

# INSTALLATION MANUAL FOR THE NTG-560 SOLID STATE TRANSMITTER / RECEIVER

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 *Japan Radio Co., Ltd.*

## Table of Contents

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| <b>1. SELECTING THE INSTALLATION POSITION .....</b>                          | <b>2</b>  |
| <b>2. INSTALLATION PROCEDURE .....</b>                                       | <b>7</b>  |
| <b>3. CONNECTING THE INSTALLATION CABLE .....</b>                            | <b>10</b> |
| <b>4. INSTALLATION OF SOLID STATE TRANSMITTER / RECEIVER (NTG-560) .....</b> | <b>14</b> |
| <b>5. SOLID STATE TRANSMITTER-RECEIVER(NTG-560) WIRING.....</b>              | <b>15</b> |
| <b>6. INSTALLATION CABLE AND WAVEGUIDE .....</b>                             | <b>19</b> |
| <b>APPENDIX .....</b>                                                        | <b>23</b> |
| <b>MAXIMUM PERMISSIBLE EXPOSURE(MPE) CALCULATION .....</b>                   | <b>35</b> |

## - Preface -

This instruction manual describes installation method of the NTG-560 Transmitter-Receiver. This manual describes radar system configuration with X-band Radar Antenna and NCD-2247-1B PC type radar monitor display as an example.

### 1. Selecting the installation position

#### 1) Physical selection criteria

- Install the antenna at the center of the mast on the keel line.
- If the antenna cannot be installed at the above position for some reason, the amount of deviation must be minimized. And, reinforce the mount base and the platform and take precautions to protect the antenna from vibration and impact at the installation position.
- To avoid the radiating section coming in contact with other installed objects while it is rotating, ensure that there is at least 200 millimeters from the swing circle (turning radius) to other installed objects (Fig.1-1). The swing circle of the X-band Radar Antenna is as shown in Table 1-1.

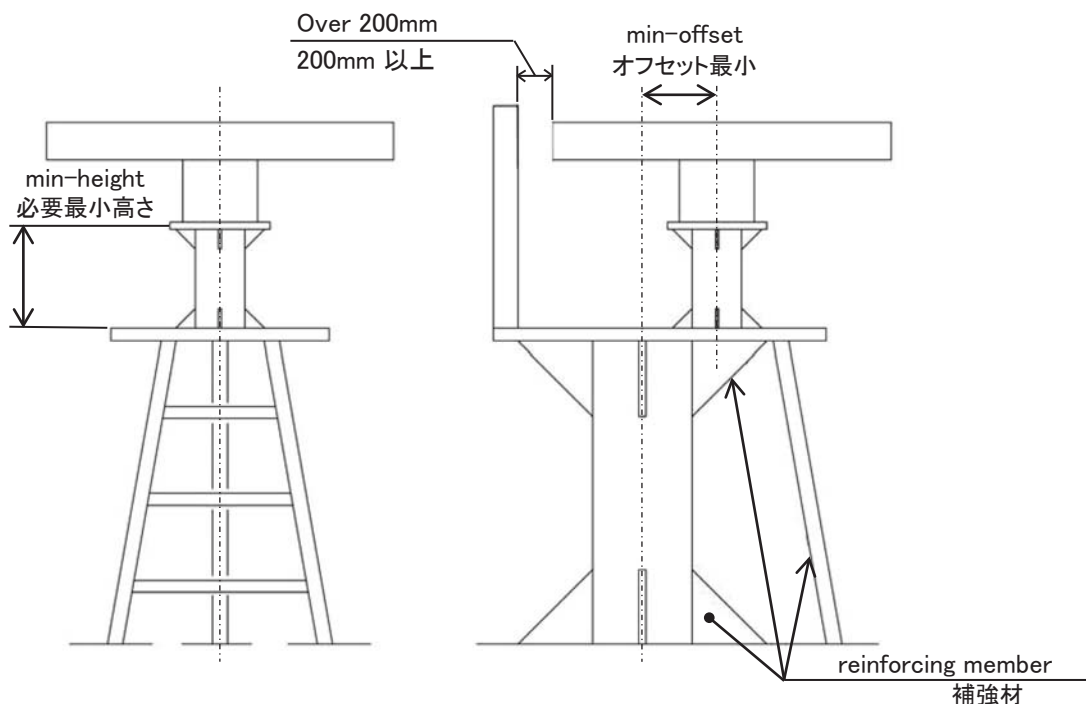


Fig.1-1 Installation of antenna

Table 1-1 Swing circle

| Antenna              | Swing circle |
|----------------------|--------------|
| NKE-339 9ft Antenna  | 2825mm       |
| NKE-402 18ft Antenna | 5330mm       |

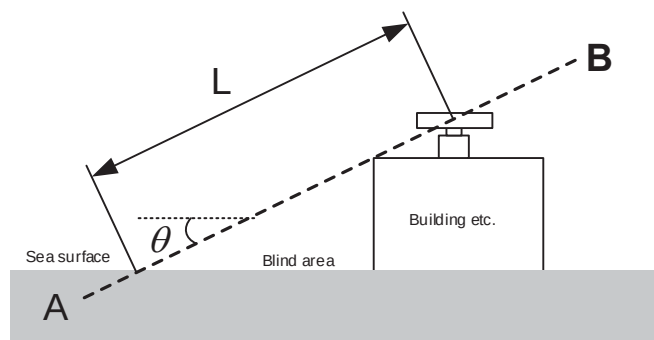
- Avoid having a rope or signal flag from winding around the radiating section thereby preventing it from rotating.
- Avoid the effects of dust and heat caused by smoke from a chimney.
- When determining the appropriate antenna height and installation location, take into consideration the reduction of vibration, the strength of the hull and the antenna mount base, and maintenance properties.
- Provide for maintenance space: platform, safety link, hand rail, steps, etc. The lower edge of a radar antenna should be a minimum of 500 mm above any safety rail.
- When installing the antenna, select a location where there are the fewest structural objects in the surrounding area so that the capability to drive the motor will not be depressed by the non-equability wind which is likely to rotate the antenna.

## 2) Electrical selection criteria

- The installation height of the antenna relates to the maximum detection distance. The higher is the better. (However, if it is too high, radio wave energy greatly attenuates above the antenna's vertical beam width (the point -3dB from the peak of the main lobe). As a result, it is difficult to detect a close-in target. Sea clutter also increases. Determine the installation height by taking into consideration the weight, maximum length of the cable, and maintenance after installation.
- If the installation height of the antenna is low, it is difficult to detect a long distance target. The ship's mast, derrick, and construction objects interfere with radiating beam causing the range that cannot be viewed on the radar display to increase.

