



Network Systems Organization

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

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Re: FCC ID H9PLA4111 Ref # 15542

Date: 10/12/00

Dear Reviewer,

In response to the following Email:

To: Norman Nwolson, Symbol Technologies, Inc.
From: Steve Dayhoff
sdayhoff@fcc.gov
FCC Application Processing Branch

Re: FCC ID H9PLA4111
Applicant: Symbol Technologies Inc
Correspondence Reference Number: 15542
731 Confirmation Number: EA97685
Date of Original E-Mail: 08/11/2000

1. EMC report is indicating 6 antennas and the MPE info has included 15 antenna configurations (started out with 11 and added 4 more later) with 7 of those have multiple connector configurations (a total of 22 configurations). Please clarify how many antenna configurations are applicable for this filing.

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.

The LA3021-500 uses a MMCX connector. Only the configurations using the MMCX connector are under consideration. I have included a [configuration table](#) that lists each of the 15 configurations in this application.

2. 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 plot](#).

3. The RF exposure statement for the four body-worn and wrist-worn antenna/device configurations needs revision. These antennas are only applicable to the specific belt-worn or wrist-worn configurations and output power described in this filing. Users should be instructed to use the antenna and belt-worn/wrist-worn configurations 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 these antenna configurations.

Attached are antenna #6, #10, #14, and #15 MPE exhibits that include the updated RF exposure statements.

4. 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 in 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 # 10 MPE exhibit.

5. The info submitted for wrist-worn antenna configuration "1046DP" has included a photo indicating two different antennas co-existing within this device, an F-element and a dipole; please clarify how do these two antennas operate within this device and provide the separation distances between the antennas and the user's body when the device is worn on a person's wrist.

The F-element antenna was approved in its shown configuration in the original grant. I am applying to add the dipole 1046DP configuration. The antennas operate as spatial / pattern diversity pair for the radio. Only one antenna is used at a time. Do to multipath the user can walk into a multipath null. Through the use of Received Signal Strength the radio will switch antenna ports to the other antenna that is not in the null.

The 1046DP will be 2.0 cm from the wrist and the 1046 (F-element) will be 2.5 cm.

Note: Output is 60 mW.

I hope these answers are satisfactory.

Respectfully,

Norman H. Nelson

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>	MXYPH75, RG-178
<i>Symbol P/N</i>	50-21900-025, 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, ANTENNA

Vocollect, Inc.

Image 1: 2.4 GHz Antenna PC Board

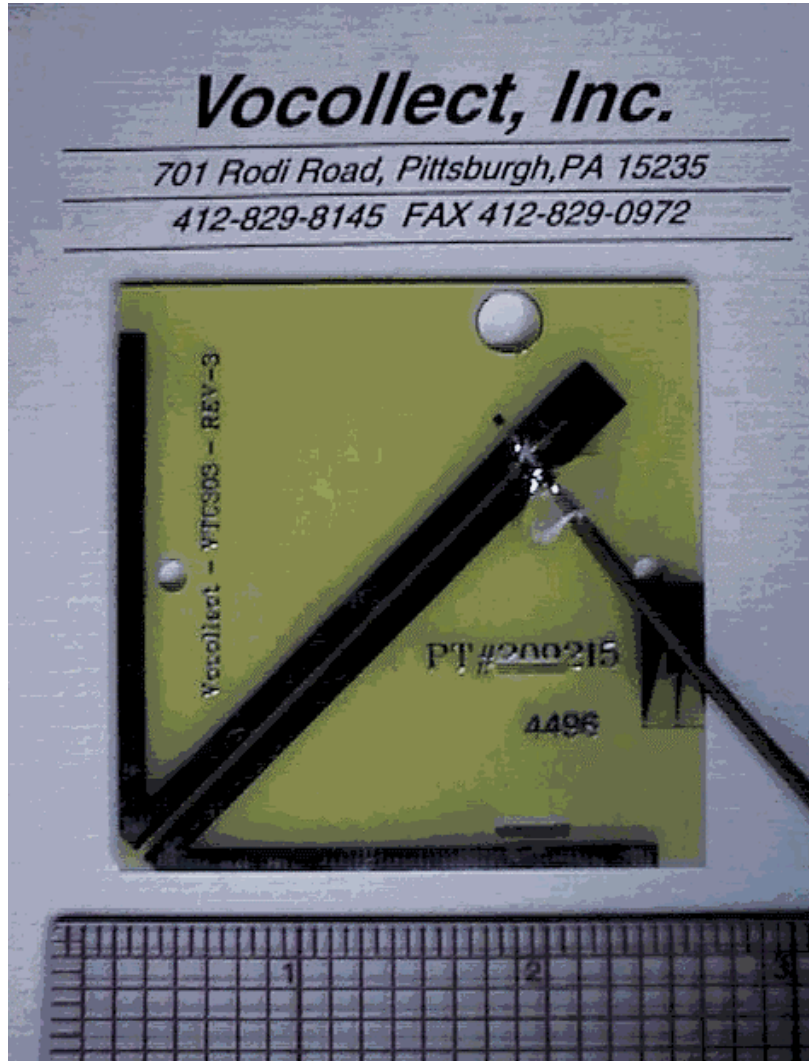


IMAGE 2: Beltworn Terminal - Drawing



IMAGE 3: Beltworn Terminal

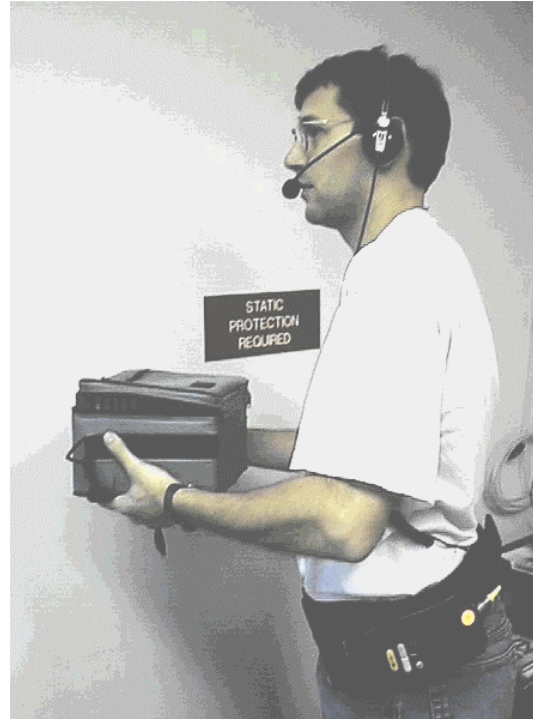


IMAGE 4: Drawing of Antenna Placement Inside Unit.

