



**Network Systems Organization**

Federal Communications Commission  
Equipment Approval Services  
P.O. Box 358315  
Pittsburgh, PA 15251-5315

Norman H. Nelson  
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San Jose, CA 95119-1208  
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FAX: (408) 528-2740  
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**Re: FCC ID H9PLA3021-100 Ref # 15534**

Date: 10/12/00

Dear Reviewer,

In response to the following Email:

Re: FCC ID H9PLA3021-100  
Applicant: Symbol Technologies Inc  
Correspondence Reference Number: 15534  
731 Confirmation Number: EA97674  
Date of Original E-Mail: 08/10/2000

1. Cover letter indicated this Class II Permissive Change filing is adding 4 antennas, the EMC report is indicating 5 antennas and the MPE info has included 10 antenna configurations with 5 of those have multiple connector configurations (a total of 15 configurations). Please clarify how many antenna configurations are applicable for this filing.

**The cover letter has a typo. It should have stated 10 antenna configurations. Per prior correspondence with the FCC it was determined that only the antenna with the highest gain for each type needed to be tested. The TR Status (Test Report Status) column for each antenna either refers you to the test report for its data (tested) or to the higher gain antenna of the same type for its test data (See # X). The LA-3021-100 only uses the MMCX connector for a total of 10 antenna configurations.**

**At this time I wish to append three more antenna configurations to bring the total to 13. I have appended the antenna MPE information for [antenna # 11](#), [antenna #12](#), and [antenna #13](#) to this document as well as supplied a new RF Exposure [summary table](#) that includes all 13 antennas. I have also uploaded the test report that covers these three new antennas.**

**In addition I am including a [configuration table](#) that shows all 13 antenna / terminal configurations in this application.**

2. The antenna list indicates the Rubber Duck antenna is for vehicle-mount use. MPE info indicates this antenna is for incorporation into hand-held devices. Please clarify the antenna configuration and state the actual devices that will be operating with this antenna configuration.

**while the RP-TNC version is on the vehicle-mounted terminal. The rubber duck with the RP-BNC is currently certified under this FCC ID in a mobile device configuration. We want to add the vehicle mount configuration for the RP-TNC connector version. I have included a corrected version of the [Antenna #1 MPE info](#).**

3. Specs for the Toko antenna has 2.15 dBi peak gain, which should be used for MPE estimations instead of the 0 dBi typical gain.

**The 2.15 dBi figure in the data sheet is with the shown optimum ground plane. For the hand held device with a sub-optimum ground plane 0 dBi is the max with -4 dBi being typical. See the attached [Antenna #5 polar plot](#).**

4. The RF exposure statement for the "Vocollect" antenna needs revision. This antenna is only applicable to the specific belt-worn configuration and output power described for this filing. Users should be instructed to use this antenna and belt-worn configuration in specific manners (as described in the manual and this filing) for satisfying FCC RF exposure compliance. Please revise and upload relevant page(s) of the manual for this antenna configuration.

**Attached is [Antenna #4 MPE](#) exhibit that includes the language added to the user information.**

5. There is a 68% duty factor applied to the two body-worn configurations. Please verify if this duty factor had been included in the original filing and explain why would different duty factors be applied to mobile and portable devices. Only source-based time-averaging factors may be used, please provide the applicable information to qualify for source-based time averaging.

**Please see the uploaded proprietary Duty Cycle exhibit.**

6. Please provide the actual separation distance between the "Oniel" antenna and a user's body when the printer containing this antenna is carry next to its user. The proposed RF exposure statement needs revision. The device must be operated in body-worn configurations as described for this filing for satisfy FCC RF exposure compliance. Please revise accordingly and upload relevant page(s) of the manual.

**The O'Neil antenna is a minimum of 2.2 cm away from the users body when clipped on the users belt. Attached is an updated [Antenna # 6 MPE](#) exhibit.**

Note: Output is 112 mW.

I hope these answers are satisfactory.

Respectfully,

Norman H. Nelson

### Rubber Duck Antenna

The **Rubber Duck** antenna is 1 dBi omnidirectional in azimuth plane. It is mounted either on the rear end of the fixed mouted terminal or on the top end of the vehicle mounted terminal as shown in the attached photos. The fixed terminal is mostly wall mounted but could be on a flat surface more than 20 cm from any user. The fixed mounted terminal uses a BNC-RP connector while the vehicle mounted terminal uses the TNC-RP. In its use on the vehicle mounted terminal it could be within 20 cm of a persons hand but more than 20 cm from the users body. It is used in mobile devices. The RF exposure information is included in a prominent place in the device's user manual and is listed next to the configuration photographs.

|                   |                                    |
|-------------------|------------------------------------|
| <i>Location</i>   | Wall / Vehicle Mount               |
| <i>Pattern</i>    | Omni                               |
| <i>Type</i>       | Dipole                             |
| <i>Max Gain</i>   | 1 dBi                              |
| <i>Physical</i>   | See attached dwg                   |
| <i>Cable</i>      | none                               |
| <i>Symbol P/N</i> | ML-2499-APA1-00<br>ML-2499-APA2-00 |



Antenna Photograph



**1380**

Vehicle mounted device Photo

“CAUTION: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this antenna shall be installed in such a manner that it may be located near hands but must be more than 20 cm from any persons body during normal operating conditions.”

RF Safety information

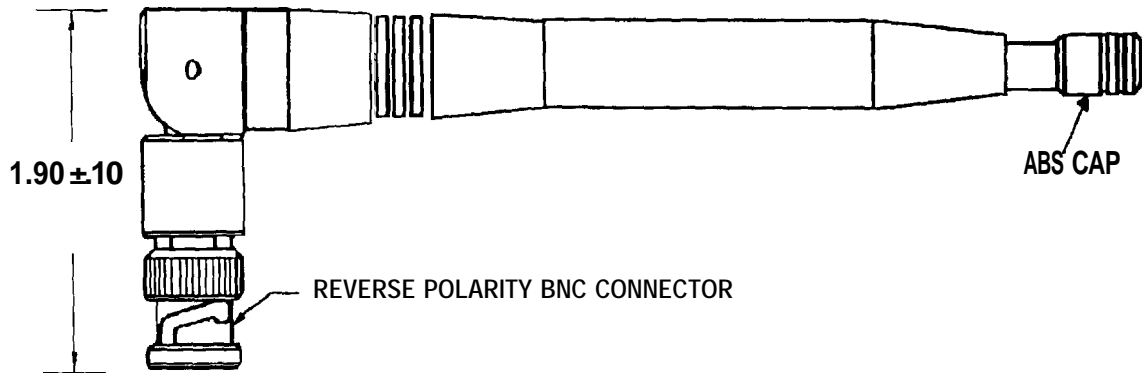
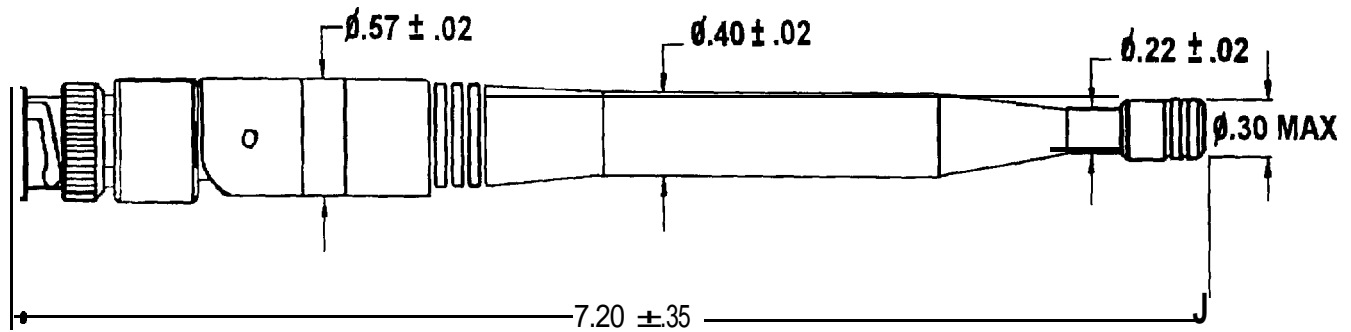


Fixed mounted device Photo

“CAUTION: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this antenna shall be installed to ensure a minimum separation distance of 20 cm from all persons during normal operating conditions.”

RF Safety information





DRAWING NOT TO SCALE

|                        |                         |
|------------------------|-------------------------|
| Bandwidth:             | 2.4 to 2.5 Ghz          |
| VSWR:                  | 1.5:1 Max. at resonance |
| Gain:                  | 1.0 dBi                 |
| Power Rating:          | 50 Watts                |
| Torque Test:           | 20 in-lbs.              |
| Operating Temperature: | -40° - +85°C            |
| Flex Test:             | Per QEA0014             |
| Pull Test:             | 20lbs Liner Pull        |

Dimensions are in inches unless otherwise noted  
 Tolerances are as follows  $\text{XX} \pm .010$  unless otherwise noted.