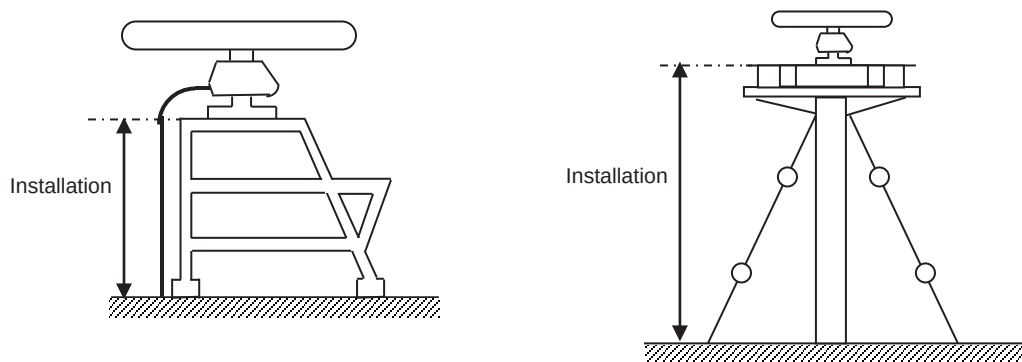
Generally, the lowest antenna installation position is supposed to be on the A-B line shown in Fig.1-2. In the case of the radar antenna,  $2\theta$  equals  $20^\circ$ . Specifically, the antenna position is normally elevated so that the building etc do not interfere with radiating beam. The inside of A point might be blind area due to antenna beam does not propagation. So, if near distance should be covered, antenna installation position must be considered carefully.

$$\theta = 10^\circ$$



**Fig.1-2 Antenna installation height vs Vertical beam width**

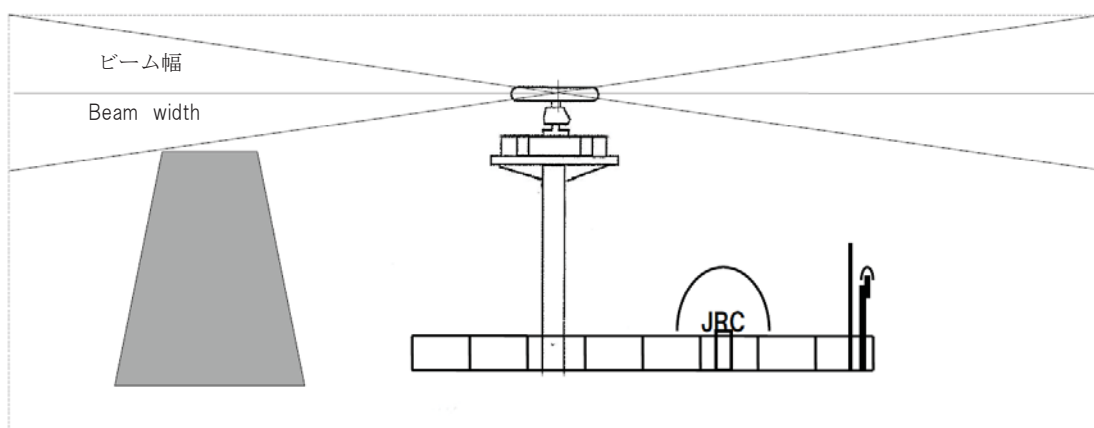
- If it is considered that sufficient installation height cannot be provided when the antenna is installed directly on the roof of the building, use a mounting rack or radar mast (Fig.1-3). Normally, when the antenna installation height is less than 2 meters from the roof of the building, provide a mounting rack assembled at an angle frame to install the antenna. When the antenna installation height is 2 meters or higher from the roof of the building, provide a cylindrical radar mast to install the antenna. Consider the convenience of the service staff who take care of installation, maintenance, adjustment, and repair of the antenna by providing adequate footholds to the mounting rack and the radar mast.



**Fig.1-3 Mounting rack and mast for the antenna**

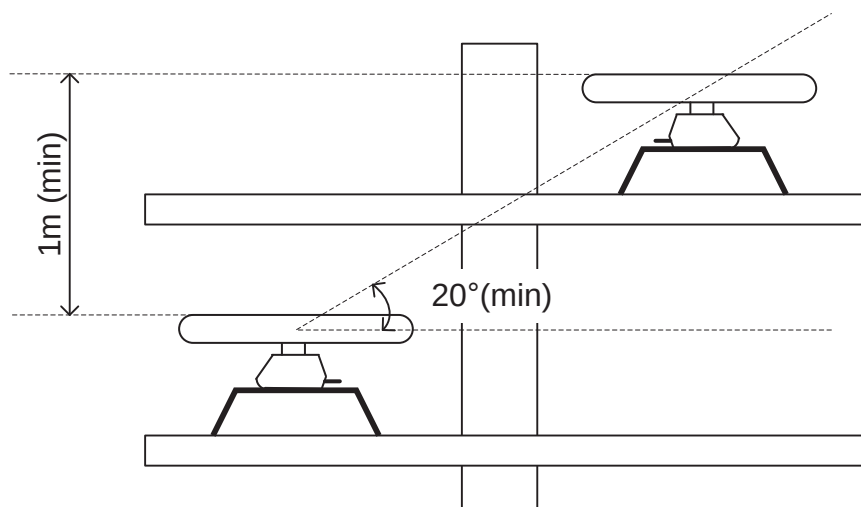
- When installing the antenna, select a location where there are the fewest structural objects in the surrounding area so that false images which interfere with target detection will not be generated by signal reflection from other antennas, equipments, and cargos. Only as a guide, note that structural objects should not exist within the range of the vertical beam width (Fig.1-4).

Vertical beam width of X-band Radar Antenna: Approx.  $20^{\circ}$  ( $\pm 10.0^{\circ}$  when the height of the radiating section is  $0^{\circ}$ ).



**Fig.1-4 Antenna and the surrounding structural objects**

- When installing two or more antennas, antennas in close proximity should have a minimum vertical elevation separation angle of 20° and a minimum vertical separation of 1m where possible, so that those antennas do not enter each other's vertical beam width range.



**Fig.1-5 Installing two or more antennas**

- To avoid interference with other equipment and to prevent radio noise from generating, do not place the VHF antenna, AIS/GPS antenna, and VSAT/INMARSAT's dome within the range of the vertical beam width.

- \* If there is a concern that structural objects existing within the vertical beam width may generate false images, equip the structural objects with a radio wave absorber. (There are two types of absorbers: broadband type having no specific resonant frequency and narrowband type which can absorb a band with a specific frequency. Use those where applicable.) Furthermore, it is effective to install a metal reflector, which reflects radio waves upwardly, between the antenna and a structural object so that the radar's radio wave will not directly come in contact with the structural object.  
When the structural objects exist in the surrounding area of Antenna unit, the false echo may appear. The sector blank function is effective to reduce the signal reflection from the structural objects. Because of it can stop transmission. Therefore, it may reduce the false echo appearance.

**Note:** Because most radio wave absorbers have poor durability, some must be replaced every year. When installing a reflector, the area to the rear of the reflector becomes a blind sector. Therefore, minimize the size of the reflector.

When the sector blank function set to on, ensure a sufficient view field in the surveillance area.

- \* The above procedures for selecting an antenna installation position are described based on the radar's antenna. Comprehensively select the antenna position by considering other antennas' installation procedure manual, building tower mast structure, strength of the selected position, and vibration.

### 3) Confirmation during test run

If the antenna vibrates a lot during test run, try to reduce or prevent vibration by reinforcing the antenna mount base or using wire stays attached to the radar mast.

