



**RF Exposure Safety:** The LA3021-500 is a 330 mW transmitter used in both Mobile and Portable device applications. Symbol Technoloiges, Inc. bases its conformance to safe RF exposure limits on design calculations and testing of its two worst case situations and good design principles.

**Mobile RF devices:** The worst case situations for mobile devices RF exposure is the Parabolic Grid antenna. In the case of the Parabolic Grid the MPE distance is 15.7 cm using equation (3) of OET Bulletin 65. Equation (3) was used instead of equations (11) through (18) for ease of computation justified by the fact that equation (3) leads to calculations of higher field strength and a greater MPE distance.

For mobile devices Symbol will include a user/installation instruction to alert the user to the MPE distance. To minimize the confusion for the users we will state the MPE for all antennas to be that of the worst case 16 cm. This is a rounding up of the actual distance from 15.7 cm to 16. The following safety statement is included with the user manuals for each of the mobile devices.

#### **Symbol Safety Statement**

“The maximum permissible exposure (MPE) limit for these antennas when used with a Spectrum24 device is 6.5 inches (16 cm). The MPE limit is calculated to reflect the distance a person should maintain from the antenna. The MPE distance does not apply to transient exposure due to incidental passage closer than the MPE limit.”

**Portable RF Devices:** All portable devices that use internal antennas are designed for best RF match inside the device while being used. Initial design uses 3d lithography plastic modes for proof of concept. However, final QA approval of the custom antenna only occurs after the antenna manufacturer has received the final plastics to tune the design for use with the final materials. Symbol’s antenna spec states that the VSWR across the band must be better than 2:1.

This design method ensures that device range is maximized and that the near field effects due to antenna miss match are minimized. Because of range degradation when users get the antenna to close to their hand the device is designed so that the radiating element is as far from human tissue as possible. Additional factors in design are grip, control button placement, and support strap ergonomics. This forces the user into correct handgrip placement to avoid range degradation and minimize RF exposure.

Body worn devices are strapped to the user with an antenna to tissue distance for the WWC 1049 of 1.3 cm. Since all of our portable devices use the same F-element family of antennas with very similar patterns and gains the 1049 is the worst case for any portable device. Portable device WWC1O4O is the same as WWC 1049 (the difference is in memory options) which was used for near field SAR measurements made by Iissan



America, Inc. The compliance test report was provided in a previous letter, September 16, 1998 reference number 3413 with respect to the H9PLA3021-500 application.

Where devices appear to be similar to either of these cases justification is given for relative exposure level differences.

**Connector Information:** The LA3021 wireless LAN PC Card family is attached to its antenna via a MMCX style coaxial connector. It is available from Amphenol. Special tools and advanced assembly skills are necessary to attach this connector to a cable. The Amphenol part number is 908-43300. Drawings of these connectors are attached. The other end of the coaxial cable is attached to a polarized BNC connector. The polarized BNC connector is similar to a regular BNC type connector but is made unique by swapping the inner conductor sex. This connector and its mate can be purchased from the manufacturer, M/A COM Inc. A drawing of this connector is attached. In some cases the coax cable is directly soldered to the antenna. The following antennas are options for antennas for the LA 3000 family of WLAN PC Cards.



Antenna Summary Tables

Remote Antennas

Ant #	Model	Type	Gain <sup>1</sup>	Usage	MPE Distance <sup>2</sup>	Symbol P/N	Mfgr.	Mfgr. P/N
2a	Dipole Antenna (4' Cable <sup>3</sup> ),	Dipole Array	3 dBi	Ceiling	7.4 cm	ML-2499-HPA1-00 (4 ft)		
2b	Dipole Antenna (15" cable)	Dipole Array	0 dBi	Ceiling	5.3 cm	ML-2499-HPA2-00 (15 ft)		
4	Yagi	Yagi	9 dB	Mast/Wall	14.8 cm	ML-2499-YGA1-01		
5	Patch	Patch	4 dBi	Wall/Rooftop	8.3 cm	ML-2499-PTA1-01		
6	Panel	Patch	7dBi	Wall/Rooftop	11.8 cm	ML-2499-PNA1-01		
15	Parabolic Grid	Parabolic	9.5 dBi	Mast	15.7 cm	ML-2499-PGA1-00		
16	S2406	Dipole Array	2 dBi	Ceiling	6.6 cm	ML-2499-WHA1-20/30		
18	Corner Patch	Patch	5 dBi	Wall, ceiling	9.3 cm	ML-2499DLA1-06		
19	Ceiling Mount Panel	Plane	3.6 dBi	Ceiling	8.0 cm	ML-2499-SD24-06		

<sup>1</sup> Antenna gain includes permanently attached cable loss.

<sup>2</sup> MPE Distance is based on Symbol's worst case H9PLA3021-500 assuming 350 mW of transmitter power.

<sup>3</sup> All cables are permanently attached to the antenna with a reverse polarity BNC on the other end. A short MMCX to RP-BNC cable is required for mating to PC Card.



**Stand Alone with Laptops & Regular Computers**

Ant #	Model	Type	Gain <sup>4</sup>	Usage	MPE Distance <sup>5</sup>	Symbol P/N	Mfgr.	Mfgr. P/N
1	Plane Antenna	Plane	0 dBi	Ceiling, Laptop	5.3 cm	ML-2499-PSA1-00		
3	Rubber Duck	Dipole	1 dBi	Ceiling, Computer	5.9 cm	ML-2499-APA1-00		
7	End Cap	F-Element	0 dBi	Laptop Card Slot	5.3 cm	ML-3099-PCEC-01		
21	Mag Mount	Dipole	-3 dBi	Vehicle	6.6 cm	ML-2499-MGA1-01		

**Hand Held Device Antennas**

Ant #	Model	Type	Gain	Usage	MPE Distance	Symbol P/N	Mfgr.	Mfgr. P/N
8	4140	Whip	< 0 dBi	hand held	5.3 cm	DR10-2		
9	4640	Patch	< 0 dBi	hand held	5.3 cm	21-17486-02		
10	2140	F-Element	< 0 dBi	hand held	5.3 cm	10-17577-01		
11	6140	F-Element	< 0 dBi	hand held	5.3 cm	10-35305-01		
12	6840	F-Element	< 0 dBi	hand held	5.3 cm	10-32290-01		
13	1040	F-Element	< 0 dBi	Worn on Arm	SAR	10-32447-01		
14	Huber Suhner	Dipole	1.8 dBi	Hand Held	5.3 cm		Huber Suhner	9090.16.0001
17	Criticare	F-Element	0 dBi	hand held	5.3 cm		Tecom	703443
20	2040	F-Element	< 0 dBi	hand held	5.3 cm	10-17577-02		

<sup>4</sup> Antenna gain includes permanently attached cable loss.