## Vocollect Antenna

The **Vocollect** antenna is 2 dBi omnidirectional in azimuth plane. It is mounted internally as shown in the attached photo. The **Vocollect** uses either a Murata Erie BFA or a MMCX connector. In its use it would be within 5 cm of a persons body. It is used in portable devices. This antenna / device combination was SAR tested and results filed with a Class II permissive change for the H9PLA3020. The antenna was driven by 240 mW of transmitter power. This produces an EIRP limit of 380 mW. Below is the user safety information located in the users manual.

|                   |                               |
|-------------------|-------------------------------|
| <i>Location</i>   | Body worn device              |
| <i>Pattern</i>    | Omni                          |
| <i>Type</i>       | Dipole                        |
| <i>Max Gain</i>   | 2 dBi                         |
| <i>Physical</i>   | See attached dwg              |
| <i>Cable</i>      | MXYP75, RG-178                |
| <i>Symbol P/N</i> | 50-21900-025,<br>50-21900-026 |

“Warning: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this device shall be used in accordance with the operating conditions and instructions listed in this manual.”



Antenna Photo



## Talkman Open – 2.4 GHz Symbol Radio Information

### Vocollect Antenna Specifications

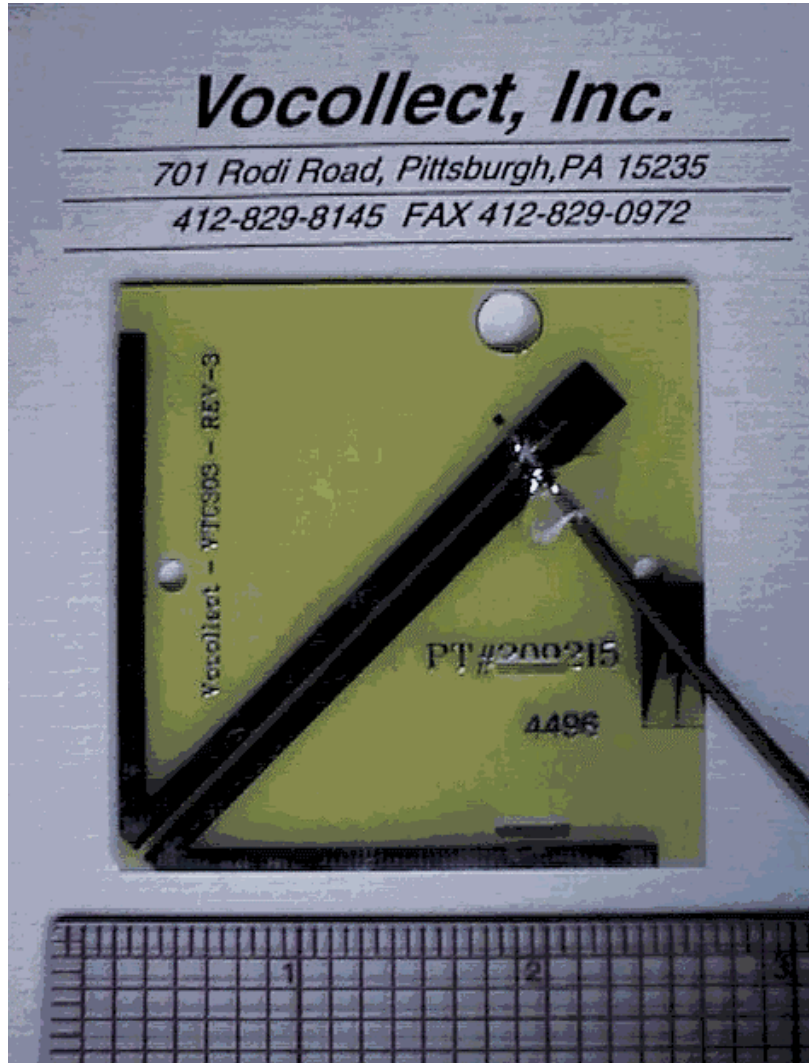
Type: Dipole  
Gain: 2 dBi  
Polarization: Circular  
Physical description: Implemented on flat and rigid printed circuit board, internally mounted, parallel to the belt mounting loop.  
Min distance from skin: 2.1 inches (1.70 inches to inside to belt loop plus 0.40 inches of padded belt)

**Table 1: Bill of Materials- Talkman Open – Symbol Radio and Antenna**

| Item | Qty | Vocollect Part # | Vendor Part # | Supplier       | Description            |
|------|-----|------------------|---------------|----------------|------------------------|
| 1    | 1   | 656022           |               | Austin Antenna | ANTENNA PCB            |
| 2    | 1   | 606012           | 90174601      | Huber-Suhner   | CABLE ASSY,<br>ANTENNA |
|      |     |                  |               |                |                        |

Voccollect, Inc.

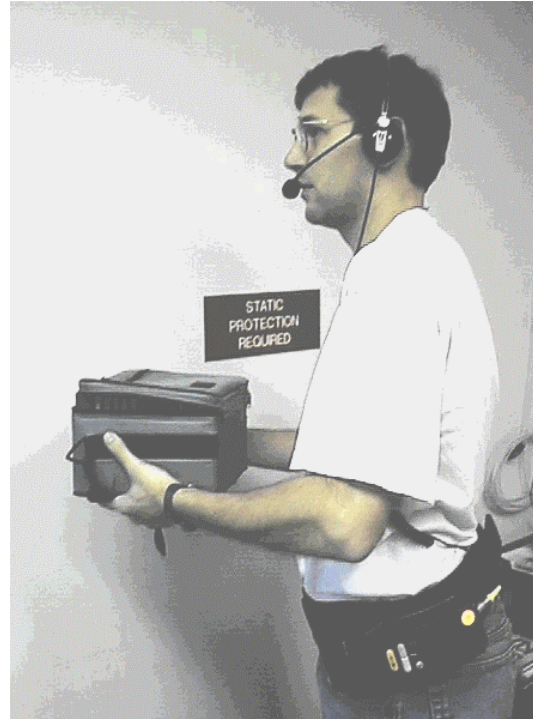
**Image 1: 2.4 GHz Antenna PC Board**



**IMAGE 2: Beltworn Terminal - Drawing**

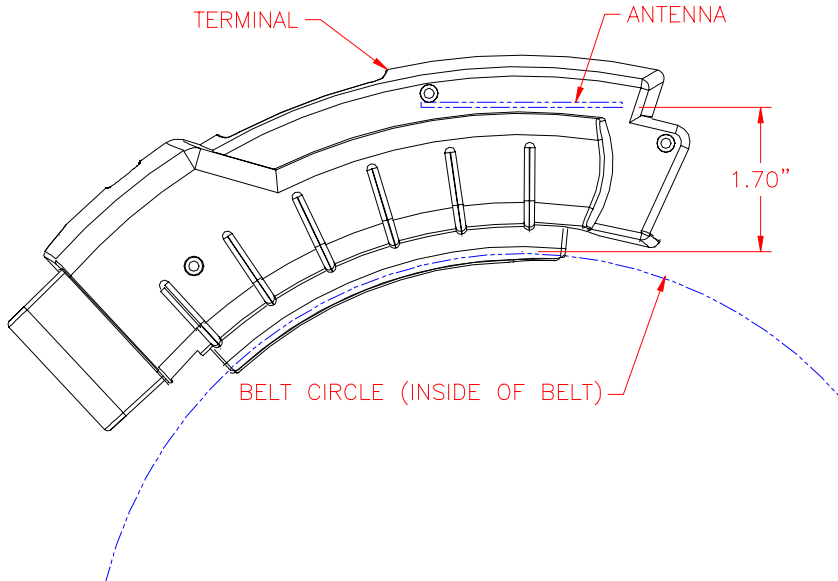


**IMAGE 3: Beltworn Terminal**



**IMAGE 4: Drawing of Antenna Placement Inside Unit.**

The antenna is mounted in the plane parallel to the belt loop and waist, 1.70 inches away from the belt loop used to connect the terminal to the padded mounting belt. Including the belt thickness, the radio is at least 2.1 inches distant from the skin.