#### 4) Others

- The design of the mounting platform for the antenna should take into account the vibration requirements defined by IEC 60945.

| Vibration    |                              |
|--------------|------------------------------|
| Frequency    | 2 to 13.2Hz<br>13.2 to 100Hz |
| Amplitude    | +/-1mm +/-10%                |
| Acceleration | 7m/s <sup>2</sup> constant   |

- All installations should facilitate protection of equipment, including cabling, from damage.  
The cables should be kept as short as possible to minimize attenuation of the signal.
- Crossing of cables should be done at right angles(90°) to minimize magnetic field coupling.
- Eliminating the interference on frequencies used for marine communications due to operation of the radar. All cables of the radar are to be run away from the cables of radio equipment. (ex. Radiotelephone. Communications receiver and direction finder, etc.) Especially inter-wiring cables between antenna unit and display unit of the radar should not be run parallel with the cables of radio equipment.
- Cable should not be exposed sharp bends.
- The grounding of equipment units should be carried out according to this manual.

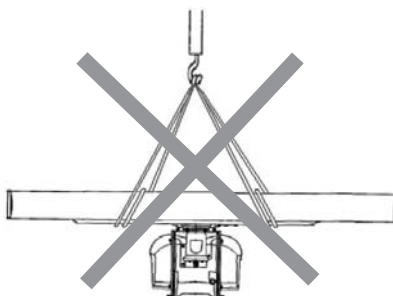
#### 5) After installation

After you have completed the installation work, check and test the installation work with customer(s) and confirm with each other.

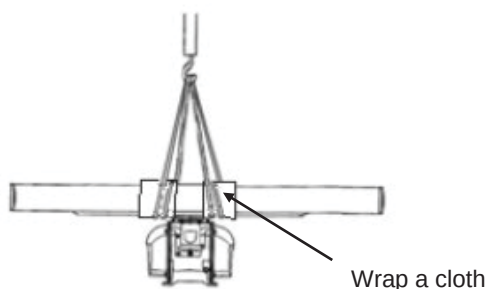
## 2. Installation procedure

### 1) Precautions for transporting and storing the antenna

- An antenna is a heavy load. Be very careful about handling it.
- Do not allow the antenna fall on its side while it is stored or being installed.
- Do not apply rope to the antenna in the way that squeezes or deforms the radiating section.
- When hoisting the antenna by a crane, do not hoist it by attaching a belt or a rope only to the antenna's radiating section as shown in Fig.2-1.
- When lifting the antenna (Fig.2-2) :  
Wrap a cloth around the antenna's support section located at the bottom of the radiator, and then attach a belt to it to lift the antenna.



**Fig.2-1 Improper way to hoist**



**Fig.2-2 Lifting the Antenna**

### 2) Installation procedures

#### a) Maintain a flat level surface on which to install the antenna.

- Use sufficiently thick steel material and reinforcement material for the antenna's installation surface (mount base) to reduce vibration and impact. Keep the mount base flat and smooth.
- If there is a partial gap between the mount base and the antenna chassis's legs, work on the installation surface so that it becomes flat and smooth. If a gap exists and the antenna is tightly clamped, the chassis will distort and become damaged by vibration.

b) Avoid using vibration-proof rubber and resin

- Do not insert an elastic body, such as vibration-proof rubber or resin, between the mount base and the antenna chassis' legs. If rubber or resin is inserted, the amplitude of vibration increases, resulting in the possibility of damage to the antenna. Furthermore, if installation bolts become loose due to deterioration of rubber or resin, the antenna may be damaged or fall from its mount.

3) Installation and clamping method

a) Installation direction

- Installation should be done so that the cable gland side is oriented accessibility by maintenance staffs.

b) Bolts, nuts and tightening torque to be used

- Use stainless steel bolts for the antenna and uniformly tighten all of the bolts using double nuts for each bolt so that the antenna will not become loose (Table 2-1).
- Although the length of the bolt will differ according to the thickness of the mount base, use a bolt long enough so that more than 4 millimeters of thread protrudes beyond the double nuts after the double nuts have been tightened.

**Table 2-1 Length of antenna mounting bolts and tightening torque**

| Antenna Unit   | Thickness of Mount Base (mm) | Bolt                   | Torque (N-m) |
|----------------|------------------------------|------------------------|--------------|
| NKE-339 ( 9ft) | 12                           | M10×55(mm) SUS304 ※1   | 40           |
| NKE-402 (18ft) | 15                           | M16X70(mm) SUS304 ※1※2 | 118          |

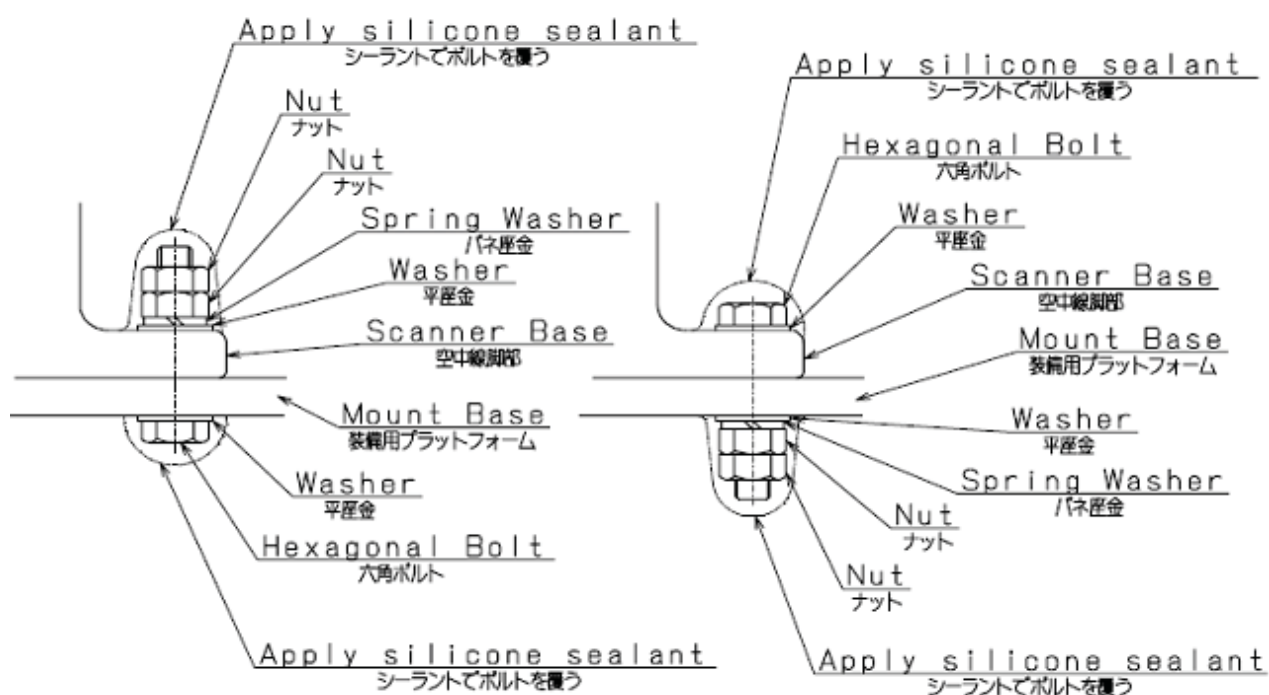
※1 Bolt length varies depending on thickness of mount base.

The length of the bolt must extend beyond the nut by at least four turns.