<sup>5</sup> MPE Distance is based on Symbol's worst case H9PLA3021-500 assuming 350 mW of transmitter power.

**Antenna # 1 Plane Antenna**

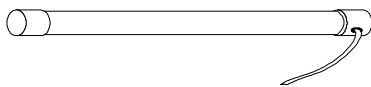


The Plane antenna is 0 dBi omni-directional in azimuth plane. It would typically be mounted on a ceiling but could mount on top of a computer. In

<i>Location</i>	Horz Surface
<i>Pattern</i>	Omni
<i>Type</i>	Plane
<i>Gain</i>	0 dBi
<i>Physical</i>	2.5" x 2.5" x 0.75"
<i>Cable</i>	4 ft (Plenum-rated)
<i>Symbol P/N</i>	ML-2499-PSA1-00
<i>MPE Distance</i>	4.46 cm

its use on a computer it would probably not, but it could come, within 20 cm of a person. Therefore this antenna is probably most often a mobile antenna. As such its MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 1 (0 dBi) and R = 20 cm,  $S = (330)(1) / ((4\pi)(20)^2) = 0.07 \text{ mW/cm}^2$ , The antenna could in some less common situations be a mobile within 20 cm of a user. In such usage it would produce lower SAR than the WWC 1049. Since the plane antenna has the same gain as the as the WWC 1049 but is not used as close as the WWC 1049 it's SAR will be lower than the WWC 1049 which is mounted in direct contact and has the same gain, 0 dBi.

**Antenna # 2 Ceiling Mount Dipole Antenna(s)**



The ceiling mount

dipole mounts on ceilings. The antenna will in this usage clearly be more than 20 cm from the user and so be classified as a mobile antenna. The ceiling mount dipole is 3 dBi. This antenna has a dipole style pattern. The MPE is less than the 1

<i>Location</i>	Horz Surface
<i>Pattern</i>	Omni
<i>Type</i>	Co Linear Dipole Array
<i>Gain</i>	3 dBi (4ft), 0 dBi (15ft)
<i>Physical</i>	14" (l) x 1.25" (dia.) pole
<i>Cable</i>	4 or 15 ft (Plenum-rated)
<i>Symbol P/N</i>	ML-2499-HPA1-00 (4 ft)
	ML-2499-HPA2-00 (15 ft)
<i>MPE Distance</i>	6.3 cm

mW/ cm<sup>2</sup> limit.  $S = (PG)/(4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 2 (3 dBi) and R = 20 cm,  $S = (330)(2) / ((4\pi)(20)^2) = 0.13 \text{ mW/cm}^2$

### Antenna # 3 Rubber Duck Dipole antenna

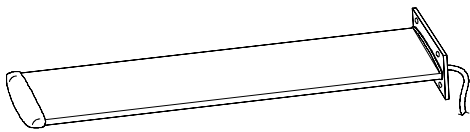
The Rubber Duck Dipole antenna is 1 dBi omni-directional in azimuth plane. It would typically be mounted in the back of a computer or on a ceiling. In its use on a computer it is connected to an add on card in the back of the computer. It would not come within



<i>Location</i>	Indoor
<i>Pattern</i>	Omni
<i>Type</i>	Dipole
<i>Gain</i>	1 dBi
<i>Physical</i>	7" (l) x 0.5" (dia.) pole
<i>Cable</i>	N/A
<i>Symbol P/N</i>	ML-2499-APA1-00
<i>MPE Distance</i>	5.0 cm

20 cm of a person. Therefore this antenna is a mobile antenna as such its MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 1.25 (1 dBi) and R = 20 cm,  $S = (330)(1) / ((4\pi)(20)^2) = 0.082 \text{ mW/cm}^2$ .

### Antenna # 4 Yagi Antenna

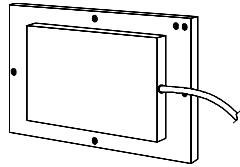


The Yagi antenna mounts on walls

near the ceiling or on rooftops. The antenna will, in this usage clearly will be more than 20 cm from the user and so be, classified as a mobile antenna. The Yagi Antenna is 9 dBi when adjusted for cable loss from a 20 foot coaxial cable terminated in the polarized BNC connector. The MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021 we know P = 330 mW, G = 8 (9 dBi) and R = 20 cm,  $S = (330)(8) / ((4\pi)(20)^2) = 0.53 \text{ mW/cm}^2$ .

<i>Location</i>	In/outdoor
<i>Pattern</i>	Directional 30° beam
<i>Type</i>	Yagi
<i>Gain</i>	9 dBi
<i>Physical</i>	27" x 4" x 1.5" blade
<i>Cable</i>	20 ft (Plenum-rated)
<i>Symbol P/N</i>	ML-2499-YGA1-01
<i>MPE Distance</i>	12.57 cm

**Antenna # 5 Patch Antenna**



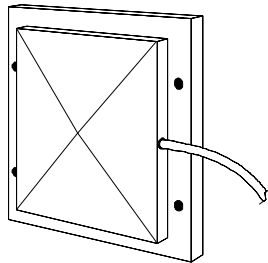
The Patch antenna mounts on walls near the ceiling or on rooftops with screws to a flat surface facing the desired coverage area. This

antenna produces a wide (70°) coverage area while remaining unobtrusive.