**IMAGE 5: The unit mounts on a padded belt ½” thick.**

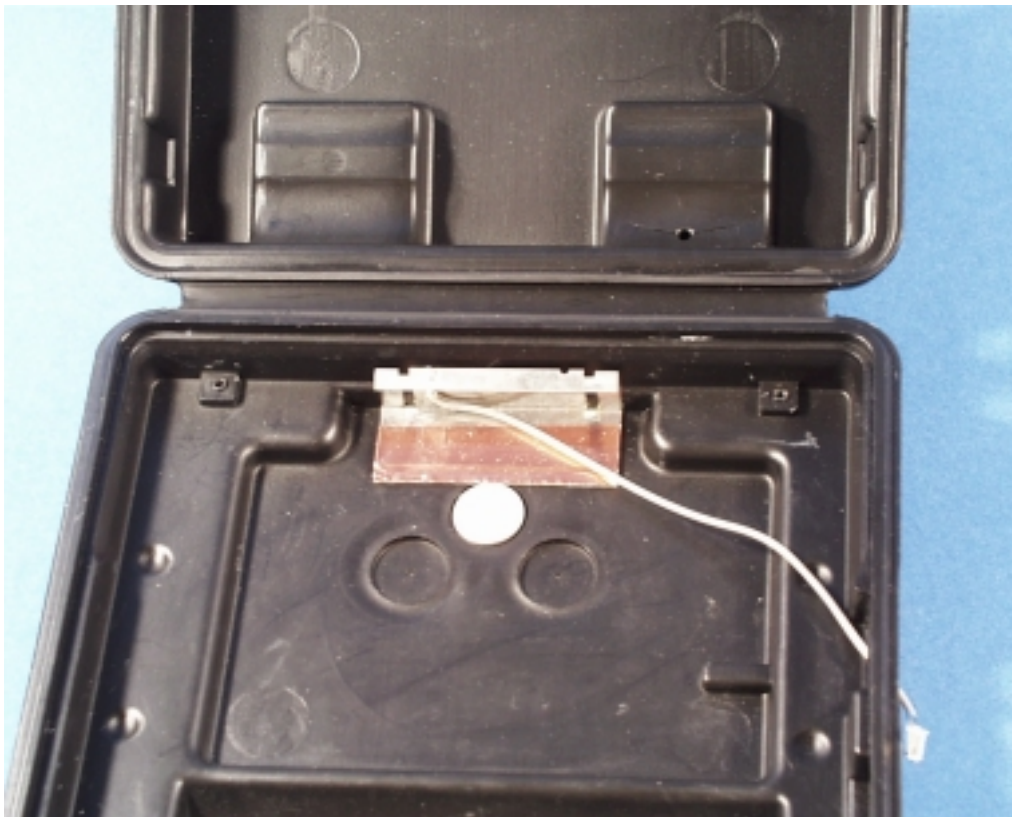
The unit is connected to the belt by a secondary strap secured to the belt. The full width of the main padded belt remains between the terminal and user's body.



**Oneil BFA / Oneil MMCX Antenna**

The **Oneil** antenna is 0 dBi omnidirectional in azimuth plane. It is available with either a MuRatta BFA or MMCX connector. It is mounted as an internal antenna on the O'Neil MicroFlash series of portable belt worn printers. In its use it could be as close as 2.2 cm of a users body. It is used in portable devices.

|                   |                              |
|-------------------|------------------------------|
| <i>Location</i>   | Body worn                    |
| <i>Pattern</i>    | Omni                         |
| <i>Type</i>       | Slot                         |
| <i>Max Gain</i>   | 0 dBi                        |
| <i>Physical</i>   | See attached dwg             |
| <i>Cable</i>      | MXYH75 or RG-178             |
| <i>Symbol P/N</i> | 50-21900-023<br>50-21900-031 |
| <i>EIRP</i>       | See Summary Tbl              |



Antenna Installation Photo

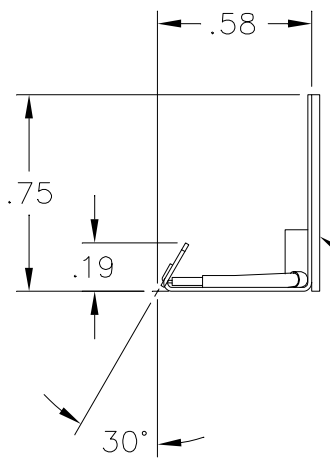
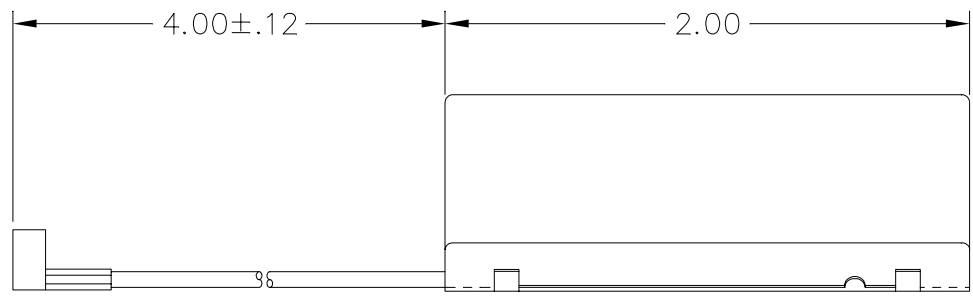


Device use Photograph.

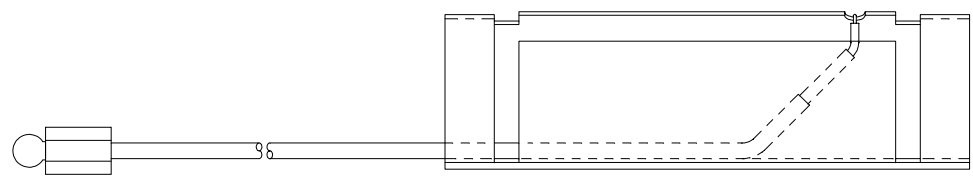
The following text will be located in a conspicuous place in the section describing proper positioning and operation of the body worn device.

“Warning: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this device shall be used in accordance with the operating conditions and instructions listed in this manual.”

| REVISIONS |     |  |              |          |
|-----------|-----|--|--------------|----------|
| ZONE      | LTR | DESCRIPTION  | DATE         | APPROVED |
| C2        | A   | .58 WAS .42<br>ADHESIVE CALLOUT WAS: ... X .025 THK<br>(3M 4930 OR EQUIV)<br>WD 2675 REDRAWN | 1-4-00<br>JL |          |



ADHESIVE FILM,  
.75 X 2.00 X .031 THK  
(3M 4032 OR EQUIV)



### SPECIFICATIONS

|              |               |
|--------------|---------------|
| FREQUENCY:   | 2.4-2.485 GHZ |
| VSWR         | 2.0:1 MAX     |
| GAIN         | 0dBi NOMINAL  |
| POLARIZATION | LINEAR        |
| CABLE:       | MURATA MXYH75 |
| CONNECTOR:   | TYPE BFA      |

4. SHARP CORNERS & EDGES .005 MAX.
3. FINISH SHALL BE UNIFORM AND EXHIBIT NO EVIDENCE OF CORROSION OR OXIDATION WHEN VIEWED WITH THE UNAIDED EYE. EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.

2. ALTERNATE:  
MATERIAL: CRS 1008, .015 THK.  
FINISH: BRIGHT TIN PLATE PER MIL-T-10727A, TYPE 1, ELECTRO DEPOSITED .00010-.00025 IN.
1. MATERIAL: ELECTROLYTIC TIN PLATED STEEL SHEET, .015 THK.



NOTES : UNLESS OTHERWISE SPECIFIED

|             |   |                            |                             |                 |
|-------------|---|----------------------------|-----------------------------|-----------------|
| PMIC        | UNLESS OTHERWISE SPECIFIED:<br>DIMENSIONS ARE IN INCHES.<br>TOLERANCES: .XX ± .03<br>.XXX ± .010 ANGLES ± 0°30'<br>MACHINED SURFACE ROUGHNESS 125✓<br>REMOVE BURRS, SHARP EDGES R.005-.015<br>MACHINED FILLETS R.005-.015<br>DIMENSIONS ARE AFTER PLATING.<br>MACHINED DIA'S ON COMMON CENTERLINE<br>CONCENTRIC WITHIN .005 TIR.<br>INTERPRET PER ANSI Y14.5M-1982. |                            | CONTRACT NUMBER             |                 |
|             |   |                            | CONTRACTOR                  |                 |
|             |   |                            | DRAWN BY<br>J. LOWE         | DATE<br>11-8-99 |
|             |   |                            | CHECKER                     | MFG ENGR        |
|             |   |                            | QA                          | ENGR<br>BI      |
|             |   |                            | PRGM MGR                    | ENGR            |
| 823362      | C090-874  | HOLE TOLERANCES:           |                             |                 |
| NEXT ASSY   | USED ON   | .040 - .128 +.003<br>-.001 | .515 - .750 +.008<br>-.001  |                 |
|             |   | .136 - .228 +.004<br>-.001 | .765 - 1.000 +.010<br>-.002 |                 |
|             |   | .234 - .500 +.006<br>-.001 | 1.031 UP +.015<br>-.002     |                 |
| APPLICATION |   | MATL ENGR                  | APPROVAL                    |                 |

|                  |                           |  |  |
|------------------|---------------------------|--|--|
|                  |                           | TECOM INDUSTRIES INC.<br>9324 TOPANGA CYN BLVD CHATSWORTH, CA. 91311<br><i>TECHNICAL EXCELLENCE COMMITTED TO QUALITY</i> |  |
|                  |                           | TITLE<br><b>ANTENNA,<br/>2.4 GHZ</b>   |  |
| SIZE<br><b>C</b> | CAGE CODE<br><b>52791</b> | DWG NO<br><b>703620</b>  |  |
| SCALE<br>2/1     | UNIT WT                   | SHEET 1 OF 1   |  |