※2 18ft Antenna attachment with double nuts.

c) Use of washer and corrosion-resistant measures

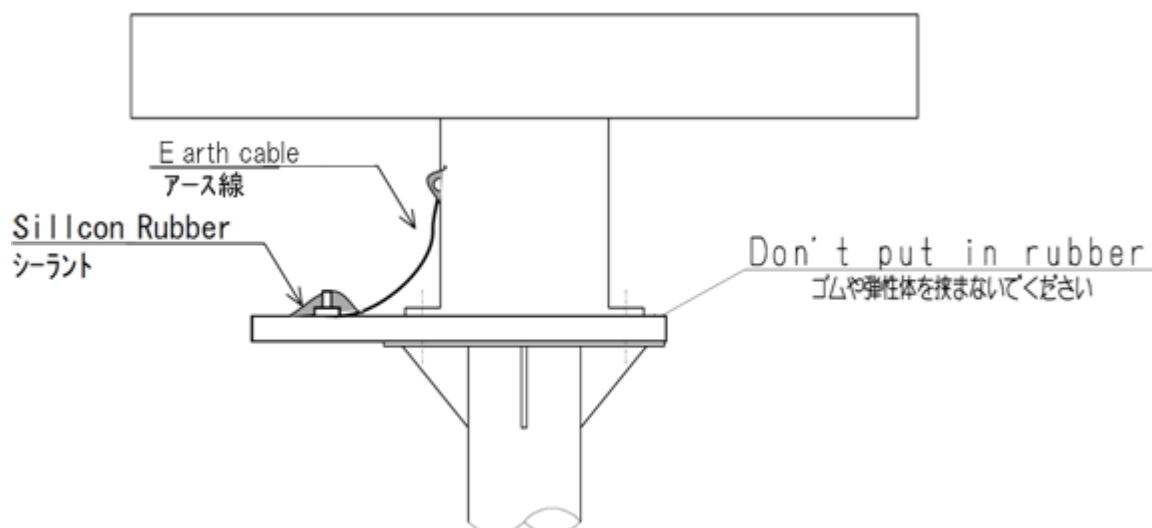
- At the location where a bolt's head or nut comes in contact with the antenna chassis' legs and the mount base, insert a plain washer which fits the bolt; and, at the location where the nut comes in contact with the plain washer, insert a spring washer, and then securely tighten the nuts (Fig.2-3).
- To prevent corrosion due to the contacts between different metals, such as the antenna chassis' legs, installation surface, bolts, nuts, etc., cover the bolt's head and nuts with sealant (Fig.2-3).



**Fig.2-3 Use of washer and corrosion-resistant measures**

d) Grounding and corrosion-resistant measures

- Ground the antenna chassis and the installation surface (hull) by using an earth line. Apply sealant to the connection portion of the earth line to prevent corrosion and damage by vibration (Fig.2-4).



**Fig.2-4 Grounding and corrosion-resistant measures**

### 3. Connecting the installation cable

(1) NKE-339 9ft Antenna

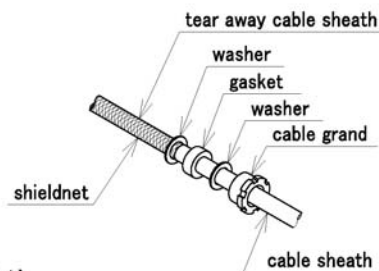
#### Instruction for Equipment

#### 装備要領

1. Put the cable into cablegrand, washers and gasket.

Tear away the cable sheath.

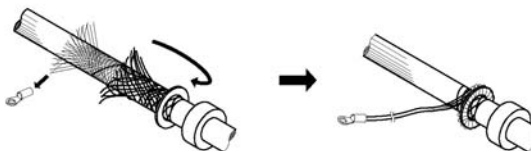
ケーブルをワッシャ、ガスケット、グラントに通し、被覆を剥がす。



2. Unknot outer shieldnet and wrap it around a washer.

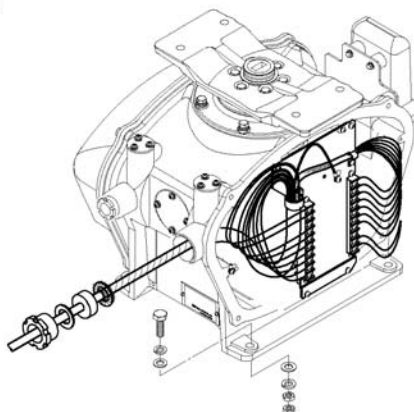
Connect a solderless terminal (for a ground) to an inner shieldnet.

外側のシールドネットをほどき、座金に巻きつけ、内側のシールドネットには丸型圧着端子(アース)を取付ける。



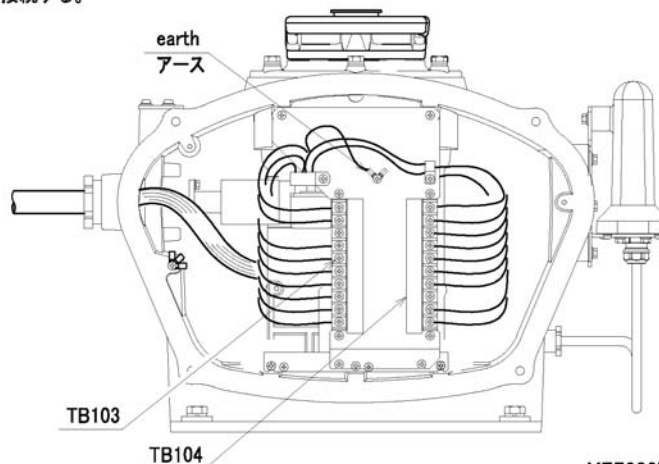
3. Equip the scannerunit with bolts and washers.

