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Network Systems Organization

FCC Certification Report for the  
**LA4111 WLAN PC Card**  
Class II Permissive Change

**EXHIBIT 4**

**RF EXPOSURE INFO**



# Antenna List by FCC ID

Network Systems Organization

FCC ID: **H9PLA4111**

WLAN PC Card, 11 Mbps, Trilogy

Output Power: 60 mW

Grant Date	Ant #:	Model	Symbol P/N	Mfg	Mfg P/N
2/18/00					
	01	Plane	50-21900-008	Tecom	505042C(48IN)
	02	Pipe Bomb 11"x4"	50-11901-048P	Cushcraft	S2403BHP548RBN
	02.1	Pipe Bomb 11"x15"	50-11901-180P	Cushcraft	S2403BHP5180RB
	03	Rubber Duck	50-21900-007	Cushcraft	RBN2400SXR
	04	Yagi	ML-2499-YGA1-	Cushcraft	PC2415RBN240
	05	Patch	ML-2499-PTA1-	UK	S2406P72PRBN
	06	Panel	ML-2499-PNA1-	Tecom	ML-2499-PNA1-01
	09	4640 Toroid	21-17486-02	AIL Systems Suf	21-17486-02
	10	2040	10-17577-01	Tecom	703117
	11	6140	10-35305-01	UK	
	12	6840	10-32290-01	UK	
	15	Parabolic Grid	ML-2499-PGA1-	Conifer	26T-2400
	16	Pipe Bomb 25"x20"	50-11902-240S	Cushcraft	S2406BHS240RBN
	17	Criticare BFA	50-21900-021	Tecom	703443-1
	18	Corner Patch	ML-2499-DLA1-	Tecom	505126C
	19	Ceiling Panel	ML-2499-SD24-	UK	
	20	6140 OBS	10-17577-02	Tecom	
	X	Trilogy AP	21-20667-01	C&M Wauregan	
	Z	End Cap "C"	10-20511-01	Tecom	822319
Applied For					
	01	7546	10-38649-02	Tecom	
	02	2742	703624-2	Tecom	703624-2
	03	XP	50-21900-024	Tecom	703611
	04	7242	10-35477-01	Tecom	
	05	Toko	50-21900-022	Toko	DAC2450CT1
	06	Vocollect MMCX	50-21900-025	Austin Antenna	200215
	07	6846	10-32290-02	Tecom	
	08	7546D	10-40948-01	Tecom	703634

FCC ID: **H9PLA4111**

WLAN PC Card, 11 Mbps, Trilogy

Output Power: 60 mW

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Grant Date	Ant #:	Model	Symbol P/N	Mfg	Mfg P/N
09	1742		703549-2	Tecom	703549-2
10		Oniel MMCX	50-21900-031	Tecom	703620-2
11		6846D	10-41003-01	Tecom	703645



# RF Exposure Antenna Summary

## Network Systems Organization

FCC ID: **H9PLA4111**

WLAN PC Card, 11 Mbps, Trilogy

Source Based

Mobile DC Factor: 1.000

Output Power: 60 mW

Class II Permissive Change

Portable DC Factor: 1.000

## Portable Antennas

Ant No	Model	Symbol P/N	Type	Gain (dBi)	Cabel Loss (dB)	Pout (dBm)	EIRP (mW)	TR Status	Device Type	Tx Limited
01.	7546	10-38649-02	F-Element	0.0	0.31	17.47	55.9	Tested	Hand Held	
02.	2742	703624-2	F-Element	0.0	0.13	17.65	58.2	Tested	Hand Held	
03.	XP	50-21900-024	Slot	0.0	0.58	17.21	52.5	Tested	Hand Held	
04.	7242	10-35477-01	F-Element	0.0	0.13	17.65	58.2	Tested	Hand Held	
05.	Toko	50-21900-022	Puck	0.0	0.00	17.78	60.0	Tested	Hand Held	
07.	6846	10-32290-02	F-Element	0.0	0.34	17.44	55.5	See # 2	Hand Held	
08.	7546D	10-40948-01	F-Element	0.0	0.22	17.57	57.1	See # 2	Hand Held	
09.	1742	703549-2	F-Element	0.0	0.11	17.67	58.4	See # 2	Hand Held	
11.	6846D	10-41003-01	Slot	0.0	0.37	17.41	55.1	See # 2	Hand Held	

## Body Worn Antennas

Ant No	Model	Symbol P/N	Type	Gain (dBi)	Cabel Loss (dB)	Pout (dBm)	EIRP (mW)	TR Status	Device Type	Tx Limited
06.	Vocollect MMCX	50-21900-025	Dipole	2.0	0.25	17.53	89.8	Tested + SAR	Body Worn	
10.	Oniel MMCX	50-21900-031	Slot	0.0	0.37	17.41	55.1	See # 3	Body Worn	

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

Monday, May 22, 2000 10:56 AM

Page 1 of 1

**7540 / 7546 Antenna**

The **7540** 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 **7540** uses the MuRatta BFA connector while the **7546** is identical to the **7540** but 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>	10-38649-01, -02

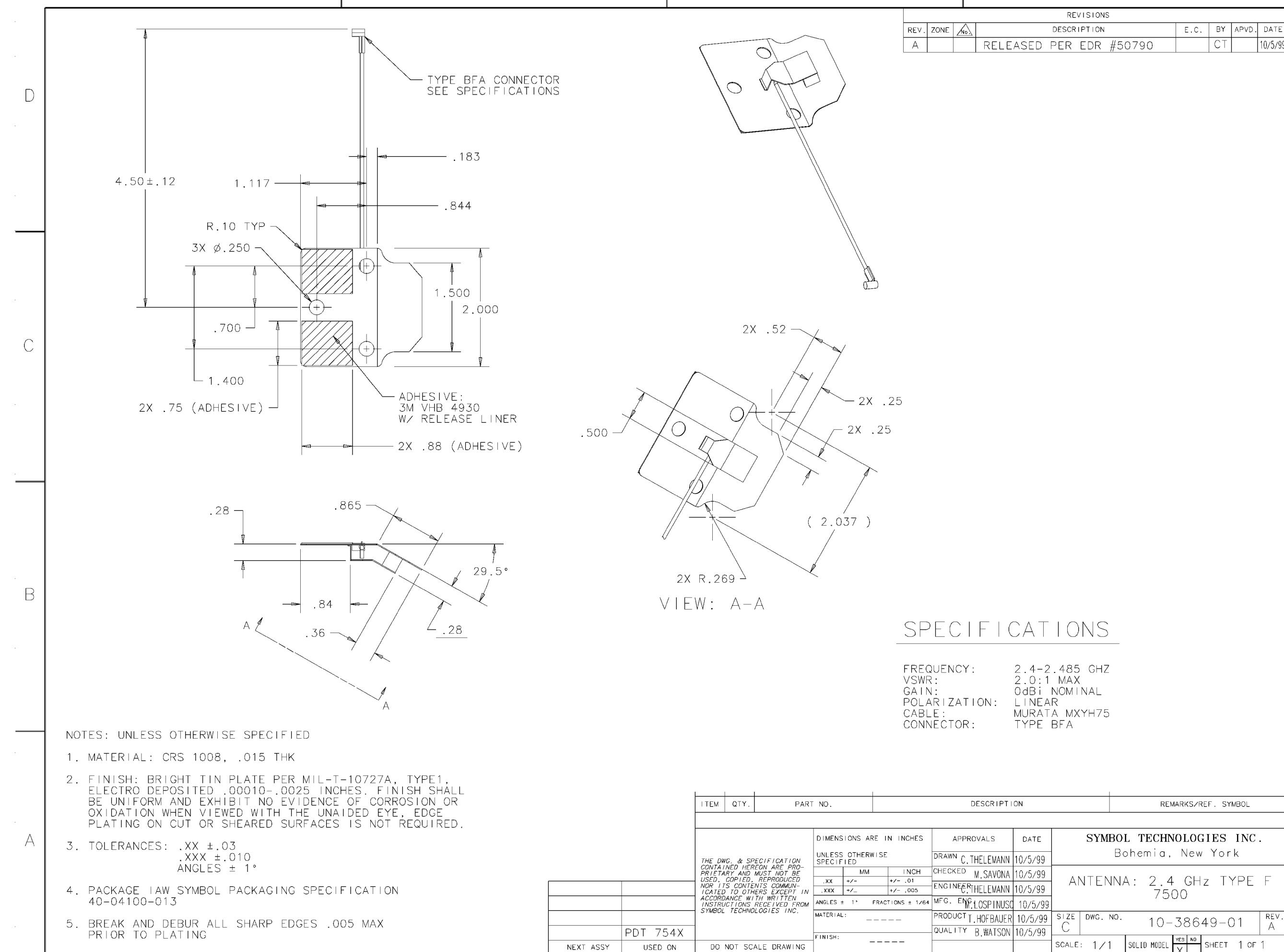
**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**

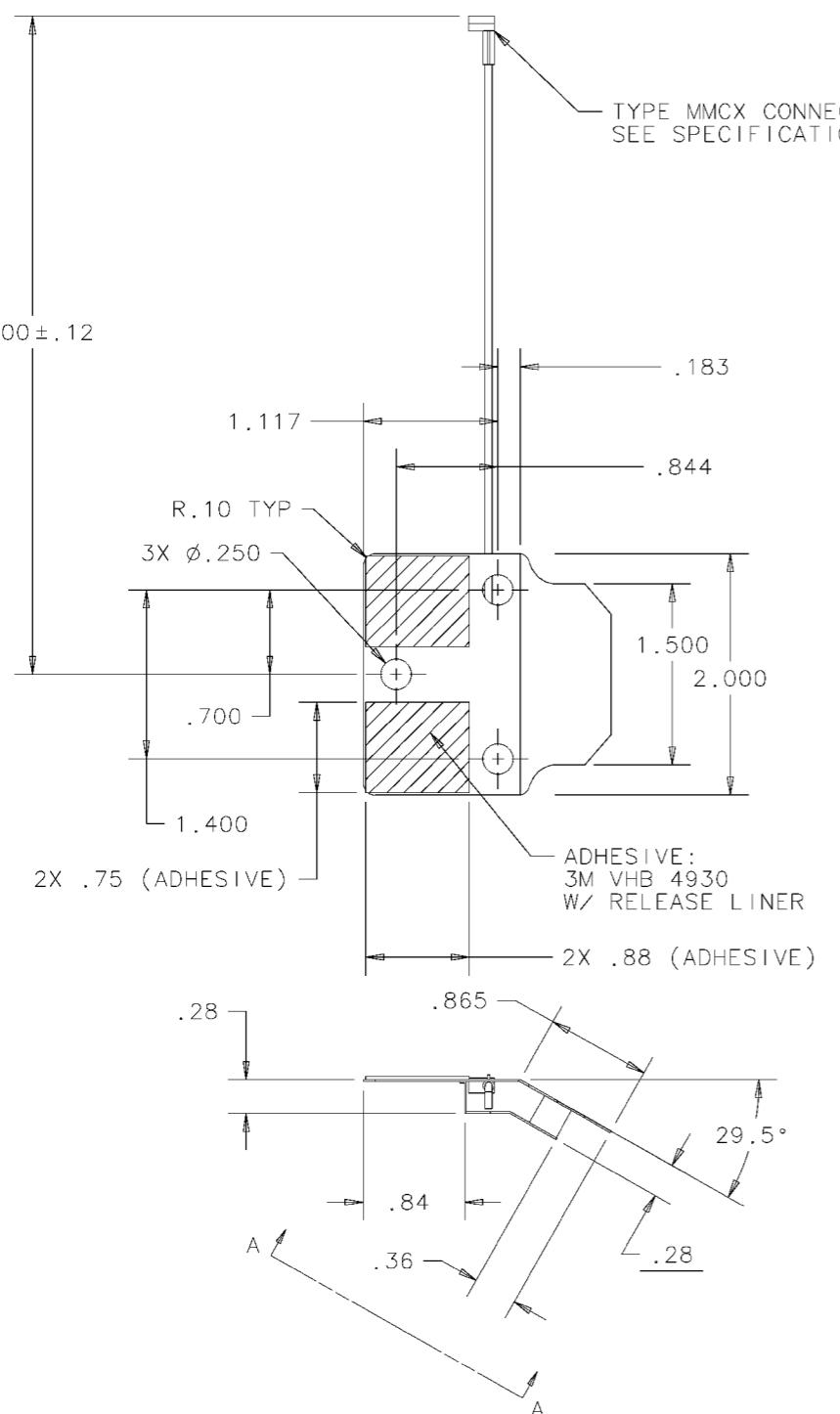


Antenna Installed in Device



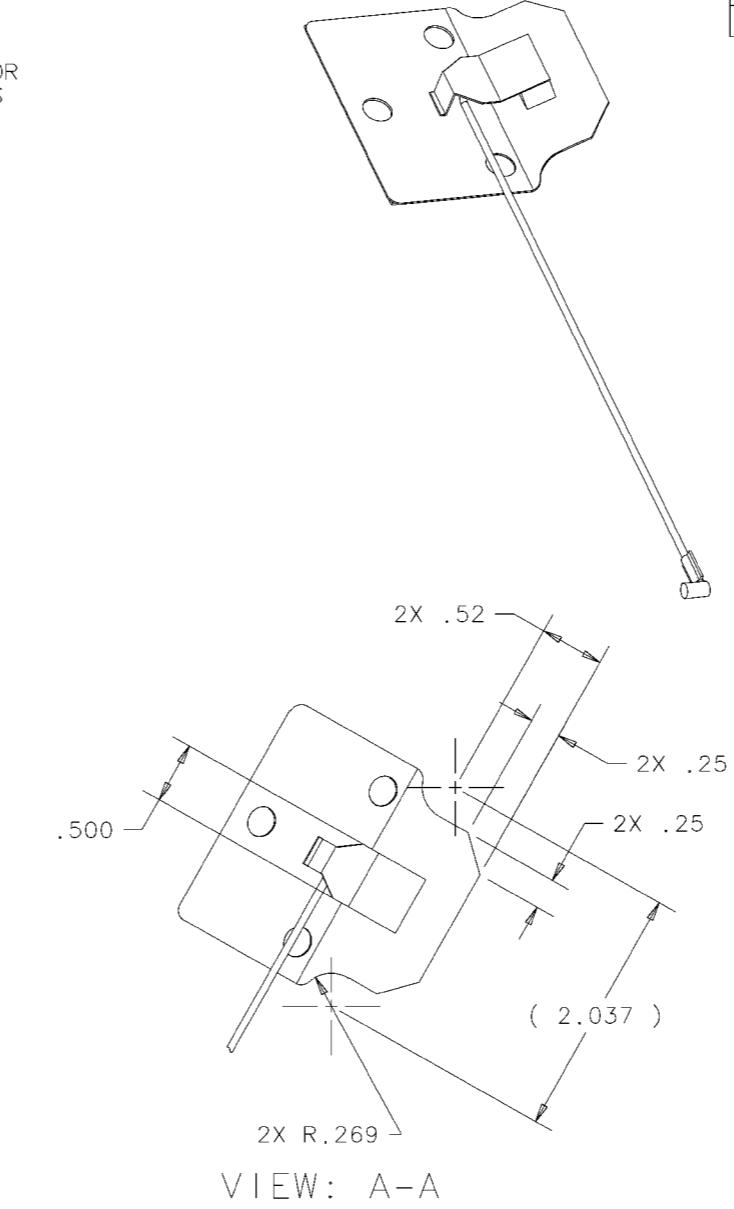
Terminal Use Photo





NOTES: UNLESS OTHERWISE SPECIFIED

1. MATERIAL: CRS 1008, .015  $\pm$ .001THK
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 UNAIDED EYE, EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.
3. TOLERANCES: .XX  $\pm$ .03  
.XXX  $\pm$ .010  
ANGLES  $\pm$  1°
4. PACKAGE LAW SYMBOL PACKAGING SPECIFICATION  
40-04100-013
5. BREAK AND DEBUR ALL SHARP EDGES .005 MAX  
PRIOR TO PLATING