Data



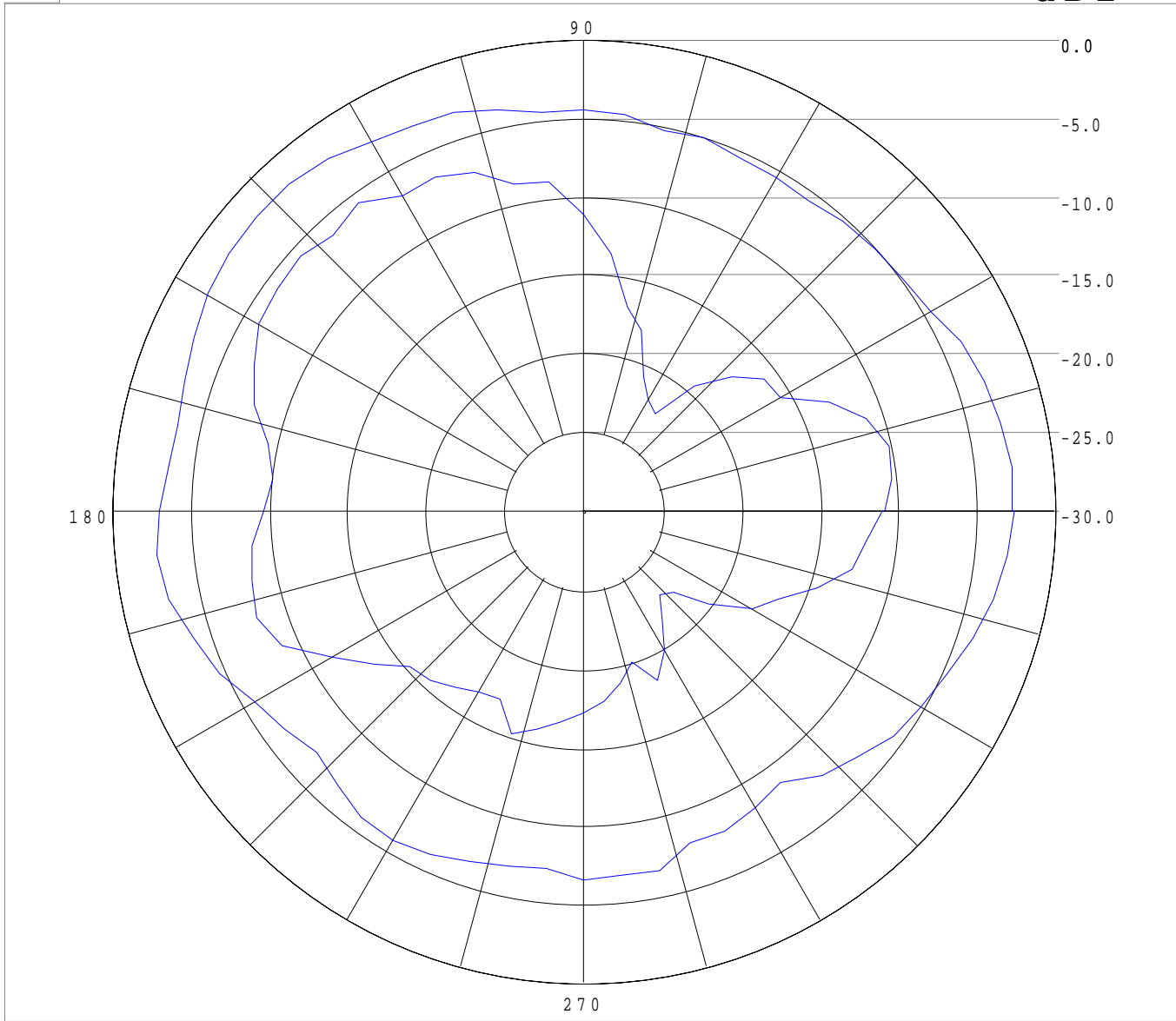
Path: g:\Labview\data1\Norm\Toko\Toko Antenna.dat

Records: 6

6/22/99 8:43:08 AM

PEP

dB*i*



Run Info

Model  S/N

Version

Ft(MHz)  Harmonic  Polarity

Scale Max

Scale Min

◀◀ **Rec No.** ▶▶

| Peak  | mean  | %  |
|-------|-------|----|
| -1.90 | -6.88 | 66 |

6/22/99 8:58:37 AM



**6140 / 6146 Antenna**

The 6146 antenna is 0 dBi omni-directional in azimuth plane. It is mounted internally on the top end of the terminal as shown in the attached photo. The 6140 uses the Muratta Erie BFA connector. The 6146 uses the MMCX connector. In its use it would be within 20 cm of a persons hand but more than 20 cm from the users body. It is used in portable devices. The following RF exposure information is included in a prominent place in the device's user manual to inform the user of safety issues as required by OET Bulletin 65, Supplement C for EIRP greater than 200 mW.

|                   |                  |
|-------------------|------------------|
| <i>Location</i>   | Hand Held Device |
| <i>Pattern</i>    | Omni             |
| <i>Type</i>       | F-Element        |
| <i>Max Gain</i>   | 0 dBi            |
| <i>Physical</i>   | See attached dwg |
| <i>Cable</i>      | MXYH75, RG-178   |
| <i>Symbol P/N</i> | 10-35305-01, -02 |

“CAUTION: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this hand held device is only approved for use in the user's hand when there is 20 cm or more between the antenna and any persons body during normal operating conditions.”

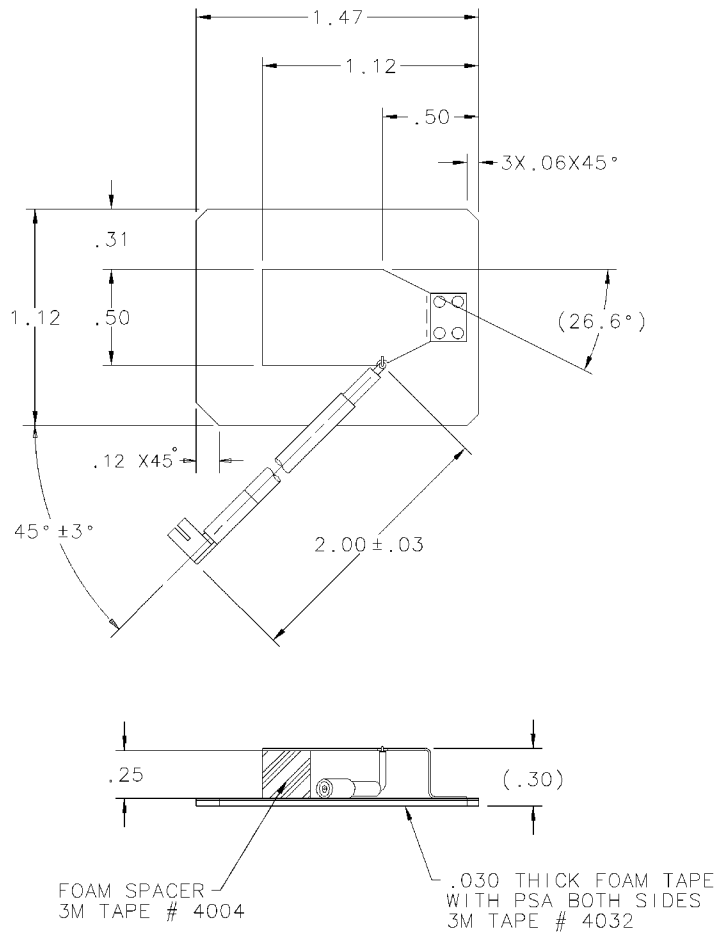


Antenna Installed in Device



Terminal Use Photo

| REVISIONS |      |                         |       |     |       |         |
|-----------|------|-------------------------|-------|-----|-------|---------|
| REV.      | ZONE | DESCRIPTION             | E. C. | BY  | APVD. | DATE    |
| A         |      | RELEASED PER EDR #40629 |       | LM  |       | 6-26-98 |
| B         |      | REVISED PER EC #E5139   |       | MB  |       | 9/15/98 |
| C         |      | REVISED PER EC #E5338   |       | JKW |       | 10/5/98 |