ボルト、ワッシャを用いて、空中線を装備する。



4. Clump the cable, connect terminals .

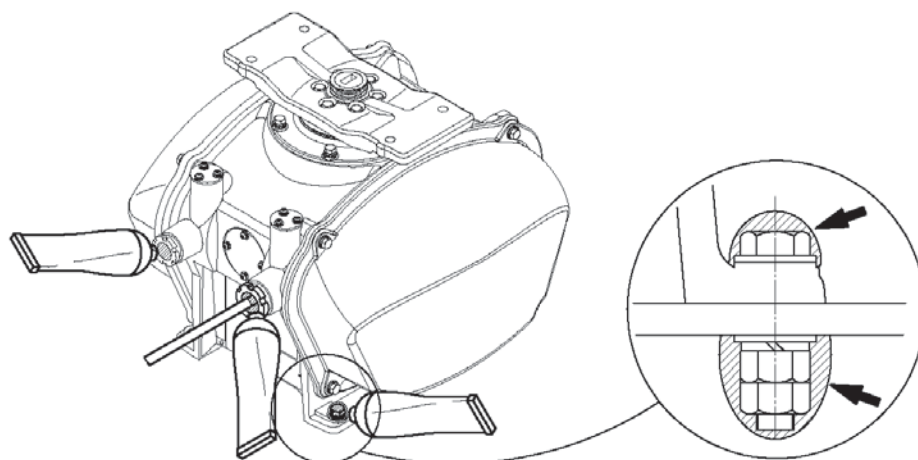
ケーブルを各部でクランプし、端子を接続する。



MTZ303797-1/2

5. Apply silicone sealant around the bolts and into the cable inlet.

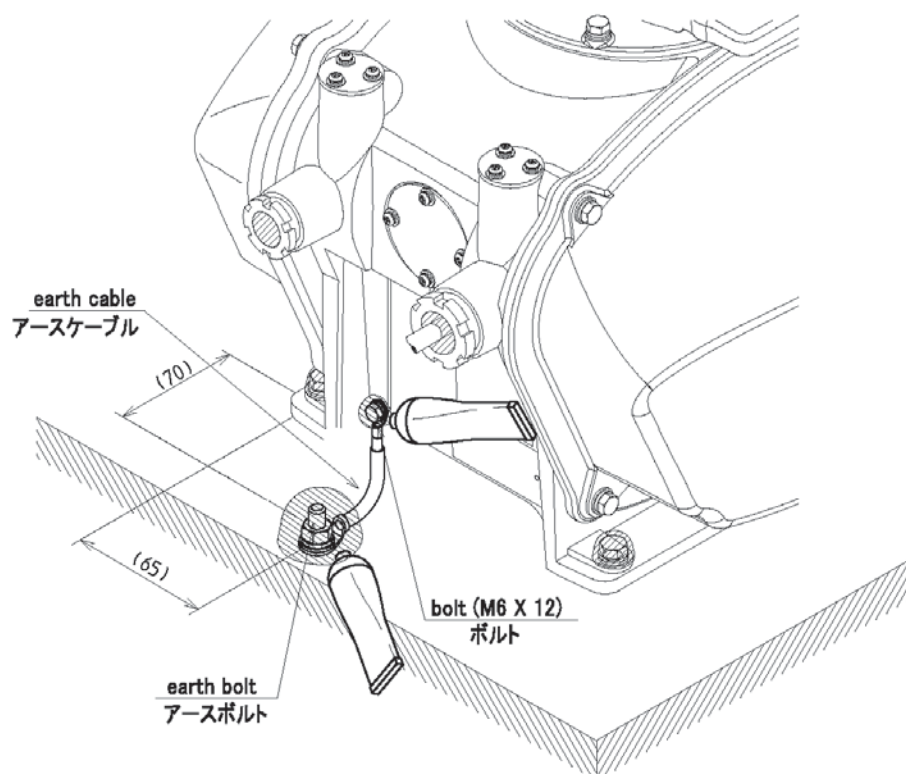
ボルトの周辺部とケーブルグランド部をシールする。



6. Bolt the earth cable to mountbase and scanner.

Apply silicone sealant around the bolts.

アースケーブルをボルトで締結後、締結部分を全てシールすること。



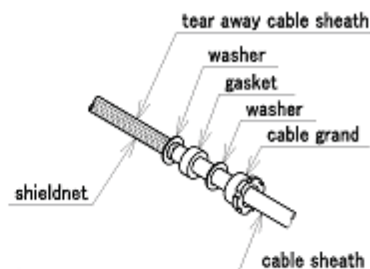
## (2) NKE-402 18ft Antenna

## Instruction for Equipment

## 装備要領

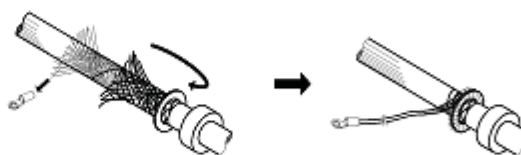
1. Put the cable into cablegrand, washers and gasket.  
Tear away the cable sheath.

ケーブルをワッシャ、ガスケット、グラントに通し、  
被覆を剥がす。



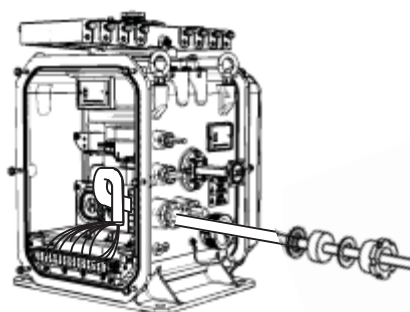
2. Unknit outer shieldnet and wrap it around a washer.  
Connect a solderless terminal (for a ground) to an inner shieldnet.

外側のシールドネットをほどき、座金に巻きつけ、内側のシールドネットには  
丸型圧着端子(アース)を取付ける。



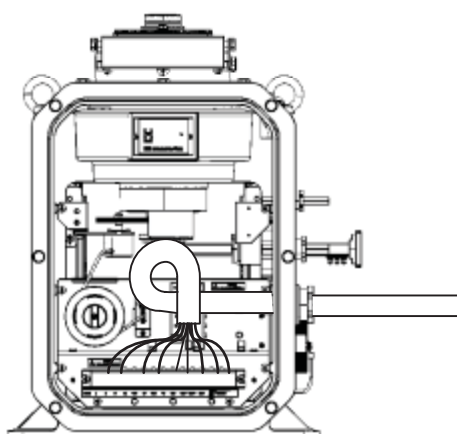
3. Equip the scannerunit with bolts and washers.

ボルト、ワッシャを用いて、空中線を装備する。



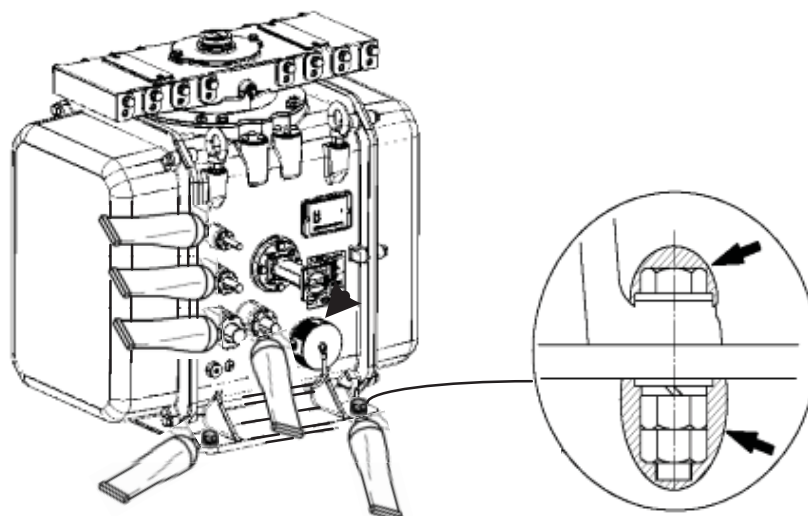
4. Clump the cable, connect terminals .

ケーブルを各部分でクランプし、端子を接続する



5. Apply silicone sealant around the bolts and into the cable inlet.

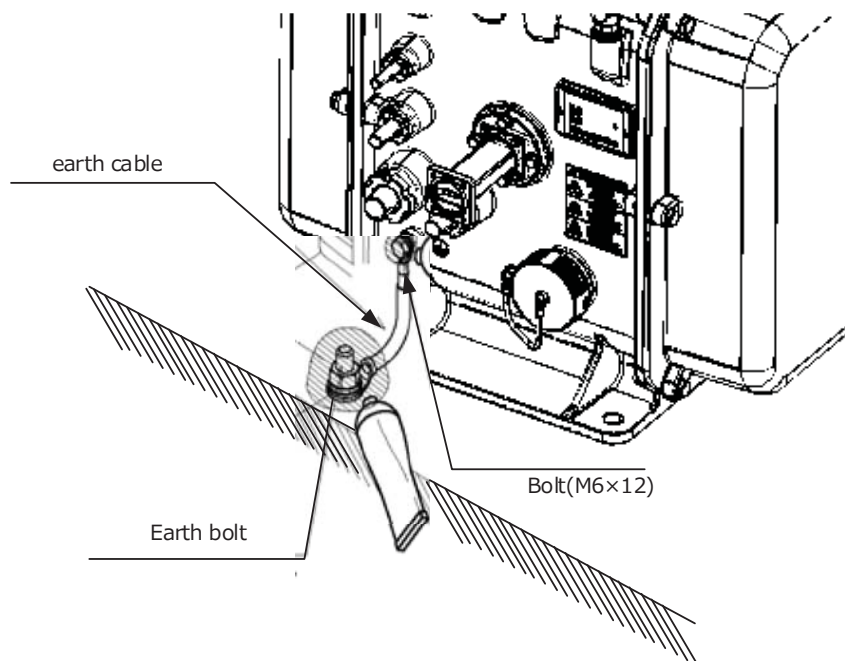
ボルトの周辺部とケーブルグランド部をシールする。



6. Bolt the earth cable to mountbase and scanner.

Apply silicone sealant around the bolts.

