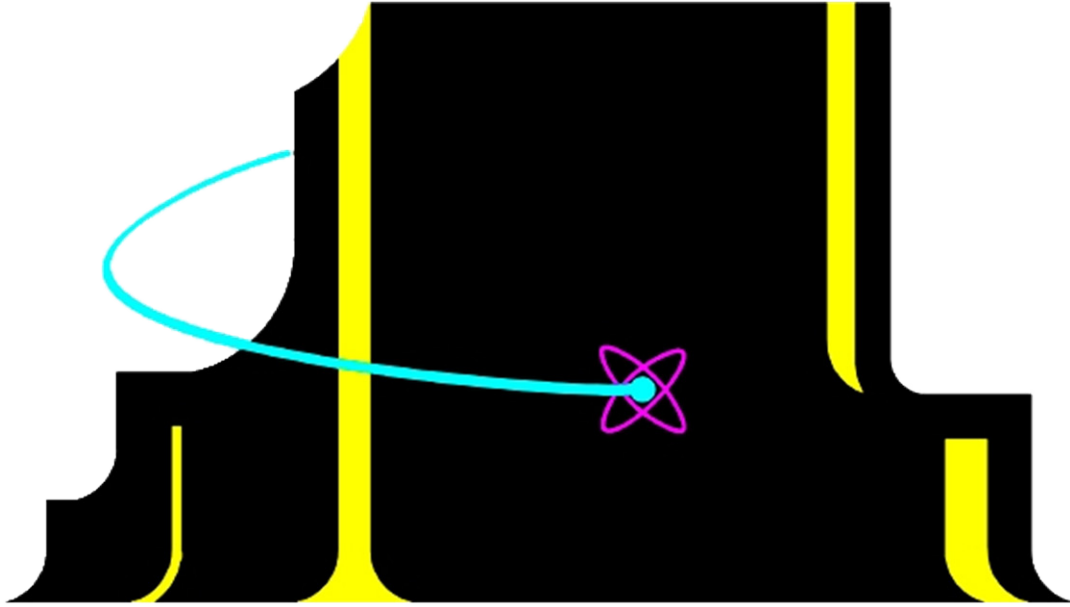


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Client: Mesa Engineering, Inc.
Model: ATRG2-MOD
FCC ID: S3VATRG2-MOD
Standards: FCC Part 90
Report #: 2013037

Appendix J: Manual

Please refer to the following pages.



Mesa Engineering

G2 Vehicle Detection Module User Manual

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1.0 Purpose

The G-2 Vehicle detection module is a self contained Doppler radar sensor designed for the purpose of detecting and counting vehicle passages with speed and length data supplied. Suitable applications are traffic logging systems and speed enforcement systems.

The system consists of a Gunn oscillator driven autodyne detected Doppler system with a single horn lens antenna with a 4X15 degree response pattern suitable for use in ATR traffic radar applications calibrated for a 22.5 degree traffic offset angle.

Base band signals from the transceiver are amplified and processed with digital logic to produce a track for each dominant Doppler return received. Tracks are analyzed for consistency duration and frequency offset to create an individual output for each track, listing its speed, duration and overall reading quality. Output and control are provided via an ASCII coded serial interface provided with a full duplex rs485 or RS232 interface, for connection to external computing of logging equipment.

2.0 General Specifications

Frequency 34.6 GHz +-100MHz

Transmitter power level -8dBm

Antenna Horn-Lens 30dBi gain

Supply voltage – current -connector
10.5-14.8 VDC 750mA max

Output
ASCII serial 115.2k Baud
RS232/DB9 or RS485/RJ-11

Mechanical
Rectangular chassis 8"x3"x10"deep
4x6-32 mounting screws
Microwave port 6.25"x2.75"

3.0 Installation

3.1 General Recommendations

Unit should be installed with antenna level horizontally, tilted down to meet the roadway midway down its measurement range and at an offset angle of 22.5 degrees from the direction of traffic flow.

Unit should be 5-10 feet from the nearest lane.

The sensor should be placed far enough from intersections that vehicles traveling in other directions should not cross into the beam.

The microwave port can be covered by an approved microwave transparent window.

3.2 Exposure Cautions

Operating and maintenance personnel should maintain a separation of at least 20 cm from the port. Mounting should also preclude exposure to pedestrians or drivers.

3.3 Co-Location Warnings

Additional radiators should not be co-located with the microwave aperture.

3.4 FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Mesa Engineering could void the user's authority to operate this equipment.

3.5 Field Tune

Recommended field tune command sequence.

This command is performed with a microwave absorbing foam block securely in front of the antenna horn. The Sequence adjusts the detector threshold for a background noise trigger rate dependant on the sensitivity threshold setting.

Larger sensitivity settings have high noise trigger rates, hence higher signal sensitivity.

Alignment should be performed anytime the sensor environment is changed, like switching vehicles or reinstalling a fixed unit.