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.

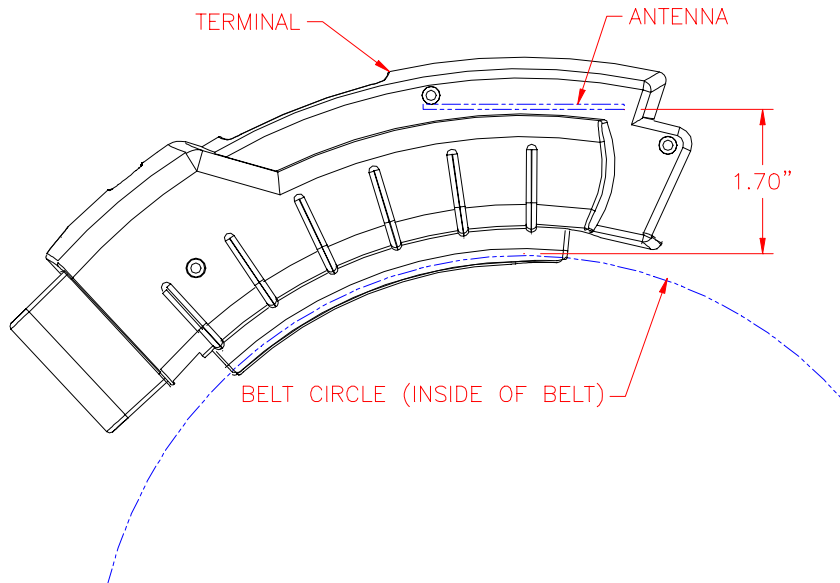


IMAGE 5: The unit mounts on a padded belt ½" thick.

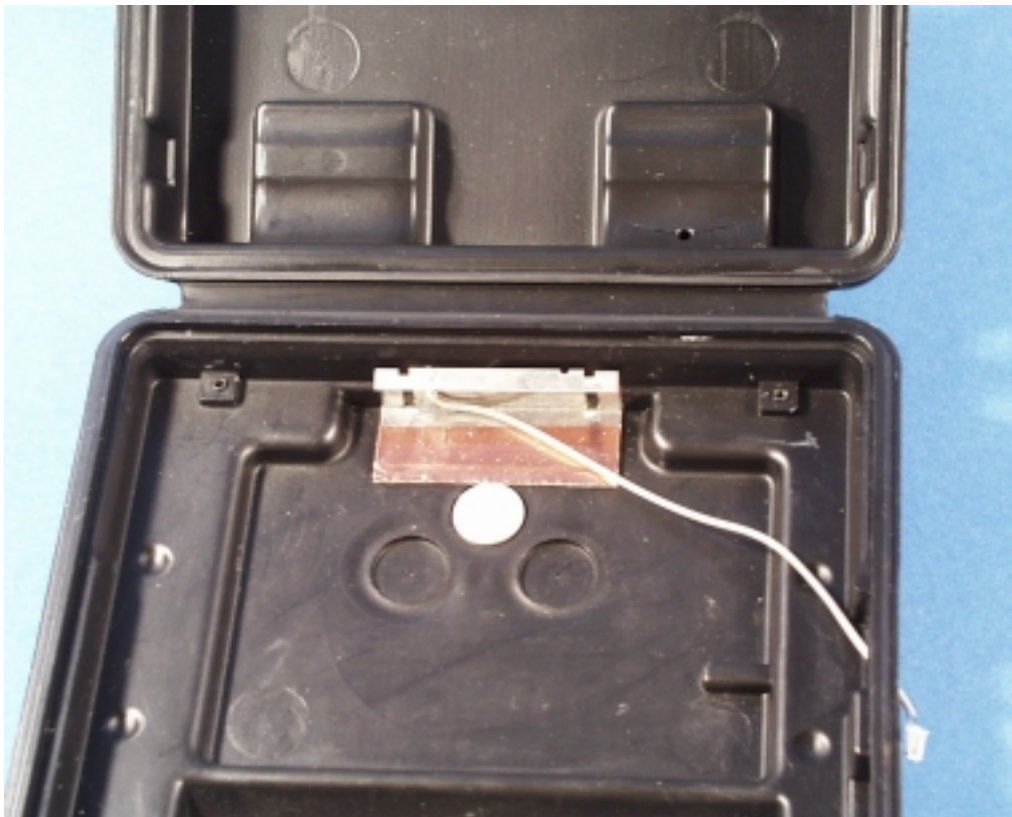
The unit is connected to the belt by a secondary strap secured to the belt. The full width of the main padded belt remains between the terminal and user's body.



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 50-21900-031
<i>EIRP</i>	See Summary Tbl



