 359.5 MHz to 375 MHz
- ▶ GMSK Modulation
- ▶ Up to 35 watts RF Output Power
- ▶ 3 antenna ports
- ▶ Ruggedized Aluminum Chassis

### Applications

- ▶ Autopilot Interface
- ▶ Command and Telemetry

The Multi-Service Data Link (MSDL) transponder is a command receiver, digital command decoder, digital telemetry encoder, telemetry transmitter, and target interface enclosed in a single lightweight package. The transponder receives commands transmitted by the ground control station and interfaces with the vehicle management computer or autopilot.

Uplink UHF command messages from the ground control station are received by the transponder in the frequency band of 359.5 MHz to 375 MHz. The RF data is converted to a serial data stream that is digitally transmitted to the vehicle autopilot for processing.

The autopilot can then send a serial data stream back to the transponder where the telemetry downlink is then transmitted down to the ground control station. The MSDL has three antenna ports to support multiple antenna inputs via the vehicle RF switch. Multiple antenna inputs can be toggled through for the strongest signal.

MSDL has also been qualified per MIL-STD-461 (EMI), MIL-STD-810 (Environmental), MIL-HDBK-781 (Reliability) making it one of the most capable devices in the industry.



# MULTI-SERVICE DATA LINK TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

▶ Temperature:	Operating: -40°C to +71°C
▶ Vibration:	Random, 20 to 2000 Hz, 11.514 G 48 minutes per orthogonal axis
▶ Altitude:	50,000 ft
▶ Shock:	Sawtooth, 20 G for 11ms, 18 shocks total
▶ Humidity:	Saturation @ 40°C
▶ EMI/RFI:	Certified to MIL-STD-461F

### Power Requirements

▶ DC Power:	22 VDC to 32 VDC (28 VDC Nominal)
▶ Reverse Polarity:	Yes
▶ Power Consumption:	55 Watts maximum (1.8 amps @ 28 VDC)

### Physical

▶ Size:	7.50" W x 3.50" H x 7.00" D
▶ Weight:	<8 pounds
▶ Connectors:	Circular, N-Type Female, SMA Female
▶ Finish:	Black Surf Paint
▶ Installation:	Flange Mount Base Plate

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# KRATOS-SERVICE DATA LINK TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ Modular Design
- ▶ Up to 99 Available Frequency Channels in the range of 359.5 MHz to 375 MHz
- ▶ GMSK Modulation
- ▶ 25 watts RF Output Power
- ▶ 3 antenna ports
- ▶ Ruggedized Aluminum Chassis

### Applications

- ▶ Autopilot Interface
- ▶ Command and Telemetry

The Kratos-Service Data Link (KSDL) transponder is a command receiver, digital command decoder, digital telemetry encoder, telemetry transmitter, and target interface enclosed in a single lightweight package. The transponder receives commands transmitted by the ground control station and interfaces with the vehicle management computer or autopilot.

Uplink UHF command messages from the ground control station are received by the transponder in the frequency band of 359.5 MHz to 375 MHz. The RF data is converted to a serial data stream that is digitally transmitted to the vehicle autopilot for processing.

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KSDL has also been qualified per MIL-STD-461 (EMI), MIL-STD-810 (Environmental), MIL-HDBK-781 (Reliability) making it one of the most capable devices in the industry.



# KRATOS-SERVICE DATA LINK TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### General

- ▶ Multiple Target Interfaces Available (RS-232, RS-422, CAN)
- ▶ Switch to Backup Frequency (channel)

### Environmental

- ▶ Temperature: Operating: -40°C to +71°C
- ▶ Vibration: Random, 20 to 2000 Hz, 11.514 G 48 minutes per orthogonal axis
- ▶ Altitude: 50,000 ft
- ▶ Shock: Sawtooth, 20 G for 11ms, 18 shocks total
- ▶ Humidity: Saturation @ 40°C
- ▶ EMI/RFI: Qualified to MIL-STD-461
- ▶ Environmental: Qualified to MIL-STD-810
- ▶ Reliability: Qualified to MIL-HDBK-781

### Encryption

- ▶ AES 256-bit Cipher-Block Chaining
- ▶ FIPS Compliant (not certified)
- ▶ Performs a power-on-self test which is required for FIPS
- ▶ Utilizing Wolfcrypt source to perform encryption / decryption
- ▶ 256-bit key is stored in flash

### Power Requirements

- ▶ DC Power: 22 VDC to 32 VDC (28 VDC Nominal)
- ▶ Reverse Polarity: Yes
- ▶ Power Consumption: 55 Watts maximum (1.8 amps @ 28 VDC)

### Physical

- ▶ Size: 7.50" W x 3.50" H x 7.00" D
- ▶ Weight: <8 pounds
- ▶ Connectors: Circular, N-Type Female, SMA Female
- ▶ Finish: Black Surf Paint
- ▶ Installation: Flange Mount Base Plate

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# KRATOS-SERVICE DATA LINK TRANSPONDER

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- ▶ Humidity: Saturation @ 40°C
- ▶ EMI/RFI: Qualified to MIL-STD-461
- ▶ Environmental: Qualified to MIL-STD-810
- ▶ Reliability: Qualified to MIL-HDBK-781

### Encryption

- ▶ AES 256-bit Cipher-Block Chaining
- ▶ FIPS Compliant (not certified)
- ▶ Performs a power-on-self test which is required for FIPS
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### Power Requirements

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### Physical

- ▶ Size: 7.50" W x 3.50" H x 7.00" D
- ▶ Weight: <8 pounds
- ▶ Connectors: Circular, N-Type Female, SMA Female
- ▶ Finish: Black Surf Paint
- ▶ Installation: Flange Mount Base Plate

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# COMMON AVIONICS PACKAGE NODE

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ Modular Design
- ▶ Built-in Autopilot/INS, IMU, GPS and Datalink processor, and UHF Radio
- ▶ 16 Available Frequency Channels in the range of 380 MHz to 400 MHz
- ▶ GMSK Modulation
- ▶ 4 Watt RF Output Power
- ▶ Includes Analog and Discrete I/O
- ▶ 3 CAN Bus Interface Ports
- ▶ Meets CDA 101 Specification

The Integrated Avionics Package (IAP) Common Avionics Package (CAP) Node is a high integration autopilot.

The CAP Node, when used in conjunction with the AFT and Forward (FWD) nodes, supplies the required signals to enable positive flight control and ancillary systems and payload control of the MQM-107 Aerial Target Vehicle. It incorporates a UHF datalink, GPS receiver, tactical grade Inertial Measurement Unit (IMU), and high performance processing electronics in a single high integration chassis. The CAP Node replaces the functions of the Digital Autopilot (DAP), Vertical Gyro, Yaw Rate Gyro, Pendulum, and Signal

Processor Vehicle Interface (SPVI) as well as the SPVI functions that process the command and control data link for target control.

The CAP Node Utilizes a Controller Area Network (CAN) Bus for data communications within the target between multiple components and subsystems. This interface meets the Common Digital Architecture (CDA) 101 series of specifications.

### Applications

- ▶ Vehicle Control System
- ▶ Autopilot
- ▶ Command and Telemetry
- ▶ Vehicle Payload Interface
- ▶ Remote Data Terminal

# COMMON AVIONICS PACKAGE NODE

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

▶ Temperature:	Operating: -40°C to +71°C, Non-Operating: -40°C to +85°C
▶ Cooling:	Passive Conductive (no moving parts)
▶ Vibration:	Random, 0.04 G2/Hz 20 – 20,000 Hz, 6 dB/Hz per orthogonal axis
▶ Altitude:	Sea level to 55,000 ft
▶ Shock:	15 G for 11ms, 18 shocks total
▶ Acceleration:	7.5 G constant in any axis
▶ Humidity:	Up to 100% (all boards are conformal coated)
▶ MTBF:	> 1000 Hrs
▶ MTBCF:	> 1500 Hrs

### Power Requirements

▶ DC Power:	22 VDC to 32 VDC (28 VDC Nominal)
▶ Protection:	Surge, Reverse, and Over Voltage protected
▶ Power Consumption:	100 Watts maximum

### Physical

▶ Size:	6.60" W x 5.25" T x 12.31" D
▶ Weight:	6 pounds
▶ Connectors:	MIL-C38999
▶ Finish:	Black Paint
▶ Installation:	Flange Mount Base Plate

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# IAP FORWARD NODE

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Provides +28VDC to main vehicle power bus
- ▶ Provides +28VDC and  $\pm 15$ VDC to on-board payloads
- ▶ Multiple CAN bus interface ports
- ▶ Meets CDA 101 Series Specification
- ▶ Supports Digital and Analog Payload
- ▶ Control and Telemetry Interfaces
- ▶ Interfaces with vehicle Power Conditioning Unit, Radar Altimeter and Air Speed Sensor

The Forward (FWD) Node is a general purpose Input/Output (I/O) node for interface and control of legacy target vehicle positive flight control, ancillary subsystems and payload control of the MQM-107E Aerial Target Vehicle.

The FWD Node replaces the functions of the Command Power Distribution Unit and the Payload Power Distribution Unit. This node provides the power source for the MQM-107E main +28 VDC target bus. The IAP FWD Node replaces the Signal Processor Vehicle Interface (SPVI) functions that process commands and telemetry for target control and payload functions located in the forward section of the target. The FWD

Node Utilizes a Controller Area Network (CAN) Bus for data communications within the target between multiple components and subsystems. This interface meets the Common Digital Architecture (CDA) 101 series of specifications.