<i>Location</i>	In/outdoor
<i>Pattern</i>	Directional 70°beam
<i>Type</i>	Patch
<i>Gain</i>	4 dBi
<i>Physical</i>	5" x 5" x 0.5" panel
<i>Cable</i>	6 ft (Plenum-rated)
<i>Symbol P/N</i>	ML-2499-PTA1-01
<i>MPE Distance</i>	8.9 cm

The antenna will, in this usage clearly will be more than 20 cm from the user and so, be classified as a mobile antenna. The Patch Antenna is 6 dBi when adjusted for cable loss from a 6 foot coaxial cable terminated in the polarized BNC connector. The MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we know  $P = 330$  mW,  $G = 4$  (6 dBi) and  $R = 20$  cm,  $S = (330)(4) / ((4\pi)(20)^2) = 0.26$  mW/cm<sup>2</sup>.

**Antenna # 6 Panel Antenna**



The Panel antenna mounts on walls near the ceiling or on rooftops. The antenna will, in this usage clearly will be more than 20

cm from the user

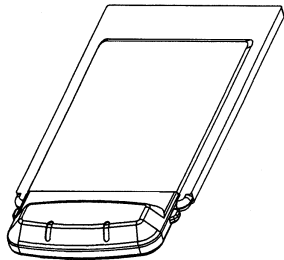
and so, be classified as a mobile antenna. The Panel Antenna is 7 dBi when adjusted for cable loss from a 20 foot coaxial cable terminated in the polarized BNC connector. The MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021 we know  $P = 330$  mW,  $G = 5$  (7 dBi) and  $R = 20$  cm,  $S = (330)(5) / ((4\pi)(20)^2) = 0.33$  mW/cm<sup>2</sup>.

<i>Location</i>	In/outdoor
<i>Pattern</i>	Directional 22°beam
<i>Type</i>	Patch
<i>Gain</i>	7 dBi (with cable)
<i>Physical</i>	8" x 7" x 1" panel
<i>Cable</i>	20 ft (Plenum-rated)
<i>Symbol P/N</i>	ML-2499-PNA1-01
<i>MPE Distance</i>	10 cm

### Antenna # 7 End Cap Antenna

The End Cap made by Symbol Technologies is attached directly to the LA 3020 family PC Card. This antenna is less than 0 dBi in all planes. The End Cap Antenna uses an inverted F style antenna like the WWC 1049. The end cap antenna attached to a PC Card is plugged into a notebook computer. This usage will bring the user within 20cm but only for the hands and wrists. This antenna is

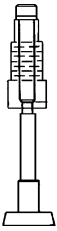
<i>Location</i>	Laptop PC Card Slot
<i>Pattern</i>	Omni
<i>Type</i>	F-Element
<i>Gain</i>	0 dBi
<i>Physical</i>	2"x1"x0.35"
<i>Cable</i>	N/A
<i>Symbol P/N</i>	ML-3099-PCEC-01
<i>SAR</i>	< WWC1049



designed and tuned while attached to a PC Card test fixture. This insures that the match is better than 2:1 while inserted into the laptop.



## Antenna # 8 Symbol 4140 Antenna

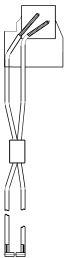


Symbol 4140 Antenna is integrated in the Symbol Technologies PPT 4140 hand held computer. The gain is less than 0 dBi in all planes. The 4140 is held in a persons hand where the distance between the antenna and tissue is maximized. An integrated hand strap allows the operator to hold the unit securely and insures that the users hand remains away from the antenna.

<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	Whip
<i>Gain</i>	< 0 dBi
<i>Physical</i>	L = 1.42"
<i>Cable</i>	N/A
<i>Symbol P/N</i>	DR10-2
<i>SAR</i>	< WWC1049



**Antenna # 9 Symbol 4640 Antenna**



Symbol 4640 Antenna is integrated in the Symbol Technologies PPT 4640 hand held pen computer. The gain is less than 0 dBi in all planes. The 4640 is held in a persons hand as shown. The antenna location

<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	Patch
<i>Gain</i>	< 0 dBi
<i>Physical</i>	1.46"x1.44"x0.29"
<i>Cable</i>	9.12" w/Bead
<i>Symbol P/N</i>	21-17486-02
<i>SAR</i>	< WWC1049



is illustrated in the exploded assembly drawing. Design of straps and button locations ensures that the user's hand is positioned to maximize the range of the device and minimize the amount of RF energy absorbed by the user's hands. This usage will bring the user within 20cm but not as close as the WWC 1049 that is in direct contact with the body. The antenna is tuned for best VSWR < 2:1 while in the device to maximize range.

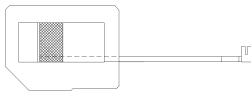


**Antenna # 10 Symbol 2140 Antenna**



<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	F-Element
<i>Gain</i>	< 0 dBi
<i>Physical</i>	1.46"x1.09"x0.36
<i>Cable</i>	N/A
<i>Symbol P/N</i>	10-17577-01
<i>SAR</i>	< WWC1049

This scanner is obsolete and the antenna is withdrawn from consideration.



**Antenna # 11 Symbol 6140 Antenna**



Symbol 6140 Antenna is integrated in the Symbol Technologies PDT 6140 hand held computer.

<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	F-Element
<i>Gain</i>	< 0 dBi
<i>Physical</i>	2"x1.8"x0.35
<i>Cable</i>	N/A
<i>Symbol P/N</i>	10-35305-01
<i>SAR</i>	< WWC1049

The gain is less than 0 dBi in all planes.

The 6140 is held in a persons hand. This usage will bring the user within 20cm but only



to hand and wrist tissues. Scanning button locations keep the users hand away from the antenna element to enhance device range and RF safety. Since the 6140 hand held computer has the same gain as the as the WWC 1049 but is not used as close as the

WWC1049 it's SAR will be lower than the WWC1049 which is mounted in direct contact and has the same gain, 0 dBi.

**Antenna # 12 Symbol 6840**



Symbol 6840 Antenna is integrated in the lower front end of the Symbol

Technologies PDT 6840 hand held computer. The gain is less than 0 dBi in all planes. The 6840 is held in a persons hand as shown. The pistol grip keeps the hand clear of the antenna that is shown in the attached exploded assembly drawing. This usage will bring the user within 20cm for hand and wrist tissues only.