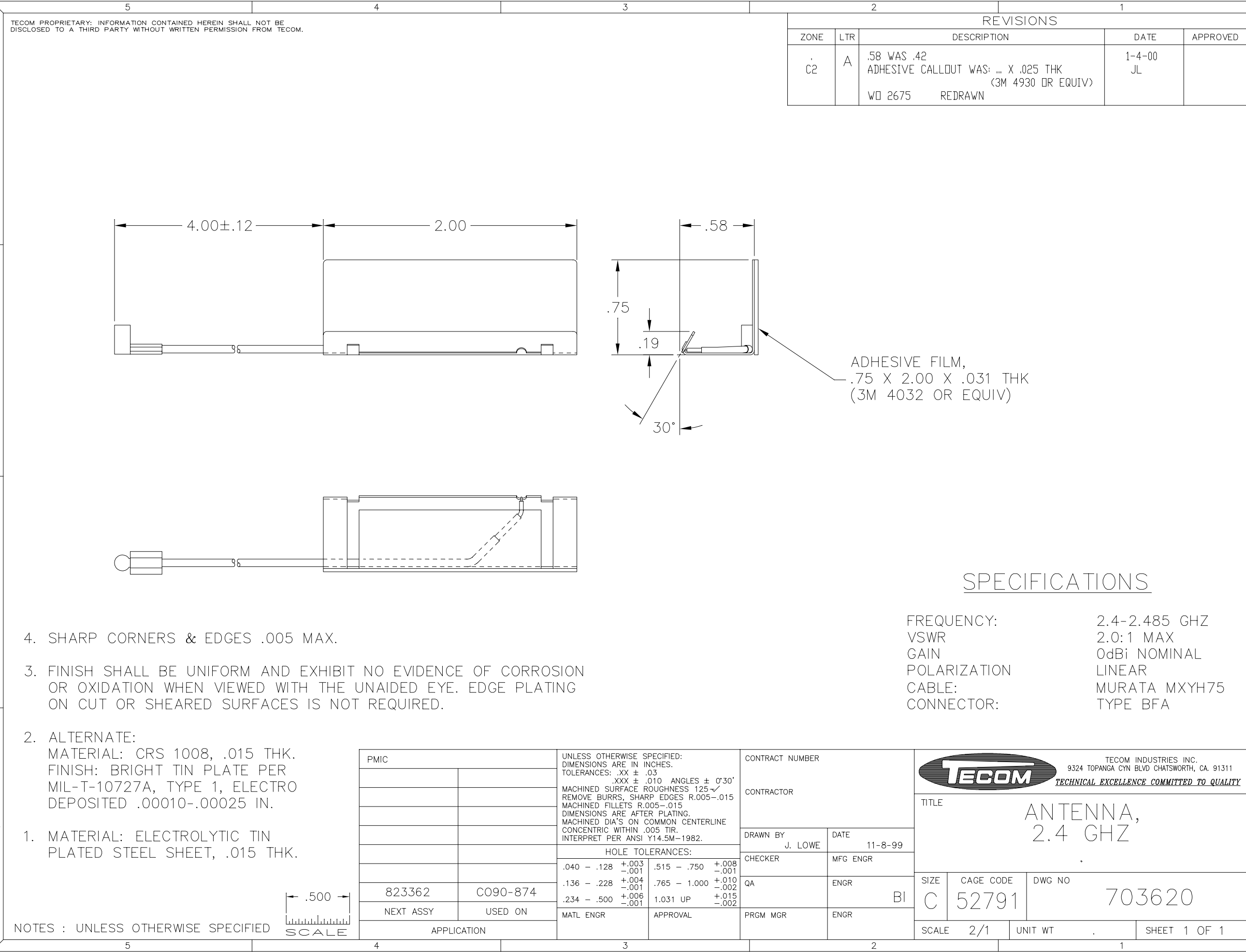
Antenna Installation Photo



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.”