### Applications

- ▶ Vehicle Control System
- ▶ Payload Interface
- ▶ Power Distribution

### Environmental

- ▶ Temperature, Operating: -40°C to +71°C
- ▶ Temperature, Storage: -40°C to +85°C
- ▶ Random Vibration: Operating, 0.4 G2/Hz 20 Hz - 2000Hz 6 dB/Hz
- ▶ Altitude: Sea level to 55,000 feet
- ▶ Acceleration: 7.5G constant in any axis
- ▶ Shock: 15G, 11 millisecond duration
- ▶ Humidity: 100%

### Electrical

- ▶ Analog Inputs: +/- 10VDC. 0-5VDC at 12 bit resolution
- ▶ Analog Outputs: +/- 10VDC, 0-5VDC at 12 bits resolution, maximum drive capacity 10mA
- ▶ Discrete Inputs: Diode protection, 0.8 VDC inactive, 2 to 35 VDC active
- ▶ Discrete Outputs: + 28 VDC/open output, 2 amp to resistive load, 0.5 amp to inductive load  
Short circuit protection without damage  
Open = >10 Megaohms impedance to ground, Minimum load = 200 mA
- ▶ CAN Bus: Adheres to CDA 101 Specifications

### Power Requirements

- ▶ Input Voltage: 22 VDC to 32 VDC (+28 VDC nominal)
- ▶ Protection: Reverse Polarity Protected
- ▶ Power Conditioning Unit (PCU): Rectifies and filters Target Alternator AC, 8 amps maximum total  
Distributes +28 VDC to Target Power Bus for Target elements, Aft Node and CAP node  
Provides +/- 15 VDC ( +/- 1%) 400 mA Internal, +/- 100 mA External  
Provides + 5 VDC( +/- 1%) 500 mA Internal
- ▶ Power Consumption: 25 Watts maximum

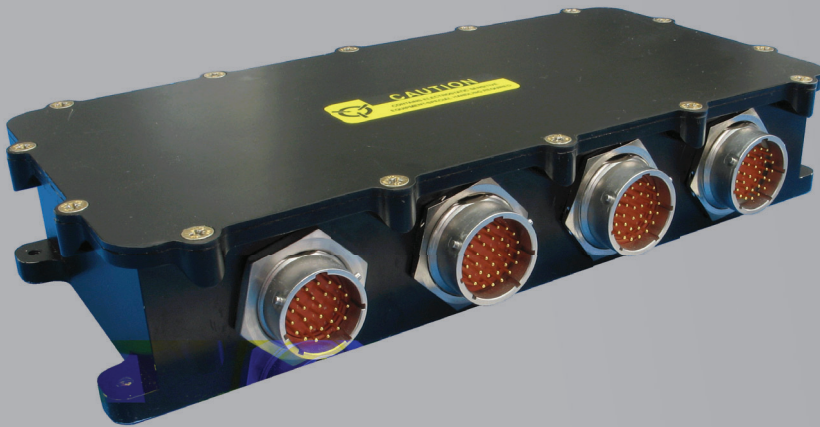
### Physical

- ▶ Dimensions: 8.4" L x 4.8" W x 4.5" H
- ▶ Weight: Approximately 4 pounds



# IAP AFT NODE

## DATA SHEET & TECHNICAL SPECIFICATIONS



The AFT Node is a general purpose Input/Output (I/O) node for interface and control of legacy target vehicle positive flight control, ancillary subsystems and payload control of the MQM-107E Aerial Target Vehicle.

The AFT Node replaces the functions of the Electro-Explosive Device (EED) Controller and the Engine Fuel Control Module. This node provides the power source for the MQM-107E main +28 Voltage Direct Current (VDC) target bus. The AFT Node replaces the Signal Processor Vehicle Interface (SPVI) functions that process commands and telemetry for target control and payload

functions located in the aft section of the target.

The AFT Node Utilizes a Controller Area Network (CAN) Bus for data communications within the target between multiple components and subsystems. This interface meets the Common Digital Architecture (CDA) 101 series of specifications.

### Electrical

- ▶ Analog Inputs: +/- 10 VDC. 0–10 VDC, 0–5 VDC at 12 bit resolution Load Resistance Conversion 15 ohms to 95 ohms, 12 bits, 10 mA source
- ▶ Analog Outputs: +/- 10 VDC, 0-5 VDC at 12 bits resolution, maximum drive capacity 10 mA
- ▶ Discrete Inputs: Diode protection, 0.8 VDC inactive, 2 VDC to 35 VDC active
- ▶ Discrete Outputs: 28 VDC/open output, 2 or 4 amp to resistive load, 0.5 amp to inductive load  
Short circuit protection without damage  
Open = >10 Megaohms impedance to ground  
12 VDC/ground output trigger voltage  
12 VDC/open, source 50 mA  
DPDT Relay 5 amp, 28 VDC 750 mA Resistive, 200 mA Inductive  
Adheres to CDA 101 Specifications
- ▶ CAN Bus:

### Environmental

- ▶ Temperature, Operating: -40°C to +71°C
- ▶ Temperature, Storage: -40°C to +85°C
- ▶ Random Vibration: Operating, 0.4G2/Hz 20 Hz – 2000 Hz 6 dB/Hz
- ▶ Altitude: Sea level to 55,000 feet
- ▶ Acceleration: 7.5 G constant in any axis
- ▶ Shock: 15G, 11 millisecond duration
- ▶ Humidity: 100%

### Power Requirements

- ▶ Input Voltage: 22 to 32 VDC, Reverse Polarity Protected, + 12 VDC Recovery Battery
- ▶ Power Conditioning Unit (PCU): Provides +/- 15 VDC (+/- 1%), + 5 VDC at 12 bit resolution
- ▶ Power Consumption: 25 Watts maximum

### Physical

- ▶ Dimensions: 5.5" W x 10.8" L x 2.0" H
- ▶ Weight: Approximately 3 pounds

# MODEL 290-3 UHF DATA LINK TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ Modular Design
- ▶ 16 Available Frequency Channels in the range of 358 MHz to 380 MHz
- ▶ GMSK Modulation
- ▶ Greater than 5W RF Output Power
- ▶ 3 antenna ports
- ▶ Ruggedized Aluminum Chassis

The Model 290 UHF datalink transponder is a command receiver, digital command decoder, digital telemetry encoder, telemetry transmitter, and target interface enclosed in a single lightweight package. The transponder receives commands transmitted by the ground control station and interfaces with the vehicle management computer or autopilot.

Uplink UHF command messages from the ground control station are received by the transponder in the frequency band of 358 MHz to 380 MHz. The RF data is converted to a serial data stream that is digitally

transmitted to the vehicle autopilot for processing. The autopilot can then send a serial data stream back to the transponder where the telemetry downlink is then transmitted down to the ground control station. It also has three antenna ports to support multiple antenna inputs via the vehicle RF switch. Multiple antenna inputs can be toggled through for the strongest signal.

The Model 290 has been qualified per MIL-STD-810 (Environmental) making it one of the most capable devices in the industry.



# MODEL 290-3 UHF DATA LINK TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

▶ Temperature:	Operating: -40° C to +71° C
▶ Vibration:	Random, 15 to 2000 Hz, 9.3 G 30 minutes per orthogonal axis
▶ Altitude:	50,000 ft
▶ Shock:	Sawtooth, 20 G for 11ms, 18 shocks total
▶ Humidity:	Up to 95% @ 40° C (all boards are conformal coated)

### Power Requirements

▶ DC Power:	22 VDC to 32 VDC (28 VDC Nominal)
▶ Reverse Polarity:	Yes
▶ Power Consumption:	80 Watts maximum (2.9 amps @ 28 VDC)

### Physical

▶ Size:	5.00" W x 2.95" T x 6.00" D
▶ Weight:	6 pounds
▶ Connectors:	Circular, SMA Female x3
▶ Finish:	Black Paint
▶ Installation:	Flange Mount Base Plate

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# MODEL 280-1 MONTAGE TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



The Model 280-1 MONTAGE Transponder is a command receiver, digital command decoder, digital telemetry encoder, telemetry transmitter, and target interface enclosed in a single lightweight package.

The transponder receives commands transmitted by the controlling station or the target drone set. Implementation of commands occurs only after verification of the address, parity, and message integrity checks. After verifying the address in the command uplink message, the transponder initiates the transmission of a telemetry reply. The self contained GPS receiver provides excellent position accuracy during all vehicle maneuvers.

The Model 280-1 allows multiple targets to be flown on the same frequency and can be used as a target relay. This transponder is currently used on the U.S. Navy's family of target vehicles including the BQM-34 and BQM-74 aerial targets, MST-35 and HSMST sea surface targets, and international vehicles like the Chukar III.

### Applications

- ▶ Autopilot Interface
- ▶ Command and Telemetry
- ▶ Vehicle Payload Interface

# MODEL 280-1 MONTAGE TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

▶ Temperature:	Operating: -40° C to +71° C
▶ Cooling:	Passive Conductive (no moving parts)
▶ Vibration:	Random, 15 to 2000 Hz, 9.3 G 30 minutes per orthogonal axis
▶ Altitude:	50,000 ft
▶ Shock:	Sawtooth, 20 G for 11ms, 18 shocks total
▶ Humidity:	Up to 95% @ 40° C (all boards are conformal coated)
▶ EMI/RFI:	Certified to MIL-STD-461D, Class A1

### Power Requirements

▶ DC Power:	22 VDC to 32 VDC (28 VDC Nominal)
▶ Reverse Polarity:	Series diode protection
▶ Power Consumption:	55 Watts maximum (1.8 amps @ 28 VDC)

### Physical

▶ Size:	10.0" W x 4.25" T x 8.50" D
▶ Weight:	7.8 pounds
▶ Connectors:	MIL-C38999
▶ Finish:	Black Paint
▶ Installation:	Flange Mount Base Plate

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# MODEL 99-8 USPVI

## DATA SHEET & TECHNICAL SPECIFICATIONS



The Model 99-8 Universal Signal Processor - Vehicle Interface (USPVI) provides the interface between a UHF Target Tracking Control Station and an on-board vehicle autopilot.

The Model 99-8 receives a command message from a ground control station, evaluates the message for proper addressing and error detection, then passes the validated commands to the vehicle autopilot. The Model 99-8 also responds to the ground control station with vehicle performance telemetry. The Model 99-8 is fully self contained including RF transceiver, high

performance GPS receiver, and processing electronics.

The Model 99-8 is currently used on the MQM-107 D/E sub and BQM-34 sub scale aerial targets. It can be adapted to other vehicles with customer provided interface definitions.

### Environmental

▶ Temperature:	Operating: -40° C to +71° C
▶ Cooling:	Passive Conductive (no moving parts)
▶ Vibration:	Random, 15 to 2000 Hz, 9.3 G 30 minutes per orthogonal axis
▶ Altitude:	50,000 ft
▶ Shock:	Sawtooth, 20 G for 11ms, 18 shocks total
▶ Humidity:	Up to 95% @ 40° C (all boards are conformal coated)

### Power Requirements

▶ DC Power:	22 VDC to 32 VDC (28 VDC Nominal)
▶ Reverse Polarity:	Series diode protection
▶ Power Consumption:	55 Watts maximum (1.8 amps @ 28 VDC)

### Physical

▶ Size:	6.50" W x 4.25" T x 11.5" D
▶ Weight:	8 pounds
▶ Connectors:	D-Subminiature
▶ Finish:	Black Paint
▶ Installation:	Flange Mount Base Plate

# INTEGRATED FLIGHT CONTROLLER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ High performance Power PC based single processor design
- ▶ Capable of processing up to 64 uplink discrete and 20 proportional commands
- ▶ Capable of providing up to 32 discrete & 32 proportional telemetry channels
- ▶ Communication with Control Datalink Transponder via RS-485
- ▶ RS-422 interface to APS, Umbilical, ECU, IFF, & ALE 47 Sequencers

The Integrated Flight Controller (IFC)/Message Processor contains the datalink encode/decode and autopilot functions. These two functions are performed by a single high performance PowerPC processor. The IFC provides autonomous control functions to assure safe operation of the aircraft in the event of command datalink loss. This includes recovery to stable flight conditions while performing commanded maneuvers and control for escape maneuvers of individual drones under all flight conditions.