## SPECIFICATIONS

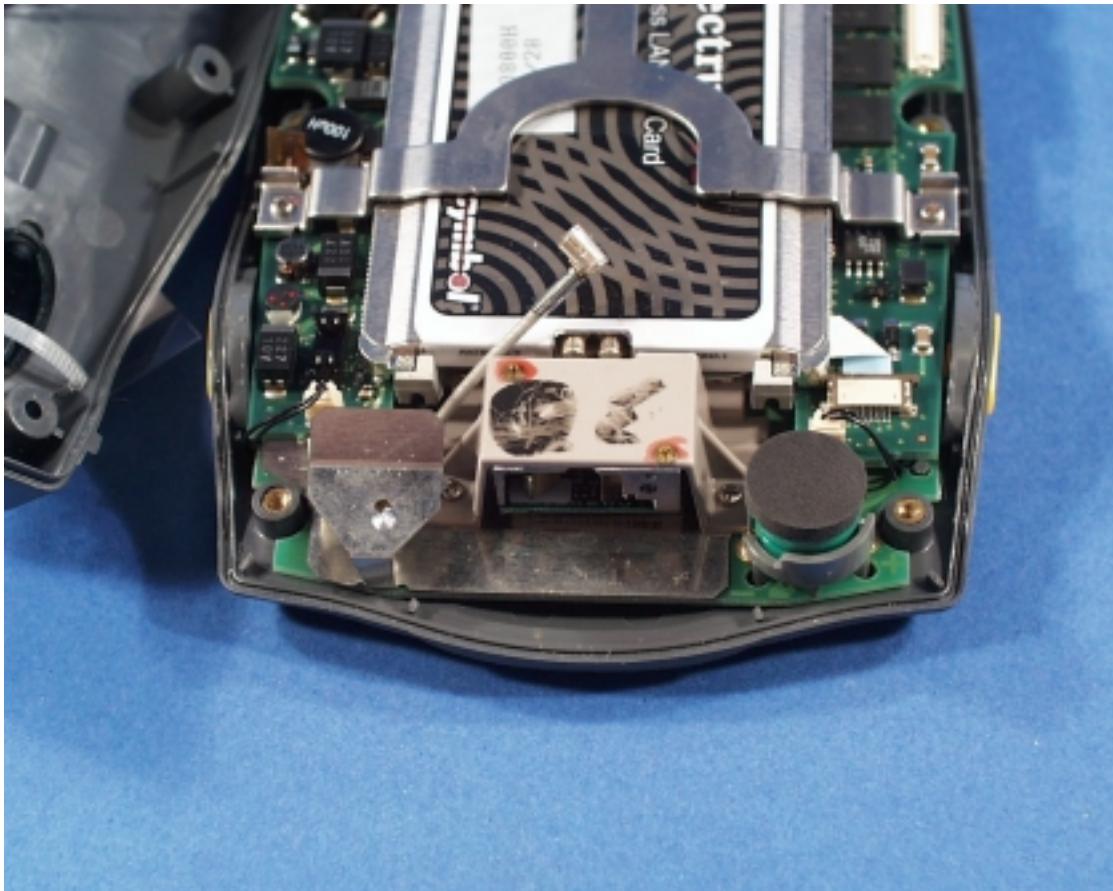
FREQUENCY: 2.4-2.485 GHZ  
VSWR: 2.0:1 MAX  
GAIN: 0dBi NOMINAL  
POLARIZATION: LINEAR  
CABLE: RG178  
CONNECTOR: TYPE MMCX, 50-22100-029

**2740 / 2742 Antenna**

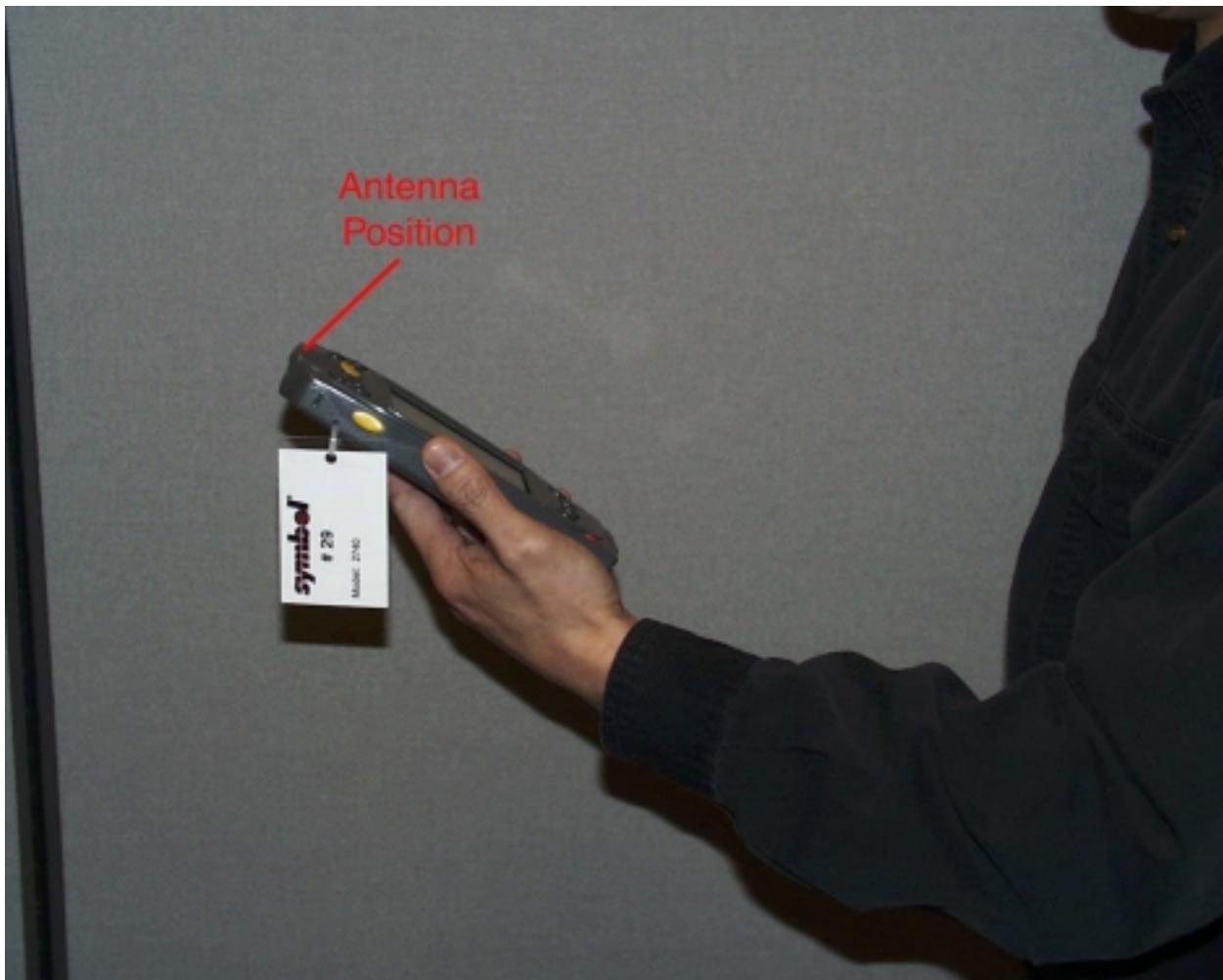
The 2740 antenna is 0 dBi omni-directional in azimuth plane. It is mounted internally on the top end of the terminal as shown in the attached photo. The 2740 uses a Murata Erie BFA connector while the 2742 uses the MMCX. In its use it would be within 20 cm of a persons hand but more than 20 cm from the 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>	703624-1, 703624-2

**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**

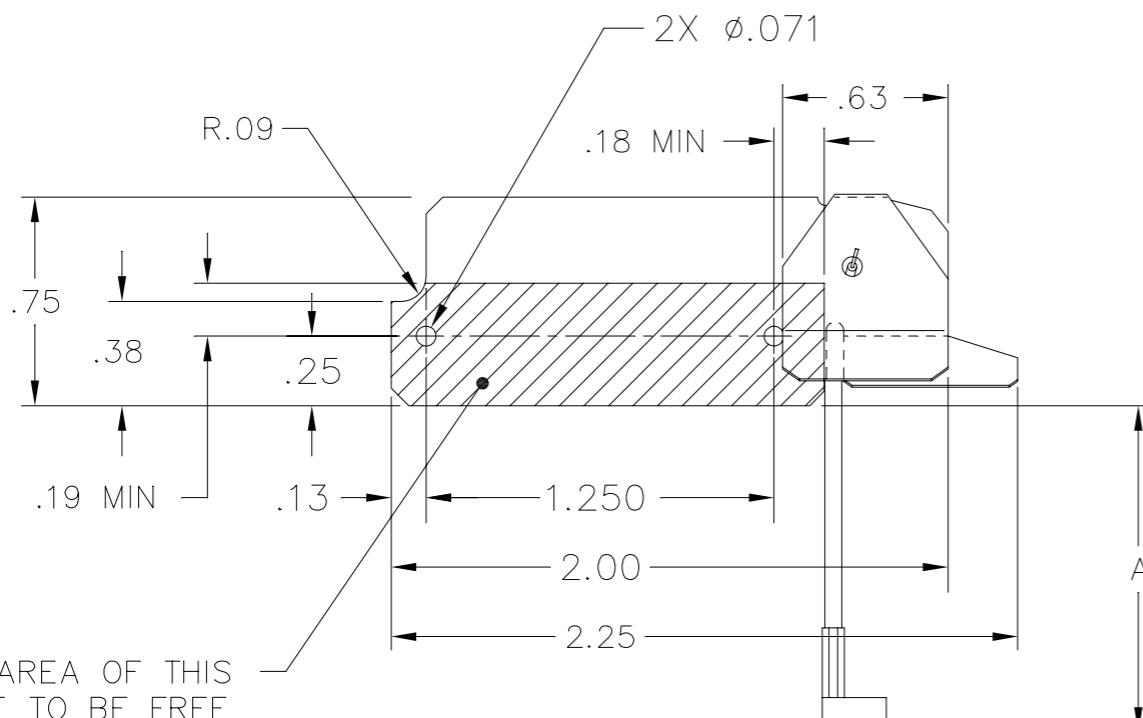


Antenna Installed in Device

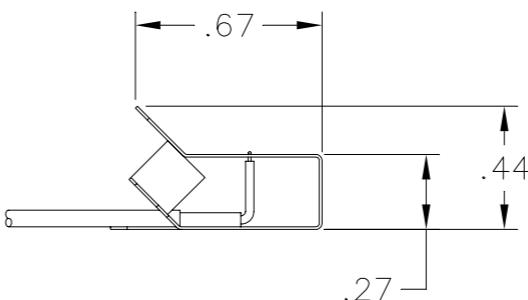


Terminal Use Photo

ZONE	LTR	DESCRIPTION	DATE	APPROVED
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CONNECTOR,

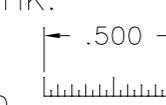


4. SHARP CORNERS & EDGES .005 MAX.  
3. FINISH SHALL BE UNIFORM AND EXHIBIT NO EVIDENCE OF CORROSION  
OR OXIDATION WHEN VIEWED WITH THE UNAIDED EYE. EDGE PLATING  
ON CUT OR SHEARED SURFACES IS NOT REQUIRED.

2. ALTERNATE:  
MATERIAL: CRS 1008, .010 THK.  
FINISH: BRIGHT TIN PLATE PER  
MIL-T-10727A, TYPE 1, ELECTRO  
DEPOSITED .00010-.00025 IN.

1. MATERIAL: ELECTROLYTIC TIN  
PLATED STEEL SHEET, .010 THK.

NOTES : UNLESS OTHERWISE SPECIFIED



PMIC	
	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .03 .XXX ± .010 ANGLES ± 0°30' MACHINED SURFACE ROUGHNESS 125~ REMOVE BURRS, SHARP EDGES R.005-.015 MACHINED FILLETS R.005-.015 DIMENSIONS ARE AFTER PLATING. MACHINED DIA'S ON COMMON CENTERLINE CONCENTRIC WITHIN .005 TIR. INTERPRET PER ANSI Y14.5M-1982.
	HOLE TOLERANCES:
.040 - .128	.003 +.003 -.001 -.001
.136 - .228	.004 +.004 -.001 -.001
.234 - .500	.006 +.006 -.001 -.001
823335	CP90-924
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED:  
DIMENSIONS ARE IN INCHES.  
TOLERANCES: .XX ± .03  
.XXX ± .010 ANGLES ± 0°30'  
MACHINED SURFACE ROUGHNESS 125~  
REMOVE BURRS, SHARP EDGES R.005-.015  
MACHINED FILLETS R.005-.015  
DIMENSIONS ARE AFTER PLATING.  
MACHINED DIA'S ON COMMON CENTERLINE  
CONCENTRIC WITHIN .005 TIR.  
INTERPRET PER ANSI Y14.5M-1982.