<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	F-Element
<i>Gain</i>	< 0 dBi
<i>Physical</i>	2"x1.8"x0.35
<i>Cable</i>	N/A
<i>Symbol P/N</i>	10-32290-01
<i>SAR</i>	< WWC1049

**Antenna # 13 Symbol WWC1040**



Symbol WWC 1040 Antenna is integrated in the Symbol Technologies

Wearable WWC 1040 computer. The gain is less than 0 dBi in all planes. The WWC1040 is the same as WWC 1049 (the difference is in memory options)

which was used for near field SAR measurements made by Iltis America, Inc. The compliance test report was provided in a previous letter, September 16, 1998 reference number 3413. The WWC 1049 is mounted in direct contact to the body. It is the worst case since it has gain the same or greater than the other portable antennas (listed below) and is located the closest to the body (directly mounted to the body).

<i>Location</i>	Worn on Arm/Wrist
<i>Pattern</i>	Omni
<i>Type</i>	F-Element
<i>Gain</i>	< 0 dBi
<i>Physical</i>	
<i>Cable</i>	N/A
<i>Symbol P/N</i>	10-32447-01
<i>SAR</i>	

**Antenna # 14 Huber Suhner Dipole**



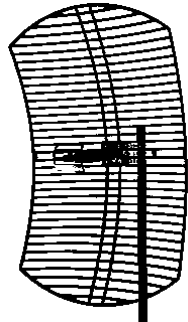
<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	Dipole
<i>Gain</i>	1.8 dBi
<i>Physical</i>	L = 79 mm
<i>Cable</i>	N/A
<i>Huber Suhner P/N</i>	9090.16.0001

The antenna is a dipole with a gain of 1.8 dBi. The antenna is attached to a hand held computer. In such usage it would produce lower SAR than the WWC 1049 that is mounted in direct contact to the body. The Rubber Duck Dipole does have 1.8 dB (1.8 dBi versus 0 dBi) more gain than the WWC 1049. It could be argued that the SAR could be worse than the WWC 1049. However, it was the judgement of Symbol's engineering staff and the SAR measurement engineers at the lab that the distance difference (contact versus several inches) between the Huber Shuner dipole usage and the WWC1049 usage would make the WWC 1049 SAR higher (worst case) than the Huber Shuner dipole.

**Antenna # 15 Parabolic Grid**

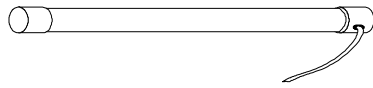
The Parabolic Grid antenna mounts on walls near the ceiling, on rooftops, or a mast. The antenna will, in this usage clearly will be more than 20 cm from the user and so be, classified as a mobile antenna. The parabolic grid antenna has 9.5 dBi gain when adjusted for cable loss from a 50 foot coaxial cable. The MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we

know  $P = 330$  mW,  $G = 8.91$  (9.5 dBi) and  $R = 20$  cm,  $S = (330)(8) / ((4\pi)(20)^2) = 0.59$  mW/cm<sup>2</sup>.



<i>Location</i>	Mast/Wall
<i>Pattern</i>	Directional 8° Beam
<i>Type</i>	Parabolic Grid
<i>Gain</i>	9.5 dBi (with cable)
<i>Physical</i>	23.5"x39.25"x15"
<i>Cable</i>	50 foot
<i>Symbol P/N</i>	ML-2499-PGA1-00
<i>MPE Distance</i>	13.3 cm

**Antenna # 16 Cushcraft S2406**

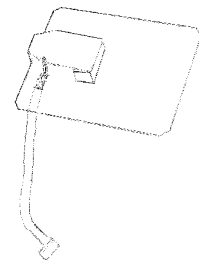


The S2406 dipole mounts on ceilings or walls in large warehouses. The antenna will in this usage clearly be more than 20 cm from the user and so be classified as a mobile antenna. The ceiling mount dipole is 2 dBi. This antenna has a dipole style pattern. The MPE is less than the 1 mW/cm<sup>2</sup> limit.  $S = (PG)/(4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 1.58 (2 dBi) and R = 20 cm,  $S = (330)(1) / ((4\pi)(20)^2) = 0.066$  mW/cm<sup>2</sup>.

<i>Location</i>	Ceiling
<i>Pattern</i>	Omni
<i>Type</i>	Collinear Dipole Array
<i>Gain</i>	2 dBi (with cable)
<i>Physical</i>	25"x1.25"
<i>Cable</i>	20/30 ft. Plenum
<i>Symbol P/N</i>	ML-2499-WHA1-20/30
<i>MPE Distance</i>	5.6 cm

**Antenna # 17 7034430 Criticare Terminal**

Criticare Antenna is integrated into a hand held computer made by Criticare. The gain is less than 0 dBi in all planes. The Criticare computer is slung over a patients shoulder and draped at the waist or mounted on a IV drip pole.