The IFC communicates with the Control Datalink Transponder via EIA RS-485 serial interfaces. The transponder receives uplink commands from the

ground control station (GCS) and sends them to the IFC, which then processes and outputs control signals to the UAV. The IFC also processes and sends the UAV telemetry (performance) information to the Control Datalink Transponder, which then transmits the information to the GCS.

The IFC/Message Processor communicates with the attitude sensor package (ASP) via EIA RS-485 at a 100 Hz rate. The IFC gathers Heading, Pitch Angle, Roll Angle, Pitch rate, Roll rate, and Yaw rate from the ASP. The IFC/Message Processor communicates to Ground Support Equipment (GSE) via an EIA RS-422 serial umbilical interface. This interface is used to load initialization



# INTEGRATED FLIGHT CONTROLLER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Applications

- ▶ Vehicle Control System
- ▶ Autopilot
- ▶ Command and Telemetry
- ▶ Vehicle Payload Interface

### Environmental

- ▶ Temperature: Operating: -40° C to +71° C Storage: -54° C to +125° C
- ▶ Cooling: Passive Conductive (no moving parts)
- ▶ Vibration: Operating, Random, 0.15g<sup>2</sup>/Hz, 20Hz to 100Hz  
Operating, Random, 0.04g<sup>2</sup>/Hz 100Hz to 2000 Hz for 5 minutes per orthogonal axis (8.8 Grms)
- ▶ Altitude: Sea Level to 50,000 ft
- ▶ Shock: Half Sine, 20 G's peak, 11 ms, 3 axes
- ▶ Humidity: Up to 95% @ 40° C (all boards are conformal coated)
- ▶ Acceleration: 10 G's, 3 axes, tested at drone level

### Power Requirements

- ▶ DC Power: 22 to 32VDC (28VDC Nominal)
- ▶ Input Current: 0.5 Amps maximum
- ▶ Protection: Reverse polarity protected

### Physical

- ▶ Size: 9.30" W x 4.25" T x 2.51" D
- ▶ Weight: 4 pounds
- ▶ Installation: Flange Mount Base Plate

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# POWER MANAGEMENT UNIT

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Field Proven Hardware
- ▶ Operates with 28 VDC input from Power Conditioning Unit, Umbilical, & Battery
- ▶ Provides 28 VDC battery backed power to the avionic components
- ▶ Provides switched power to servos, fuel system, & payloads

### Applications

- ▶ Vehicle Power Management System

The Power Management Unit (PMU) is suitable for use on Aerial Targets and UAVs to distribute switched and un-switched power (+28 VDC & Ground) to the various avionic and payload components. The PMU utilizes the latest in modern devices and circuitry to provide a reliable product with an extremely long operating life.

# POWER MANAGEMENT UNIT

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Characteristics

- ▶ Power Consumption: <1.5 amps @ 28 VDC
- ▶ Temperature: Operating: -4° C to +71° C Storage: -54° C to +125° C
- ▶ Cooling: Passive Conductive (no moving parts)
- ▶ Vibration: Operating, Random, 10 GRMS
- ▶ Shock: Half Sine, 20 G's peak, 11 ms, 3 axes
- ▶ Altitude: Up to 50,000 feet

### Capabilities

- ▶ Operates with 28 VDC input from:
  - Power Conditioning Unit
  - Umbilical
  - Battery
- ▶ Provides 28 VDC battery backed power to the avionic components of the air vehicle including but not limited to:
  - Fuel control system including Main Flow Meter and Linearizer - Transfer Flow Meter and Linearizer
  - Fuel Quality Sensor
  - Fuel Boost Pump
  - APS, Radar Altimeter, Command & Control Transponder, Engine Control Unit, Antenna Switch, EED, GPS antenna, IFC, Pitot Heaters and IFF Transponder
- ▶ Provides switched power to:
  - Servo actuators including Rudder, Stabilator, Aileron, & Speed Brakes
  - Fuel Pumps, Air Data Module, Strobe Light, Engine Igniter, & Scoring
  - Payload components including APC-4 (up to 10 amps @ 28 VDC) for future payload use
  - PMU provides spare switched power (5 amp, 12 amp, & 25 amp) for future payload use
  - Accepts Discrete commands from the Integrated Flight Controller (IFC) to provide switched power to the onboard components

### Physical

- ▶ Size: 9.75" W x 4.82" T x 6.00" D
- ▶ Weight: 11 pounds
- ▶ Installation: Flange Mount Base Plate

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# ELECTRO-EXPLOSIVE DEVICE CONTROLLER

## DATA SHEET & TECHNICAL SPECIFICATIONS



The Electro-Explosive Device (EED) Controller is suitable for use on Aerial Targets and UAV's to enable the orderly deployment of the parachutes in order to safely recover the vehicle. The unit provides timing circuits for recovery system arming, the main parachute deployment delay, and automatic and commanded recovery sequences. It controls power to the explosive cartridges used to deploy and release the parachute and tow target systems and deactivation of power to the avionics suite. The EED utilizes the latest modern devices and circuitry to provide reliable a product with an extremely long operating life.

# ELECTRO-EXPLOSIVE DEVICE CONTROLLER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Capabilities

- ▶ Recovery Initiation:
  - Emergency Parachute Release: Manual activation of the recovery and tail cone release sequence
  - Command Signal Loss: Automatic recovery sequence initiation upon Loss of Command (IFC OK)
  - Low Voltage: Automatic recovery sequence initiation upon detection of a low voltage of 22 +/- 1 VDC
  - Drogue Deploy: Automatic recovery sequence initiation upon Loss of regulated 15 VDC power or 28 VDC Drogue Deploy
- ▶ Recovery Arm (Telemetry)
  - The downlink telemetry data for the recovery arm: 3.5 +/- VDC
- ▶ Provides switched power to:
  - Orderly activation of the Squibs, Bag Line Cutters, and Chute Release Circuit armaments
  - Organized chute release switch activation, chute release Squib firing, and final deactivation of the power to the avionics components of the vehicle

### Characteristics

- |                        |  |
|------------------------|--|
| ▶ Input Voltage Range: | 24 VDC to 32 VDC (28 VDC Nominal) and 12 VDC +/- 1 VDC |
| ▶ Power Consumption:   | <1 amp @ 28 VDC  |
| ▶ Temperature:         | Operating: -40° C to +71° C Storage: -54° C to +125° C |
| ▶ Cooling:             | Passive Conductive (no moving parts)                   |
| ▶ Vibration:           | Operating, Random, 10 GRMS                             |
| ▶ Shock:               | Half Sine, 20 G's peak, 11 ms, 3 axes                  |
| ▶ Altitude:            | Up to 50,000 feet                                      |

### Physical

- |                 |                              |
|-----------------|------------------------------|
| ▶ Size:         | 9.30" W x 4.125" T x 2.51" D |
| ▶ Weight:       | 3.5 pounds                   |
| ▶ Installation: | Flange Mount Base Plate      |

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# GRDCS/DFCS RF TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Operates with single power supply
- ▶ Designed for extended temperature range  
Power consumption < 100 Watts
- ▶ Bi-phase modulated 915 MHz Transmit/Receive
- ▶ Direct Sequence Spread Spectrum (DSSS)
- ▶ Peak RF Output Power of  $\geq 200$  Watts
- ▶ Communication to IFC via RS-422 Channel

The Gulf Range Drone Control System (GRDCS) / Drone Formation Control System (DFCS) RF Transponder is an L-Band transmitter/receiver designed to function as a Distance Measuring Equipment (DME) to support GRDCS/DFCS navigation requirements.

The use of Time-Of-Arrival (TOA) measurements to compute distances requires the transponder to reply to uplinked command messages from ground control stations with precisely timed downlink telemetry messages. The update rate for the datalink messages is nominally 10 messages/second. The GRDCS/DFCS RF

Transponder is capable of interrogation rates from 20 Hz (50 milliseconds) to 2 Hz (500 milliseconds).

The GRDCS/DFCS RF Transponder supports datalink message communication by decoding and transferring uplink command data to the Integrated Flight Controller (IFC) system, and by encoding downlink telemetry data representing aircraft flight control mode status and sensor readings from the IFC. The GRDCS/DFCS RF Transponder communicates with the IFC via EIA RS-422

# GRDCS/DFCS RF TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

- ▶ Random Vibration: Operating: 0.015g<sup>2</sup>/Hz 20 to 100 Hz  
0.04g<sup>2</sup>/Hz 100 to 2000 Hz for 5 minutes in each orthogonal direction (8.8 Grms)
- ▶ Temperature: Operating: -40° C to +71° C Storage: -54° C to +125° C
- ▶ Cooling: Passive Conductive (no moving parts)
- ▶ Shock: Half Sine, 20 G's peak, 11 ms, 3 axes
- ▶ Altitude: Sea level up to 50,000 feet
- ▶ Humidity: To 95% at any temperature forming frost or condensation

### Physical

- ▶ Size: 9.75" W x 7.42" T x 4.00" D
- ▶ Weight: less than 13 pounds  
(excluding the mounting brackets)
- ▶ Connectors: J1 = TNC; J2 = MS27474Y12B35P

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# MODEL MD500L IFF TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Operates in 1, 2, 3/A, or C Modes
- ▶ 400 Watt Peak Power Output (typ.)
- ▶ 100% Solid State for High Reliability
- ▶ IFF/TACAN Blanking & Suppression
- ▶ Interrogation side lobe suppression for use in busy air corridors
- ▶ Front panel and remote reply code selection
- ▶ Weighs less than 4 pounds
- ▶ Built-in duplexer for single antenna operation

### Applications

- ▶ Radar Identification
- ▶ Vehicle Tracking

The Model MD500L IFF Transponder is an L-Band augmentation device ideally suited for use in aerial target drones, unmanned vehicles, and cruise missiles as a radar enhancement device to provide automatic radar identification in response to interrogations from L-Band IFF and Air Traffic Control (ATC) radars. It also supports Mode C (altitude reporting) operation.