アースケーブルをボルトで締結後、締結部分を全てシールすること。



**4. Installation of Solid State Transmitter / Receiver (NTG-560)**

The mounting place of NTG-560 Solid State Transmitter-Receiver is shown below. It is required to secure a space for equipment and maintenance.

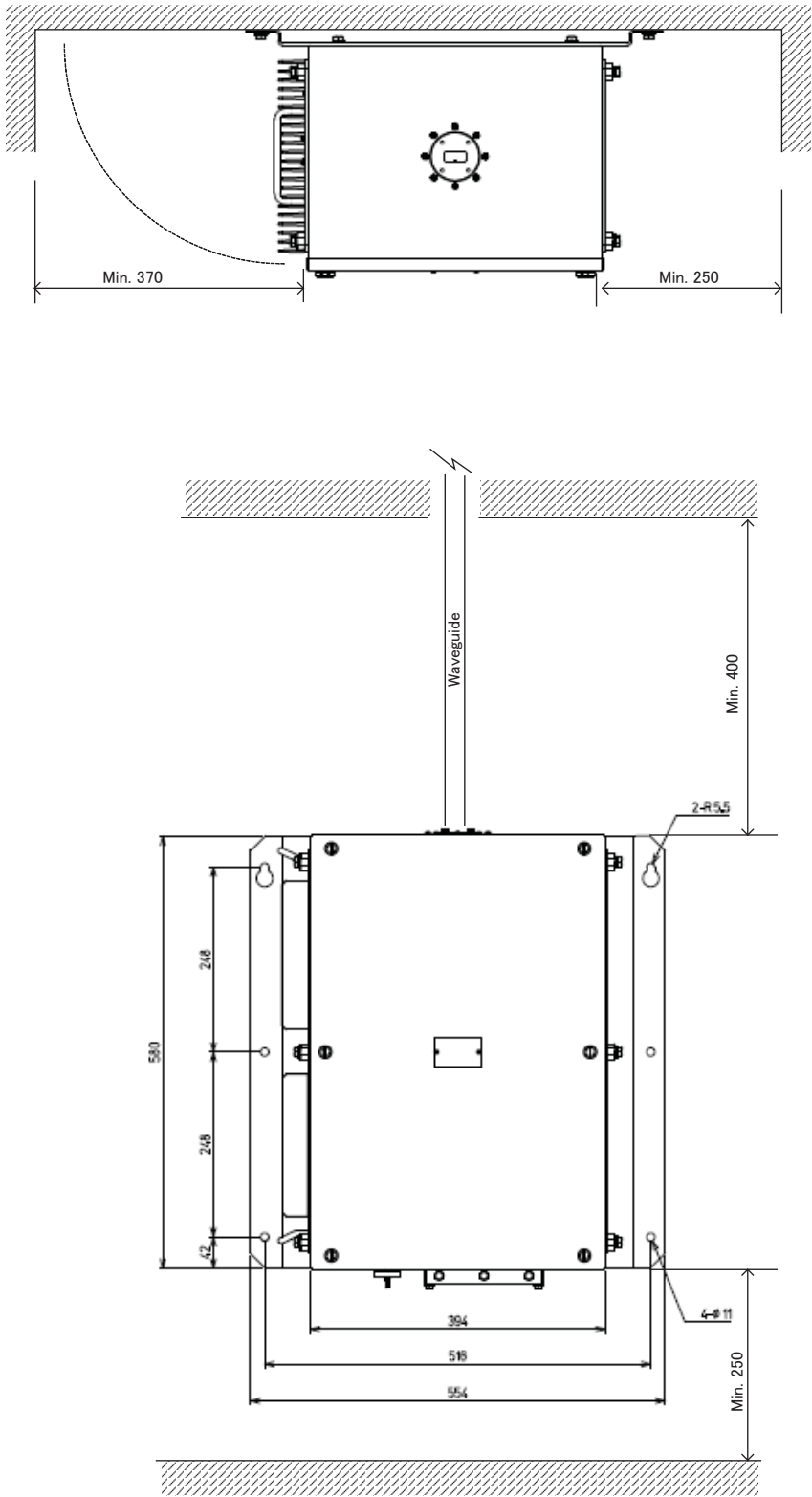


Fig.4-1 NTG-560 Installation (Space for Mounting Place)

## 5. Solid State Transmitter-Receiver(NTG-560) Wiring

Table 5-1 Connect Terminal of NTG-560

| Terminal No.                                          | Connect                                       | Cable                                                    |
|-------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------|
| Waveguide flange(UG-51/U)                             | X-band 9ft Antenna                            | WRJ-9 Waveguide                                          |
| P1                                                    | DC Power Supply (DC 48V)                      | Power Cable                                              |
| P2<br>Not Used for this System                        | External Equipment (ex. Radar Data Processor) | RE-422 cable or equivalent                               |
| P3<br>Not Used for this System                        | External Equipment (ex. Radar Data Processor) | 14-core shield composite cable(2695110056).              |
| P4                                                    | X-band Radar Antenna                          | 14-core shield composite cable(2695110056) or equivalent |
| RJ-45JJ                                               | NCD-2247—1B Radar Control/Monitoring PC       | LAN cable Cat.6a                                         |
| Optical Communication Board (AGM-741 daughter board ) | NCE-5584-1B IQ Data Recording PC              | Optical Cable 2C                                         |
| Earth Point                                           | Earth line                                    | IV-5.5 or equivalent                                     |