SPECIFICATIONS

FREQUENCY: 2400-2485 MHz  
 VSWR: 2:1  
 GAIN: 0dbi NOMINAL  
 CABLE/CONNECTOR: TECOM 817283-19  
 MXYH62XXXXXXX

NOTES: UNLESS OTHERWISE SPECIFIED:

- MATERIAL: CRS 1008, .010±.001 THICK.
- FINISH: BRIGHT TIN PLATE PER MIL-T 10727A, TYPE 1 ELECTRO DEPOSITED .00010-.00025 INCHES. FINISH SHALL BE UNIFORM AND EXHIBIT NO EVIDENCE OF CORROSION OR OXIDATION WHEN VIEWED WITH THE UNAIDED EYE. EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.
- BREAK AND DEBUR ALL SHARP CORNERS AND EDGES .005 MAX PRIOR TO PLATING.
- OPERATING TEMPERATURE: -20 TO +50°C. STORAGE TEMPERATURE: -40 TO +70°C. HUMIDITY: 95% NON CONDENSING
- PACKAGE ITEMS IN ACCORDANCE WITH STI GENERAL PACKAGING SPEC #50-04100-013.

| ITEM   | QTY.    | PART NO.                 | DESCRIPTION      | REMARKS/REF. SYMBOL   |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
|--|---------|--------------------------|------------------|---|--------------------------|--|-----------|------|---|----------------------------|--|-----------|---------|-----|----|------|----------------|------|----|------|-----------------|------------------------------|--|--------------------------|------------------|--------|--------------------|--|---------|--|----------------------|------------------|--|--|--|--------|-----------|---------|----------------------|--|---|
| <table border="1"> <tr> <td colspan="2">DIMENSIONS ARE IN INCHES</td> <td>APPROVALS</td> <td>DATE</td> <td rowspan="4"> <b>SYMBOL TECHNOLOGIES INC.</b><br/>                     Bohemia, New York<br/><br/>                     ANTENNA: TYPE F,S24, COBALT                 </td> </tr> <tr> <td colspan="2">UNLESS OTHERWISE SPECIFIED</td> <td>DRAWN LJM</td> <td>1/22/98</td> </tr> <tr> <td>.XX</td> <td>MM</td> <td>INCH</td> <td>CHECKED F GONG</td> </tr> <tr> <td>.XXX</td> <td>MM</td> <td>INCH</td> <td>ENGINEER F GONG</td> </tr> <tr> <td colspan="2">ANGLES ± 1° FRACTIONS ± 1/64</td> <td>MFG. ENG. F MAZURKIEWICZ</td> <td>PRODUCT HOFBAUER</td> <td>SIZE C</td> </tr> <tr> <td colspan="2">MATERIAL: SEE NOTE</td> <td>QUALITY</td> <td></td> <td>DWG. NO. 10-35305-01</td> </tr> <tr> <td colspan="2">FINISH: SEE NOTE</td> <td></td> <td></td> <td>REV. C</td> </tr> <tr> <td>NEXT ASSY</td> <td>USED ON</td> <td>DO NOT SCALE DRAWING</td> <td></td> <td>SCALE: 2/1 SOLID MODEL <input checked="" type="checkbox"/> SHEET 1 OF 1</td> </tr> </table> |         |                          |                  |   | DIMENSIONS ARE IN INCHES |  | APPROVALS | DATE | <b>SYMBOL TECHNOLOGIES INC.</b><br>Bohemia, New York<br><br>ANTENNA: TYPE F,S24, COBALT | UNLESS OTHERWISE SPECIFIED |  | DRAWN LJM | 1/22/98 | .XX | MM | INCH | CHECKED F GONG | .XXX | MM | INCH | ENGINEER F GONG | ANGLES ± 1° FRACTIONS ± 1/64 |  | MFG. ENG. F MAZURKIEWICZ | PRODUCT HOFBAUER | SIZE C | MATERIAL: SEE NOTE |  | QUALITY |  | DWG. NO. 10-35305-01 | FINISH: SEE NOTE |  |  |  | REV. C | NEXT ASSY | USED ON | DO NOT SCALE DRAWING |  | SCALE: 2/1 SOLID MODEL <input checked="" type="checkbox"/> SHEET 1 OF 1 |
| DIMENSIONS ARE IN INCHES   |         | APPROVALS                | DATE             | <b>SYMBOL TECHNOLOGIES INC.</b><br>Bohemia, New York<br><br>ANTENNA: TYPE F,S24, COBALT |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| UNLESS OTHERWISE SPECIFIED   |         | DRAWN LJM                | 1/22/98          |   |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| .XX  | MM      | INCH                     | CHECKED F GONG   |   |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| .XXX   | MM      | INCH                     | ENGINEER F GONG  |   |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| ANGLES ± 1° FRACTIONS ± 1/64   |         | MFG. ENG. F MAZURKIEWICZ | PRODUCT HOFBAUER | SIZE C  |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| MATERIAL: SEE NOTE   |         | QUALITY                  |                  | DWG. NO. 10-35305-01  |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| FINISH: SEE NOTE   |         |                          |                  | REV. C  |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |
| NEXT ASSY  | USED ON | DO NOT SCALE DRAWING     |                  | SCALE: 2/1 SOLID MODEL <input checked="" type="checkbox"/> SHEET 1 OF 1                 |                          |  |           |      |   |                            |  |           |         |     |    |      |                |      |    |      |                 |                              |  |                          |                  |        |                    |  |         |  |                      |                  |  |  |  |        |           |         |                      |  |   |

4

3

2

1

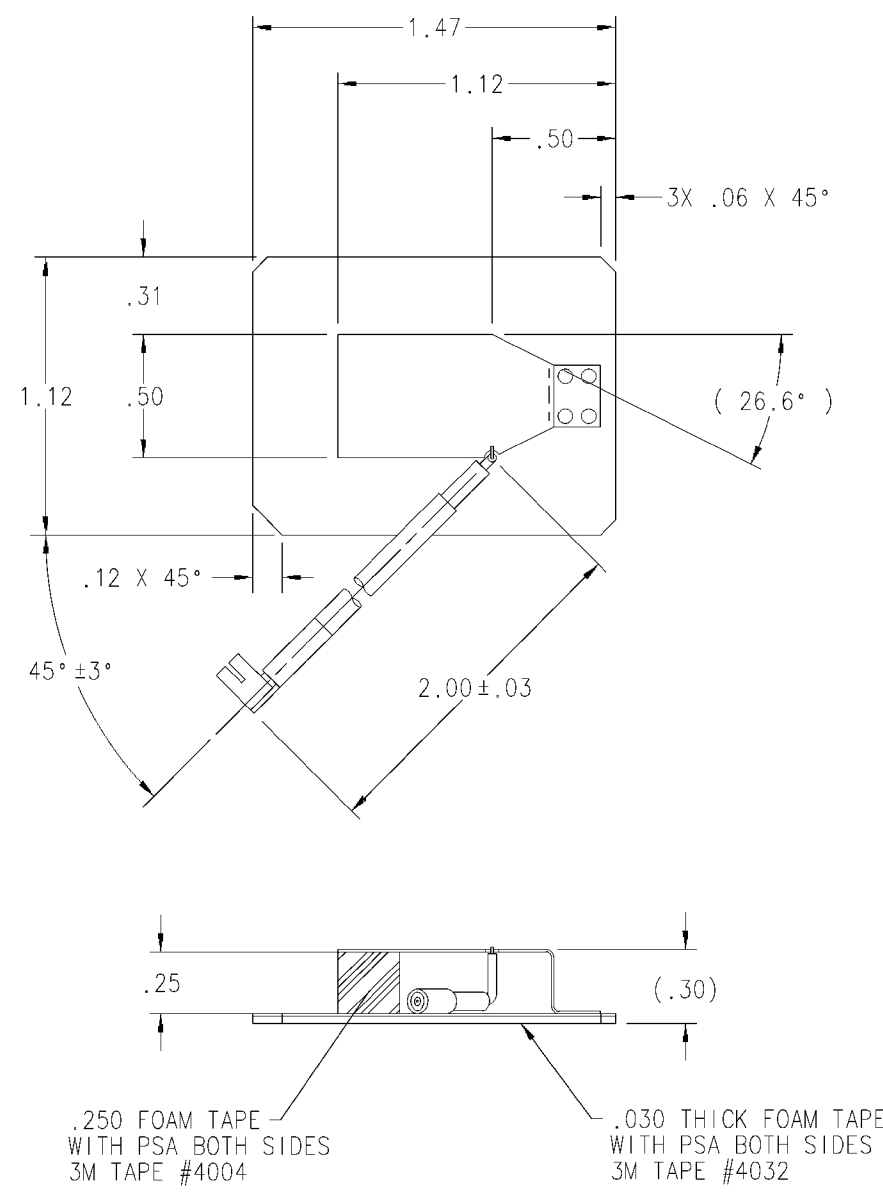
| REVISIONS |      |     |                         |      |    |       |         |
|-----------|------|-----|-------------------------|------|----|-------|---------|
| REV.      | ZONE | NO. | DESCRIPTION             | E.C. | BY | APVD. | DATE    |
| A         |      |     | RELEASED PER EDR #53453 |      | JS |       | 1/13/00 |

D

C

B

A



NOTES: UNLESS OTHERWISE SPECIFIED.