It features a modern compact design with less than 90 cubic inches (1475 cubic centimeters) volume and weighs 3.02 pounds (~1.4 kilograms) which is 35% smaller than previous versions. The transponder

incorporates the latest in solid state electronics design and features a 400 watts nominal peak power output. It also features IFF/TACAN blanking and suppression, reverse polarity power lead protection, and has a built in duplexer for single antenna operation. Also, the transponder was designed with both front panel and remote reply code selection for greater convenience and ease of use. The L-Band IFF meets the requirements of MIL-STD-810 and is designed to operate over the temperature range of -40° C to +70° C.

# MODEL MD500L IFF TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

- ▶ Temp, Operating: -40 ° C
- ▶ Temp, Storage: -80 ° F (-62° C) to 185 ° F (+85 ° C)
- ▶ Altitude: Sea Level to 100,000 feet
- ▶ Vibration: Random, 9.3 Grms max from 10 to 2000 Hz
- ▶ Acceleration: 20 G in each of 6 direction for 1 min per axis while operating
- ▶ Shock: 20 G (11 ms), 3 shocks each axis

### Electrical

- ▶ Frequency: 1030 / 1090 MHz
- ▶ Impedance, Input/Output: 50 ohms nominal
- ▶ Protection: Built-in series diode protection against from DC input power reversal
- Input Voltage: 24 to 32 VDC, common GND
- Quiescent Current: 0.4 Amp nominal
- ▶ Input Current: 1.1 Amp typical @ 2500 prf
- ▶ Input Power: 40 Watts max, all conditions
- ▶ Suppression Modes:
  - (1) Decoding suppression during transmission
  - (2) Interrogation Side Lobe Suppression (ISLS)
  - (3) Over-interrogation reply limiting
  - (4) Suppression from an external IFF or TACAN system
  - (5) Provides suppression pulse to an IFF or TACAN system

### Physical

- ▶ Size: 5.00" W x 2.52" T x 5.13" D (12.7 x 6.40 x 13.03 cm)
- ▶ Weight: > 4 pounds
- ▶ Antenna Connector: TNC Female
- ▶ Pwr/Remote Connector: MS27474E14B35P
- ▶ IFF/TACAN Connector: BNC female
- ▶ Installation: Flange Mount Base Plate

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# MODEL 25X-X C-BAND RADAR TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Small footprint ideal for missiles and smaller unmanned vehicles.
- ▶ Enhanced Pulse parameter capabilities
- ▶ 30% smaller than comparable units
- ▶ Minimum peak power outputs of 20 Watts and 50 Watts
- ▶ Infinite Shelf Life
- ▶ Reliable Solid State Transmitter using the latest GaAs technology

### Applications

- ▶ Vehicle Tracking

The C-Band Radar Tracking Transponders are compact precision augmentation systems for enhancing the tracking capability of C-Band Radars. It is particularly suitable for small missiles, targets, and aerial vehicles where weight and space are of a premium.

These units offer an industry first, providing a reliable solid state transmitter and using the latest in GaAs technology. The result is low modulation pulse voltages, increased reliability, infinite shelf-life, and no maintenance requirements. The transmit frequency, receive frequency, and all pulse code parameters are

externally programmable using a standard PC – another industry first. This series of transponders provides a substantial savings of time and money for testing, systems maintenance, and operational parameter changes. Minimum peak power outputs of 20, and 50 watts are available.

Our C-Band Transponders provide enhanced pulse parameter capabilities incorporating the latest range requirements in an effort to expand the operational capability of existing C-Band radar systems.

# MODEL 25X-X C-BAND RADAR TRANSPONDER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Environmental

‣ Temp, Operating:	-40°C to +71°C; -54°C to +85°C
‣ Temp, Storage:	-62°C to +95°C
‣ Vibration:	MIL-STD-810C
‣ Altitude:	85,000 feet
‣ Acceleration:	50 G's all axis 1 minute
‣ Shock:	100 G's all axis 6 msec, 120 G's all axis 4 msec
‣ Humidity:	100%
‣ EMI/RFI:	MIL-STD-461C, Class A1 equipment, IAW MIL-STD-462

### Electrical

‣ DC Power:	22 to 34 VDC (28 VDC nominal)
‣ Reverse Polarity:	Series diode protection
‣ Impedance:	50 ohms
‣ Power Consumption:	9 Watts maximum (320 mA @ 28 VDC)

### Physical

‣ Size:	3.50" W x 1.40" T x 3.95" D (8.9 x 3.6 x 10 centimeters)
‣ Weight:	18 ounces (510 grams)
‣ Volume:	18 cubic inches (295 cubic cm)
‣ Power Connector:	MS2746Y08D35P

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# C-BAND RADAR TRANSPONDER PROGRAMMING SET

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ USB Computer Interface
- ▶ Windows XP and later operating system compatibility
- ▶ Multiple Programming options.

### Applications

- ▶ C-Band Transponder/Beacon Programming
- ▶ Mini-Tester Programming

The C-Band Transponder Programming Set provides the user with the capability to field program the operational parameters of our Models 252 and 253 C-Band Radar Tracking Transponders. When connected to a user supplied laptop computer, and a compatible transponder, the programmer enables the user to set the following operational parameters:

- Transmit Frequency
- Receive Frequency
- Reply Delay
- Pulse Coding Type (Single or Double Pulse)
- Pulse Spacing
- Pulse Width

The programming set also enables field programming of the transmit frequency of our Models 38-2, 38-4, and 38-5 Mini-Testers. The programming set includes software, USB Interface Cable, Programming Cable, and AC Power Adapter.

# C-BAND RADAR TRANSPONDER PROGRAMMING SET

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Characteristics

- ▶ PC Interface: USB
- ▶ Compatible with: Transponders: Model 251-2, 252-2, 252-3, 253-3 | Test Sets: Model 38-2, 38-4, 38-5
- ▶ Operating System: Windows XP and later

### Electrical

- ▶ DC Power: 22 to 34 VDC
- ▶ Reverse Polarity: Series diode protection
- ▶ Power Consumption: 10 Watts maximum

### Environmental

- ▶ Temperature, Operating: 0°C to +40°C
- ▶ Temperature, Storage: -25°C to +65°C

### Physical

- ▶ Size: 5" W x 1.5" T x 2.0" D
- ▶ Weight: less than 18 ounces (510 grams)

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# AN/DSQ-50A MISS DISTANCE SCORING SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ 0 to 75 feet scoring range
- ▶ 1 foot scoring accuracy
- ▶ Multiple target application
- ▶ Environmentally qualified to MIL-STD-810
- ▶ EMI qualified to MIL-STD-461
- ▶ Sea Skimming or High Altitude

### Applications

- ▶ Vehicle Miss Distance Scoring

The AN/DSQ-50A Miss Distance Sensor is the airborne element of the AN/USQ-104 RF Scalar Scoring System. Tracking data from the AN/DSQ-50A is transferred in real time to the Scoring Ground Control System, where it is captured and processed to produce scores for the user.

The AN/DSQ-50A was designed for the installation in all US Navy targets to acquire scoring information on passing projectiles and missiles. This unit is ideally suited for installation into subscale targets where available space and weight are a concern. It is a non-cooperative, scalar miss-distance indicator (MDI) system capable of providing near real-time, accurate miss-distance, time,

and closing velocity data for high altitude and low altitude intercept scenarios.

The AN/DSQ-50A operates against high performance missiles as well as ballistic projectiles as small as 76 mm. It has the capability to operate in live-fire training mission environments containing up to six target vehicles, with each vehicle equipped with a MDI system. Each MDI operates without concern of interference from other MDIs. It consists of two functional elements; and MDI radar sensor to acquire the scoring information and a telemetry transmitter downlink to send the scoring information to a ground set.

# AN/DSQ-50A MISS DISTANCE SCORING SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Characteristics

- ▶ Type: RF, Non-cooperative, Scalar
- ▶ Scoring: Missiles and Projectiles (76 mm and larger)
- ▶ Scoring Rate: 90 projectiles per minute
- ▶ Scoring Range: 0 to 75 feet (0 to 22.86 meters)
- ▶ Closing Velocity: 200 to 8,000 ft/sec (60.96 to 2438.4 m/sec)
- ▶ Accuracy Miss Distance: 1.0 ft (rms) for 0 to 75 ft scoring range
- ▶ Accuracy Velocity: 25 ft/sec (7.62 m/sec or 1% (rms))

### Power Requirements

- ▶ DC Power: 22 to 32 VDC (28 VDC Nominal)
- ▶ Consumption: 65 Watts max
- ▶ Protection: Reverse polarity protected

### Electrical

- ▶ Radar Transmitter
  - Frequency: 2433.077 – 2433.913 MHz (6 channels)
  - Power (peak pulse): 20 Watts maximum at antenna
  - Pulse Width: 220 ns nominal
  - PRF: 1 MHz nominal
- ▶ Telemetry
  - Format: NRZL
  - Bit Rate: 700 kb/s
  - Bandwidth: 1 MHz
  - Frequency (tunable): 1435.5 – 1535.5 MHz (L-Band) and 2200.5 – 2289.5 MHz (S-Band)
  - Power: 2 Watts minimum
- ▶ Number of Targets: 6 simultaneous max with 200 feet minimum separation

### Environmental

- ▶ Temperature, Operating: -40°F to +159°F (-40°C to +71°C)
- ▶ Temperature, Storage: -65°F to +203°F (-54°C to +95°C)
- ▶ Cooling: Passive Conductive (no moving parts)
- ▶ Vibration: MIL-STD-810G, Method 514.7, Equipment Category 12, Procedure I
- ▶ Temp/Humidity/Alt: MIL-STD-180G, Method 520.4, Procedure III
- ▶ Shock: MIL-STD-810G, Method 516.4, Procedure I
- ▶ Salt Fog: MIL-STD-180G, Method 509.6, Procedure I
- ▶ Acoustical Noise: MIL-STD-180G, Method 515.7, Procedure II
- ▶ Reliability: 500 hours Mean Time Between Failure

### Physical

- ▶ Size: 9.06" L x 6.33" W x 3.00" H  
(23.01 cm x 16.08 cm x 7.62 cm)
- ▶ Weight: 9 pounds
- ▶ Installation: Flange Mount Base Plate

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# SCORING GROUND CONTROL STATION

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ 0 to 75 feet scoring range
- ▶ 1 foot scoring accuracy
- ▶ Multiple target application
- ▶ EMI qualified to MIL-STD-461
- ▶ Sea Skimming or High Altitude

### Applications

- ▶ Vehicle Miss Distance Scoring

This easy-to-use Miss Distance Scoring System that provides high accuracy scoring with minimal training requirements. The system is a rugged complete scoring solution that is field proven and ideal for gunnery training and weapons assessment for surface and dynamic airborne targets. It is a highly portable system that can be easily set up and ready to support mission operations in less than 5 minutes.