HOLE TOLERANCES:  
.040 - .128 +.003 -.001 -.001  
.136 - .228 +.004 -.001 -.001  
.234 - .500 +.006 -.001 -.001  
823335 CP90-924  
NEXT ASSY USED ON  
APPLICATION

CONTRACT NUMBER  
CONTRACTOR  
DRAWN BY  
J. LOWE  
DATE  
12/1/99  
CHECKER  
MFG ENGR  
QA  
ENGR  
PRGM MGR  
ENGR

-2	MMCX MALE RT ANGLE	1.85±.12	-
-1	MURATA TYPE BFA	1.16±.12	-
DASH NO	CONNECTOR	A	REV



TECOM INDUSTRIES INC.  
9324 TOPANGA CYN BLVD CHATSWORTH, CA. 91311  
TECHNICAL EXCELLENCE COMMITTED TO QUALITY

TITLE

ANTENNA,  
2.4 GHZ

SIZE

CAGE CODE

DWG NO

703624

SCALE

2/1

UNIT WT

SHEET 1 OF 1

**Amity BFA / Amity MMCX Antenna**

The Amity antenna is 0 dBi omni-directional in azimuth plane. It is available with either a MuRatta BFA or MMCX connector. It is mounted internally on the top end of the terminal as shown in the attached photo. 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 Bullitin 65, Supplement C for EIRP greater than 200 mW.

<i>Location</i>	Hand Held Device
<i>Pattern</i>	Omni
<i>Type</i>	Slot
<i>Max Gain</i>	0 dBi
<i>Physical</i>	See attached dwg
<i>Cable</i>	MXYH75, RG-178
<i>Symbol P/N</i>	703611-1, 2

**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**



Antenna Installed in Device



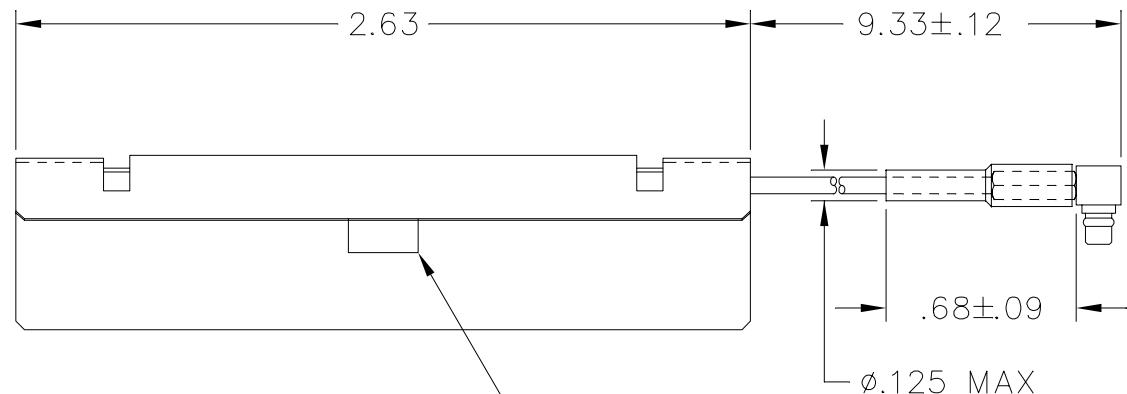
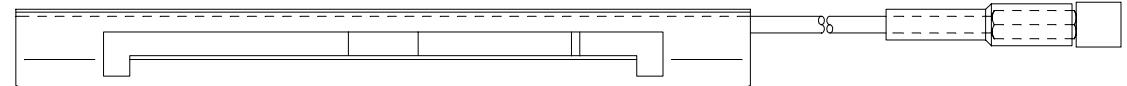
Mobile & Wireless Systems

Amity

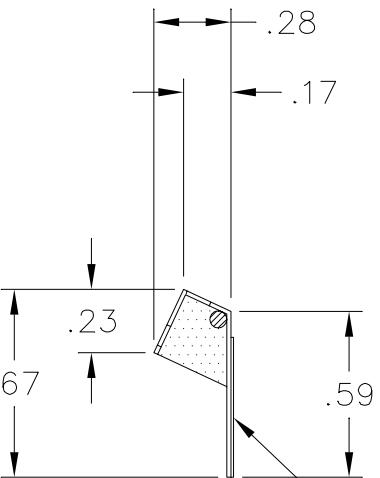


Terminal Use Photo

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	9.33±.12 WAS TBD±.12 ADDED Ø.125 MAX & .68±.09 ADDED STRAIN RELIEF SLEEVE (PICTURE CHG) ADDED FOAM SUPPORT (PICTURE & CALLOUT) REDRAWN WO 2654	11-5-99 JL	



FOAM SUPPORT



.005 THK X .50 WIDE  
FILM ADHESIVE

## SPECIFICATIONS

- SHARP CORNERS & EDGES .005 MAX.
- ALTERNATE:  
MATERIAL: CRS 1008, .015 THK.  
FINISH: BRIGHT TIN PLATE PER  
MIL-T-10727A, TYPE 1, ELECTRO  
DEPOSITED .00010-.00025 IN.
- 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.

FREQUENCY: 2.4-2.485 GHZ  
VSWR 2.0:1 MAX  
GAIN 0dBi NOMINAL  
POLARIZATION LINEAR  
CONNECTOR: MMCX MALE

- MATERIAL: ELECTROLYTIC TIN  
PLATED STEEL SHEET, .015 THK.

500  
SCALE

NOTES : UNLESS OTHERWISE SPECIFIED

PMIC		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .03 .XXX ± .010 ANGLES ± 0°30' MACHINED SURFACE ROUGHNESS 125 $\mu$ REMOVE BURRS, SHARP EDGES R.005-.015 MACHINED FILLETS R.005-.015 DIMENSIONS ARE AFTER PLATING. MACHINED DIA'S ON COMMON CENTERLINE CONCENTRIC WITHIN .005 TIR. INTERPRET PER ANSI Y14.5M-1982.		CONTRACT NUMBER		TECOM 9324 TOPANGA CYN BLVD CHATSWORTH, CA. 91311 TECHNICAL EXCELLENCE COMMITTED TO QUALITY	
		CONTRACTOR					
		DRAWN BY	DATE				
		J. LOWE	10-11-99				
		CHECKER	MFG ENGR				
		QA	ENGR	BI			
		MATL ENGR	APPROVAL	PRGM MGR	ENGR		
APPLICATION		PRGM MGR		ENGR			
NEXT ASSY		ENGR					
USED ON							
SCALE		2/1		UNIT WT			
5							
4							
3							
2							
1							
A							
B							
C							
D							

ANTENNA,  
SLOT, 2.4 GHZ

TECOM INDUSTRIES INC.  
9324 TOPANGA CYN BLVD CHATSWORTH, CA. 91311  
TECHNICAL EXCELLENCE COMMITTED TO QUALITY

703611

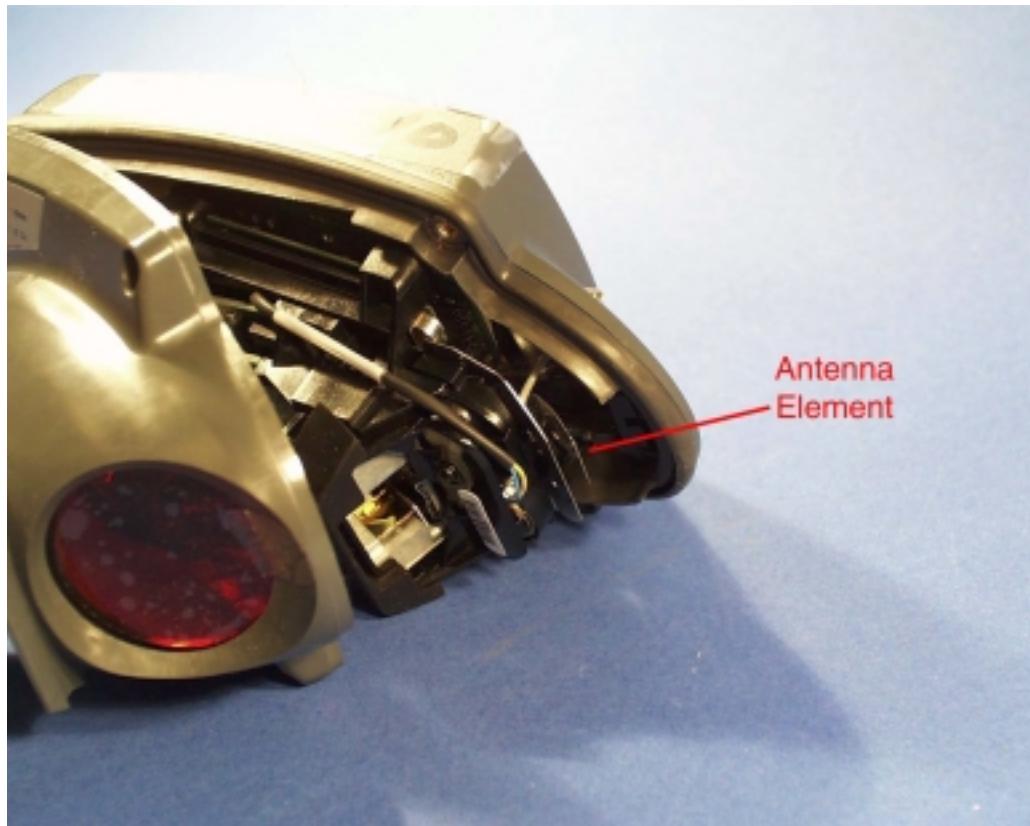
SHEET 1 OF 1

**7240 / 7242 Antenna**

The **7240** 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 **7240** uses the MuRatta BFA connector. The **7242** is identical to the **7240** but 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.

