

RANGING PROCESSOR

MD700

Features

- ◆ Selectable Format: SGLS, CCSDS, USB, ESA or Commercial
- ◆ SGLS:
 - ◆ Selectable Code Length: Long (818,000 km), Medium (91,000 km) and Short (11,000 km)
 - ◆ Tunable Code Rate: 100 kbps to 1 Mbps
- ◆ USB:
 - ◆ Selectable Major Tones: High (500 kHz), Medium (100 kHz) and Narrow (20 kHz)
 - ◆ Selectable Ambiguity Resolution Code: Long (958,000 km), Medium (119,000 km) and Short (15,000 km)
- ◆ Enhanced Acquisition through Doppler and Range Acquisition Aids
- ◆ Adjustable Acquisition and Tracking Bandwidths for Performance Optimization
- ◆ High Selectivity, Tunable Anti-Aliasing Filter Minimizes Interference and Distortion
- ◆ SGLS Code Correlation Value Provides Real Time Measure of Transponder Quality
- ◆ Flexible, Reconfigurable-Logic Design Allows Modification for Unique Requirements
- ◆ Doppler Measurement (option)
- ◆ Time Tag Measurements

General Description



The Model 700 Ranging Processors are an integrated state-of-the-art, high performance, multiple format unit. Both forward link range code generation and return link range processing functions are accommodated. The MD700 is unique in eight major ways: 1) It processes major ranging formats: SGLS, CCSDS, USB, ESA and Commercial. 2) It is programmable to select SGLS and CCSDS code rates and USB / ESA Major Tone frequencies. 3) It is programmable for SGLS, USB and ESA code lengths. 4) Doppler and Range estimates are included in the process. 5) Adjustable acquisition and tracking bandwidths enhance operation in low signal-to-noise applications. 6) A tunable, high dynamic range, high selectivity front end is incorporated to minimize adjacent signal interference and ranging signal distortion. 7) An all-digital design improves accuracy, stability and resolution. 8) Reconfigurable logic allows for modifications to accommodate unique customer needs.

The MD700 generates the forward link ranging signal using digital processing and an NCO clocked by a high rate oscillator locked to an external frequency reference. The digital signal is passed to a D/A, smoothing filter and output signal conditioner to create the Ranging Output for transmission to the satellite. The return link Ranging Input is passed through input signal conditioning and a tunable anti-alias filter to minimize noise and interference. The signal is then digitized and digitally filtered to reduce noise and interference. A digital Phase Lock Loop (PLL) is used to acquire and track the phase of the Major Tone (SGLS Clock). A frequency search is performed over an adjustable range at an adjustable rate. Acquisition is assisted by a Doppler frequency offset estimate, if available. Once acquired, the phase of the received signal is compared to the phase of the transmitted signal. The phase comparison provides a high-resolution measure of the time delay between the transmitted and received signal. After the Major Tone is acquired, the Minor Tones and Code Components are sequentially acquired to resolve range ambiguity. Ambiguity Resolution is assisted by a Range estimate, if available. If lock is lost, the acquisition process can be automatically reinitiated using the last Major Tone frequency and Range measurement as an aid. Different bandwidths may be set for the acquisition mode versus the tracking mode. These settings can be automatically set based on the measured signal-to-noise ratio. In the tracking mode, a 3rd order PLL is used to prevent acceleration errors from developing.

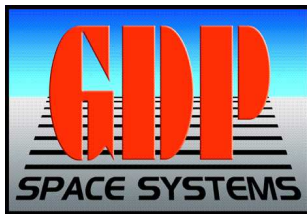
Outputs from the Ranging Processor include: the measured Range, acquisition status, tracking status, signal quality and alarm

conditions. This information is provided by way of the available remote interfaces (Ethernet, RS232 or IEEE-488). A self-test feature internally loops-back the Ranging Output to the Ranging Input for calibration and operation verification. All status and control is via the remote interface and the front panel (optional). All I/O is via the rear of the box.



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SPECIFICATIONS

Reference Input

Source: 5 MHz or 10 MHz, selectable
Form: sinusoid or square wave
Type: 0 dBm +/- 3 dB, TTL/50 ohms or
EIA-485/EIA-422A, selectable

Timing Input

Source: One pulse per second (pps)
input or internal, selectable
Pulse Width: 1 microsecond
Type: TTL, or EIA-485/EIA-422A

Range Output Word

32 Bit word updated on rising edge of Timing
Reference

Status Words

Overload, Loss, Signal Present, Acquisition Status, PLL Lock, Code Lock, Reference Lock, Range Word Valid, Acquisition Odd/Even Bit, Input Power, Signal Power, Phase Error, Frequency Offset, Reference Alarm, Strobe Alarm

Size

1U Standard 19-inch, EIA equipment-rack.

Unambiguous Range (SGLS)

Long Code = 817,836km
Medium Code = 90,882km
Short Code = 10,734km
(1MHz Code Rate)

Range Resolution (SGLS)

.25 feet
(1MHz Code Rate)

Range Accuracy (SGLS)

RMS noise error: < 4 feet
@ S/No = 30 dB

Acquisition Time (unaided) (SGLS)

<60 sec, for Long Code
<2 sec, for Short Code
(1Mbps Code Rate @ S/No = 50 dB)

Correlation Value (SGLS)

Indicates Transponder Quality
+/- 1 % Resolution

Self Test

Internal loop back

Remote Operation

Ethernet Interface
RS232 Serial Interface
IEEE 488 GPIB Interface

071009

Ordering Information

MD700-00	Basic Unit	OP700-42	Time Code
OP700-10	USB Ranging	OP700-43	Time Code with GPS Receiver
OP700-10	CCSDS 414 Ranging	OP700-44	Parallel Measurement Output
OP700-21	IEEE488	OP700-50	KVM Drawer (1U)
OP700-22	Ethernet		
OP700-23	Removable Hard Drive		
OP700-40	PCI PM/PSK Demodulator		
OP700-41	Doppler Measurement		

Recognizing that no standard product can meet all the needs of all users, GDP stands ready to provide units tailored to unique applications.

The statements in this data sheet are not intended to create any warranty, expressed or implied. Equipment specifications are subject to change without notice.