Offering a complete turn-key scoring system that includes the miss distance scoring ground system and DSQ-50 scoring sensor. The scoring sensor transmits a Doppler radar signal and then detects the radar reflection from a projectile as it passes by. The radar

reflection data is then telemetered in real-time to the miss distance ground system which allows the scoring system operator to analyze the data and determine the miss distance score within seconds. This is a scalar system which enables the operator to determine how close the projectile actually came to the target.

This scoring system is a necessity for advanced training and weapon assessment. Scoring data is obtained by the system in seconds which provides for extremely efficient training and evaluation missions. As a training tool users will get immediate feedback of their firing performance as well as objective measurement weapon system operator skills.

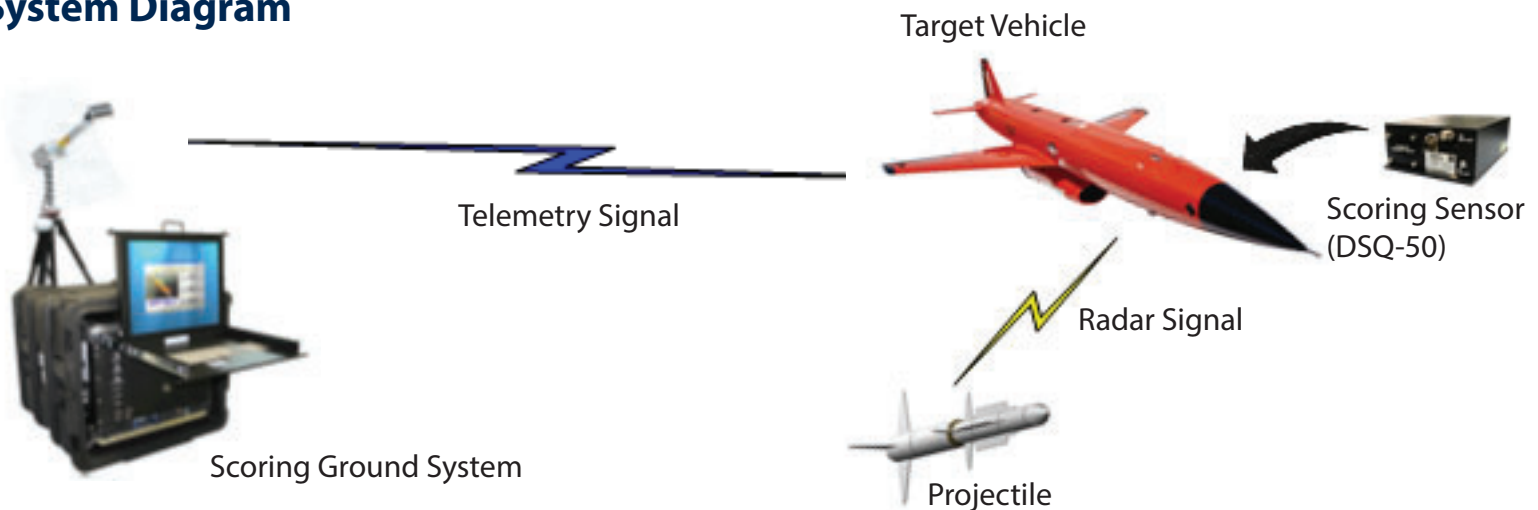
# SCORING GROUND CONTROL SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Characteristics

- ▶ Time to Display Score: Within 5 minutes of each scoring event
- ▶ Range: Line Of Sight (LOS) system to 5mi (8km) – dependent on altitude, obstacles, etc.
- ▶ Accuracy: +/- 1 ft RMS (.30m)
- ▶ Projectile Passage Range: 0 to 75 ft (0 to 23 m)
- ▶ Rate: Up to 90 projectiles per minute
- ▶ Minimum Projectile Size: From 50 Caliber and up (12.7mm and up)
- ▶ Closing Velocity: 60 m/s (135 mph) to 2500 m/s (5600 mph)
- ▶ Time of Miss Distance: +/- 0.5 msec
- ▶ Operator Displays: Miss Distance, Time of Miss Distance, Plot of Closing Velocity vs. Time
- ▶ Data Storage: All raw telemetry data and calculated parameters are stored for each scoring event
- ▶ Telemetry Frequency Range: 1429 MHz to 1545 MHz (L-Band) or 2185 MHz to 2485 MHz (S-Band)
- ▶ Telemetry Sensitivity: -85 dBm
- ▶ Telemetry Demodulation: PCM NRZ-L, Up to 7 Mbps
- ▶ Temperature: Operating: +5 deg C to +40 deg C
- ▶ Input Voltage: 115 VAC, Single Phase
- ▶ Power: 200 Watts
- ▶ Dimensions: 19" x 7" x 24.5"

### System Diagram



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# MODEL 41 C-BAND TEST SET

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Full Bench top testing or quick Go/No-Go testing options
- ▶ Automated and Manual Tests
- ▶ Radiate and Direct connect operation Interface
- ▶ Rugged and Portable design
- ▶ Easy to use and highly configurable to support multiple testing
- ▶ Stores all test data for future analysis and comparison
- ▶ Removable Hard Drive

The Model 41 test set is a stand-alone unit that performs automated and manual bench and go-no/go tests on compatible 5, 20, 50, and 400-Watt C-band Transponders. It is available in a rugged shock-mounted transit case for field or flight line use and can also be removed from the case and installed in an E.I.A. standard 19" equipment rack for lab use.

The Model 41 performs a full suite of transponder tests ideal for preflight equipment validation and verification. It can be configured for a variety of frequency and pulse parameters to verify Receiver Frequency, Receiver Sensitivity, Double Pulse Code Spacing, Transmitter Frequency, Transmitter Pulse Width, Transmitter Output

Power, and Relay Reply. The test set has an easy to use Windows 7 based software application with all parameters and test panels controlled via touch screen monitor. All test results are stored in a user defined directory and can be viewed either on the test set or copied to a external device via the front panel USB interface.

The Model 41 can be operated in either Direct Mode with a supplied RF cable connecting the transponder directly to the test set or in Radiate Mode with a supplied antenna to transmit and receive signals to and from the transponder. It can support radiated Radiate Mode tests at distances up to 50 feet.

# MODEL 41 C-BAND TEST SET

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Receiver

- ▶ Frequency: 5.4 GHz to 5.9 GHz
- ▶ Frequency Adjustment: 1.0 MHz steps
- ▶ RF Bandwidth: 5.35 GHz to 5.95 GHz
- ▶ Measurement Accuracy: +/- 2 MHz

### Environmental

- ▶ Temperature, Operating: -20°C to +65°C
- ▶ Temperature, Storage: -40°C to +70°C

### Power Requirements

- ▶ Input Voltage: 115 +/- 5 VAC, 60 Hz Single Phase

### Functional Tests

- ▶ Receiver Sensitivity
- ▶ Receiver Frequency
- ▶ Double Pulse Code Spacing
- ▶ Transmitter Frequency
- ▶ Transmitter Pulse Width
- ▶ Transmitter Output Power
- ▶ Reply Delay

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# MODEL 38-4 C-BAND MINITESTER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Small handheld device
- ▶ PC Programmable Transmit Frequency
- ▶ Includes Antenna, Rechargeable Battery, and Charger

### Applications

- ▶ "Go/No-Go" Test C-Band Transponders

The C-Band Mini-Tester (Model 38-4) is a handheld battery powered unit that provides go/no-go testing for the Micro Systems Models 251, 252, and 253 C-Band transponders and the C-Band transponders.

The Mini-Tester verifies proper transponder operation by interrogating a transponder installed in and powered by a platform. It is capable of testing compatible transponders at distances of up to 350 feet. Indicator lights verify the transmission of signals and the received reply.

The Mini-Tester is also available as part of a kit that includes the Mini-Tester, power supply, programming set, cables, and carry case.

# MODEL 38-4 C-BAND MINI TESTER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Receiver

- ▶ Frequency: 5.4 GHz to 5.9 GHz
- ▶ Frequency Adjustment: Manually tuned
- ▶ Transmitter Category: 5.4 to 5.9 GHz, programmed in 1 MHz steps

### Environmental

- ▶ Temperature, Operating: 0°C to +50°C
- ▶ Temperature, Storage: -20°C to +65°C

### Power Requirements

- ▶ Power Source: Internal rechargeable battery with separate plug-in charger
- ▶ Battery Life: 4 hours with 1 test per minute

### Physical

- ▶ Dimension: 2.50" W x 1.45" T x 6.25" D (excluding knobs)
- ▶ Weight: 25 ounces

### Options

- ▶ Universal Charger for International Use (reference Model 38-4i)
- ▶ Carrying Case
- ▶ Programming Set for programming transmit frequency in the field

### C-Band Mini Tester Kit (KT 11075) includes:



**38-4 Mini Tester**



**USB Programmer**



**Carrying Case**

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# MULTI-PLATFORM VEHICLE TEST SET

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Easy to use Graphical User Interface
- ▶ Automated and Manual Testing
- ▶ L-Band or UHF RF Communication
- ▶ Operate in Direct or Radiate Mode
- ▶ Analog and Discrete Input/Output
- ▶ Hi-current I/O
- ▶ Rugged Transportable Design

### Applications

- ▶ Pre-mission Vehicle Checkout
- ▶ "Go/No-Go" & Bench Testing
- ▶ LRU Troubleshooting

The Multi-Platform Vehicle Test Set (MPVTS) is a self-contained portable equipment rack test instrument for performing vehicle electrical system verification. MSI can develop a custom MPVTS software application designed specifically to perform complete pre-mission verification of your airborne, ground, or marine vehicle. The MPVTS is the first test set designed to be completely vehicle platform independent.