<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>	10-35475-01, 10-35477-01

**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**



Antenna Installed in Device



Mobile & Wireless Systems

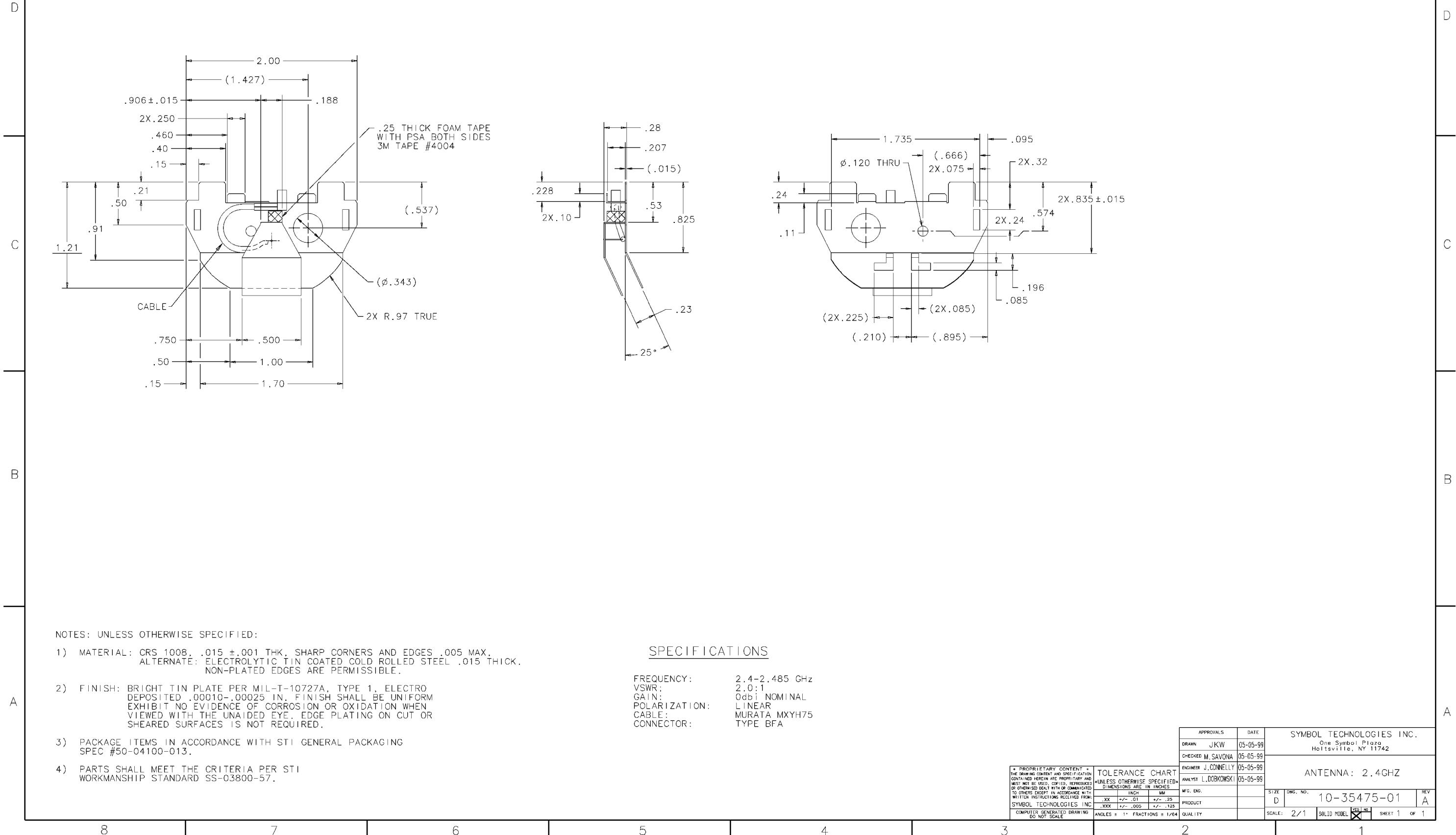
7240 / 7242

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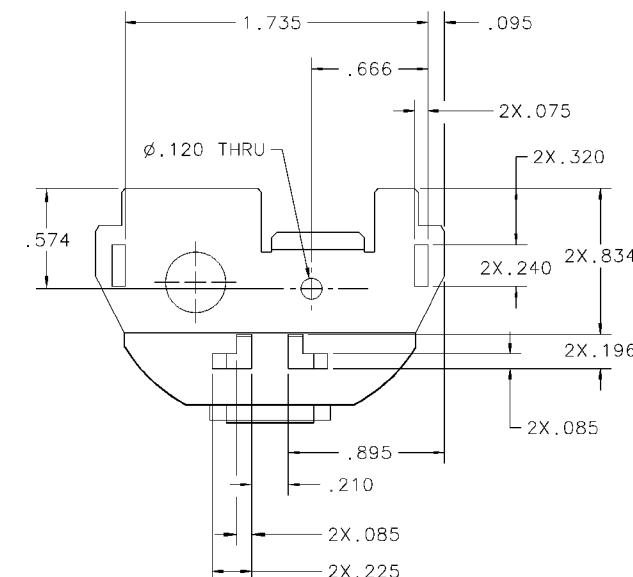
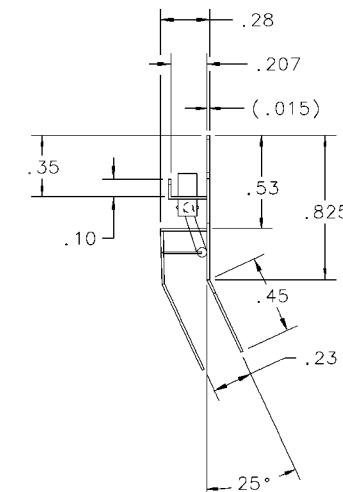
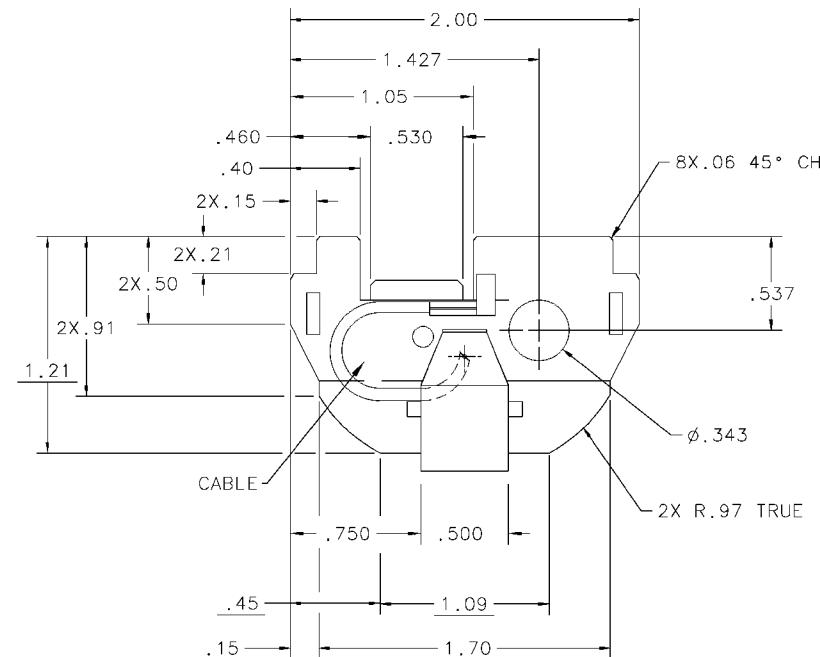
Terminal Use Photo

REVISIONS			
REV	ZONE	NO.	DESCRIPTION
A			RELEASED PER EDR #54642



D

D



NOTES: UNLESS OTHERWISE SPECIFIED:

1. MATERIAL: CRS 1008, .015 THK, SHARP CORNERS AND EDGES .005 MAX. ALTERNATE: ELECTROLYTIC TIN.
2. FINISH: BRIGHT TIN PLATE PER MIL-T-10727A, TYPE 1, ELECTRO DEPOSITED .00010-.00025 IN. FINISH SHALL BE UNIFORM EXHIBIT NO EVIDENCE OF CORROSION OR OXIDATION WHEN VIEWED WITH THE UNAIDED EYE. EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.
3. PACKAGE ITEMS IN ACCORDANCE WITH STI GENERAL PACKAGING SPEC #50-04100-013.
4. WORKMANSHIP PER STI STANDARD SS-03800-57.
5. ALL UNDERLINED DIMENSIONS ARE OUT OF SCALE AND ARE NOT REFLECTED IN THE 3-D DATA BASE

### SPECIFICATIONS

FREQUENCY: 2.4-2.485 GHz  
 VSWR: 2.0:1  
 GAIN: 0dbi NOMINAL  
 POLARIZATION: LINEAR  
 CABLE: RG178  
 CONNECTOR: 50-22100-029 (MMCX)

ITEM	QTY	PART NO.	DESCRIPTION	REMARKS/REF. SYMBOL
PARTS LIST				
			DIMENSIONS ARE IN UNLESS OTHERWISE SPECIFIED	
			DRAWN J KW 11-03-99	
			XX +/- .03	
			XXX +/- .010	
			ENGINEER J. CONNELLY 11-03-99	
			ANGLES +/- 0.30° FRACTIONS +/- 1/64	
			MFG. ENG.	
			SEE NOTE 1	
			PRODUCT	
			SEE NOTE 2	
			ANALYST L. DOBKOWSKI 12-29-99	
			SCALE: 2:1 SOLID MODEL YES NO	
			SHEET 1 OF 1	
			SIZE D DWG. NO. 10-35477-01 REV 3	

**Toko Antenna**

The Toko antenna is 0 dBi omni-directional in azimuth plane. It is mounted as a through hole device directly on the printed circuit board of a hand held device. 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 Bullitin 65, Supplement C for EIRP greater than 200 mW.

<i>Location</i>	Hand Held Device
<i>Pattern</i>	Omni
<i>Type</i>	Dielectric Puck
<i>Max Gain</i>	2.15 dBi
<i>Physical</i>	See Attached Dwg.
<i>Cable</i>	none
<i>Symbol P/N</i>	50-21900-022

**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**



Installed Antenna Photo



Mobile & Wireless Systems

Toko



Terminal Use Photo



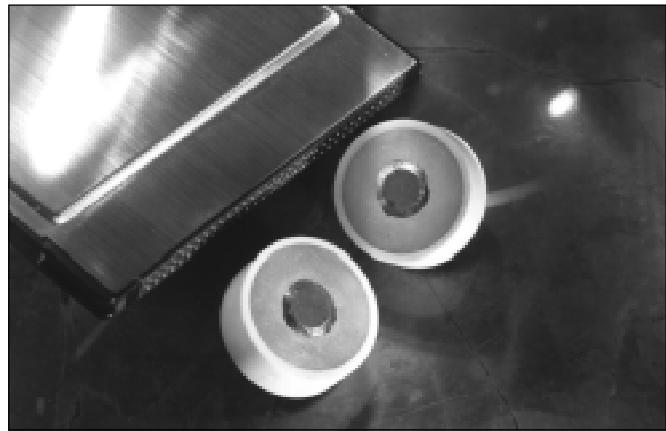
## ANTENNA ELEMENT FOR 2.4 GHz

### DESCRIPTION

The DAC Series is a miniature dielectric antenna element for 2.4 GHz wireless LAN systems. This antenna has vertical polarization characteristics. TOKO's proprietary ceramic dielectric material provides excellent stability and sensitivity. It is mountable in Type II extended PCMCIA cards.

### FEATURES

- Vertical Polarization reception
- Low profile (6.5mm max)
- Omni-directional in azimuth
- Low interference design
- Central feeding point terminal
- Wide bandwidth
- Light weight

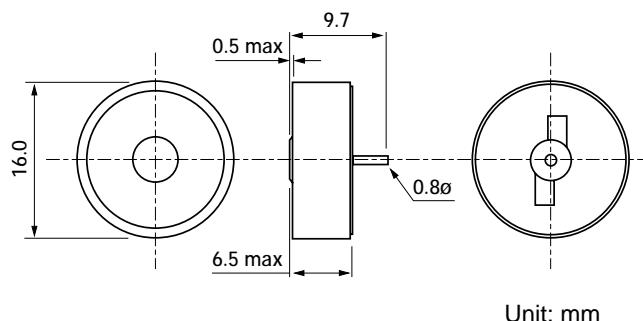


### SPECIFICATIONS

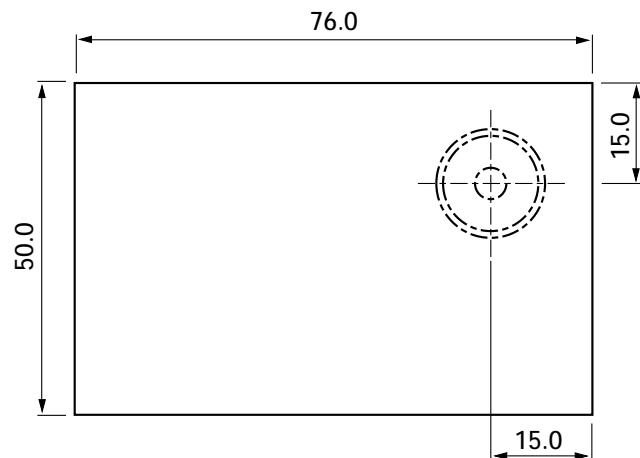
Part Number	DAC2450CT1
Center Frequency	2450 MHz
Receiving Bandwidth	$\pm 50$ MHz min.
Impedance	50 $\Omega$
Peak Gain	2.15 dBi (0dBi typ.) max.
Operating Temperature	-10 ~ +60° C
Storage Temperature	-20 ~ +85° C
Weight	4g