- MATERIAL: CRS 1008, .010±.001 THICK.
- FINISH: BRIGHT TIN PLATE PER MIL-T 10727A, TYPE 1 ELECTRO DEPOSITED .00010-.00025 INCHES. FINISH SHALL BE UNIFORM AND EXHIBIT NO EVIDENCE OF CORROSION OR OXIDATION WHEN VIEWED WITH THE UNAIDED EYE. EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.
- BREAK AND DEBUR ALL SHARP CORNERS AND EDGES .005 MAX PRIOR TO PLATING.
- OPERATING TEMPERATURE: -20 TO +50°C. STORAGE TEMPERATURE: -40 TO +70°C. HUMIDITY: 95% NON CONDENSING.
- PACKAGE ITEMS IN ACCORDANCE WITH STI GENERAL PACKAGING SPEC #50-04100-013.

SPECIFICATIONS:

FREQUENCY: 2400-2485 MHz  
 VSWR: 2:1  
 GAIN: 0dbi NOMINAL  
 CABLE: RG178  
 CONNECTOR: 50-22100-029

| ITEM  | QTY.  | PART NO.        | DESCRIPTION                 | REMARKS/REF. SYMBOL   |   |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
|---|---|-----------------|-----------------------------|---|---|--|--|-----------|------|--|----|------|-----------------|---------|---------|---------|------------------|---------|----------|----------|-------------------|---------|----------------------|--|-----------------|-----------------------------|--|--------|--------------------|--|------------|--|---|--------------|
| <table border="1"> <tr> <td rowspan="4"> <small>THE DWG. &amp; SPECIFICATION CONTAINED HEREON ARE PROPRIETARY AND MUST NOT BE USED, COPIED, REPRODUCED NOR ITS CONTENTS COMMUNICATED TO OTHERS EXCEPT IN ACCORDANCE WITH WRITTEN INSTRUCTIONS RECEIVED FROM SYMBOL TECHNOLOGIES INC.</small> </td> <td colspan="2">DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED</td> <td>APPROVALS</td> <td>DATE</td> <td rowspan="4"> <b>SYMBOL TECHNOLOGIES INC.</b><br/>           Bohemia, New York<br/><br/>           ANTENNA: TYPE F,S24,<br/>           COBALT, MMCX         </td> </tr> <tr> <td>MM</td> <td>INCH</td> <td>DRAWN J.SIMMONS</td> <td>1/13/00</td> </tr> <tr> <td>.XX +/-</td> <td>+/- .01</td> <td>CHECKED M.SAVONA</td> <td>1/13/00</td> </tr> <tr> <td>.XXX +/-</td> <td>+/- .005</td> <td>ENG. B.ROSENGRANT</td> <td>1/13/00</td> </tr> <tr> <td colspan="2">MATERIAL: SEE NOTE 1</td> <td>PRODUCT QUALITY</td> <td colspan="2">SIZE C DWG. NO. 10-35305-02</td> <td>REV. A</td> </tr> <tr> <td colspan="2">FINISH: SEE NOTE 2</td> <td colspan="2">SCALE: 2:1</td> <td>SOLID MODEL <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO</td> <td>SHEET 1 OF 1</td> </tr> </table> |   |                 |                             |   | <small>THE DWG. &amp; SPECIFICATION CONTAINED HEREON ARE PROPRIETARY AND MUST NOT BE USED, COPIED, REPRODUCED NOR ITS CONTENTS COMMUNICATED TO OTHERS EXCEPT IN ACCORDANCE WITH WRITTEN INSTRUCTIONS RECEIVED FROM SYMBOL TECHNOLOGIES INC.</small> | DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED  |  | APPROVALS | DATE | <b>SYMBOL TECHNOLOGIES INC.</b><br>Bohemia, New York<br><br>ANTENNA: TYPE F,S24,<br>COBALT, MMCX | MM | INCH | DRAWN J.SIMMONS | 1/13/00 | .XX +/- | +/- .01 | CHECKED M.SAVONA | 1/13/00 | .XXX +/- | +/- .005 | ENG. B.ROSENGRANT | 1/13/00 | MATERIAL: SEE NOTE 1 |  | PRODUCT QUALITY | SIZE C DWG. NO. 10-35305-02 |  | REV. A | FINISH: SEE NOTE 2 |  | SCALE: 2:1 |  | SOLID MODEL <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | SHEET 1 OF 1 |
| <small>THE DWG. &amp; SPECIFICATION CONTAINED HEREON ARE PROPRIETARY AND MUST NOT BE USED, COPIED, REPRODUCED NOR ITS CONTENTS COMMUNICATED TO OTHERS EXCEPT IN ACCORDANCE WITH WRITTEN INSTRUCTIONS RECEIVED FROM SYMBOL TECHNOLOGIES INC.</small>   | DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED |                 | APPROVALS                   | DATE  |   | <b>SYMBOL TECHNOLOGIES INC.</b><br>Bohemia, New York<br><br>ANTENNA: TYPE F,S24,<br>COBALT, MMCX |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
|   | MM  | INCH            | DRAWN J.SIMMONS             | 1/13/00   |   |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
|   | .XX +/-   | +/- .01         | CHECKED M.SAVONA            | 1/13/00   |   |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
|   | .XXX +/-  | +/- .005        | ENG. B.ROSENGRANT           | 1/13/00   |   |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
| MATERIAL: SEE NOTE 1  |   | PRODUCT QUALITY | SIZE C DWG. NO. 10-35305-02 |   | REV. A  |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
| FINISH: SEE NOTE 2  |   | SCALE: 2:1      |                             | SOLID MODEL <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | SHEET 1 OF 1  |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |
|   |   | PDT6140         | DO NOT SCALE DRAWING        |   |   |  |  |           |      |  |    |      |                 |         |         |         |                  |         |          |          |                   |         |                      |  |                 |                             |  |        |                    |  |            |  |   |              |

