

Form 442 question 6: DESCRIPTION OF PROJECT AND EQUIPMENT

This project involves the testing and repair of GPS receivers manufactured by GEOTAB Inc. The GPS re-radiating kit HNRRKIT manufactured by GPS Networking will be used as experimental RNSS test equipment for the purpose of testing GPS receivers. It will allow us to re-radiate the GPS signal within our test and repair facility at 705 South College Street Woodbury Tennessee 37190, and eliminate doubt of the current antenna set up and improve GPS latch times.

A copy of the test equipment specifications is included in this attachment.

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# ***HNRRKIT***

## Technical Product Data

### Features

- **Amplified Roof Antenna**  
Gain  $\geq 35$ dB
- **Re-Radiating Amplifier with Power Supply**  
Gain  $\geq 20$ dB
- **Optional Mounting Kit Hardware**  
Roof Antenna Mount & Re-Radiating Amp Mount
- **Variable Gain Option**  
Re-Radiating Amp Gain Varies from  $-3$  to  $+23$  dB

### Description

The GPS Hanger Re-Radiating Kit (HNRRKIT) is a complete re-radiating system that allows re-radiation of the GPS L1 signal indoors. The HNRRKIT consists of an active roof antenna, a re-radiating amplifier with a wall mount plug-in transformer that powers the entire system, and a passive re-radiating antenna. The GPS L1 signal from the roof antenna is amplified and radiated indoors. Thus, if a receiver has line of sight with the re-radiating antenna, it can receive the GPS signal indoors up to 100 feet away.

### Roof Antenna

#### Electrical Specifications, $T_A = 25^{\circ}\text{C}$

| Parameter                 | Conditions | Min | Typ   | Max   | Units    |
|---------------------------|------------|-----|-------|-------|----------|
| Frequency                 | L1         |     | 1.575 |       | GHz      |
| Bandwidth                 |            |     | 20    |       | MHz      |
| Out Imped. <sup>(1)</sup> |            |     | 50    |       | $\Omega$ |
| Pre-Amp Gain              |            |     | 35    | 38    | dB       |
| Noise Figure              |            |     | 2.75  |       | dB       |
| Output SWR                |            |     |       | 2.0:1 | -        |
| Filtering                 | 1626 MHz   | -20 |       |       | dB       |
|                           | 1500 MHz   | -10 |       |       | dB       |
| Req. DC Input V.          |            | 4.5 |       | 5.5   | Vdc      |
| Current                   |            |     | 22    |       | mA       |

## Re-Radiating Amplifier

### Electrical Specifications, $T_A = 25^{\circ}\text{C}$

| Parameter                | Conditions                               | Min | Typ | Max   | Units    |
|--------------------------|------------------------------------------|-----|-----|-------|----------|
| Freq. Range              | Ant – J1                                 | 1.1 |     | 1.7   | GHz      |
| In/Out Imped.            | Ant, J1                                  |     | 50  |       | $\Omega$ |
| Gain <sup>(1)</sup>      |                                          |     |     |       | dB       |
|                          |                                          | 20  | 22  | 24    | dB       |
| Input SWR <sup>(2)</sup> | J1 - 50 $\Omega$                         |     |     | 1.8:1 | -        |
| Output SWR               | Ant - 50 $\Omega$                        |     |     | 1.8:1 | -        |
| Noise Figure             | Ant – J1                                 |     | 3.3 | 3.5   | dB       |
| Current                  |                                          |     |     | 15    | mA       |
| Gain Flatness            | L1 – L2   ; Ant – J1                     |     | 0.5 | 1     | dB       |
| Reverse Isolation        | J1 – Ant                                 | 35  |     |       | dB       |
| Group delay Flatness     | $\tau_{d,max} - \tau_{d,min}$ : Ant – J1 |     |     | 1     | ns       |

(1). See LA20RPDC Data Sheet for performance plots

## Re-Radiating Antenna

### Electrical Specifications, $T_A = 25^{\circ}\text{C}$

| Parameter    | Conditions | Min | Typ   | Max   | Units    |
|--------------|------------|-----|-------|-------|----------|
| Frequency    | L1         |     | 1.575 |       | GHz      |
| Bandwidth    |            |     |       | 20    | MHz      |
| Impedance    |            |     | 50    |       | $\Omega$ |
| Peak Gain    |            |     | 3     |       | dBic     |
| Output SWR   |            |     |       | 1.5:1 | -        |
| Polarization |            |     | RHCP  |       | -        |

## Available Options

| Re-Radiating Amp System Power Supply Options |                               |                          |
|----------------------------------------------|-------------------------------|--------------------------|
| Source Voltage Options                       | VOLTAGE INPUT                 | STYLE                    |
|                                              | 110VAC                        | Transformer (Wall Mount) |
|                                              | 220 VAC                       | Transformer (Wall Mount) |
|                                              | 240 VAC (United Kingdom)      | Transformer (Wall Mount) |
|                                              | Customer Supplied DC 9-32 VDC | Military Style Connector |
| Re-Radiating Amp Gain Control Options        |                               |                          |
| Normal Gain                                  | Gain ≥ 20 dB                  |                          |
| Variable Gain                                | -3 ≤ Gain ≤ 23dB              |                          |
| Re-Radiating Amp RF Connector Options        |                               |                          |
| Connector Options                            | CONNECTOR STYLE               | CHARGE                   |
|                                              | Type N                        | NC                       |
|                                              | Type SMA                      | NC                       |
|                                              | Type TNC                      | NC                       |
|                                              | Type BNC                      | NC                       |

## Part Number

- HNRRKIT - S / 110

Gain Option:

**VG** =Variable; **Blank** = Normal

Connector Options:

**N** = N type; **S** = SMA; **T** = TNC; **B** = BNC

Source Voltage:

**110** -Transformer, **220** – Transformer, **240** – U.K. Transformer **MC** – Military Conn. (User supplies DC Voltage)