### DIMENSIONS

#### DAC SERIES



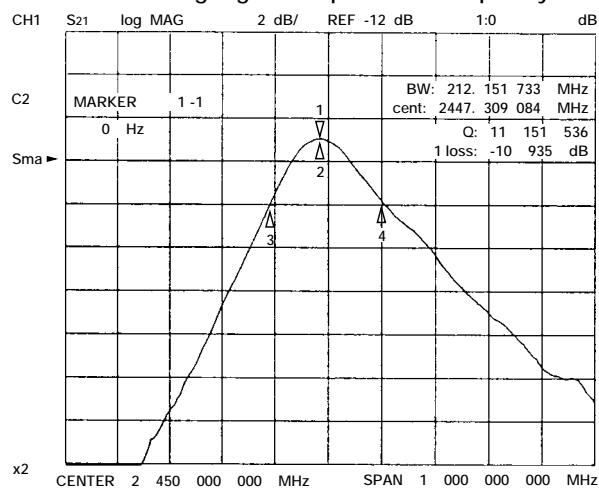
#### Mounted with Ground Plane



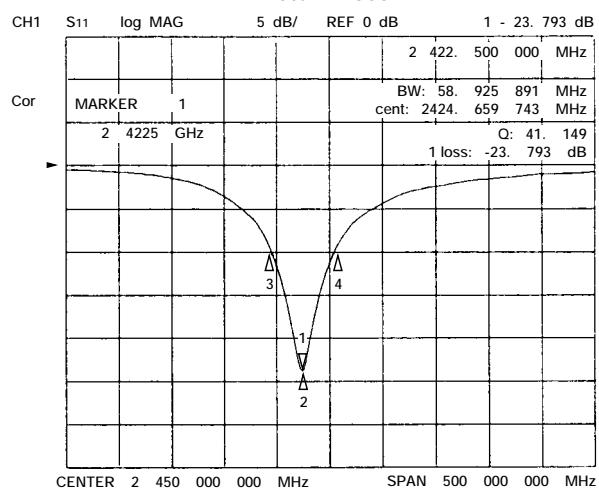
# DAC Series

## TYPICAL CHARACTERISTICS

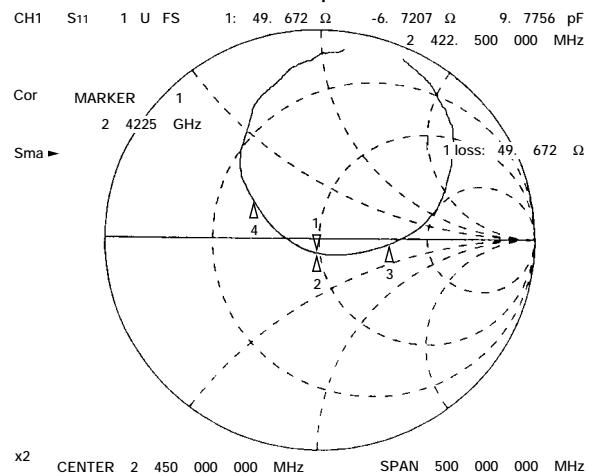
Receiving Signal Response vs Frequency



Return Loss

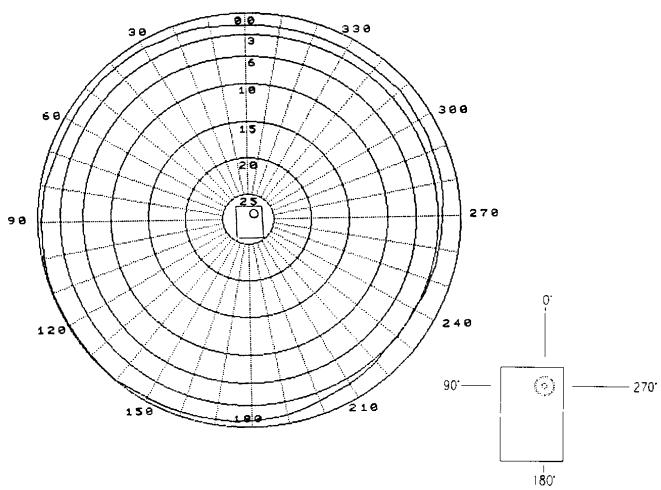


Smith Impedance

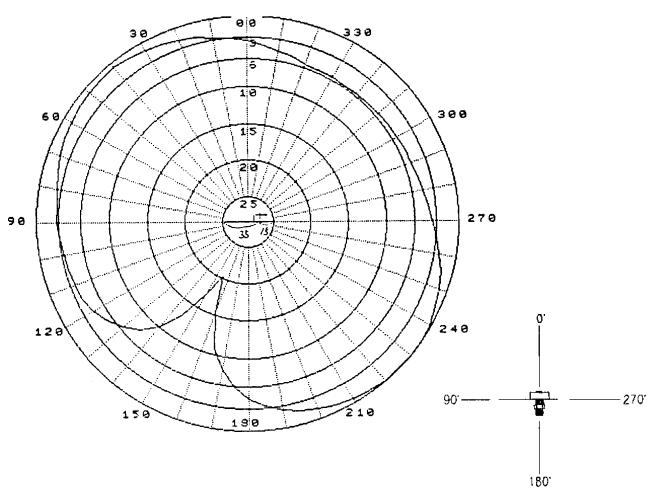


## DIRECTIVITY CHART

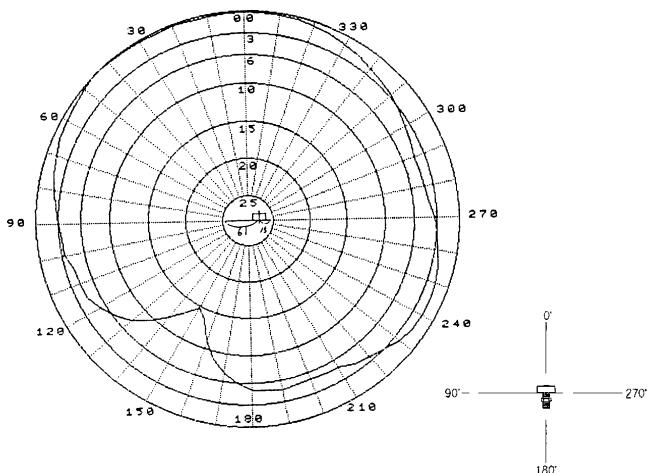
Horizontal Pattern



Vertical Pattern

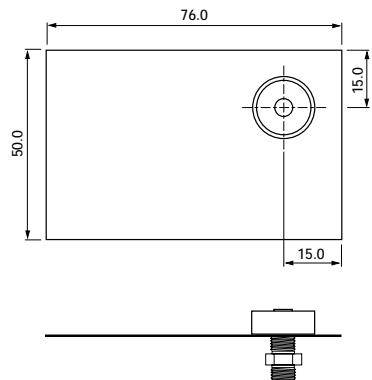


Vertical Pattern

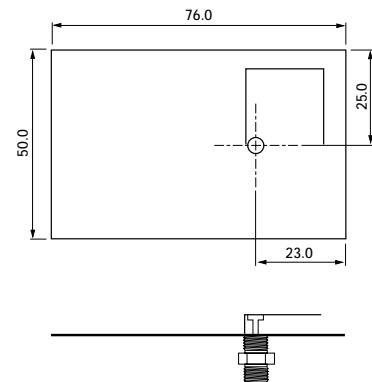


## INTERFERENCE COMPARISON OF DAC VS. PLANAR INVERTED F ANTENNA

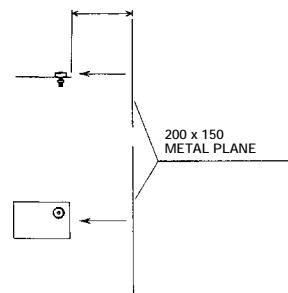
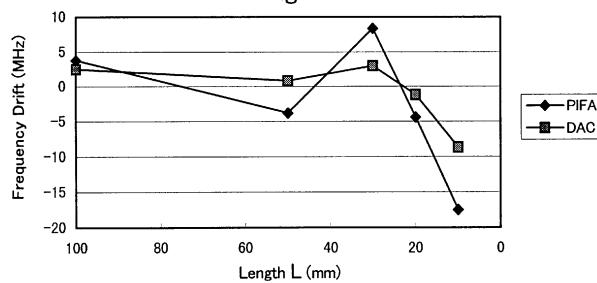
**DAC Set-up**



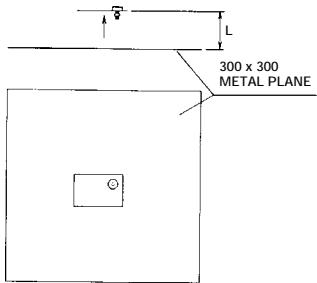
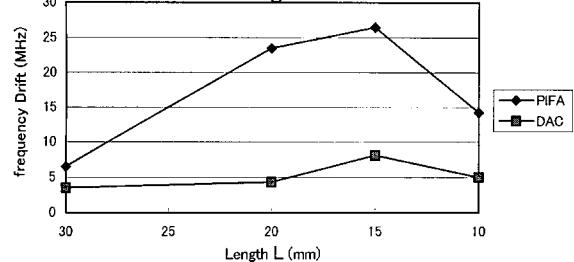
**Planar F  
Inverted  
Set-up**



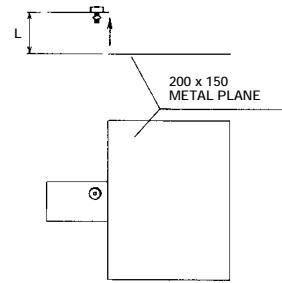
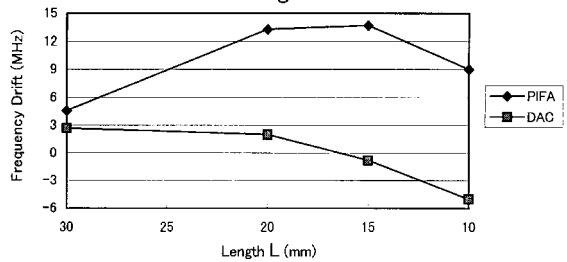
**Fig.1**



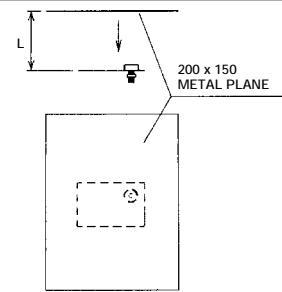
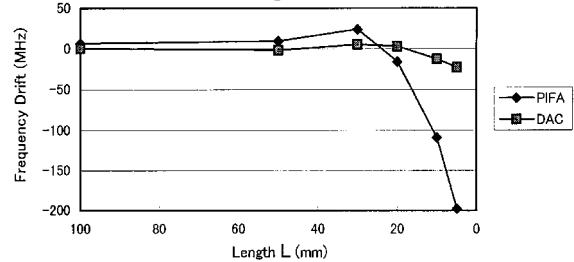
**Fig.2**



**Fig.3**

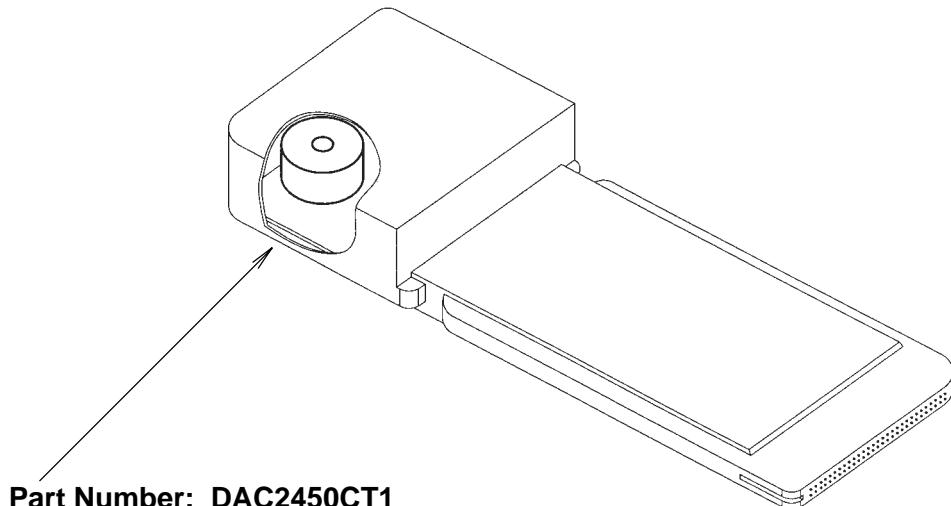


**Fig.4**

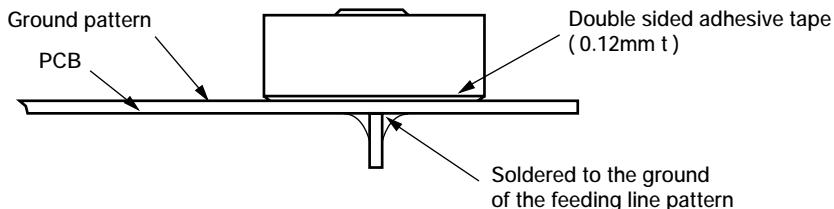


# DAC Series

## TYPICAL APPLICATION MOUNTED IN PCMCIA TYPE II EXTENDED CARD

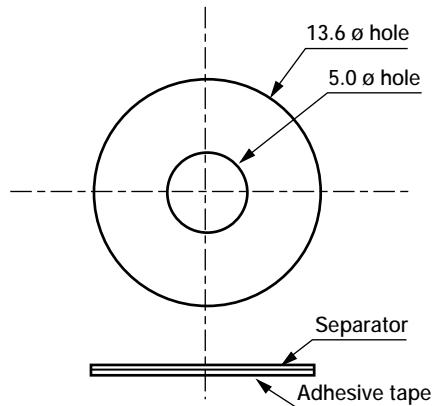


## TYPICAL MOUNTING TO PRINTED CIRCUIT BOARD



### Notes:

- Fix the antenna element on PCB using double sided adhesive tape of 0.12mm thickness. (Recommend No. 5015 : NITTO DENKO CORP.)
- Solder the antenna terminal pin on the bottom side of PCB to the ground of the feeding line pattern.
- The terminal pin should be separated from the ground pattern.



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Toko America, Inc.  
1250 Feehanville Drive, Mt. Prospect, IL 60056  
Tel: (847) 297-0070 Fax: (847) 699-7864 Web: <http://www.tokoam.com>

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Tel: (847) 297-0070  
Fax: (847) 699-7864

Western Regional Office  
Toko America, Inc.  
2480 North First Street, Suite 260  
San Jose, CA 95131  
Tel: (408) 432-8281  
Fax: (408) 943-9790

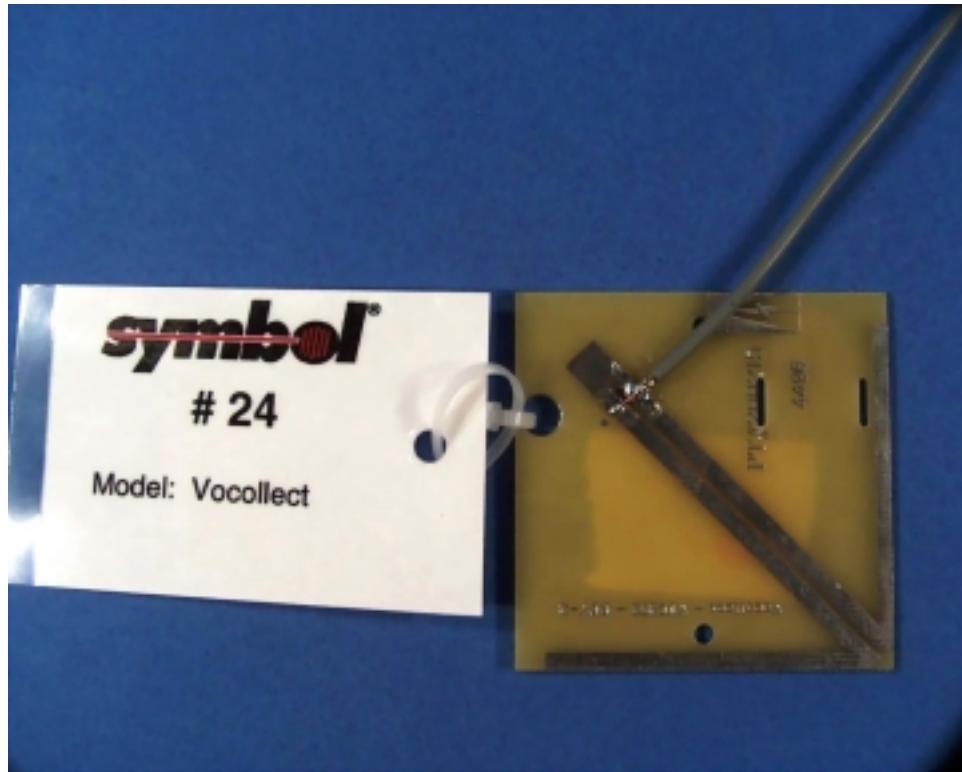
Eastern Regional  
Office  
Toko America, Inc.  
107 Mill Plain Road  
Danbury, CT 06811  
Tel: (203)748-6871  
Fax: (203)797-1223

**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.

<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>	MXYH75, RG-178
<i>Symbol P/N</i>	50-21900-025, 50-21900-026

**Note: This antenna / terminal configuration is only to be used with a transmitter that produces an EIRP of less than 380 mW. For an EIRP of more than 380 mW a SAR test must be performed.**



Antenna Photo

## **Talkman Open – 2.4 GHz Symbol Radio Information**

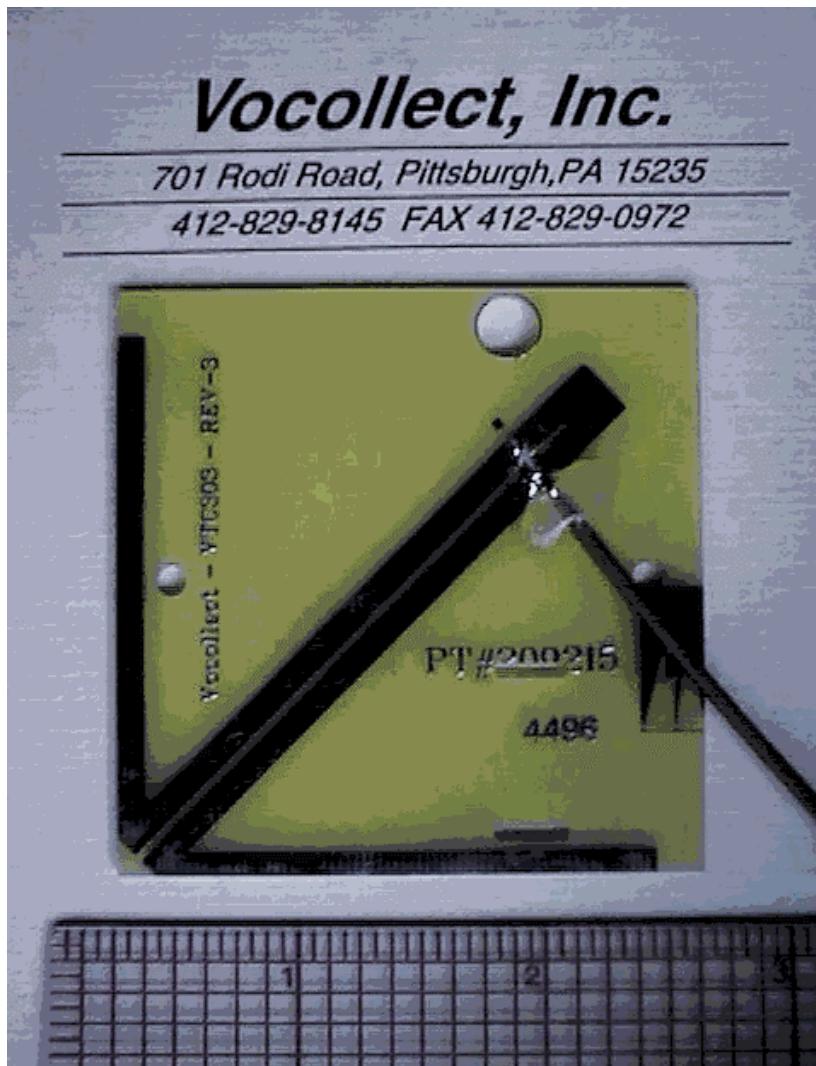
### **Vocollect Antenna Specifications**

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

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



**IMAGE 2: Beltworn Terminal - Drawing**

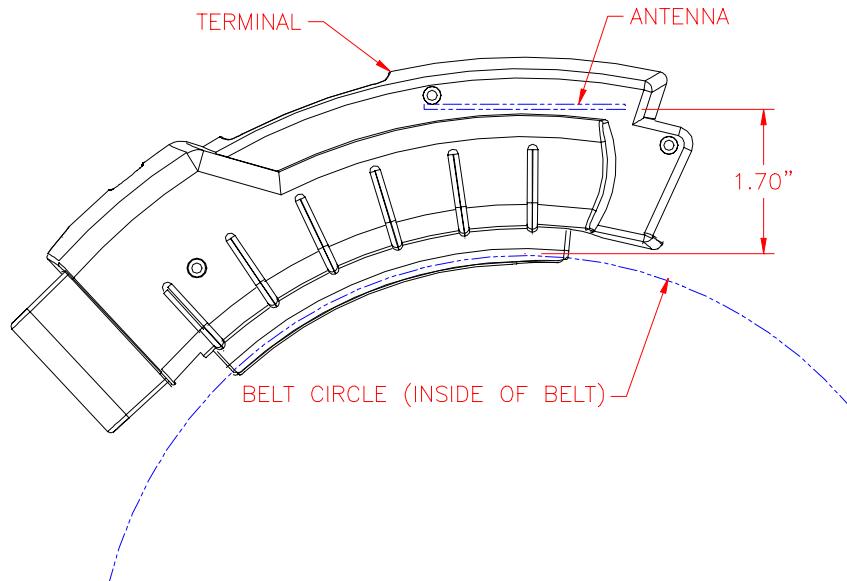


**IMAGE 3: Beltworn Terminal**



#### **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 $\frac{1}{2}$ " 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.