4

3

2

1

D

C

B

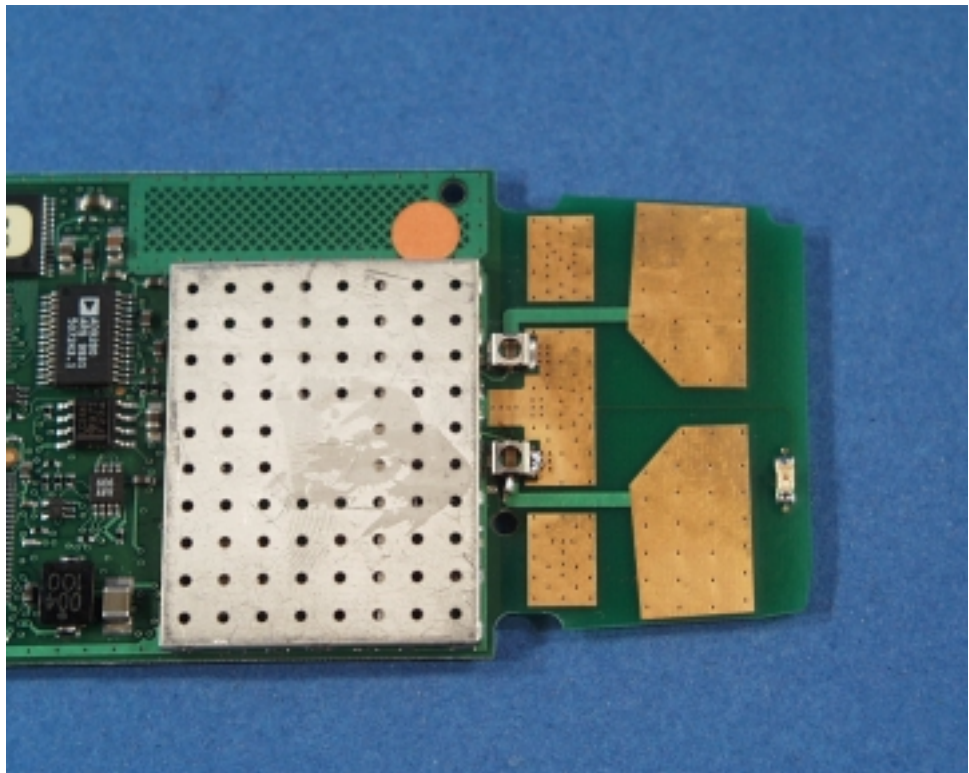
A

### IEC PC Antenna

The **IEC PC** antenna is 0 dBi omnidirectional in azimuth plane. It is printed on a extended version of the PCB as shown in the attached photo. There are two patches for spatial diversity. The **IEC PC** does not use a connector. In its use it could be within 20 cm of a persons hand but more than 20 cm from the users body. It is used in portable devices. The following RF exposure information is included in a prominent place in the device's user manual to inform the user of safety issues as required by OET Bulletin 65, Supplement C for EIRP greater than 200 mW.

|                   |                  |
|-------------------|------------------|
| <i>Location</i>   | Laptop PC        |
| <i>Pattern</i>    | Omni             |
| <i>Type</i>       | Patch            |
| <i>Gain</i>       | 0 dBi            |
| <i>Physical</i>   | See attached dwg |
| <i>Cable</i>      | none             |
| <i>Symbol P/N</i> | 24- 20776- 02    |
| <i>EIRP</i>       | See Summary Tbl  |

“CAUTION: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this antenna shall be installed in such a manner that it may be located near hands but must be more than 20 cm from any persons body during normal operating conditions.”



Antenna Internal Photo



Antenna External Photo



Antenna Use Photo

### Micropaq Antenna

The **Micropaq** antenna is 2 dBi omnidirectional in azimuth plane. It is mounted internally as shown in the attached photo. The **Micropaq** uses a MMCX connector. In its use it could be as close as 2.2 cm of a persons body.

|                   |                  |
|-------------------|------------------|
| <i>Location</i>   | Body worn device |
| <i>Pattern</i>    | Omni             |
| <i>Type</i>       | PCB              |
| <i>Max Gain</i>   | 2 dBi            |
| <i>Physical</i>   | See attached dwg |
| <i>Cable</i>      | Flex strip       |
| <i>Symbol P/N</i> | 50-21900-037     |



Antenna Photo

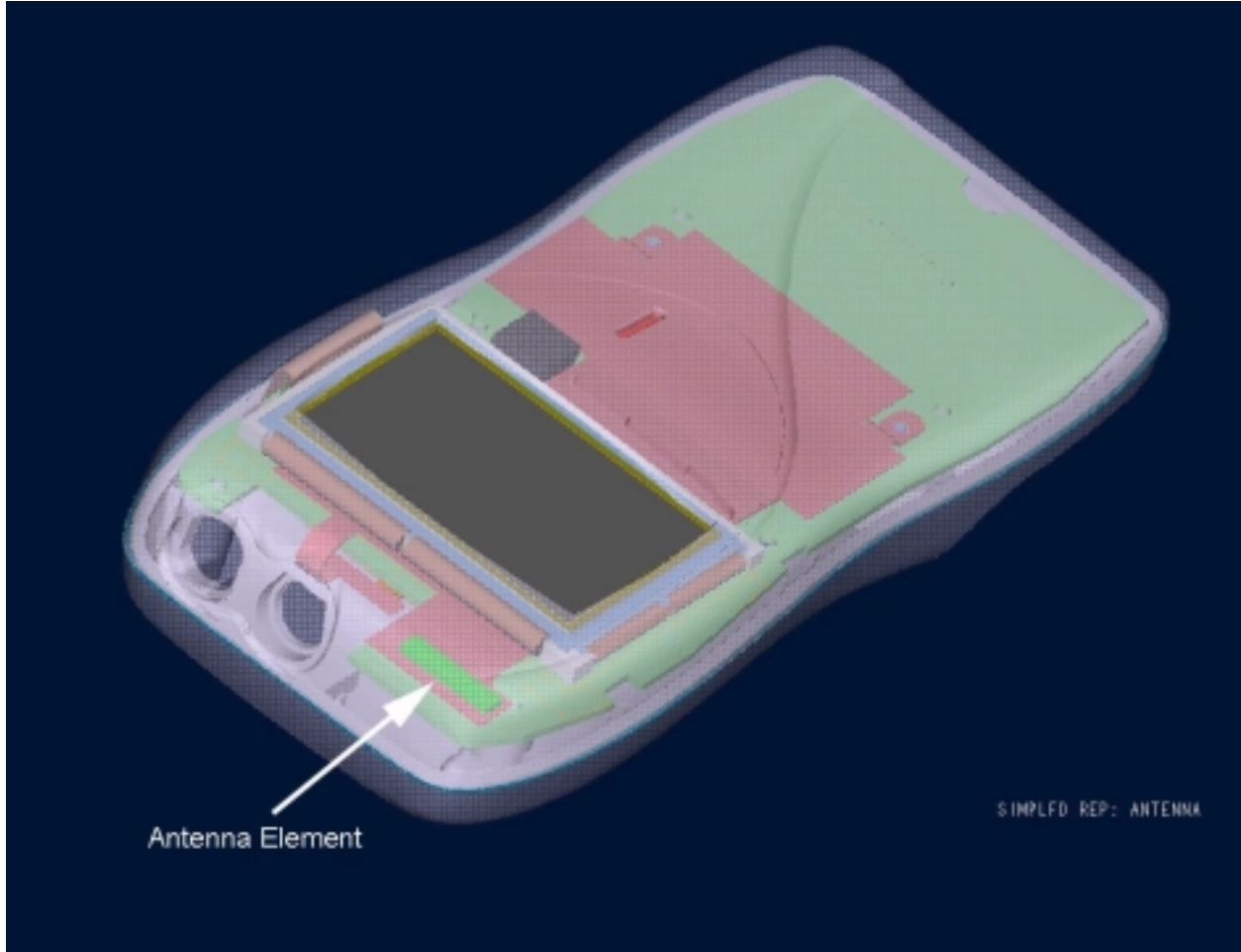


### Terminal Use

The following text will be located in a conspicuous place in the section describing proper positioning and operation of the body worn device.

“Warning: Exposure to Radio Frequency radiation. To conform to FCC RF exposure requirements this device shall be used in accordance with the operating conditions and instructions listed in this manual.”





Antenna Position



### Features

- Small and lightweight
- No tuning components
- Available in tube and reel packing for automatic mounting

### Ultima™ Series Antennas

This small embedded antenna provides the most reliable, easy to use, and adjustment-free antenna technology for handling during assembly and implementation by developers.

### Electrical

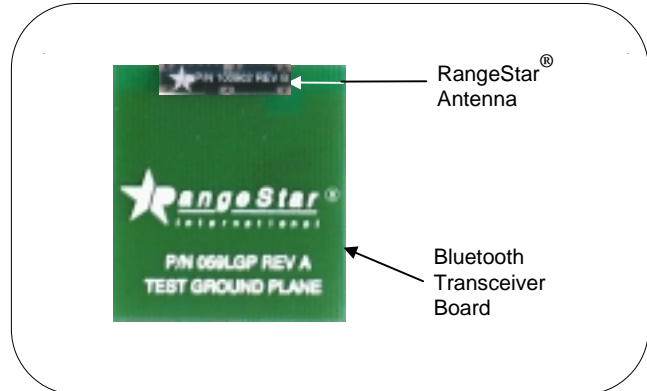
|                          |                    |
|--------------------------|--------------------|
| Frequency Range          | 2.40 – 2.50 GHz    |
| Peak Gain <sup>(1)</sup> | 0 dBi peak         |
| VSWR <sup>(1)</sup>      | Less than 2.0:1    |
| Front-to-Back Ratio      | n/a                |
| Polarization             | Linear             |
| Azimuth beamwidth        | Omnidirectional    |
| Power handling           | 10 Watt cw         |
| Feed point impedance     | 50 Ohms unbalanced |