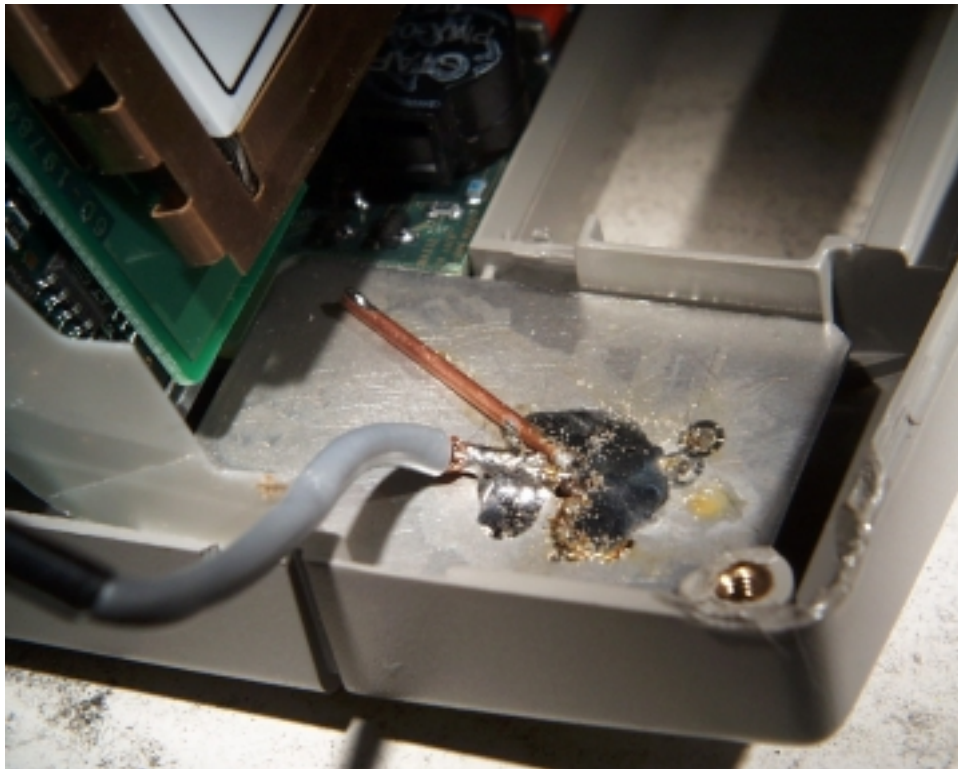


1040, 1046 Antenna

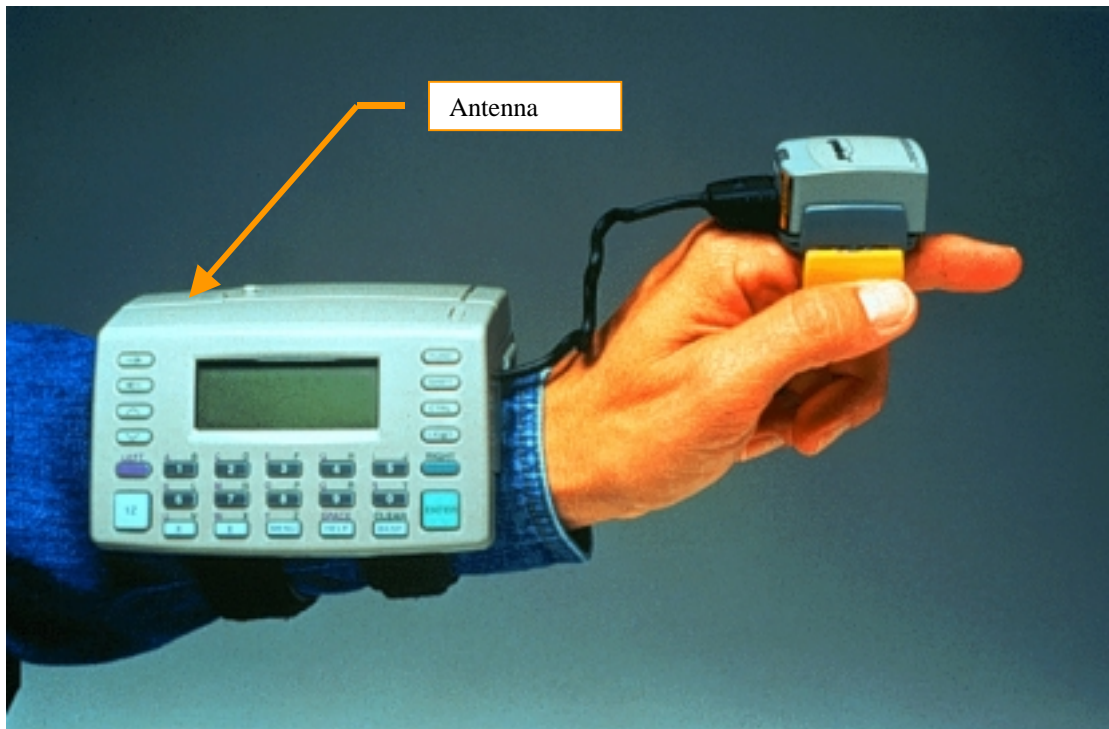
The **1040** antenna is 0 dBi omni-directional in azimuth plane. It is mounted internally as shown in the attached photo. The **1040** uses the Murata Erie BFA and the **1046** a MMCX connector. In its use it would be within 2.5 cm of a persons body. It is used in portable devices. This antenna / device combination was SAR tested and results filed with a Class II permissive change for the H9PLA2400. driven by 500 mW of transmitter power. The RF safety statement that is included in a prominent place in the users manual is listed below.

<i>Location</i>	Body worn 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>	MXYP75, RG-178
<i>Symbol P/N</i>	10-32447-01, 10-32447-02


“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.”

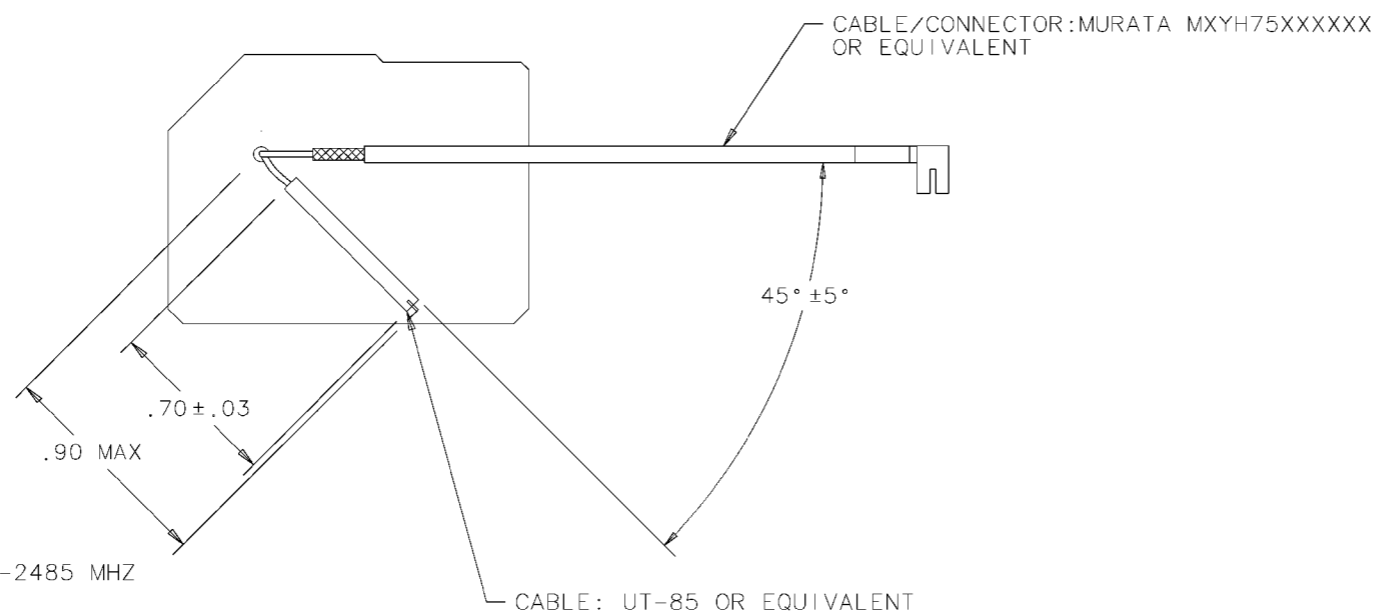
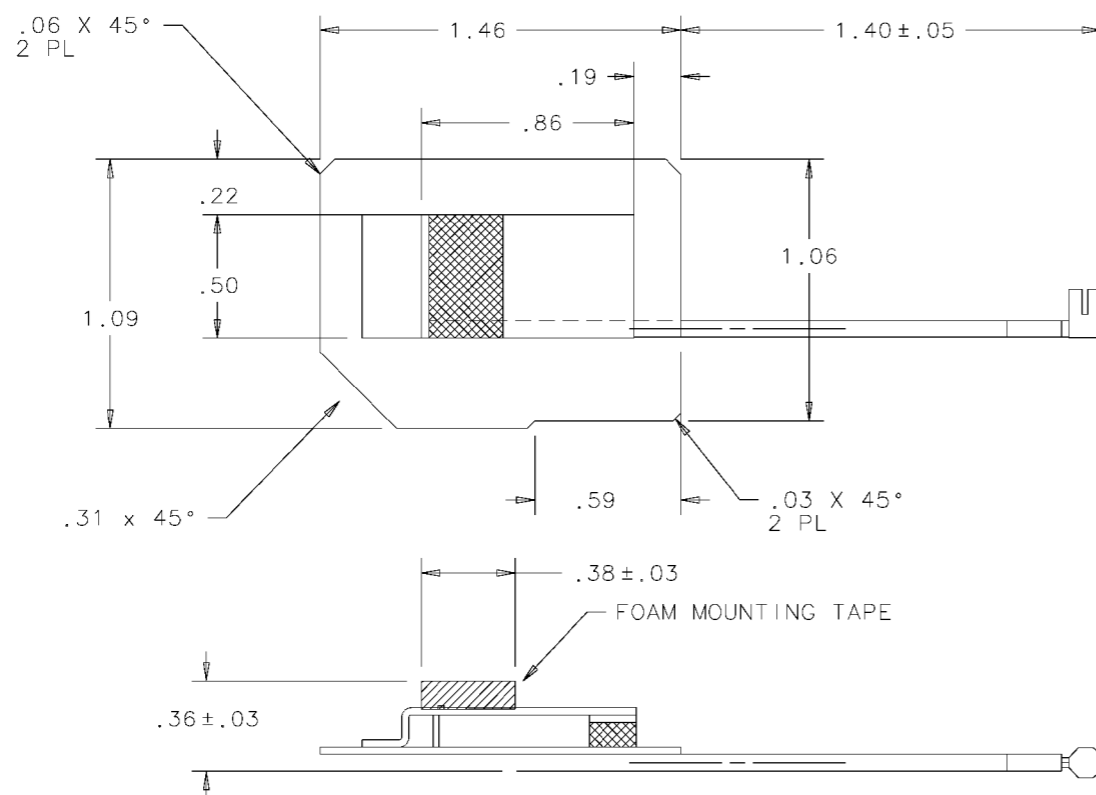