For directions on sending commands, see Command Guide section below.

TN02 -- set sensitivity threshold to 2

TA Threshold -> 02 -- Auto tune thresholds

.....
04/0000/F7

.....
03/0000/FA

.....
02/0002/FB

.....
01/0000/FC

4.0 Calibration

Unit operating frequency should be certified at least once per year and electronic tuning fork test can be performed on starting and ending each deployment.

5.0 Interface

Power Molex 39-01-4031

Pin: 1 3
GND +12

Data 115.2 kBaud 8 bit, no parity, no handshake

RS232 9 Pin Sub-D Female

Pin: 2 3 5
Out In GND

RS485 RJ-11

Pin: 1 2 3 4 5 6
GND IN+ IN- Out- Out+ NC

6.0 Data Format

6.1 Power Up Message

Alignment ch4 -> ch1 => F7 FA FB FC

ATR g3 v3.0

FPGA revision 97 D9 1C

The power up message provides the current field tune alignment, firmware revision level and the fpga revision level

6.2 Measurement Message

The measurement message is a 30 byte message followed by an optional variable flag message terminated by cr-lf.

The following reference contains decoding information. One message is output for

each vehicle track observed by the sensor.

6.3 ATR Reporting Format Quick Reference

000000000011111111122222222223333333333

0123456789012345678901234567890123456789

| | | | | | | |

RE061 010 K+074 t 0000 00011D10 f

RE059 009 K+074 t 0000 0001054D f

RE059 009 K+074 t 0000 0001054D f

RE -Radar Event per earlier software

059 -The signal strength, BCD format

009 -The apparent vehicle length in meters, BCD format

K -Units of measure, Kph in this case, M if this is MPH

+ -The direction of travel, + is approaching the radar

074 -The vehicle speed, BCD format

T -The track termination mechanism, usually t, s, or r

0000-The track history standard deviation in HEX format

0001054D -The track duration in 8 usec units

"f" -Informational flags, multiple possibilities

These ARE VOID codes. If the flag field contains any one or more of these then do not issue the citation:

g - LVLEN was zero in QC-final

c - Track history contains too few or too many data points

s - Track standard deviation was excessive

m - Excessive track data missing

e - Extraneous track data present

In the MFM logic, c, m, & e voids are grouped together into one statistic.

The track termination field is a fixed single character lower case alphabetic and follows the speed field.

Its usage and meaning is unrelated to the flags field.

These codes occur after the speed and express the mechanism by which the target track terminated. None of these are VOID codes.

t -Reflected signal fell below minimum threshold strength

r -Reflected signal reversed direction

s -Reflected signal centered to new different speed

7.0 Command Guide

Commands are an ASCII coded message terminated by a cr. Undefined command strings get a ? cr-lf response.

Help

H cr causes a dump of available commands and their syntax/

Ax Analog channel lock

0-Float {default}, 1-DopA approach

2-DopB recede, 3-PhaA, 4-PhaB

Cx Calibrator function

0- terminate

1-4 Tuning Fork profile#

5-8 (151,75,38,19)Mph (243,123,60,30)Kmh Calibrator profile#

Dmx DebugTrace mode control

0-normal operation {default}, 1-sequential states, 2-packet values

TRACE state symbols: ! =squelch transition + =1 Meter marker

annnn =SQLbreak value p =arriving measure packet l =speedlock set

t =track timeout r =direction reversal z =short track abort

[=track drop start ~ =drop timeout] =drop normal w =wait state entered

Jxxyy Manual analog channel setting

xx = channel select

01-DopB{approach}, 02-DopA{recede}, 03-I, 04-Q

yy = channel sensitivity, FF=maximum, 00=minimum

L Force Watchdog activation

Q Compact information summary request

Rn Read CPLD channel n, 0 thru 6 inclusive

Wnyy Write CPLD register n with value yy

S Simulate Vehicle: S+v Approaching, S-v Receding

TNnn Set Analog alignment threshold to nn

TA perform verbose analog channel alignment

T? report current analog channel settings

Xn Microwave transceiver control
0-Standby, m-Mph, k-Kmh, s-Pulsed Mph, t-Pulsed Kmh
blank - Report current operating mode

If no command is received for two minutes after power up, the unit enters MPH measurement mode and turns on the radar power.

T? Alignment ch4 -> ch1 => F7 F7 F7 FC -- command displays current alignment factors.

RQ030097D91CF7F7F7FC

[illegible]

C5 -- electronic tuning fork test 1

C6 -- electronic tuning fork test 2

C7 -- electronic tuning fork test 3

Rip 019

C5 -- electronic tuning fork test 1

C6 -- electronic tuning fork test 2

C7 -- electronic tuning fork test 3

RIP 061

C8 -- electronic tuning fork test 4

RIP 031

X0 -- turns off radar system