The MPVTS is used to provide control and monitoring of the communication and input and/or output (I/O) signals to and from various vehicle platforms. It can display vehicle telemetry and system status while allowing the test operator to transmit vehicle commands in either direct link or radiate mode. Radiate

Mode is RF Communication for UHF or L-Band datalinks. An embedded RF Power Meter can be used to measure signal strength of radiated datalink. Direct link uses Ethernet, USB, RS-232, or RS-422. Multiple Analog and Relay I/O channels are available for monitoring and providing stimulus to vehicle systems. The MPVTS can also provide power to vehicle systems for testing and verification. An embedded Oscilloscope can be used to monitor any analog, discrete, or power signals.

The MPVTS is a turn-key system can be used to perform full Go/No-Go vehicle verification in either manual or automated test modes. All equipment is encased in a portable, ruggedized transit case that is quick and easy to setup to support any mission requirements.

# MULTI-PLATFORM VEHICLE TEST SET

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Electrical

- ▶ Input Power: MPVTS uses two primary power sources; 1 for internal components and the second for vehicle power
- ▶ MPVTS Input Power: 115VAC +/- 10 VAC, 60Hz, 15 Amps  
MPVTS Vehicle Power Supply Input: 115VAC +/- 10 VAC, 60 Hz, 30 Amps
- ▶ Vehicle Power:  
6 High Current Outputs: 0 – 36VDC, 10A  
4 Low Current Outputs: 0 – 20 VDC, 5A
- ▶ Analog I/O:  
34 Inputs: 0 – 40 VDC (4kohm nominal load)  
10 Inputs: 0 – 20 VDC (4kohm nominal load)  
6 Outputs: -10 – 10 VDC
- ▶ Relay Closures:  
9 Relay Closures: 8 Normally Open (NO),  
1 Normally Closed (NC)
- ▶ Serial Communication:  
RS-422: 5 wire, 115,200 baud, 8, N, 1  
RS-232: 9 pin  
RS-485: 2 wire ,19.2 baud, 8, Odd parity, 1  
USB: 3 ports on front panel  
Ethernet: TCP/IP

### Physical

- ▶ Size: 8U, E.I.A. Rackmount Transit Case - 30"W x 30"D x 23"H
- ▶ Weight: Less than 150lbs
- ▶ Temperature: +5° C to +40° C
- ▶ Reliability (MTBF): 1000hrs

### Options

- ▶ RF Modules
- ▶ Interface Cables
- ▶ Rack Configuration

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# FLIGHT TERMINATION SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ RCC 319 (IRIG) compliant command signals
- ▶ Redundant transmitters
- ▶ Fault Detection
- ▶ Ethernet interface for remote control, monitoring and antenna positioning data
- ▶ Data recording and time stamping
- ▶ Command tone verification
- ▶ Automatic 1:1 redundancy
- ▶ Field serviceable and upgradeable

### Applications

- ▶ Airborne platforms
- ▶ Range safety

The Flight Termination System (FTS) is a turn-key system capable of transmitting MONITOR, ARM, and TERMINATE flight termination encoded command signals as well as the 20 individual IRIG tones up to 6 simultaneously. The system can be manually or automatically switched between transmitters, includes fault monitoring, audio alarms, data recording and system time stamping, and full remote control operation and configuration. The system is ready for installation in E.I.A. 19 inch standard racks for mobile platforms or in transportable cases high portability.

The redundant transmitter system generates a 1000W Wideband FM signal that can be routed to two pedestal

antennas for full redundant operation. FTS commands are initiated either at the Command Control Unit (CCU) front panel when in Local Mode or from the remotely located Master Control Module via Ethernet link when in Remote Mode. The initiated command signals are RCC 319 (IRIG) compliant and compatible with the Herley Industries HFTR60 (or compatible) Flight Termination Receivers (FTR).

The FTS also includes a command verification Receiver Monitor Unit (RMU) complete with Omni-antenna kit for monitoring transmitted commands from a remote location. The RMU interfaces to the FTS via Ethernet link for data recording and time stamping capability.

# FLIGHT TERMINATION SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Command Control Unit

- ▶ Carrier Frequency: 406 MHz to 450 MHz, adjustable in 100 kHz steps, +/- .005%
- ▶ Tolerance
- ▶ FTS Commands: MONITOR, ARM, TERMINATE
- ▶ IRIG Tone Frequencies: 1 – 20 (up to 6 on simultaneously), Tolerance +/-0.1
- ▶ Exciter Output Power: 0 dBm
- ▶ Modulation: Wideband FM
- ▶ Interface: Ethernet
- ▶ Prime Power: Universal AC - 115 to 230 VAC, 50-60 Hz
- ▶ Equipment Enclosure: Standard 19 inch transit case with Front and Rear covers and shock mounted internal frame
- ▶ Feature Enhancements: Data Recording/Event Time Stamp, Fault Detection, Audio Alarm, Manual/Auto Switchover
- ▶ Indicators: Illuminated LED's

### 1000 W RF Power Amplifier Module

- ▶ Frequency Range: 400 MHz to 450 MHz
- ▶ Output Power: 1000 Watts (typical)
- ▶ Power Input: 0 dBm
- ▶ Prime Power: 180 to 260 VAC, single phase
- ▶ Equipment Enclosure: E.I.A. Standard 19", 5U High, 22" deep, 80lbs
- ▶ Display: Fwd/Rev Power, Gain Adjustment, ALC Fast/Slow, On/Off, Fault Indication,
- ▶ Interface: Ethernet

### Receiver Monitor Unit

- ▶ Frequency Band: 406 MHz to 450 MHz, adjustable in 100 kHz steps
- ▶ Sensitivity: -107 dBm
- ▶ Response Time: 15ms nominal
- ▶ Prime Power: 115 to 230 VAC, 50-60 Hz
- ▶ Equipment Enclosure: Standard 19 inch transit case with Front and Rear covers and shock mounted internal frame

### System Includes

- ▶ 2 Command Control Units
- ▶ 2 High Power RF Amplifiers
- ▶ 1 System Failover Controller
- ▶ 1 Master Control Console
- ▶ Associated cabling
- ▶ 1 Receiver Monitor Unit w/ associated antenna kit
- ▶ Ethernet Switch
- ▶ Operation Manual
- ▶ Training

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# FLIGHT TERMINATION SYSTEM - 200W DUAL VEHICLE

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Features

- ▶ EIA 19" Rack Components
- ▶ Independent Control of up to 2 vehicles
- ▶ RF Power Output of 200 Watts
- ▶ IRIG 313-01 Compliant
- ▶ MONITOR, ARM and DESTRUCT Command
- ▶ Switches
- ▶ Safety wire switch protection caps
- ▶ Universal AC input power

### Applications

- ▶ Range Safety
- ▶ Test



The 200W Dual Vehicle FTS was specifically designed for use with Unmanned Aerial Vehicles (UAV's), missile systems and aerial target drones and is currently in operation supporting various missions worldwide. Designed to be IRIG 313-01 and 319-07 compliant, it is a rack mount unit used for flight termination and command. The unit accepts AC power and generates a modulated RF output FM signal suitable for interrogation of flight termination receivers such as the Herley HFTR60 and a variety of command receiver/decoders. The 200W Dual Vehicle FTS features two sets of command switches on the front panel for MONITOR, ARM, and DESTRUCT to provide quick and easy emergency control of up to two vehicles in flight. All command switches have protective switch covers to prevent unintentional command initiation. A battery backup module capable

of providing back up power for up to 15 minutes can also be added to the system. From the control panel the operator can monitor command status indicator lamps and there is also a panel meter for monitoring AC input power.

The 200W Dual Vehicle FTS internally generates command tones that modulate the synthesized RF carrier to produce a 200 Watt (minimum) RF output. Upon power up, the system will immediately transmit the carrier frequency and will continue to do so until the DESTRUCT command is issued. The MONITOR and ARM switches can be toggled ON/OFF independently of each other to send the corresponding command tone combinations listed on page 2 of this datasheet. To initialize the DESTRUCT command the ARM command must first be initialized.

# FLIGHT TERMINATION SYSTEM - 200W DUAL VEHICLE

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Transmitter System

- ▶ Power Input: Universal Input: 115 VAC to 230 VAC, 50 to 60 Hz
- ▶ Carrier Frequency: User Adjustable between 406 – 450 MHz in 100 kHz steps
- ▶ Tone Frequencies: 1, 2, 3, 5, 6 and 7 per IRIG 313-01
- ▶ Carrier Frequency Stability:  $\pm 0.0005\%$
- ▶ Power Output: 200 Watts (nominal)
- ▶ Output Impedance: 50 ohms
- ▶ Output Connection: Type N Female
- ▶ Modulation: Wideband FM,  $\pm 30$  kHz per tone
- ▶ Spurious Outputs: -50 dBc
- ▶ Vehicle 1 Commands: MONITOR – Apply Tone 5 (12.14 kHz)  
ARM – Apply Tone 1 (7.50 kHz) to Tone 5  
DESTRUCT – Remove Tone 5, Add Tone 2 (8.46 kHz) to Tone 1
- ▶ Vehicle 2 Commands: MONITOR – Apply Tone 6 (13.70 kHz)  
ARM – Apply Tone 3 (9.54 kHz) to Tone 6  
DESTRUCT – Remove Tone 6, Add Tone 7 (15.45 kHz) to Tone 3
- ▶ Protection: RF Output protection, Circuit Breaker/Fuse protected
- ▶ Enclosure: EIA 19" Shockmount case
- ▶ Dimensions: 28.5 x 22.5 x 21.6 inches
- ▶ Weight: Less than 120 lbs

### Receiver System

- ▶ Power Input: Universal Input: 115 VAC to 230 VAC, 50 to 60 Hz
- ▶ Carrier Frequency: User Adjustable between 406 – 450 MHz in 100 kHz steps
- ▶ Tone Frequencies: 1, 2, 3, 5, 6 and 7 per IRIG 313-01
- ▶ Sensitivity: -106 to -115 dBm
- ▶ Maximum Input Power: +13 dBm
- ▶ Vehicle 1 Commands: MONITOR – Apply Tone 5 (12.14 kHz)  
ARM – Apply Tone 1 (7.50 kHz) to Tone 5  
DESTRUCT – Remove Tone 5, Add Tone 2 (8.46 kHz) to Tone 1
- ▶ Vehicle 2 Commands: MONITOR – Apply Tone 6 (13.70 kHz)  
ARM – Apply Tone 3 (9.54 kHz) to Tone 6  
DESTRUCT – Remove Tone 6, Add Tone 7 (15.45 kHz) to Tone 3
- ▶ Protection: RF Output protection  
Circuit Breaker/Fuse protected
- ▶ Enclosure: EIA 19" Shockmount case
- ▶ Dimensions: 24 x 22.5 x 9.3 inches
- ▶ Weight: Less than 50 lbs
- ▶ Equipment Enclosure: Standard 19 inch transit case with Front and Rear covers and shock mounted internal frame