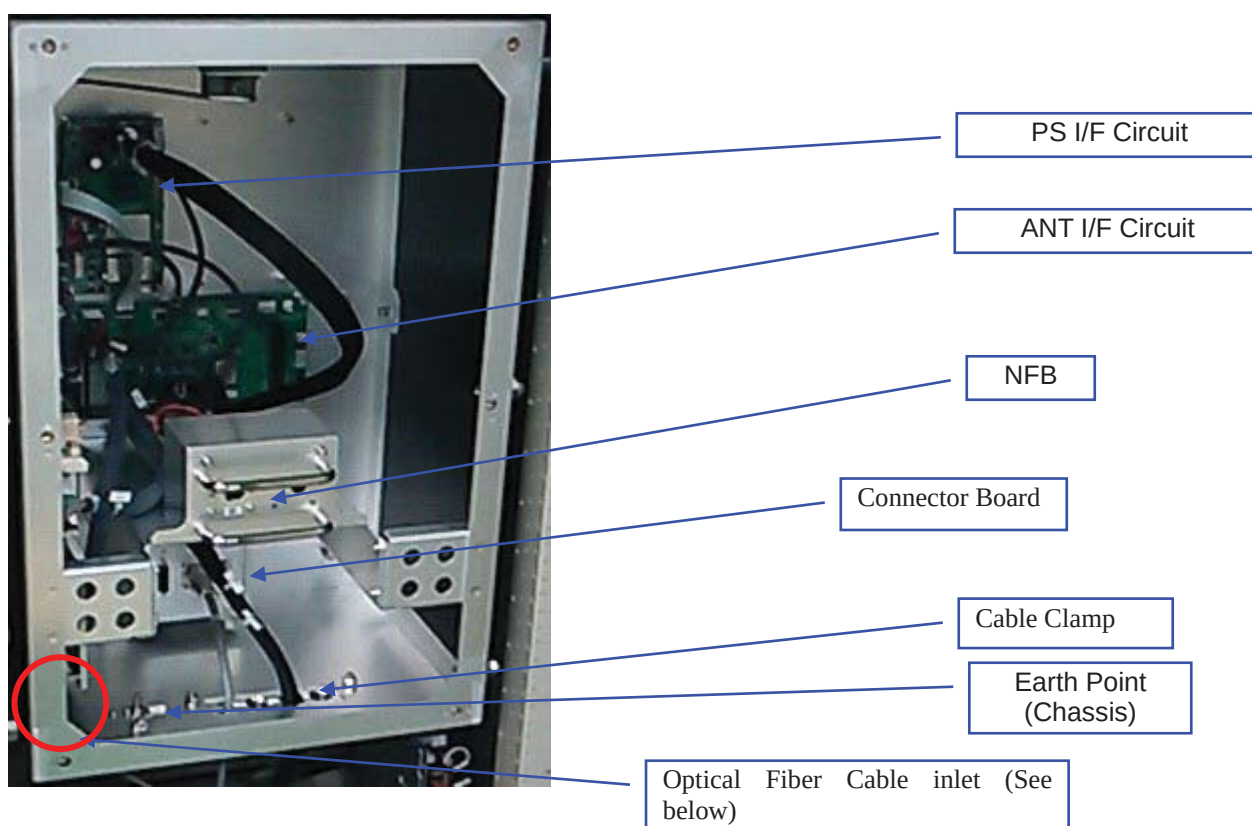


Fig.5-1 Inside View of NTG-560

Table 5-1 Signal Layout of each Terminal

Table 5-1 (1) P1

| Pin No. | Pin Name | In/Out | Description |
|---------|----------|--------|-------------|
| 1       | +48V     | In     | +48V        |
| 2       | +48V RTN | In     | +48V Return |
| 3       | GND      |        | Ground      |

Table 5-1 (2) P2

| Pin No. | Pin Name | In/Out | Description                      |
|---------|----------|--------|----------------------------------|
| 1       | MNT-TX-P | Out    | Maintenance Port RS-422 output-P |
| 2       | MNT-TX-N | Out    | Maintenance Port RS-422 output-N |
| 3       | MNT-RX-P | In     | Maintenance Port RS-422 input-P  |
| 4       | MNT-RX-N | In     | Maintenance Port RS-422 input-N  |
| 5       | MNT E    | In/Out | Shield (Ground)                  |
| 6       | NC       | -      | Reserved                         |
| 7       | NC       | -      | Reserved                         |
| 8       | NC       | -      | Reserved                         |
| 9       | NC       | -      |                                  |

Table 5-1 (3) P3

| Pin No. | Pin Name | In/Out | Description                         |
|---------|----------|--------|-------------------------------------|
| 1       | VD       | Out    | Radar Video Signal                  |
| 2       | VD_E     | Out    | Radar Video Signal Return           |
| 3       | TRIG     | Out    | Radar Trigger Signal                |
| 4       | TRIG_E   | Out    | Radar Trigger Signal Return         |
| 5       | BP       | Out    | Antenna Bearing Pulse Signal        |
| 6       | BPE      | Out    | Antenna Bearing Pulse Signal        |
| 7       | BZ       | Out    | Bearing Reference Signal            |
| 8       | BZE      | Out    | Bearing Reference Signal Return     |
| 9       | NMEA_P   | In/Out | Control/Monitoring Signal(RS-485)-P |
| 10      | NMEA_N   | In/Out | Control/Monitoring Signal(RS-485)-N |
| 11      | NMEA_E   | In/Out | Return                              |
| 12      | NC       | -      | Reserved                            |
| 13      | NC       | -      | Reserved                            |
| 14      | NC       | -      | Reserved                            |
| 15      | SHIELD   | -      |                                     |

Table 5-1 (4) P4

| Pin No. | Pin Name  | In/Out | Description                             |
|---------|-----------|--------|-----------------------------------------|
| 1       | SAF SW-   | In     | Antenna Safety Switch Return            |
| 2       | SAF SW+   | In     | Antenna Safety Switch Signal            |
| 3       | $\Phi$ Z  | In     | Antenna Bearing Pulse ( $\Phi$ Z-Phase) |
| 4       | $\Phi$ ZE | In     | Return                                  |
| 5       | $\Phi$ A  | In     | Antenna Bearing Pulse ( $\Phi$ A-Phase) |
| 6       | $\Phi$ AE | In     | Return                                  |
| 7       | $\Phi$ B  | In     | Antenna Bearing Pulse ( $\Phi$ B-Phase) |
| 8       | $\Phi$ AE | In     | Return                                  |
| 9       | NC        | -      | Reserved                                |
| 10      | NC        | -      | Reserved                                |
| 11      | NC        | -      | Reserved                                |

|    |          |     |                            |
|----|----------|-----|----------------------------|
| 12 | +12V ISO | Out | +12V Antenna Encoder Power |
| 13 | +12V RET | Out | Return                     |
| 14 | NC       | -   | Reserved                   |
| 15 | SHIELD   |     |                            |



Fig. 5-2 Waveguide Flange (UG-51U) of NTG-560

## 6. Installation Cable and Waveguide

### 6.1 CM14CXVBTBTV(2695110056)

This is composite cable of 14 wires with shielded coaxial cable. This cable is using between Antenna and TRX. Also, equivalent cable can be used which is provided by customer.