Antenna Photo



Terminal Use Photo

REVISIONS							
REV.	ZONE		DESCRIPTION	E.C.	BY	APVD.	DATE
A			RELEASED PER EDR 36634		LM		



SPECIFICATIONS:

1. FREQUENCY: 2400-2485 MHZ
2. VSWR: <2.5:1
3. IMPEDENCE: 50 OHMS
4. GAIN: WHEN INSTALLED IN SYMBOL UNIT WWC1019
ORIENTED IN PREFERRED POSITION, THE
VERTICALLY POLARIZED GAIN OVER 135 DEGREES
OF AZIMUTH AND COVERING ± 15 DEGREES ELEVATION
SHALL BE GREATER THAN -2 dBi NOMINAL AND -10 dBi
MINIMUM.

NOTES:

1. PACKAGE ITEMS IN ACCORDANCE WITH STI
GENERAL PACKAGING SPEC # 50-04100-013

ITEM	QTY.	PART NO.	DESCRIPTION		REMARKS/REF.		SYMBOL	
<div>THE DWG. & 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.</div>			DIMENSIONS ARE IN INCHES		APPROVALS		DATE	
			UNLESS OTHERWISE SPECIFIED		DRAWN LJM		8/25/96	
					CHECKED JC			
					ENGINEER J CONNELLY			
					MFG. ENG. [Signature]			
					PRODUCT			
					QUALITY			
DO NOT SCALE DRAWING								

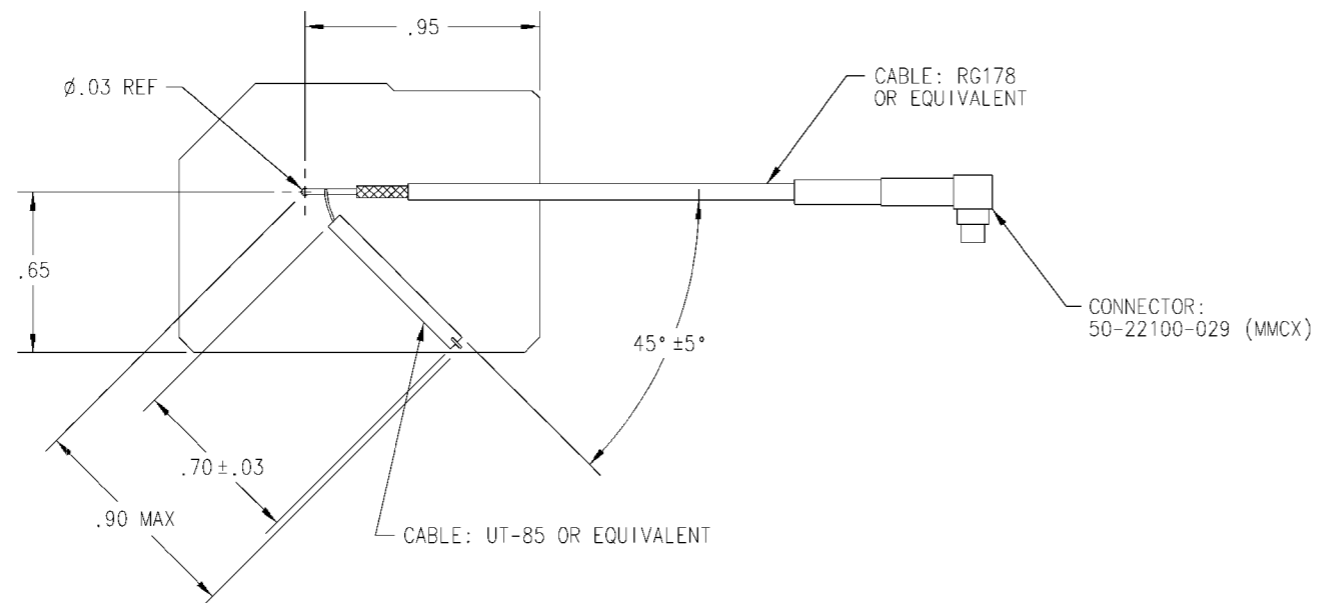
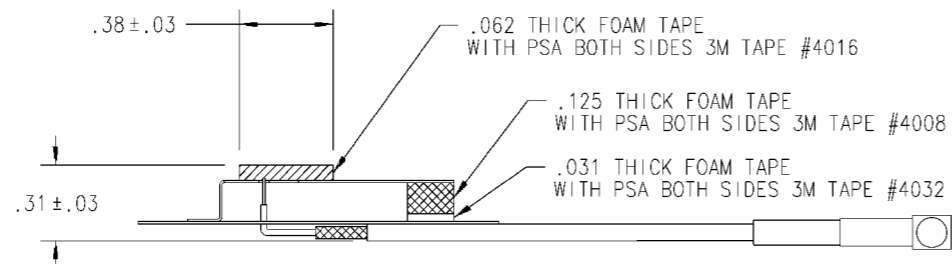
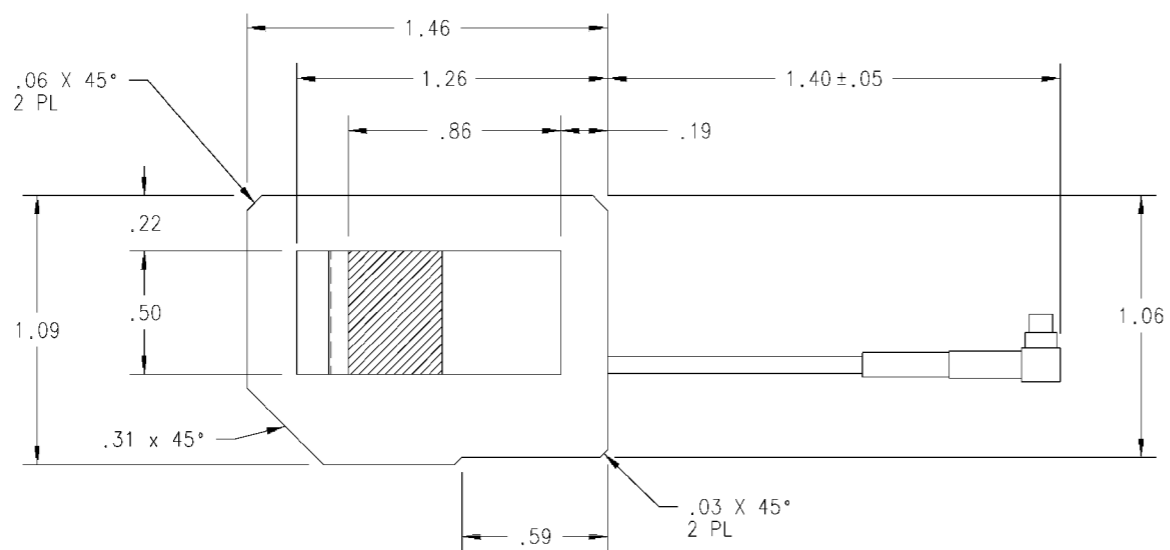
4