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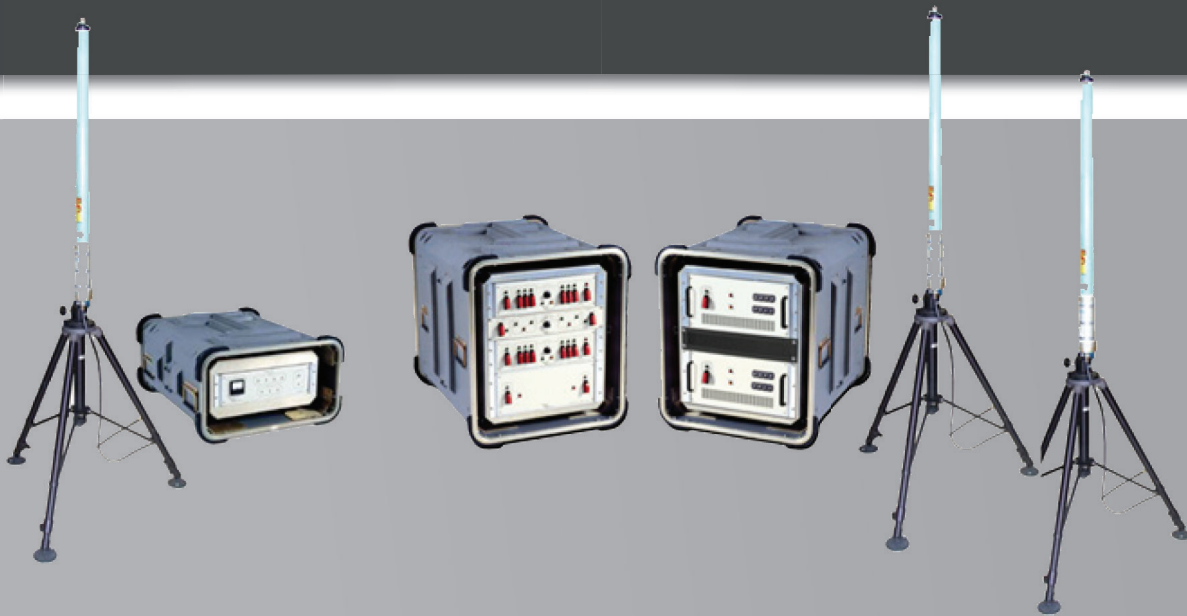
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# TRANSPORTABLE FLIGHT TERMINATION SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS



The Flight Termination System (FTS) is a complete turn-key system that includes a Command Control Unit, High Power RF Amplifiers, Receiver Monitor Unit, Antenna Kits and airborne Flight Termination Receiver (FTR). It is a redundant self-contained, portable 425 MHz system that transmits IRIG 313-01 compliant commands to Monitor, Arm, and Destruct a vehicle in flight. FAULT monitoring and an auto switch-over from Primary to Redundant components are standard features that make the FTS a safe and reliable range safety system. The FTS is a transportable modular design that is highly maintainable and easily upgraded for future applications. The system is set up in seconds and ready for deployment in ruggedized shock-mounted cases. The Command Control Unit (CCU) contains the solid-state encoder/exciter that generates the RF command messages when the control switches on the front panel are initiated. The RF command messages

are output from the CCU to the RF Power Amplifier Module where they are amplified and transmitted. The transmitted signal is received and processed by the Flight Termination Receiver in the airborne vehicle. The transmitted signal is also received and can be monitored on the ground using the remote Receiver Monitor Unit (RMU). RF command messages are generated when the control switches on the front panel are initiated. The RF command messages are output from the CCU to the RF Power Amplifier Module where they are amplified and transmitted. The transmitted signal is received and processed by the Flight Termination Receiver in the airborne vehicle. The transmitted signal is also received and can be monitored on the ground using the remote Receiver Monitor Unit (RMU). The FTS is a advanced high reliable and safe system to handle all of your range safety requirements.



# TRANSPORTABLE FLIGHT TERMINATION SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Features

- ▶ Transmit Power Options Available
- ▶ IRIG 313-01 Compliant
- ▶ Redundant RF Power Amplifiers
- ▶ Automatic 1:1 Redundancy
- ▶ Fault Detection
- ▶ Primary and Redundant Modes of Operation
- ▶ Remote Control (optional)
- ▶ Command Tone Verification
- ▶ Multi-Vehicle Control (optional)
- ▶ Ruggedized Design

### Command Control Unit

- ▶ Carrier Frequency: 406 MHz to 450 MHz, adjustable in 100 kHz steps
- ▶ Carrier Frequency Tolerance: +/- .0005%
- ▶ Tone Frequencies: Tone 1: 7.5 kHz | Tone 2: 8.460 kHz | Tone 5: 12.14 kHz | Tone 7: 15.450 kHz  
- additional tones available
- ▶ Tone Frequency Tolerance: +/-0.1
- ▶ RF Output Power: 50 Watts (minimum at output)
- ▶ Modulation: Wideband FM
- ▶ Multi-Vehicle Control: Up to 2 vehicles simultaneously
- ▶ Prime Power: 115 to 230 VAC, 50-60 Hz
- ▶ Equipment Enclosure: Standard 19 inch transit case with Front and Rear covers and shock mounted internal frame
- ▶ Fault Detection: RF Output Power, Tone Monitor

### 200W RF Power Amplifier Module

- ▶ Frequency Range: 400 MHz to 450 MHz
- ▶ Saturated Output Power: 200 Watts (typical) - Additional options available
- ▶ Power Input: 50 Watts
- ▶ Prime Power: 115 to 230 VAC, 50-60 Hz
- ▶ Equipment Enclosure: Standard 19 inch transit case with Front and Rear covers and shock mounted internal frame

### Receiver Monitor Unit

- ▶ Frequency Band: 406 MHz to 450 MHz, adjustable in 100 kHz steps
- ▶ Sensitivity: -107 dBm
- ▶ Response Time: 15ms nominal
- ▶ Prime Power: 115 to 230 VAC, 50-60 Hz
- ▶ Equipment Enclosure: Standard 19 inch transit case with Front and Rear covers and shock mounted internal frame

### Antenna Kit

- ▶ Antenna: Directional, circular polarized
- ▶ Mounting: Tripod, Tower, or Mast options
- ▶ Cables: RG-214 included

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# PORTABLE FLIGHT TERMINATION SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Includes: Command Control Unit, Remote
- ▶ Monitor Unit, Remote Control Unit
- ▶ IRIG 313-01 Compliant
- ▶ Redundant RF Power Amplifiers
- ▶ Automatic 1:1 Redundancy
- ▶ Fault Detection
- ▶ Primary and Redundant Modes of Operation
- ▶ Remote Control
- ▶ Command Tone Verification
- ▶ Ruggedized Design

The Flight Termination System (FTS) is a redundant self-contained, portable 425 MHz wideband FM system that can transmit the necessary codes to Monitor, Arm, and Destroy a missile in flight.

The FTS consists of a Transmitter Systems and a Receiver System. The Command Control Unit (CCU) is the Transmitter System used for encoding IRIG flight termination commands. The Remote Monitor Unit (RMU) is the Receiver System for detecting, decoding, and monitoring commanded signals from the CCU. A Remote Control Unit (RCU) is also included for initiating

FTS commands remotely from the CCU.

The FTS is currently available with CCU transmitter configurations for 15 Watt, 25 Watt, and 50 Watt RF Output Power.

### Applications

- ▶ Range Safety
- ▶ 15, 25, and 50 Watt RF transmitter configurations available

# PORTABLE FLIGHT TERMINATION SYSTEM

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Electrical

- ▶ Carrier Frequency: 425 MHz
- ▶ Carrier Frequency Tolerance: +/- .0005%
- ▶ Tone Frequencies:
  - Tone 1 7.50 kHz
  - Tone 2 8.46 kHz
  - Tone 4 10.76 kHz
  - Tone 5 12.14 kHz
- ▶ Tone Frequency Tolerance: +/- 0.1
- ▶ RF Output Power: 15 Watts, 25 Watts, or 50 Watts
- ▶ Modulation: Wideband FM

### Power Requirements

- ▶ Input Voltage: Available for DC input voltage or AC input voltage applications

### Operational

- ▶ Tone Sequences:
  - MONITOR – Apply Tone 5
  - ARM – Add Tone 1 to Tone 5
  - DESTRUCT – Remove Tone 5 and add Tone 2 to Tone 1
- ▶ Time Between Commands: 500 ms
- ▶ Fault Detection:
  - RF Output Power
  - Transmit Tone ≠ Monitored Tone

### Mechanical

- ▶ Equipment Enclosure: Aluminum Zero Case
- ▶ Cooling: Fans mounted directly to RF power amplifiers

### Options

- ▶ Antenna
- ▶ RF Power Meters
- ▶ RF Power Levels
- ▶ Input Voltage
- ▶ Command Tone Configurations

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# FLIGHT TERMINATION SYSTEM TEST SET

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ Portable
- ▶ 8 Tones (1 - 8 standard)
- ▶ IRIG 313-01 Compliant
- ▶ Variable RF Output Level
- ▶ Variable Carrier Frequency
- ▶ 20 Tone model also available
- ▶ Antenna and Coaxial Cable included

### Applications

- ▶ Range Safety
- ▶ Test

The Model FTTS-P-8 Flight Termination Test Set (FTTS) is a portable unit used for flight-line checkout of flight termination receivers and/or command receiver/decoders.

The FTTS accepts AC power and generates a modulated RF output suitable for interrogation of flight termination receivers and/or command receiver/decoders.

The FTTS can transmit up to 6 tones simultaneously and the RF output power is adjustable from 0 to -127 dBm. The IRIG tones can be switched ON/OFF independently

from the control panel.

A 20 Tone version of the FTTS is also available.