**6840/ 6846 Antenna**

The **6840** 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 **6840** uses a Murata Erie BFA connector while the **6846** uses the MMCX. 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>	10-32290-01, -02

**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**



Antenna Installed in Device



Mobile & Wireless Systems

6840 / 6846

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Terminal Use Photo

REVISIONS						
REV.	ZONE	△ <sub>NO</sub>	DESCRIPTION	E.C.	BY	APVD.
A	ALL	△	RELEASED PER EDR 39215	△	LM	
B	△	△	REVISED PER ECN	4418	RM	
C	△	△	DIM 2.37 WAS 2.30	E4874	LM	
D	△	△	ADDED DIM 2X.18 PER EC	E5856	MB	

D

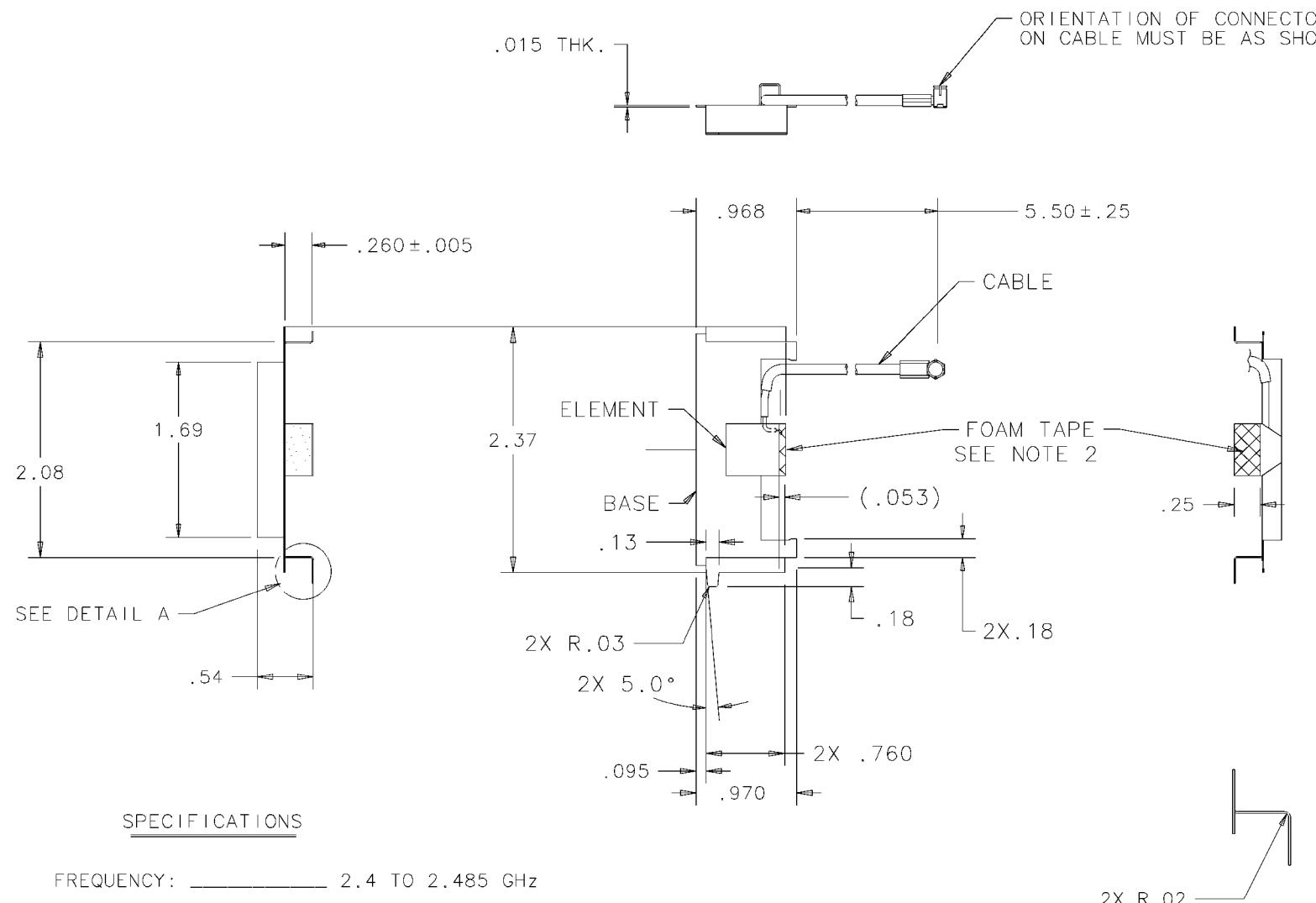
D

C

C

B

B



#### SPECIFICATIONS

FREQUENCY: 2.4 TO 2.485 GHz

VSWR: 2.0:1  
GAIN 0 dBi NOM

IMPEDANCE: 50 OHMS

CABLE/CONNECTOR: TECOM 817283-X  
MURATA ERIE  
MXYH62-XX-XXXX

## NOTE:

1. PACKAGE ITEMS IN ACCORDANCE WITH STI GENERAL PACKAGING SPEC 50-04100-013.
2. ADHESIVE TO BE 3M DOUBLE-SIDED SCOTCH 4026 URETHANE FOAM TAPE (.062 THICK) WITH POLY COATED LINER OR EQUIVALENT.

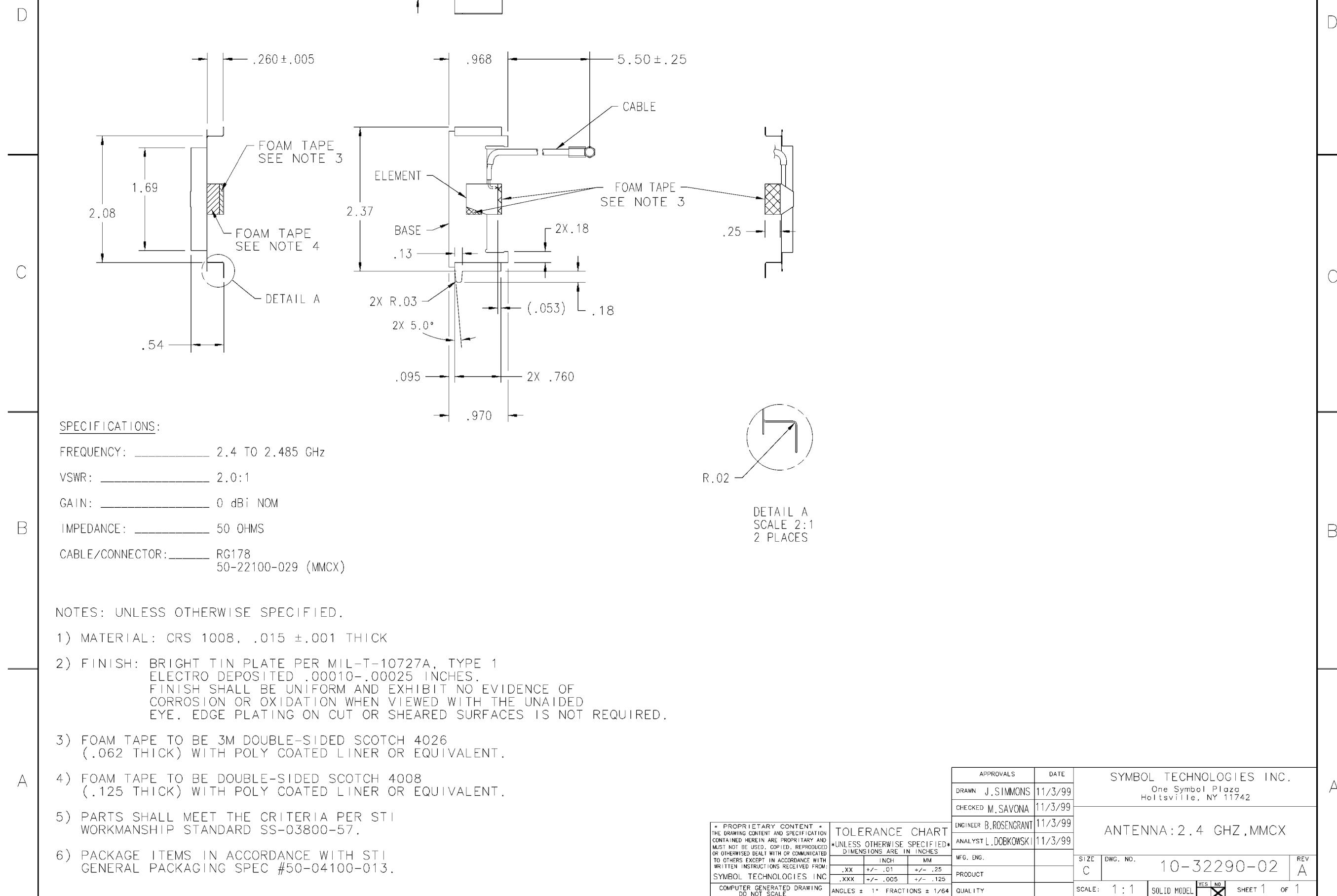
DETAIL A  
(2 PL)

ITEM	QTY.	PART NO.	DESCRIPTION	REMARKS/REF. SYMBOL
			DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED	
			DRAWN LJM 12/23/97	
			CHECKED J CHAN	
			ENGINEER J CHAN	
			MFG. ENG S SPITERI	
			PRODUCT M SAVONA	
			SIZE C DWG. NO. 10-32290-01	REV. D
			QUALITY	
			SCALE: FULL	SOLID MODEL YES NO
				SHEET 1 OF 1

THE DWG. & SPECIFICATION  
CONTAINED HEREON ARE PRO-  
PRIETARY AND MUST NOT BE  
USED, COPIED, REPRODUCED  
NOR ITS CONTENTS COMMUN-  
ICATED TO OTHERS EXCEPT IN  
ACCORDANCE WITH WRITTEN  
INSTRUCTIONS RECEIVED FROM  
SYMBOL TECHNOLOGIES INC.



REVISIONS					
REV.	ZONE	$\Delta_{\text{tol}}$	DESCRIPTION	E.C.	BY
A			RELEASED PER EDR #53958	MB	01/27/00



**7546D Antenna**

The **7546D** antenna is 0 dBi omni-directional in azimuth plane. It is mounted internally at the far end of the terminal on the bottom side as shown in the attached photo. The **7546D** uses two F-elements for spatial diversity. The **7546D** uses a 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>	RG-178
<i>Symbol P/N</i>	10-40948-01