3

2

1

REVISIONS						
REV	ZONE	△	DESCRIPTION	E.C.	BY	APVD. DATE
A			RELEASED PER EDR #55811		JS	3/28/00



SPECIFICATIONS:

FREQUENCY: 2400-2485 MHZ
VSWR: <2.5:1
IMPEDENCE: 50 OHMS
GAIN: WHEN INSTALLED IN SYMBOL UNIT WWC1019 ORIENTED IN PREFERRED POSITION, THE VERTICALLY POLARIZED GAIN OVER 135 DEGREES OF AZIMUTH AND COVERING ±15 DEGREES ELEVATION SHALL BE GREATER THAN -2 dBi NOMINAL AND -10 dBi MINIMUM.

- NOTES: UNLESS OTHERWISE SPECIFIED.
1. MATERIAL: CRS 1008, .010±.001 THICK.
 2. 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 UN-AIDED EYE. EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.
 3. BREAK AND DE-BURR ALL SHARP CORNERS AND EDGES .005 MAX PRIOR TO PLATING.
 4. PACKAGE ITEMS IAW STI GENERAL PACKAGING SPEC #50-01400-013.
 5. PARTS TO MEET THE CRITERIA PER STI WORKMANSHIP STANDARDS #SS-03800-57.

PROPRIETARY CONTENT	TOLERANCE CHART	
THE DRAWING CONTENT AND SPECIFICATIONS CONTAINED HEREIN ARE PROPRIETARY AND MUST NOT BE USED, COPIED, REPRODUCED OR OTHERWISE DEALT WITH OR COMMUNICATED TO OTHERS EXCEPT IN ACCORDANCE WITH WRITTEN INSTRUCTIONS RECEIVED FROM SYMBOL TECHNOLOGIES, INC.	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	
	INCH	MM
	.XX +/- .01	+/- .25
COMPUTER GENERATED DRAWING DO NOT SCALE	.XXX +/- .005	+/- .125
	ANGLES ± 1°	FRACTIONS ± 1/64

APPROVALS		DATE	SYMBOL TECHNOLOGIES, INC. One Symbol Plaza Holtsville, NY 11742	
DRAWN	J. SIMMONS	3/28/00		
CHECKED	M. SAVONA	3/28/00		
ENG.	E. KOGAN	3/28/00	ANTENNA: 2.4GHZ, S24 MMCX	
ANALYST	L. DOBKOWSKI	3/28/00		
MFG. ENG.			SIZE	DWG. NO.
PRODUCT			C	10-32447-02
QUALITY			SCALE: 2:1	SOLID MODEL
			YES	NO
			SHEET 1	OF 1