# FLIGHT TERMINATION SYSTEM TEST SET

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Specifications

- ▶ Size: 9.00" H x 12"W x 5" D
- ▶ Weight: Approximately 10 pounds
- ▶ Power Input: Universal Input: 115 VAC to 230 VAC, 50 to 60 Hz
- ▶ Carrier Frequency: 406 to 450 MHz (users electable) in 100 kHz steps
- ▶ Carrier Frequency Stability:  $\pm .0005\%$
- ▶ Power Output: 0 to -127 dBm
- ▶ Output Impedance: 50 ohms
- ▶ Output Connection: Type N Female
- ▶ Modulation: Wideband FM,  $\pm 30$  kHz per tone
- ▶ Tone Frequencies: Any combination of up to 8 tones per IRIG 313-01 (maximum of 6 tones ON simultaneously)
- ▶ Remote Control: RS-232 (other options available)
- ▶ Spurious Outputs: -50 dBc
- ▶ Harmonic Distortion: < 2%

### Options

- ▶ Rackmount
- ▶ Select any 8 of 20 available Tones: 1 to 8 standard
- ▶ 20 Tone model available (FTTS-P-20)
- ▶ Local/Remote: RS-232, GPIB, or 10Base100 Ethernet
- ▶ Customizable to fit your needs



20 Tone



Ready to Transport

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# COMMAND ENCODER/EXCITER (8 TONE)

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ EIA 19" Standard Rackmount
- ▶ 8 Tones (1 - 8 standard)
- ▶ IRIG 313-01 Compliant
- ▶ Variable RF Output Level
- ▶ Variable Carrier Frequency
- ▶ Carrier ON/OFF Switch
- ▶ Local and Remote Control
- ▶ 20 Tone model also available

### Applications

- ▶ Range Safety
- ▶ Test

The Model CEE-8-I Command Encoder/Exciter (CEE) is a rack mount unit used for Flight Termination Systems for checkout of flight termination receivers and/or command receiver/decoders.

The CEE accepts AC power and generates a modulated RF output suitable for interrogation of flight termination receivers and/or command receiver/decoders.

The CEE can transmit up to 6 tones simultaneously and the RF output power is adjustable from 0 to -127 dBm. The IRIG tones can be switched ON/OFF independently

from the control panel. The CEE can be controlled in Local mode using the front panel switches or in Remote mode using an RS-232 or GPIB interface.

A 20 Tone version of the CEE is also available

# COMMAND ENCODER/EXCITER (8 TONE)

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Specifications

▶ Size:	3.50" H x 18.75" D (Standard EIA 19" Rack Mount)
▶ Power Input:	Universal Input: 115 VAC to 230 VAC, 50 to 60 Hz
▶ Carrier Frequency:	406 to 450 MHz in 100 kHz steps
▶ Carrier Frequency Stability:	±.0005%
▶ RF Power Output:	0 to -127 dBm
▶ Output Impedance:	50 ohms
▶ Output Connection:	Type N Female
▶ Modulation:	Wideband FM, ±30 kHz per tone
▶ Tone Frequencies:	Any combination of up to 8 tones per IRIG 313-01 (maximum of 6 tones ON simultaneously)
▶ Remote Control:	RS-232 (other options available)
▶ Spurious Outputs:	-50 dBc
▶ Harmonic Distribution:	< 2%

### Options

- ▶ Portable
- ▶ Select any 8 of 20 available Tones
- ▶ 20 Tone model available
- ▶ Local/Remote: RS-232, GPIB, or 10Base100 Ethernet
- ▶ Customizable to fit your needs

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# COMMAND ENCODER/EXCITER (20 TONE)

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ EIA 19" Standard Rackmount
- ▶ 20 Tones
- ▶ IRIG 313-01 Compliant
- ▶ Variable RF Output Level
- ▶ Variable Carrier Frequency
- ▶ Carrier ON/OFF Switch
- ▶ Local and Remote Control
- ▶ 8 Tone model also available

### Applications

- ▶ Range Safety
- ▶ Test

The Model CEE-20-R Command Encoder/Exciter (CEE) is a rack mount unit used for Flight Termination Systems and for checkout of flight termination receivers and command receiver/decoders.

The CEE accepts AC power and generates a modulated RF output suitable for interrogation of flight termination receivers and/or command receiver/decoders.

The CEE can transmit up to 6 tones simultaneously and the RF output power is adjustable from 0 to -127 dBm. The IRIG tones can be switched on or off independently

from the control panel. The CEE can be controlled in Local mode using the front panel switches or in Remote mode using an RS-232 or GPIB interface.

An 8 Tone version of the CEE is also available.

# COMMAND ENCODER/EXCITER (20 TONE)

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Specifications

▶ Size:	3.50" H x 18.75" D (Standard EIA 19" Rack Mount)
▶ Carrier Frequency:	406 to 450 MHz in 100 kHz steps
▶ Carrier Frequency Stability:	±.0005%
▶ Power Output:	0 to -127 dBm
▶ Output Impedance:	50 ohms
▶ Output Connection:	Type N Female
▶ Modulation:	Wideband FM, ±30 kHz per tone
▶ Tone Frequencies:	20 tones per IRIG 313-01 (maximum of 6 tones ON simultaneously)
▶ Remote Control:	RS-232 (other options available)
▶ Spurious Outputs:	-50 dBc
▶ Harmonic Distribution:	< 2%

### Options

- ▶ Portable
- ▶ 8 Tone model available
- ▶ Local/Remote: RS-232, GPIB, or 10Base100 Ethernet
- ▶ Customizable to fit your needs

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# COMMAND ENCODER/EXCITER - 5 WATT

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ EIA 19" Standard Rackmount
- ▶ Individual Tone Control: 1, 2, 5 (standard)
- ▶ IRIG 313-01 Compliant
- ▶ RF Output Power of 5 Watts (other options available)
- ▶ Carrier ON/OFF Switch
- ▶ Adjustable Carrier Frequency

### Applications

- ▶ Range Safety
- ▶ Test

The Model CEE-XR5A5W was specifically designed for use with Unmanned Aerial Vehicles (UAV's), missile systems and aerial target drones and is currently in operation supporting various missions worldwide. Designed to be IRIG 313-01 and 319-14 compliant, it is a rack mount unit used for flight termination and command. The unit accepts AC power and generates a modulated RF output FM signal suitable for interrogation of flight termination receivers such as the Herley HFTR60 and a variety of command receiver/decoders.

The basic CEE-XR5A5W features a three tone switches on the front panel that can be factory set to the frequencies of your choice. The unit also features thumbwheel switches for setting the carrier frequency from 406 MHz

to 450 MHz in 100 kHz steps as well as a carrier ON/OFF switch.

Internally generated command tones modulate the synthesized RF carrier to produce a 5 Watt (minimum) RF output. Upon power up, the CEE-XR5A5W will immediately transmit the FM carrier frequency and the three tone switches can be turned ON/OFF independently to allow the operator to output any command tone sequence. There are many different variations of the unit available. Individual tone selection, FTS command tone sequences, switch configuration, RF output power, and many other options are available to meet any mission requirement.



# COMMAND ENCODER/EXCITER - 5 WATT

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Specifications

- ▶ Power Input: Universal Input: 115 VAC to 230 VAC, 50 to 60 Hz
- ▶ Carrier Frequency: 406 to 450 MHz in 100 kHz steps
- ▶ Tone Frequencies: 1 through 20 are available per IRIG 313-01
- ▶ Carrier Frequency Stability:  $\pm 0.0005\%$
- ▶ Power Output: 5 Watts (minimum) and higher power options are available
- ▶ Output Impedance: 50 ohms
- ▶ Output Connection: Type N Female
- ▶ Modulation: Wideband FM,  $\pm 30$  kHz per tone
- ▶ Spurious Outputs: -50 dBc
- ▶ Commands (Optional):
  - MONITOR – Tone 5
  - OPTIONAL – Tone 4
  - ARM – Tone 5 + Tone 2
  - DESTRUCT – Tone 2 + Tone 1 minus Tone 5
- ▶ Size: 5.25" H x 18.75" D  
(Standard 3U EIA 19" Rack Mount)
- ▶ Weight: Less than 20lbs

### Options

- ▶ Portable
- ▶ Tone Assignments
- ▶ RF Power Level
- ▶ FTS Commands
- ▶ Local/Remote: RS-232, GPIB
- ▶ Permanently attached power cord
- ▶ Customizable to fit your needs

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# 20 TONE RECEIVER/DECODER

## DATA SHEET & TECHNICAL SPECIFICATIONS



### Features

- ▶ EIA 19" Standard Rackmount
- ▶ 20 Tones
- ▶ IRIG 313-01 Compliant
- ▶ Signal Strength Display Meter
- ▶ Variable Carrier Frequency
- ▶ Local and Remote Control

### Applications

- ▶ Range Safety
- ▶ Test

The Model TRD-20 Tone Receiver/Decoder (TRD) is a rack mount RF receiver that will display the presence of any of the 20 individual tones or combination command tones.

The unit was designed to conform with the requirements set forth in the IRIG Standard 313-01 of the Range Commanders Council (RCC) and to detect and display up to 6 tones simultaneously.

The rear panel connections include RF IN, Signal Strength, and Decoded Channel outputs of the 20 tone detector circuits.

# 20 TONE RECEIVER/DECODER

## DATA SHEET & TECHNICAL SPECIFICATIONS

### Specifications

- ▶ Size: 3.50" H x 18.75" D (Standard EIA 19" Rack Mount)
- ▶ Power Input: Universal Input: 115 VAC to 230 VAC, 50 to 60 Hz
- ▶ Carrier Detect: Front Panel LED display and discrete output on rear panel
- ▶ Channel Deviation Threshold:  $\pm 10$  to  $\pm 15$  kHz
- ▶ Channel Bandwidth:  $\pm 1\%$  Minimum @ 2 dB Bandwidth  
 $\pm 4\%$  Maximum @ 14 dB Bandwidth
- ▶ RF Input: 406 MHz to 450 MHz, 50 ohm BNC female connector
- ▶ RF Sensitivity: - 100 dBm
- ▶ Decoded Channel Output: DB-37 Female output connector driven by an Open Collector, DC output module
- ▶ Remote Control: RS-232 (other options available)
- ▶ Signal Strength: Voltage ranges from 0 VDC to 5 VDC

### Options

- ▶ Portable
- ▶ IF Input
- ▶ Audio Input
- ▶ Compact hard case for portable use
- ▶ Local/Remote: RS-232, GPIB, or 10Base100 Ethernet
- ▶ Decoded Channel Output – TTL Logic or Contact Closures
- ▶ Customizable to fit your needs

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