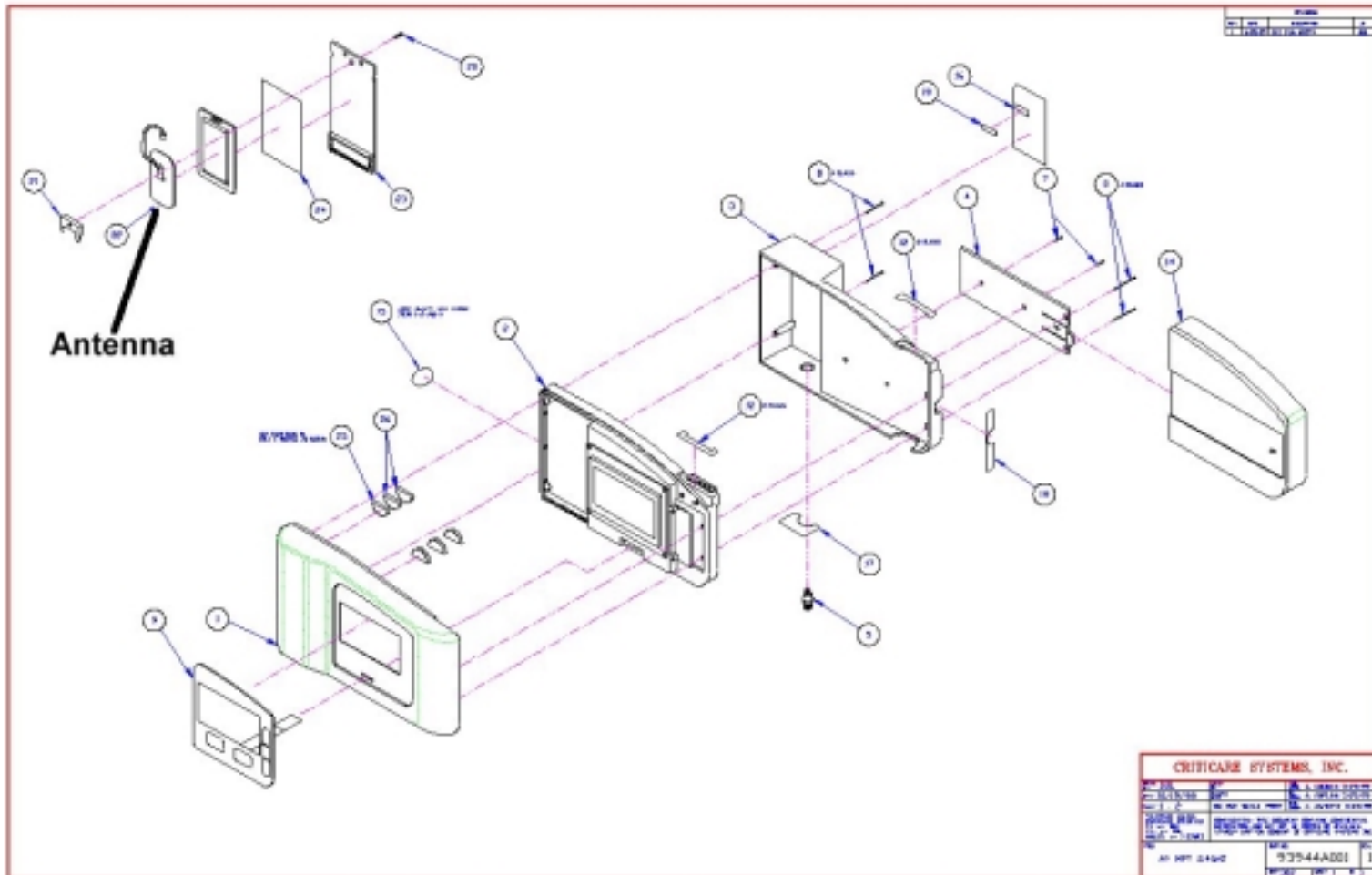


<i>Location</i>	Hand Held
<i>Pattern</i>	Omni
<i>Type</i>	F-Element
<i>Gain</i>	0 dBi
<i>Physical</i>	2.0"x1.625"x0.290"
<i>Cable</i>	N/A
<i>Tecom P/N</i>	703443
<i>SAR</i>	< WWC1049

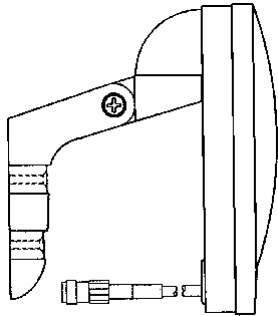
The position of the antenna inside the device



is shown in the attached exploded assembly drawing. This usage will bring the user within 20cm but not as close as the WWC 1049 that is in direct contact with the body. Since the Criticare hand held computer has the same gain as the as the WWC 1049 but is not used as close as the WWC 1049 it's SAR will be lower than the WWC 1049 which is mounted in direct contact and has the same gain, 0 dBi.



**Antenna # 18 Corner Patch**

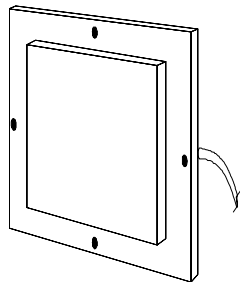


The Corner Patch 7.5 dBi with coaxial cable. The DirectLink Corner Patch antenna mounts on walls near the ceiling or on rooftops. The

<i>Location</i>	Wall / Ceiling
<i>Pattern</i>	Directional Beam
<i>Type</i>	Patch
<i>Gain</i>	5 dBi (with cable)
<i>Physical</i>	5.81"X5.75"X5.03"
<i>Cable</i>	6' Plenum
<i>Symbol P/N</i>	ML-2499DLA1-06
<i>MPE Distance</i>	10.6 cm

antenna will, in this usage clearly will be more than 20 cm from the user and so, be classified as a mobile antenna. The MPE is less than the 1 mW/ cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 3.16 (5dBi) and R = 20 cm,  $S = (330)(3.16) / ((4\pi)(20)^2) = 0.21 \text{ mW/cm}^2$ .

**Antenna # 19 Ceiling Mount Panel**



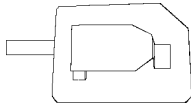
The Ceiling Mount Panel is 3.6 dBi with coaxial cable. The Ceiling Mount Panel antenna mounts on walls near the ceiling or on rooftops. The

<i>Location</i>	Wall / Ceiling
<i>Pattern</i>	Omni
<i>Type</i>	Plane
<i>Gain</i>	3.6 dBi (with cable)
<i>Physical</i>	6"x6"x2"
<i>Cable</i>	6' Plenum
<i>Symbol P/N</i>	ML-2499-SD24-06
<i>MPE Distance</i>	6.75 cm

antenna will, in this usage clearly will be more than 20 cm from the user and so, be classified as a mobile antenna. The MPE is less than the 1 mW/cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 2.2 (3.6 dBi) and R = 20 cm,  $S = (330)(2.2) / ((4\pi)(20)^2) = 0.14 \text{ mW/cm}^2$ .