4

3

2

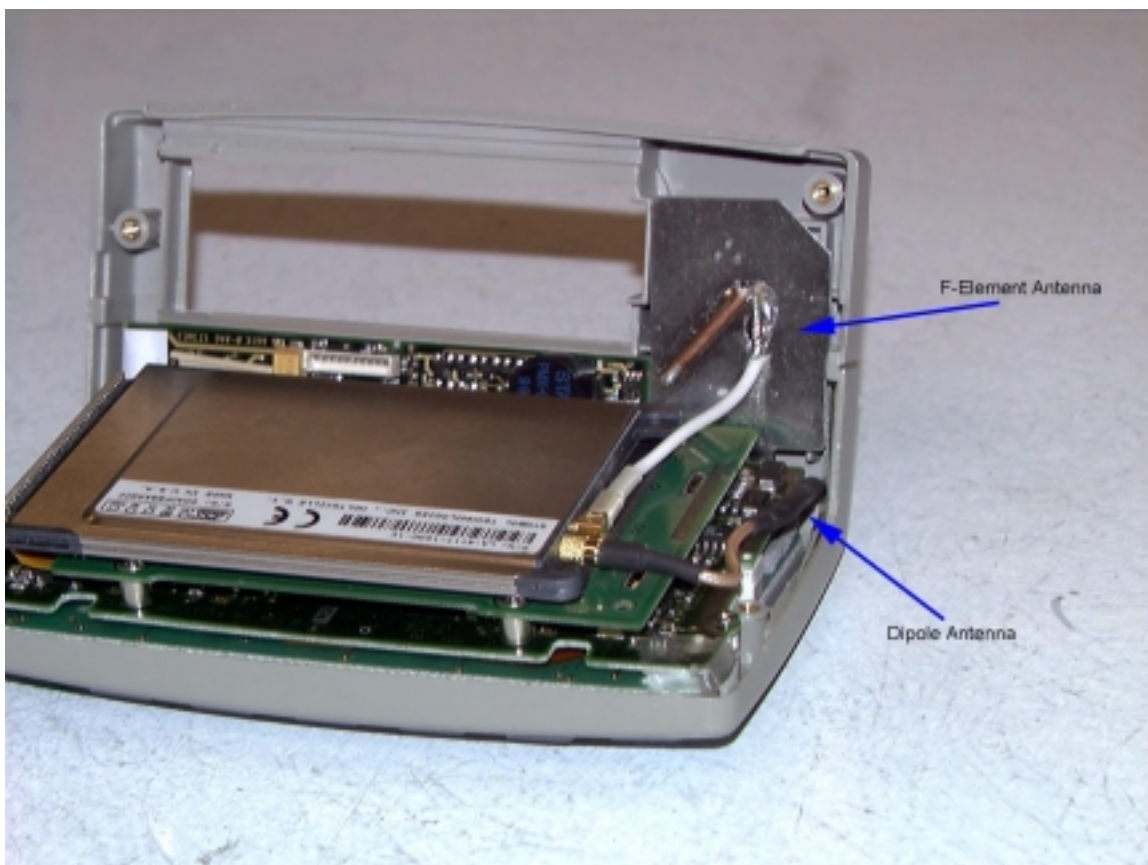
1

1046DP Antenna

The **1046DP** antenna is 2 dBi omnidirectional in azimuth plane. It is mounted internally as shown in the attached photo. The **1046DP** uses a MMCX connector. In its use it would be within 2.5 cm of a persons wrist. It is used in portable devices. The RF safety statement included in a prominent place in the users manual is listed below.

<i>Location</i>	Wrist 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>	RG-178
<i>Symbol P/N</i>	10-41370.01

"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



Antenna Use Photo

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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
A	PRODUCTION RELEASE SEE ECO 4375	05/25/00	

NOTES: UNLESS OTHERWISE SPECIFIED.

1. LABEL SIZE, SHAPE AND CONTENTS SUBJECT TO CHANGE WITHOUT NOTICE.
2. TOLERANCES: .XX \pm .03
.XXX \pm .010

SPECIFICATION:

FREQUENCY: 2.4 TO 2.485 GHz
POLARIZATION: LINEAR

RADIATION COVERAGE:

FRONT/BACK: \geq TBD dB
GAIN: TBD dBi NOM @ ZENITH
VSWR: $<2.0:1$
WEIGHT: TBD OZ

PART NO. DESIGNATION

AT2400-4X-XXXX-XXX-XX-XX-XX

COLOR
* W = WHITE
* S = SMOKE GRAY
* O = OLIVE DRAB

CONNECTOR
* TNCM = TNC MALE
* TNCF = TNC FEMALE
* BNCM = BNC MALE
* BNCF = BNC FEMALE
* MCXM = MCX MALE
* MCXF = MCX FEMALE
* SMAM = SMA MALE
* SMAF = SMA FEMALE
* MMCXM = MMCX MALE
* MMCXF = MMCX FEMALE
* NTPM = NTP MALE
* NTPF = NTP FEMALE
* 0000 = NO TERMINATION

CABLE LENGTH
* 000 = IN INCHES

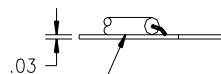
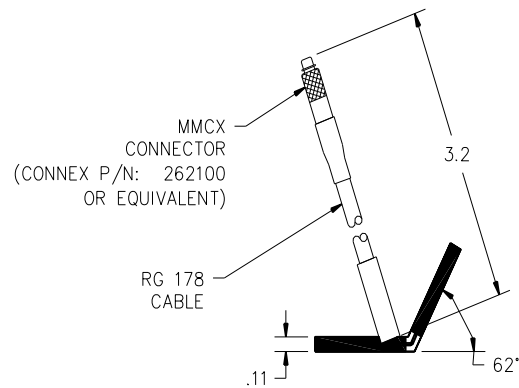
* = OPTION NOT AVAILABLE WITH THIS MODEL

STANDARD MODEL = AT2400-4-MMCXM-3.20-00-00-L

POLARIZATION
L = LINEAR
RHCP = RIGHT HAND
CIRCULAR
POLARIZED

GAIN
00 = PASSIVE
* 12 = 12 dB (20 mA)
* 26 = 26 dB (35 mA)
* 40 = 40 dB (50 mA)
* XX = OTHER

VOLTAGE
00 = PASSIVE
* 05 = 05 VDC
* RG = 5 - 18 VDC
* XX = OTHER



COMPLETE CABLE ASSEMBLY
NOT SHOWN FOR CLARITY

DO NOT SCALE THIS DRAWING ALL DIMENSIONS ARE IN INCHES DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982 TOLERANCES: .XX = \pm .01 .XXX = \pm .005 FRACT = \pm 1/32 ANG. = \pm 1/2° ✓ SURFACE ROUGHNESS PER ANSI B46.1 REMOVE BURRS AND BREAK SHARP EDGES; PART TO BE CLEAN AND OIL FREE	DRAWN S. VALDES 05/25/00 CHECKED ENGR Q.A. APPROVED	AeroAntenna Technology Inc			
TITLE WIRELESS ANTENNA, 2.4 GHz LINEAR		SIZE B	CAGE CODE OUVG2	DRAWING NO. AT2400-4	REV A
USED ON	UNLESS OTHERWISE SPECIFIED	DRAWN IN ACAD	SCALE NONE	AT2400-4A	SHEET 1 OF 1