**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**



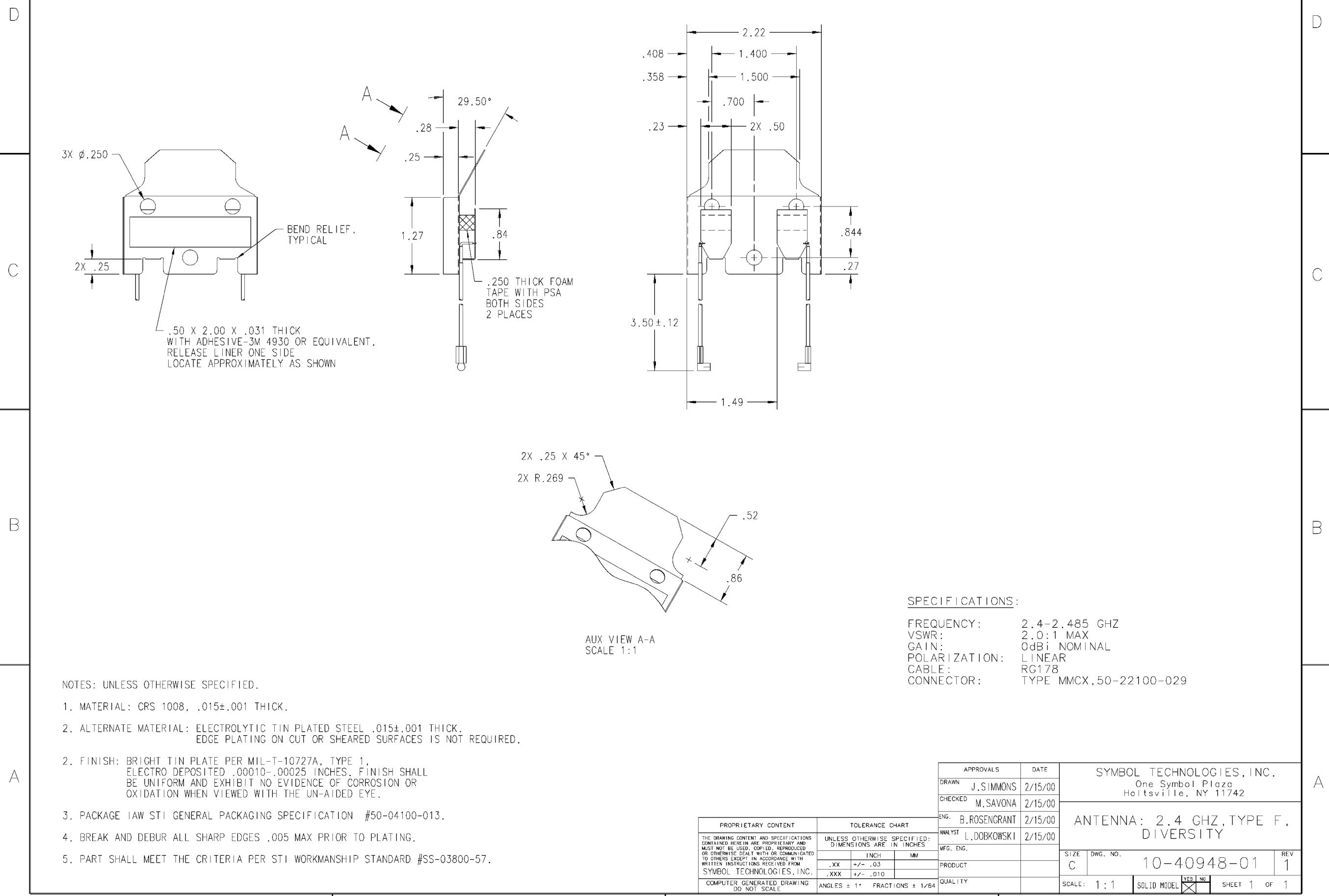
Antenna Installed in Device



Terminal Use Photo

## REV. A

REV.	ZONE	△	DESCRIPTION	E.C.	BY	APVD.	DATE
1			INITIAL RELEASE PER PPD #54570		JS		2/15/00

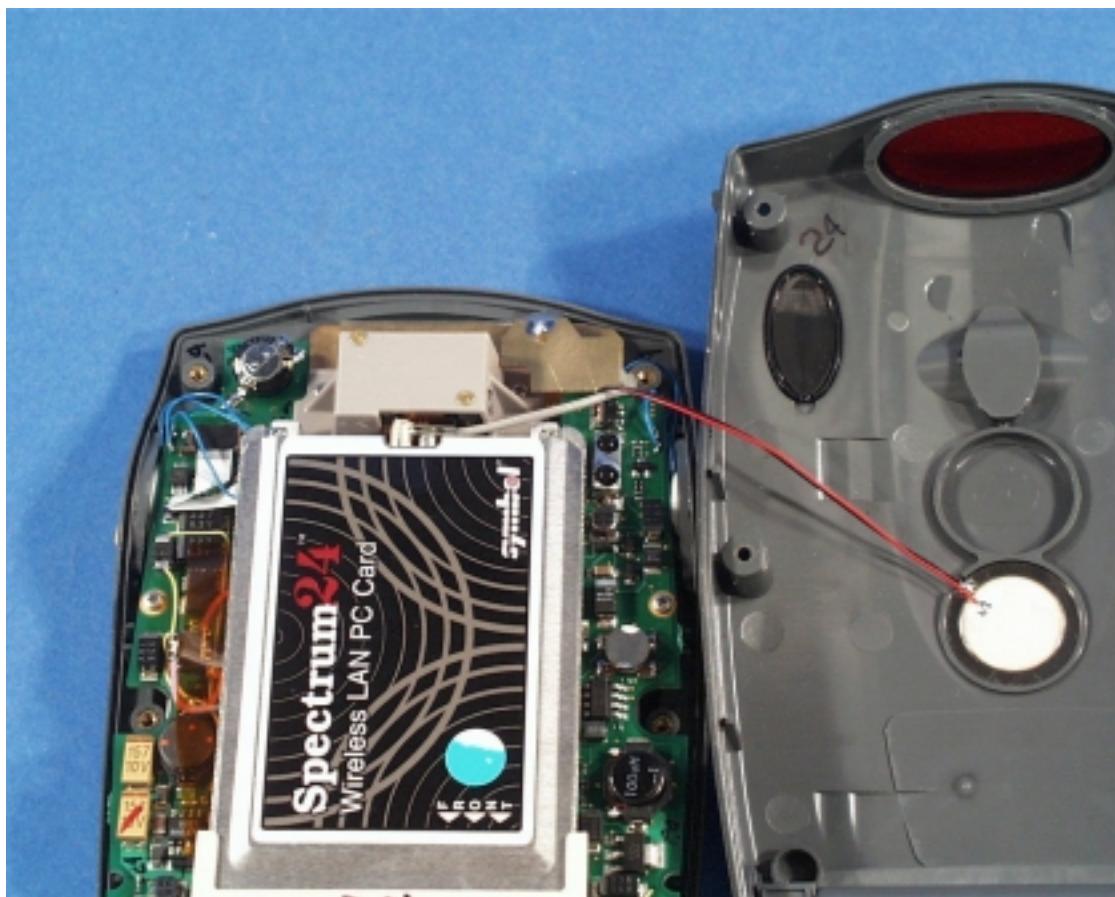


**1740 / 1742 Antenna**

The **1740** 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. 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 **1742** uses the MMCX connector instead of the MuRata BFA. 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>	703549-1

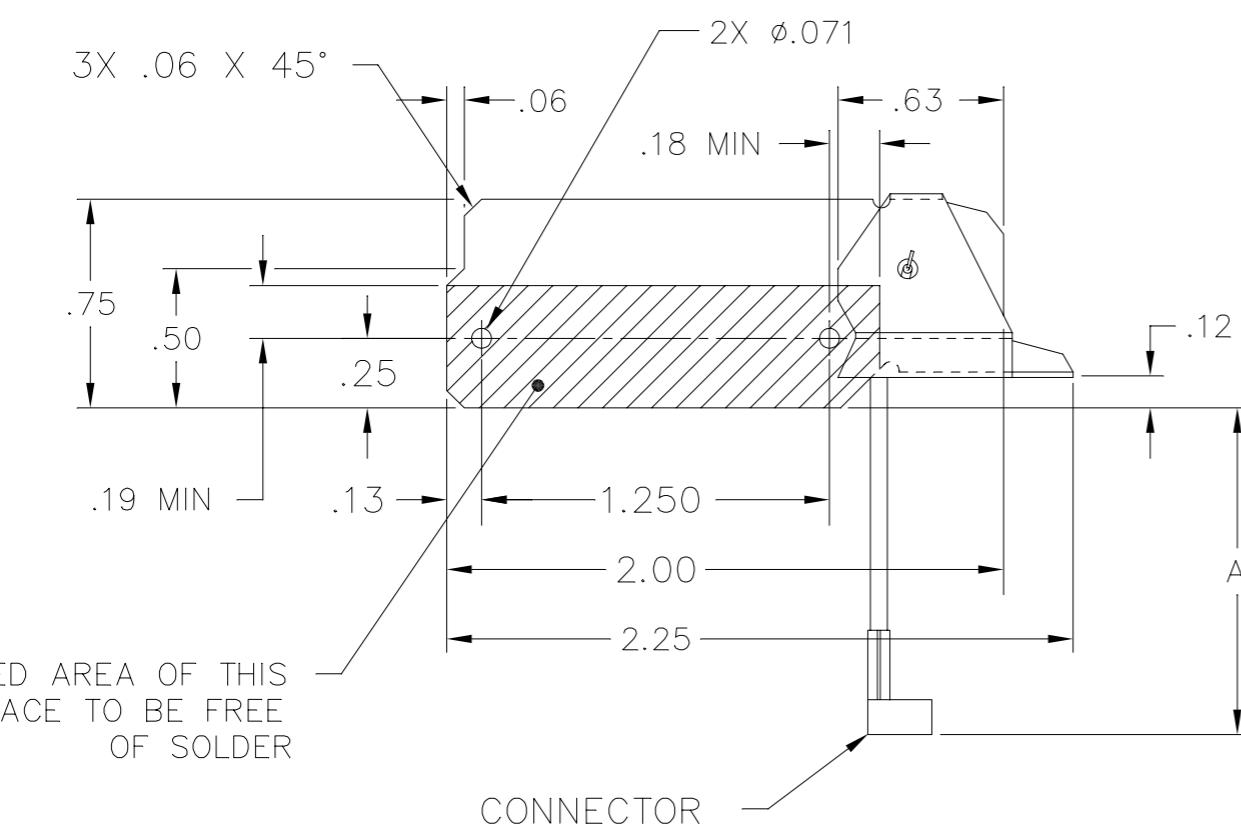
**“Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user’s hand when there is 20 cm or more between the antenna and everyone’s body.”**



Antenna Installed in Device

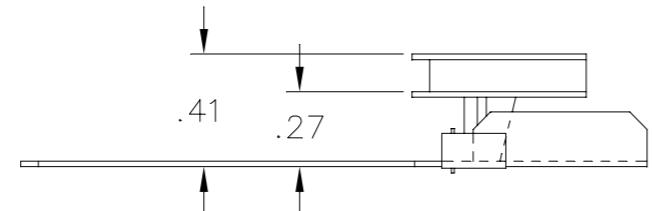
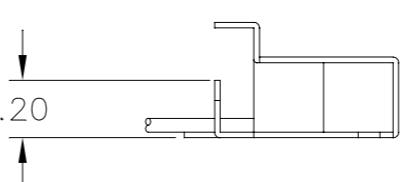


Terminal Use Photo



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
.	B	1.16±.12 WAS 2.06±.12. .63 WAS .750 ADDED .71, .41, .20. CHANGED PICTORIALLY. REDRAWN. WO 2357, 2372	3-26-99 JL	BI MMZ JK
4C-D	C	ADDED .38, R.09. NOTCH WAS .06 (IS .13), WO CP90-476	6-10-99 JL	BI JK
.	D	DELETED .38, R .09 NOTCH ADDED .06 & .50 3X .06 X 45° WAS 2X ... ADDED .18 MIN, .19 MIN ADDED "NO SOLDER CALLOUT" UPDATED NOTES REDRAWN	7-23-99 JL	
B4	E	ADDED -2 CONFIG & TAB, BLOCK CALLOUT WAS: CONNECTOR, MURATA TYPE BFA WO CP90-924	12-8-99 JL	

-2	MMCX MALE RT ANGLE	1.85±.12	E
-1	MURATA TYPE BFA	1.16±.12	D
DASH NO	CONNECTOR	A	REV

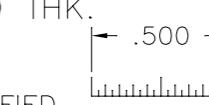


5. TOLERANCES ON: .XX ±.03, .XXX ±.010, ANGLES ±.5°
4. SHARP CORNERS & EDGES .005 MAX.
3. FINISH SHALL BE UNIFORM AND EXHIBIT NO EVIDENCE OF CORROSION OR OXIDATION WHEN VIEWED WITH THE UNAIDED EYE. EDGE PLATING ON CUT OR SHEARED SURFACES IS NOT REQUIRED.

2. ALTERNATE:  
MATERIAL: CRS 1008, .010 THK.  
FINISH: BRIGHT TIN PLATE PER  
MIL-T-10727A, TYPE 1, ELECTRO  
DEPOSITED .00010-.00025 IN.

1. MATERIAL: ELECTROLYTIC TIN  
PLATED STEEL SHEET, .010 THK.

NOTES : UNLESS OTHERWISE SPECIFIED



PMIC	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .03	CONTRACT NUMBER
	.XXX ± .010 ANGLES ± 0°30' MACHINED SURFACE ROUGHNESS 125 $\mu$ m REMOVE BURRS, SHARP EDGES R.005-.015 MACHINED FILLETS R.005-.015 DIMENSIONS ARE AFTER PLATING. MACHINED DIA'S ON COMMON CENTERLINE CONCENTRIC WITHIN .005 TIR. INTERPRET PER ANSI Y14.5M-1982.	CONTRACTOR
(10-36063-01)	HOLE TOLERANCES: .040 - .128 +.003 .515 - .750 +.008 .136 - .228 +.004 .765 - 1.000 +.010 .234 - .500 +.006 1.031 UP +.015 -.001 -.001 -.002 -.002	DRAWN BY J. LOWE DATE 1-15-99
(DRAGON)	CHECKER QA	MFG ENGR ENGR
822903	CP80-875	BI
NEXT ASSY	USED ON	PRGM MGR ENGR
APPLICATION		SCALE 2/1 UNIT WT . SHEET 1 OF 1

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .03	CONTRACT NUMBER
.XXX ± .010 ANGLES ± 0°30' MACHINED SURFACE ROUGHNESS 125 $\mu$ m REMOVE BURRS, SHARP EDGES R.005-.015 MACHINED FILLETS R.005-.015 DIMENSIONS ARE AFTER PLATING. MACHINED DIA'S ON COMMON CENTERLINE CONCENTRIC WITHIN .005 TIR. INTERPRET PER ANSI Y14.5M-1982.	CONTRACTOR
HOLE TOLERANCES: .040 - .128 +.003 .515 - .750 +.008 .136 - .228 +.004 .765 - 1.000 +.010 .234 - .500 +.006 1.031 UP +.015 -.001 -.001 -.002 -.002	DRAWN BY J. LOWE DATE 1-15-99
CHECKER QA	MFG ENGR ENGR
PRGM MGR ENGR	SCALE 2/1 UNIT WT . SHEET 1 OF 1

TECOM	TECOM INDUSTRIES INC. 9324 TOPANGA CYN BLVD CHATSWORTH, CA. 91311 TECHNICAL EXCELLENCE COMMITTED TO QUALITY
TITLE	ANTENNA, 2.4 GHZ
SIZE	CAGE CODE
C	52791
DWG NO	703549