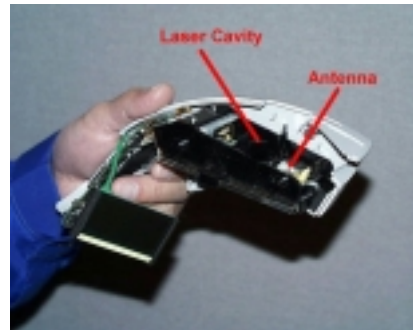


**Antenna # 20 Symbol 2040**



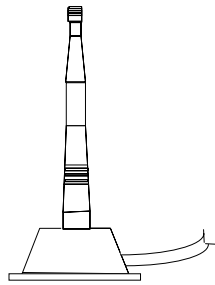
The 24040 antenna is internally mounted in the model CST240 hand held Customer Shopping Terminal. The gain is less than 0 dBi in all planes. The terminal is held in a persons hand as shown. This usage will bring the users hands and wrists within 20cm but not as close as the

<i>Location</i>	Hand Held
<i>Pattern</i>	Directional Beam
<i>Type</i>	Patch
<i>Gain</i>	0 dBi
<i>Physical</i>	2"X1.8"X0.35"
<i>Cable</i>	N/A
<i>Symbol P/N</i>	10-17577-01
<i>SAR</i>	< WWC1049



WWC 1049 that is in direct contact with the body. The antenna is mounted in an air cavity for the laser scanner and is designed for low VSWR matched for maximum range and minimum tissue absorption. The plastic housing has a grip that is designed to keep the users hands from sliding up into the area of the antenna. Since the 2440 antenna has the same gain as the as the WWC 1049 but is not used as close as the WWC 1049 it's SAR will be lower than the WWC 1049 which is mounted in direct contact and has the same gain, 0 dBi.

**Antenna # 21 Magnetic Mount Dipole Antenna**



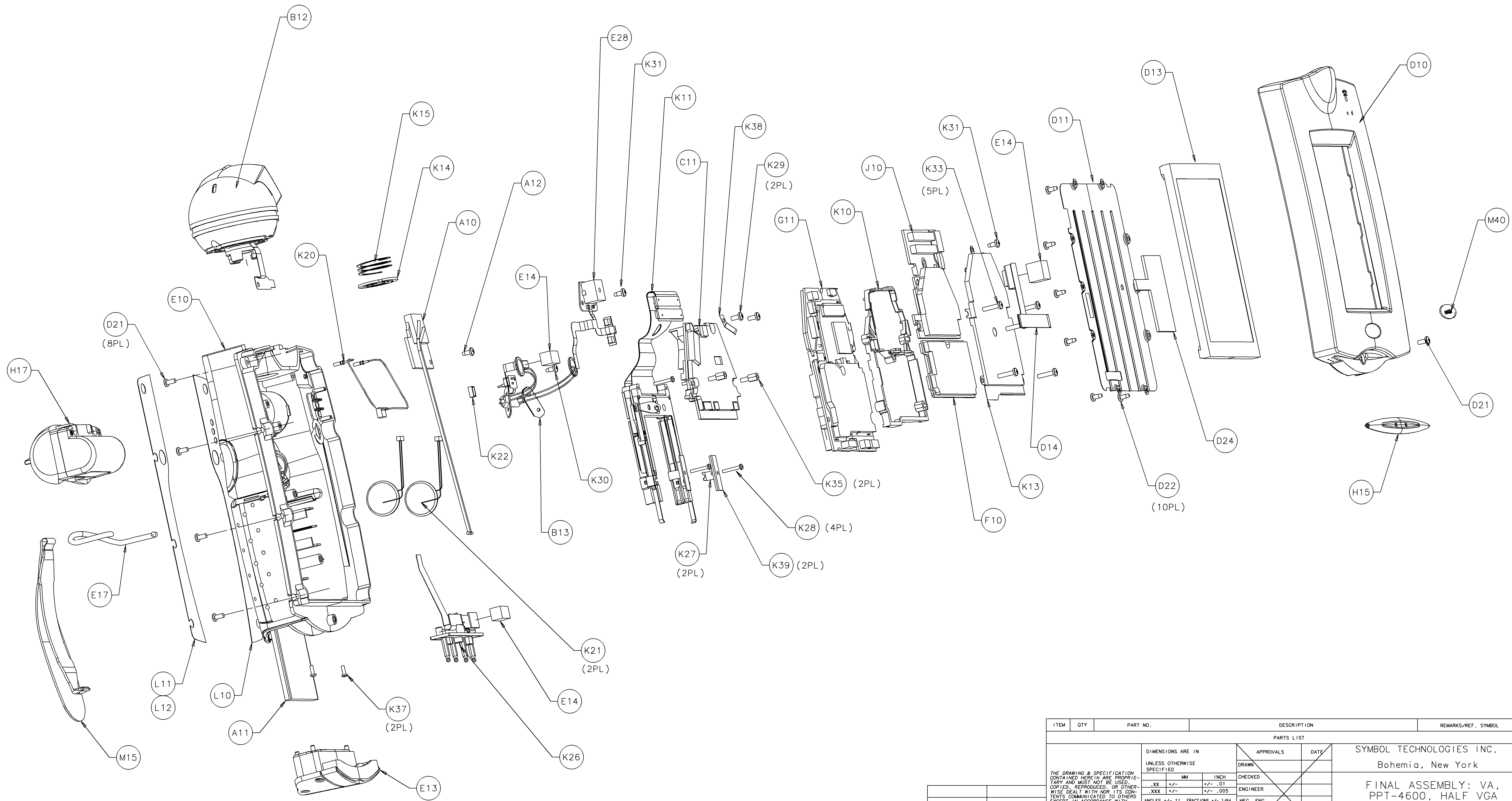
The Magnetic Mount Dipole antenna mounts to magnetic surfaces and is similar to the Rubber Duck Dipole except the gain is lower due to the long cable length. This antenna is best used in temporary

<i>Location</i>	In/outdoor
<i>Pattern</i>	Omni
<i>Type</i>	Dipole
<i>Gain</i>	-3 dBi (with cable)
<i>Physical</i>	5" (tall) x 2" (base diameter)
<i>Cable</i>	12 ft (NOT Plenum-rated)
<i>Symbol P/N</i>	ML-2499-MGA1-01
<i>MPE Distance</i>	3.16 cm

setups, or for vehicle mounting. The MPE is less than the 1 mW/cm<sup>2</sup> limit.  $S = (PG) / (4\pi R^2)$ , for the LA3021-500 we know P = 330 mW, G = 0.5 (-3 dBi) and R = 20 cm,  $S = (330)(5) / ((4\pi)(20)^2) = 0.033 \text{ mW/cm}^2$ .