Note (1) Figures dependant on ground plane size

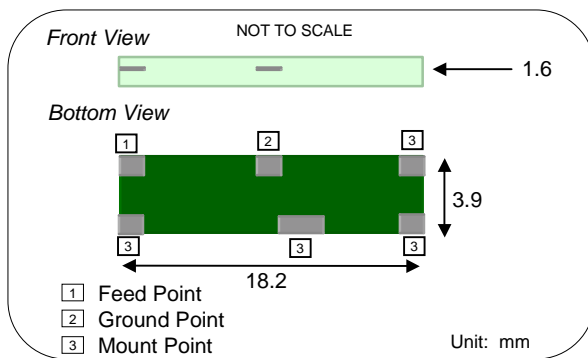
### Mechanical

|          |                            |
|----------|----------------------------|
| Size     | 18.2 x 3.9 x 1.6 mm        |
| Weight   | Less than 1 g              |
| Mounting | Surface mounted technology |

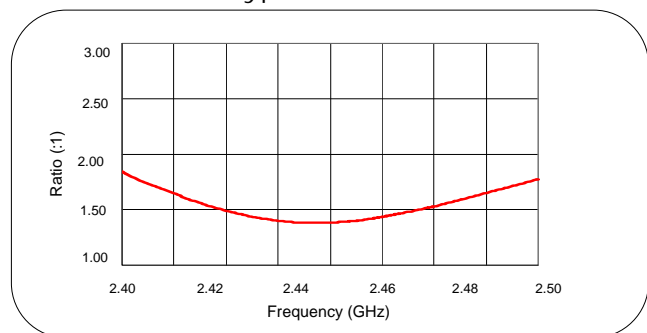
### Typical Mounting



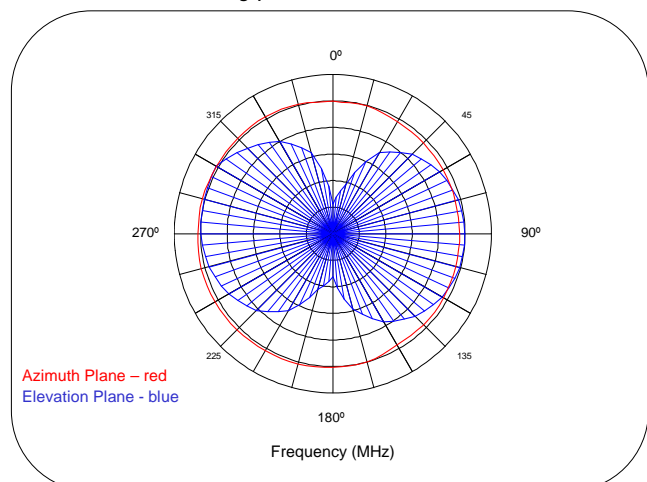
### 100902 Dimensions



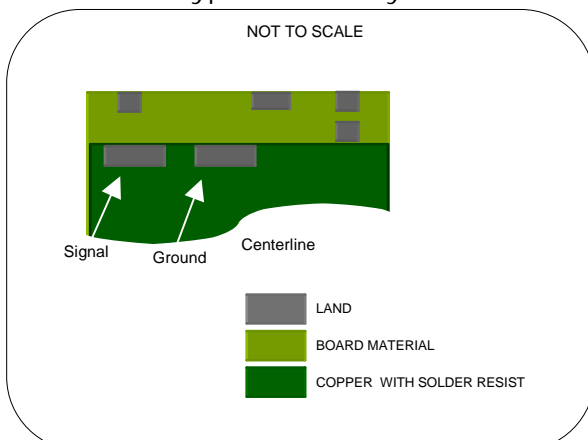
### Typical VSWR



### Typical Pattern



### Typical Pad Layout





# RF Exposure Antenna Summary

Network Systems Organization

FCC ID: **H9PLA3021-100**

WLAN PC Card, 2 Mbps, Proj. C, Lo Pwr

Source Based

Mobile DC Factor: 0.650

Output Power: 112 mW

Class II Permissive Change

Portable DC Factor: 0.640

## Mobile Antennas (R>20cm)

| Ant No | Model             | Symbol P/N   | Type      | Gain (dBi) | Cabel Loss (dB) | Pout (dBm) | MPE (cm) | TR Status | Device Type   |
|--------|-------------------|--------------|-----------|------------|-----------------|------------|----------|-----------|---------------|
| 01.    | XP                | 50-21900-024 | Slot      | 0.0        | 0.58            | 19.92      | 1.8      | Tested    | Hand Held Ocp |
| 02.    | 2742              | 703624-2     | F-Element | 0.0        | 0.13            | 20.36      | 1.9      | Tested    | Hand Held Ocp |
| 04.    | 7242              | 10-35477-01  | F-Element | 0.0        | 0.12            | 20.37      | 1.9      | Tested    | Hand Held Ocp |
| 05.    | Toko              | 50-21900-022 | Puck      | 0.0        | 0.00            | 20.49      | 1.9      | Tested    | Hand Held Ocp |
| 07.    | 6846              | 10-32290-02  | F-Element | 0.0        | 0.34            | 20.15      | 1.9      | See # 2   | Hand Held Ocp |
| 08.    | 1742              | 703549-2     | F-Element | 0.0        | 0.11            | 20.38      | 1.9      | See # 2   | Hand Held Ocp |
| 09.    | 7546              | 10-38649-02  | F-Element | 0.0        | 0.31            | 20.18      | 1.9      | See # 2   | Hand Held Ocp |
| 10.    | Rubber DuckTNC-RP | 50-21900-029 | Dipole    | 1.0        | 0.00            | 20.49      | 2.2      | See # 3   | Vehicle Mount |
| 11.    | 6146              | 10-35305-02  | F-Element | 0.0        | 0.12            | 20.37      | 1.9      | Tested    | Hand Held Ocp |
| 12.    | IEC PC-LP         | LA-3021-100  | Patch     | 2.0        | 0.00            | 20.49      | 2.4      | Tested    | Laptop        |

## Portable Antennas (R < 5cm)

| Ant No | Model          | Symbol P/N   | Type   | Gain (dBi) | Cabel Loss (dB) | Pout (dBm) | EIRP (mW) | TR Status    | Device Type  | Tx Limited |
|--------|----------------|--------------|--------|------------|-----------------|------------|-----------|--------------|--------------|------------|
| 03.    | Vocollect MMCX | 50-21900-025 | Dipole | 2.0        | 0.25            | 20.24      | 107.3     | Tested + SAR | Belt Worn 5- |            |
| 06.    | Oniel MMCX     | 50-21900-031 | Slot   | 0.0        | 0.37            | 20.12      | 65.8      | See #1       | Belt Worn 5- |            |
| 13.    | Micropaq       | 50-21900-037 | PCB    | 2.0        | 0.15            | 20.34      | 109.8     | Tested       | Belt Worn 5- |            |

Antenna Gain listed without cable  
TR Status refers to whether the antenna was tested. If not refer to the directed antenna test data

Duty Cycle Factors are applied to MPE and EIRP

Tx Limited configurations are for low power versions of the radio. See the specific antenna exhibit for detail

Wednesday, October 11, 2000 08:44 PM

Page 1 of 1



# RF Exposure Configuration Summary

Network Systems Organization

FCC ID: **H9PLA3021-100**

WLAN PC Card, 2 Mbps, Proj. C, Lo Pwr

Output Power: 112 mW

Class II Permissive Change

| Ant # | Antenna Model     | Terminal Mfgr.              | Terminal Model | Use           |
|-------|-------------------|-----------------------------|----------------|---------------|
| 01    | XP                | Mitsubishi                  | XPn            | Hand Held Ocp |
| 02    | 2742              | Symbol                      | SPT-2742-100   | Hand Held Ocp |
| 03    | Vocollect MMCX    | Vocollect                   | Talkman Open   | Belt Worn 5-  |
| 04    | 7242              | Symbol                      | PDT-7242       | Hand Held Ocp |
| 05    | Toko              | Percon                      | Falcon 315     | Hand Held Ocp |
| 06    | Oniel MMCX        | O'Neil Product Development. | MF4TS24-2      | Belt Worn 5-  |
| 07    | 6846              | Symbol                      | PDT-6842       | Hand Held Ocp |
| 08    | 1742              | UK                          | SPT-1746       | Hand Held Ocp |
| 09    | 7546              | Symbol                      | PDT-7542       | Hand Held Ocp |
| 10    | Rubber DuckTNC-RP | Percon                      | 1380           | Vehicle Mount |
| 11    | 6146              | Symbol                      | PDT-6142       | Hand Held Ocp |
| 12    | IEC PC-LP         | Generic                     | Laptop         | Laptop        |
| 13    | Micronaa          | Protocol Systems            | Micropaq 40X   | Belt Worn 5-  |

5- R < 5 cm

5+ 5 cm < R < 20 cm

Ocp Occupational