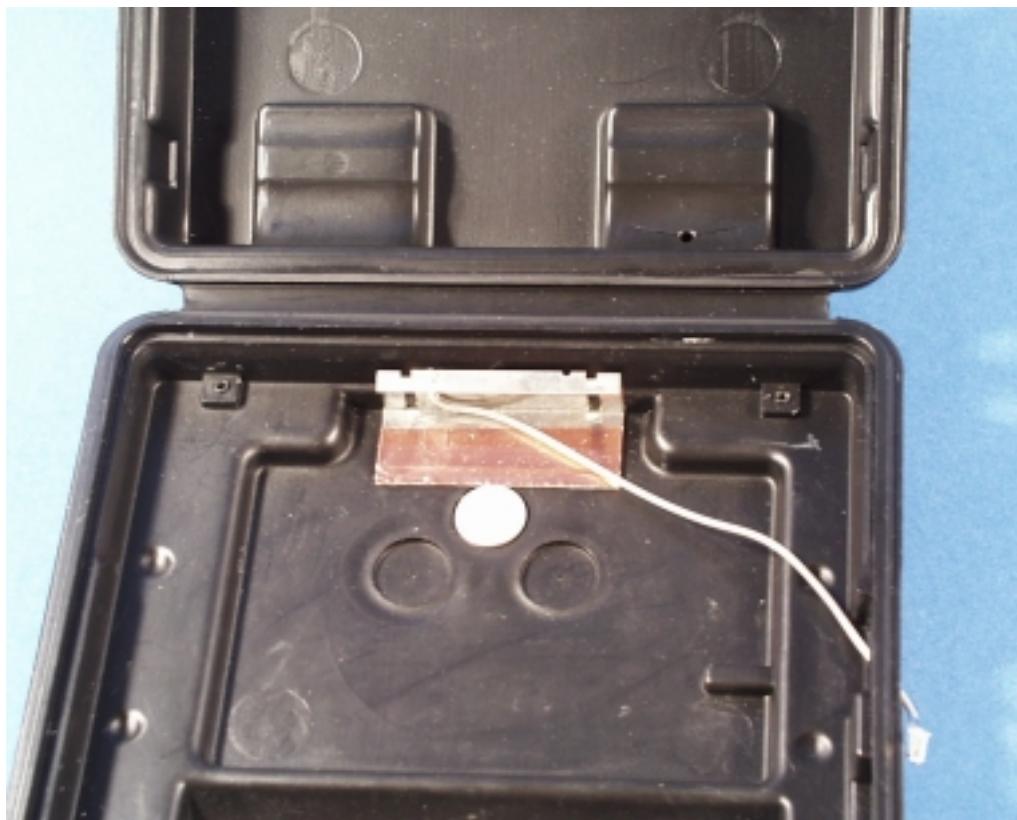
FREQUENCY: 2.4-2.485 GHZ  
VSWR: 2.0:1 MAX  
GAIN: 0dBi NOMINAL  
POLARIZATION: LINEAR

**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 would be within 5 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

**Note: This antenna is only to be used with a transmitter that produces an EIRP of less than 200 mW. For an EIRP of more than 200 mW a SAR test must be performed.**



Antenna Installation Photo



Mobile & Wireless Systems

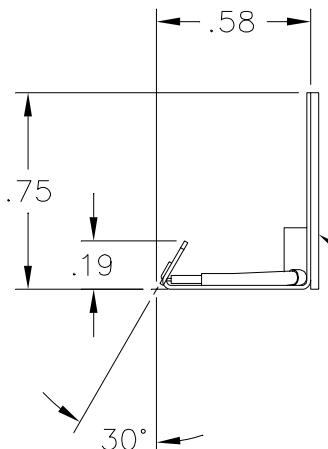
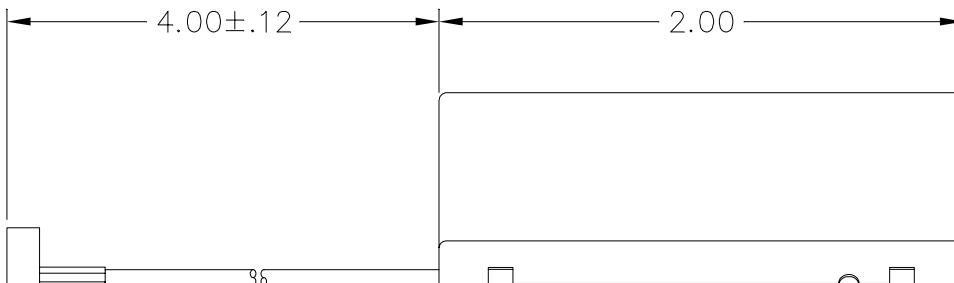
Oneil



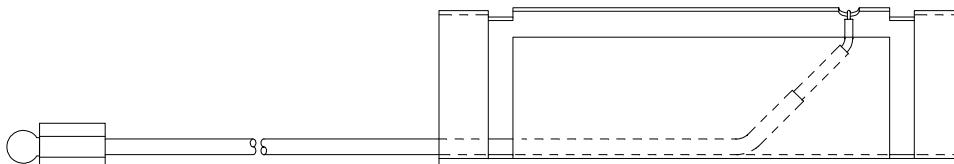
Device use Photograph.

## REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
C2	A	.58 WAS .42 ADHESIVE CALLOUT WAS: ... X .025 THK (3M 4930 OR EQUIV) W# 2675 REDRAWN	1-4-00 JL	



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



- SHARP CORNERS & EDGES .005 MAX.
- ALTERNATE:  
MATERIAL: CRS 1008, .015 THK.  
FINISH: BRIGHT TIN PLATE PER  
MIL-T-10727A, TYPE 1, ELECTRO  
DEPOSITED .00010-.00025 IN.
- 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.

- MATERIAL: ELECTROLYTIC TIN  
PLATED STEEL SHEET, .015 THK.

NOTES : UNLESS OTHERWISE SPECIFIED

SCALE

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

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

## SPECIFICATIONS

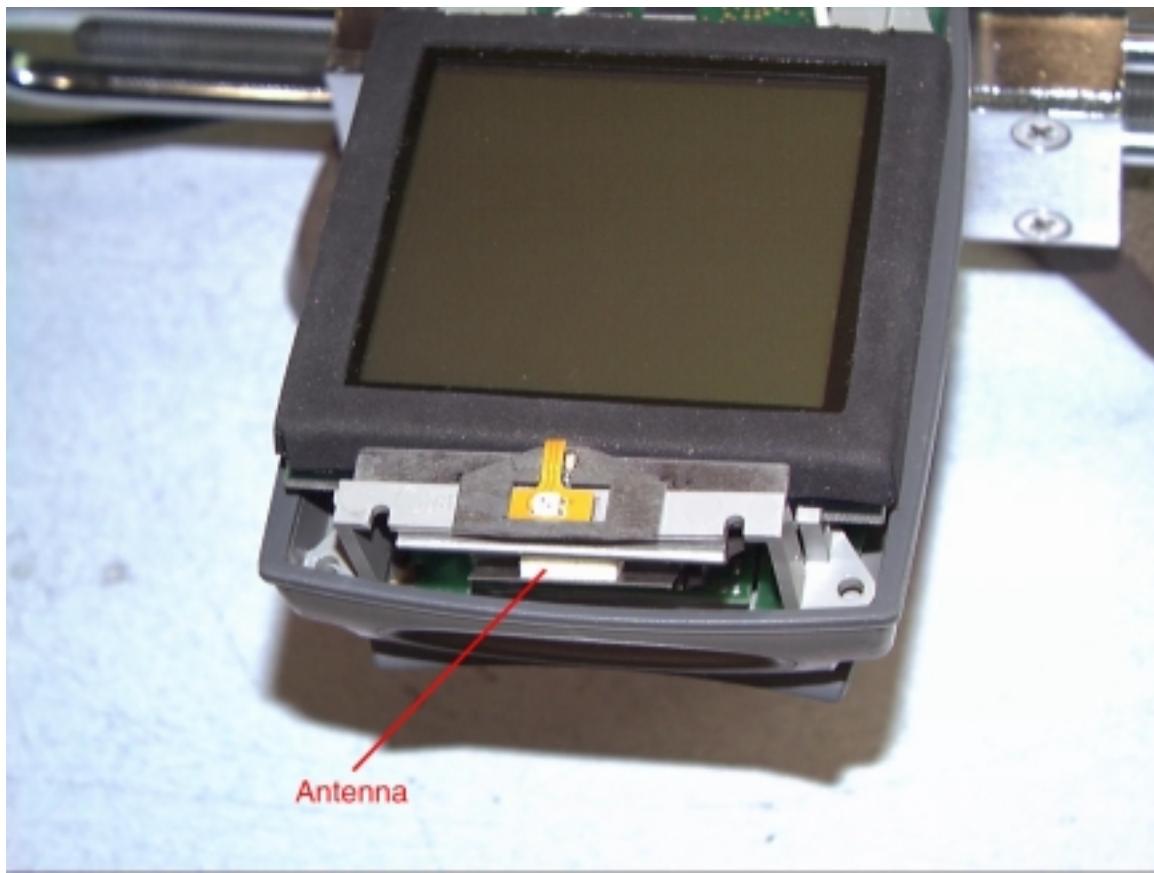
TECOM	TECOM INDUSTRIES INC. 9324 TOPANGA CYN BLVD CHATSWORTH, CA. 91311 TECHNICAL EXCELLENCE COMMITTED TO QUALITY	
	TITLE ANTENNA A, 2.4 GHZ	
SIZE	CAGE CODE	DWG NO
C	52791	703620
SCALE	2/1	UNIT WT
		SHEET 1 OF 1

**6846D Antenna**

The **6846D** 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 **6846D** uses a 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>	10-41003-01

**"Important Note: To comply with FCC RF exposure requirements, this hand-held device is approved for operation in a user's hand when there is 20 cm or more between the antenna and everyone's body."**



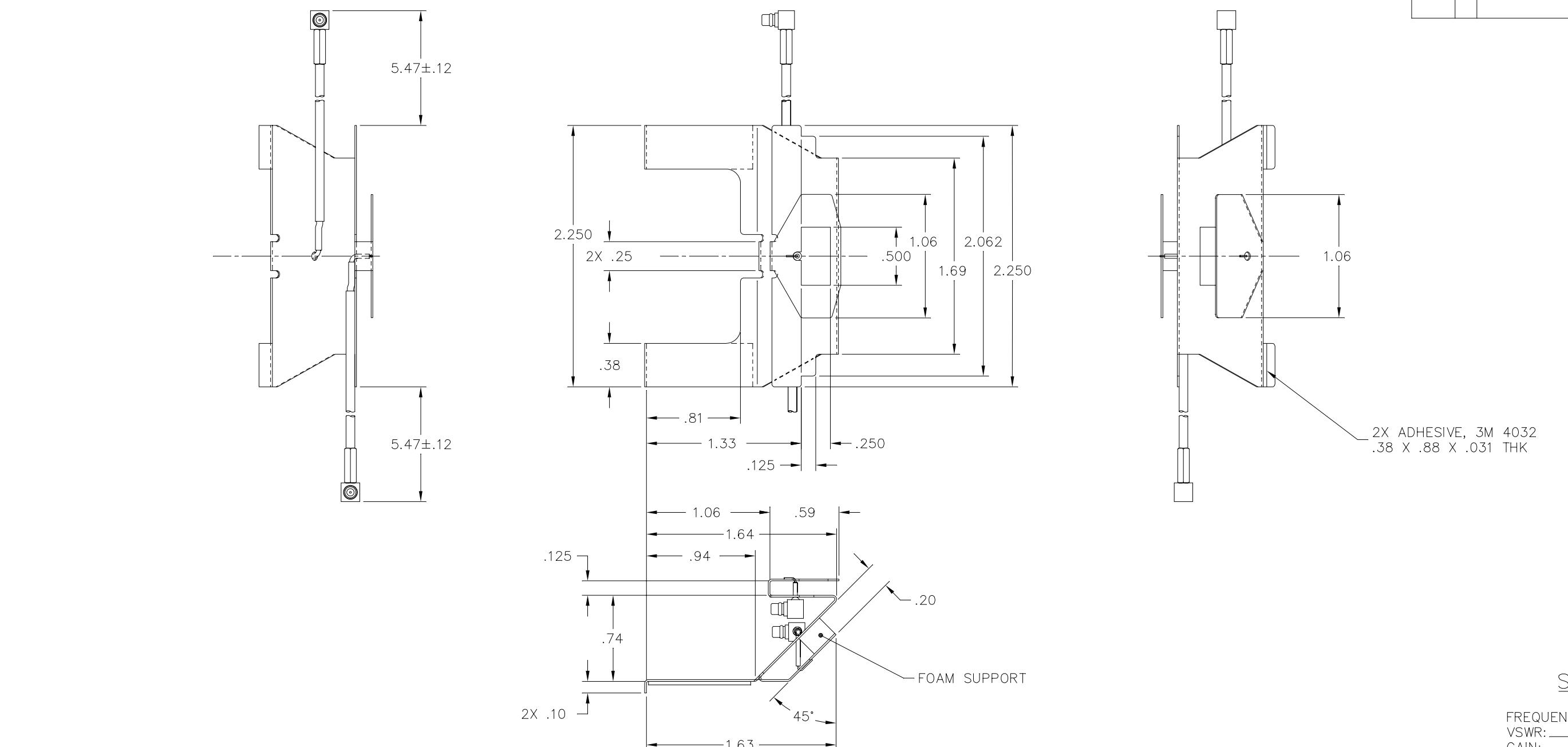


Mobile & Wireless Systems

6846D



Terminal Use Photo



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

PROPOSAL DRAWING

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
.	A	REDESIGNED TO IMPROVE FIT & PERFORMANCE REDRAWN.	2-10-00 JL	
5B,6A	B	.74 WAS .740, .94 WAS .938 1.06 WAS 1.063, .59 WAS .594	2-18-00 JL	
5B	C	1.33 WAS 1.334	2-29-00 JL	

SPECIFICATIONS

FREQUENCY: 2.4-2.485 GHZ  
VSWR: 2.0:1 MAX  
GAIN: 0dBi NOMINAL  
POLARIZATION: LINEAR  
CABLE: RG178 OR EQUIV  
CONNECTOR: MMCX MALE

**TECOM**

TECOM INDUSTRIES INC.  
9324 TOPANGA CYN BLVD CHATSWORTH, CA 91311  
TECHNICAL EXCELLENCE COMMITTED TO QUALITY

TITLE

ANTENNA,  
2.4 GHZ

PMIC		CONTRACT NUMBER		DRAWN BY	DATE
		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .03 XXX ± .010 ANGLES ± 0°30' MACHINED SURFACE ROUGHNESS 125 $\mu$ REMOVE BURRS, SHARP EDGES R.005-.015 MACHINED FILLETS R.005-.015 DIMENSIONS ARE AFTER PLATING. MACHINED DIA. ON COMMON CENTERLINE CONCENTRIC WITH .005" IR. INTERPRET PER ANSI Y14.5M-1982.	CONTRACTOR	J. LOWE	1-25-00
		HOLE TOLERANCES: .040 -.128 +.003 .515 -.750 +.008 -.001 .136 -.228 +.004 .765 -1.000 +.010 -.002 .234 -.500 +.006 1.031 UP +.015 -.002	CHECKER	MFG ENGR	
	(SLK DIVERSITY)	QA	ENGR		
823407	CP00-021	MATL ENGR	APPROVAL	PRGM MGR	ENGR
NEXT ASSY	USED ON	APPLICATION		SCALE	2/1
				UNIT WT	
				SHEET	1 OF 1

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