8 7 6 5 4 3 2 1

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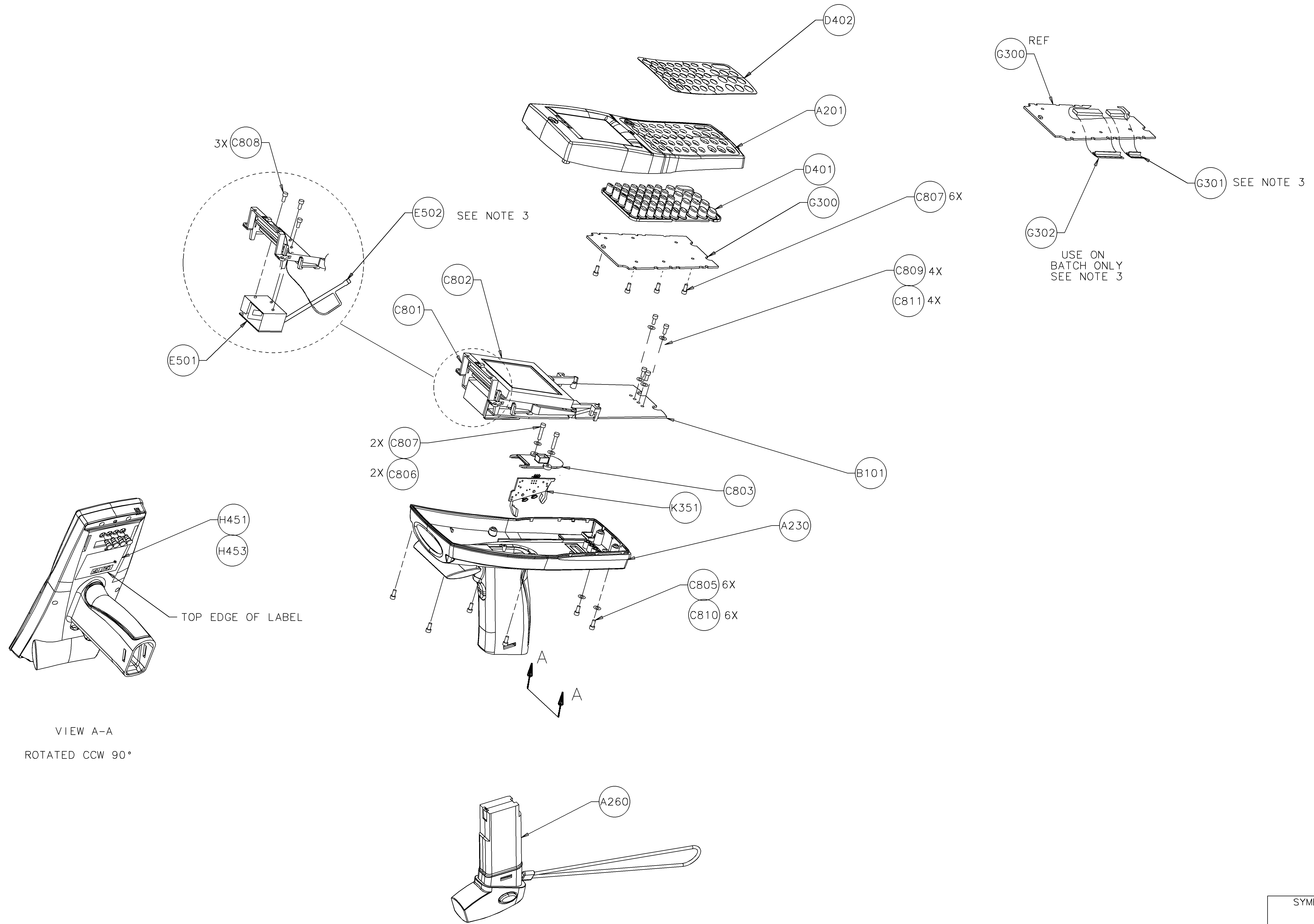


ITEM	QTY	PART NO.	DESCRIPTION	REMARKS/REF. SYMBOL
PARTS LIST				
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		DRAWN		
		CHECKED		
		ENGINEER		
		MFG. ENG.		SIZE D
		PRODUCT		DWG. NO. 20-15044-XX
		QUALITY		REV B
NEXT ASSY USED ON		FINISH:		SCALE: NONE
		DO NOT SCALE DRAWING		SHEET 2 OF 2