RF Exposure Configuration Summary

Network Systems Organization

FCC ID: **H9PLA4111**

WLAN PC Card, 11 Mbps, Trilogy

Output Power: 60 mW

Class II Permissive Change

Ant #	Antenna Model	Terminal Mfgr.	Terminal Model	Use
01	7546	Symbol	PDT-7546	Hand Held Ocp
02	2742	Symbol	SPT-2746-T1	Hand Held Ocp
03	XP	Mitsubishi	XPn	Hand Held Ocp
04	7242	Symbol	PDT-7246-T1	Hand Held Ocp
05	Toko	Percon	Falcon 315	Hand Held Ocp
06	Vocollect MMCX	Vocollect	Talkman Open	Belt Worn 5-
07	6846	Symbol	PDT-6846	Hand Held Ocp
08	7546D	Symbol	PDT-7546	Hand Held Ocp
09	1742	Symbol	SPT-1746	Hand Held Ocp
10	Oniel MMCX	O'Neil Product Development.	MF4TS24-11-T1	Belt Worn 5-
11	6846D	Symbol	PDT-6846	Hand Held Ocp
12	6146D	Symbol	PDT-6146	Hand Held Ocp
13	3146BD	Symbol	PDT-6146BD	Hand Held Ocp
13	3146BD	Symbol	PDT-3146BD	Hand Held Ocp
14	1046	Symbol	WSS-1046	Wrist Worn
15	1046DP	Symbol	WSS-1046	Wrist Worn

5- R < 5 cm

5+ 5 cm < R < 20 cm

Ocp Occupational

Data



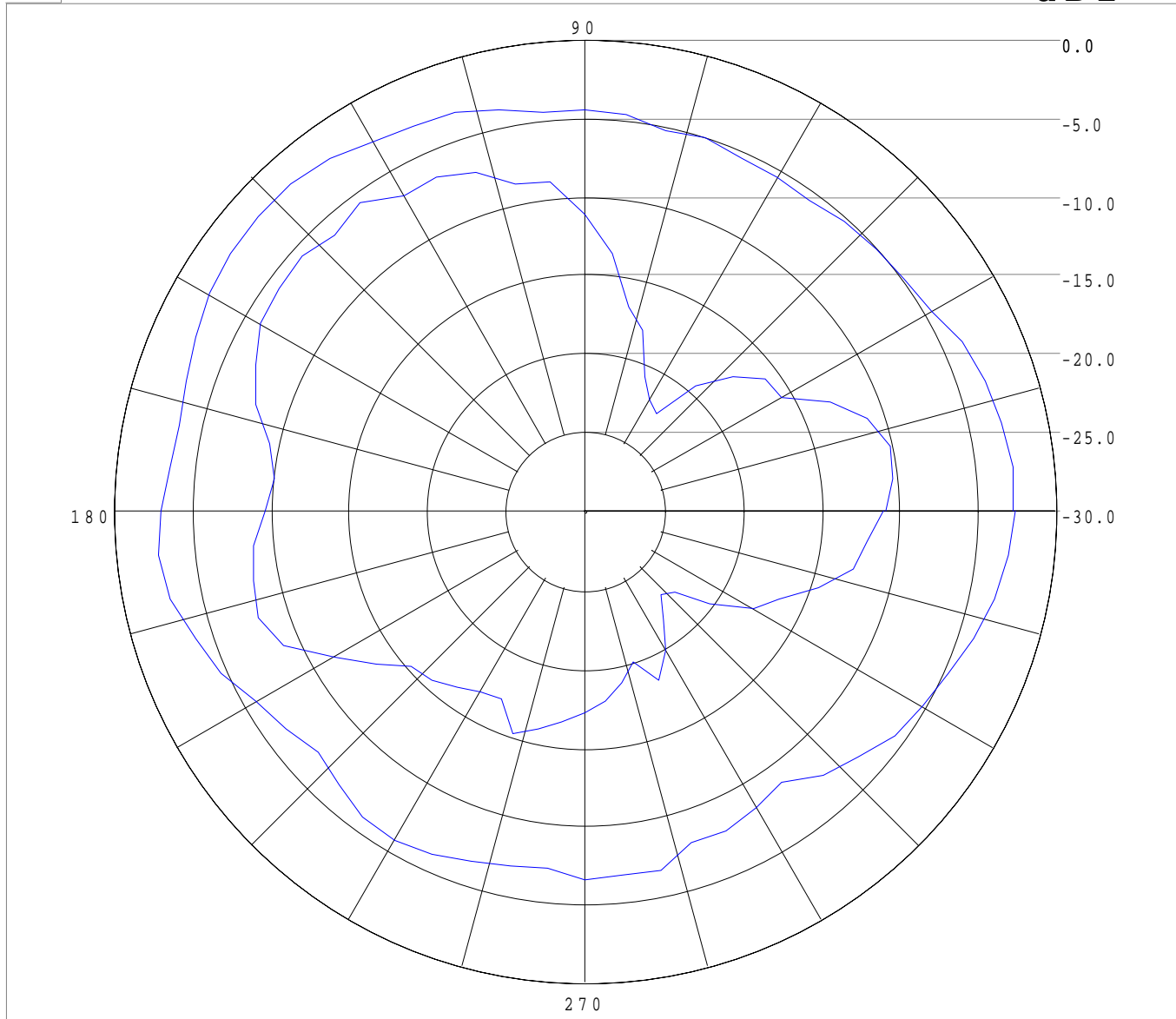
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Records: 6

6/22/99 8:43:08 AM

PEP

dB*i*



Run Info

Model	Toko Antenna	S/N	
Version	Antenna Test Fixture		
Ft(MHz)	2440	Harmonic	Fund.
		Polarity	Vert

Scale Max

0.00

Scale Min

-30.00

◀◀ Rec No. ▶▶

3

6/22/99 8:58:37 AM

Peak	mean	%
-1.90	-6.88	66

dB*i*