8 7 6 5 4 3 2 1

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REV	ZONE	DESCRIPTION	E.C.	BY	APVD.	DATE
A	ALL	SEE SHEET 1		LM		

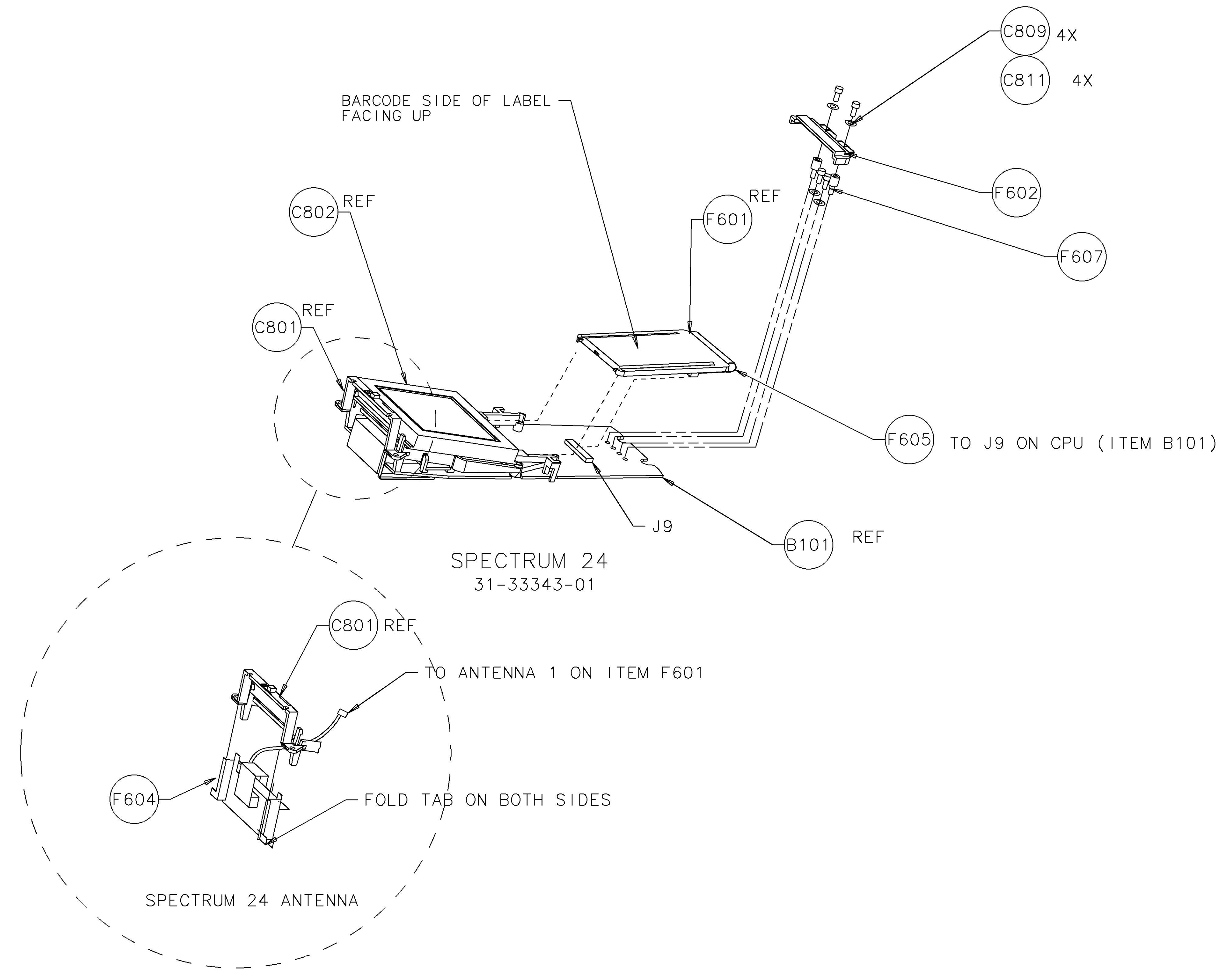
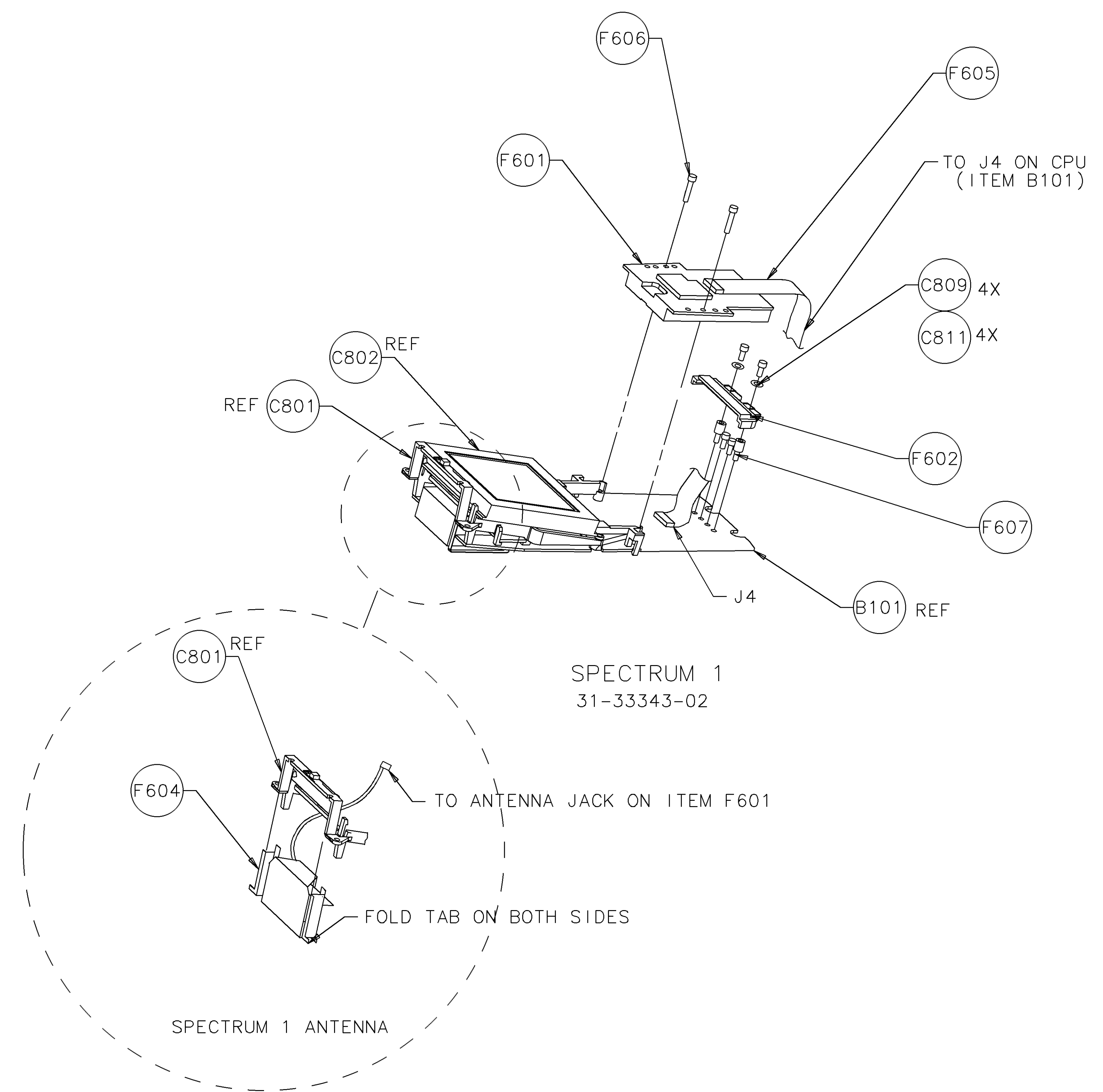


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8 7 6 5 4 3 2 1