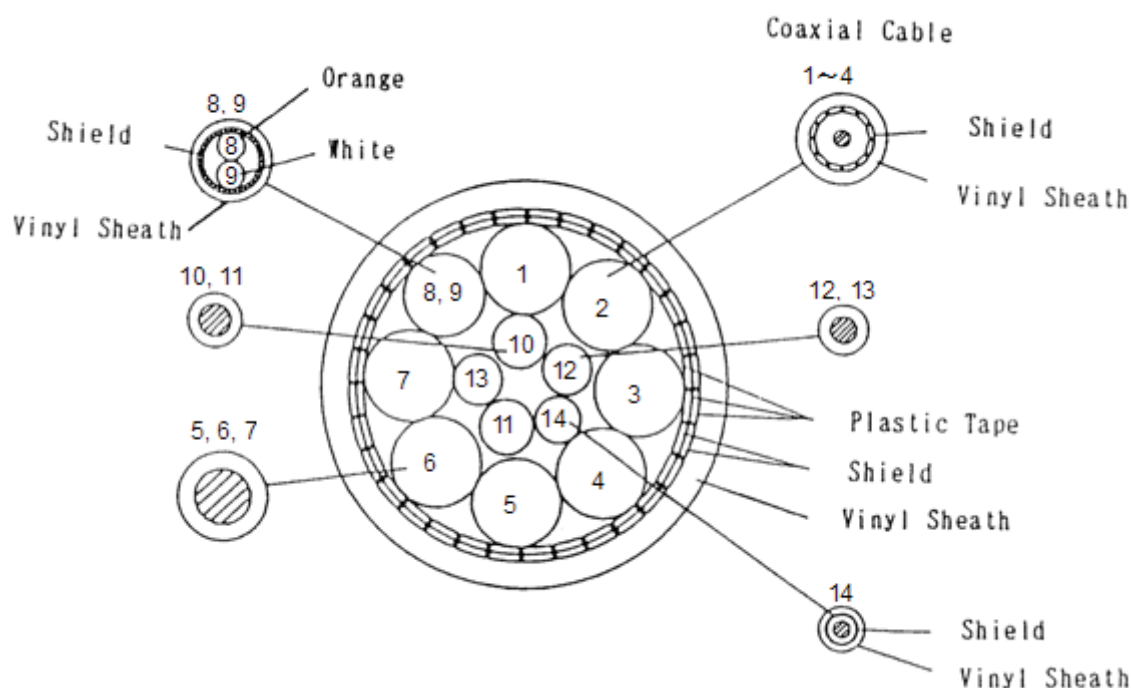


Fig.6-1 CM14CXVBTBTV(2695110056) Component

Table 6-1 CM14CXVBTBTV(2695110056) material

| Core (No.) | Cross Section (m2) | No. of wire / $\phi$ | Color   | Remarks                                     |
|------------|--------------------|----------------------|---------|---------------------------------------------|
| 1          | 0.5                | 19 / 0.18            | Black 1 | Coaxial Cable                               |
| 2          | 0.5                | 19 / 0.18            | Black 2 | Coaxial Cable                               |
| 3          | 0.5                | 19 / 0.18            | Black 3 | Coaxial Cable                               |
| 4          | 0.5                | 19 / 0.18            | Black 4 | Coaxial Cable                               |
| 5          | 5.5                | 35 / 0.45            | Yellow  |                                             |
| 6          | 5.5                | 35 / 0.45            | Green   |                                             |
| 7          | 5.5                | 35 / 0.45            | Brown   |                                             |
| 8          | 0.3                | 12 / 0.18            | White   | Twisted pair cable with Shield sheath white |
| 9          | 0.3                | 12 / 0.18            | Orange  |                                             |
| 10         | 2                  | 37 / 0.26            | Red     |                                             |
| 11         | 2                  | 37 / 0.26            | Blue    |                                             |
| 12         | 1.25               | 50 / 0.18            | Black   |                                             |
| 13         | 1.25               | 50 / 0.18            | Purple  |                                             |
| 14         | 0.5                | 1 / 0.18             | Gray    | Shield wire                                 |

Max. diameter: 23.0mm

## 6.2 Waveguide and Cable Installation

**(1) NTG-560 with 9ft Antenna NKE-339**

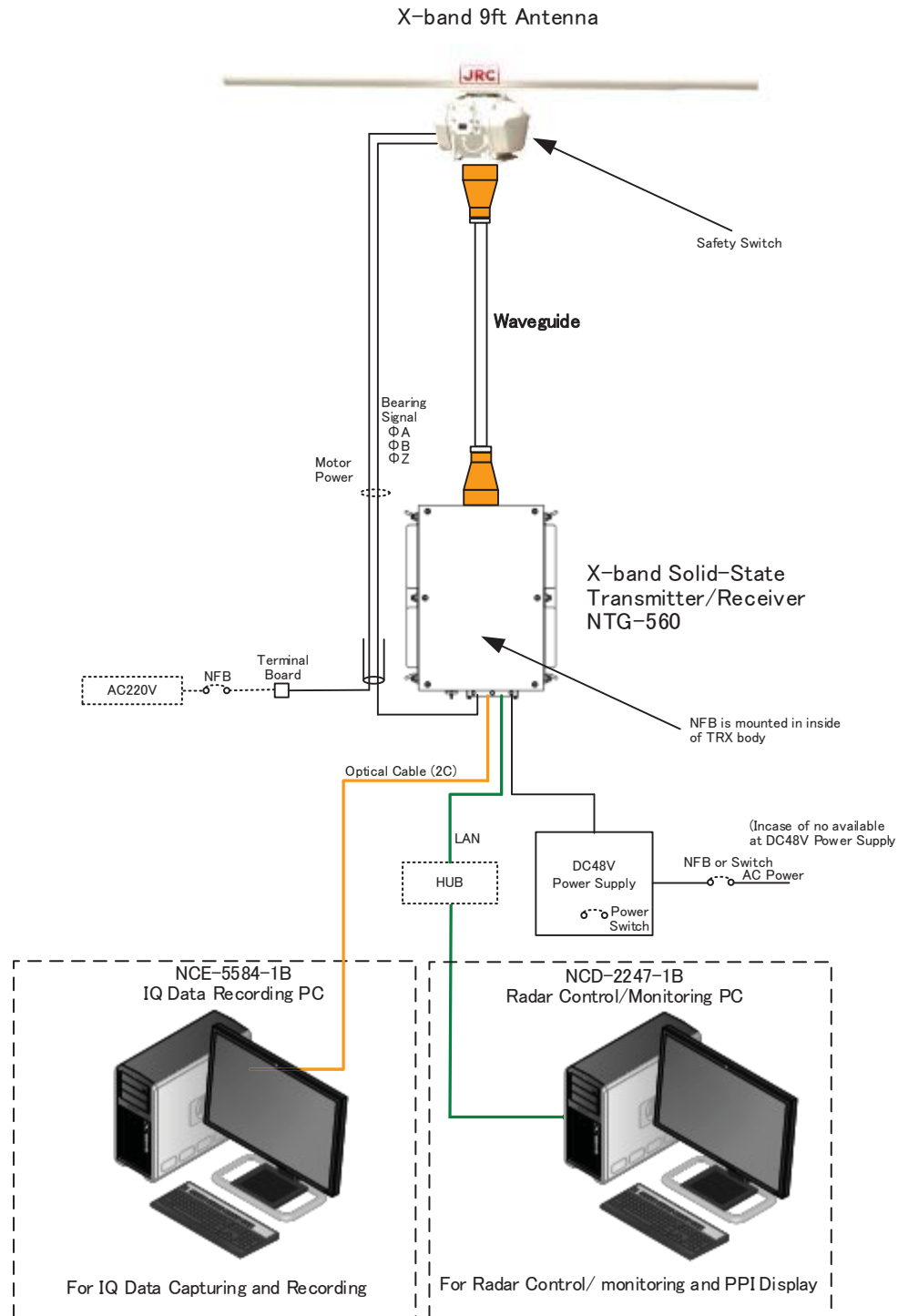


Fig.6-2 Waveguide and Cable Installation Diagram for NTG-560 with peripheral equipment

(2) NTG-560 with 18ft Antenna NKE-402

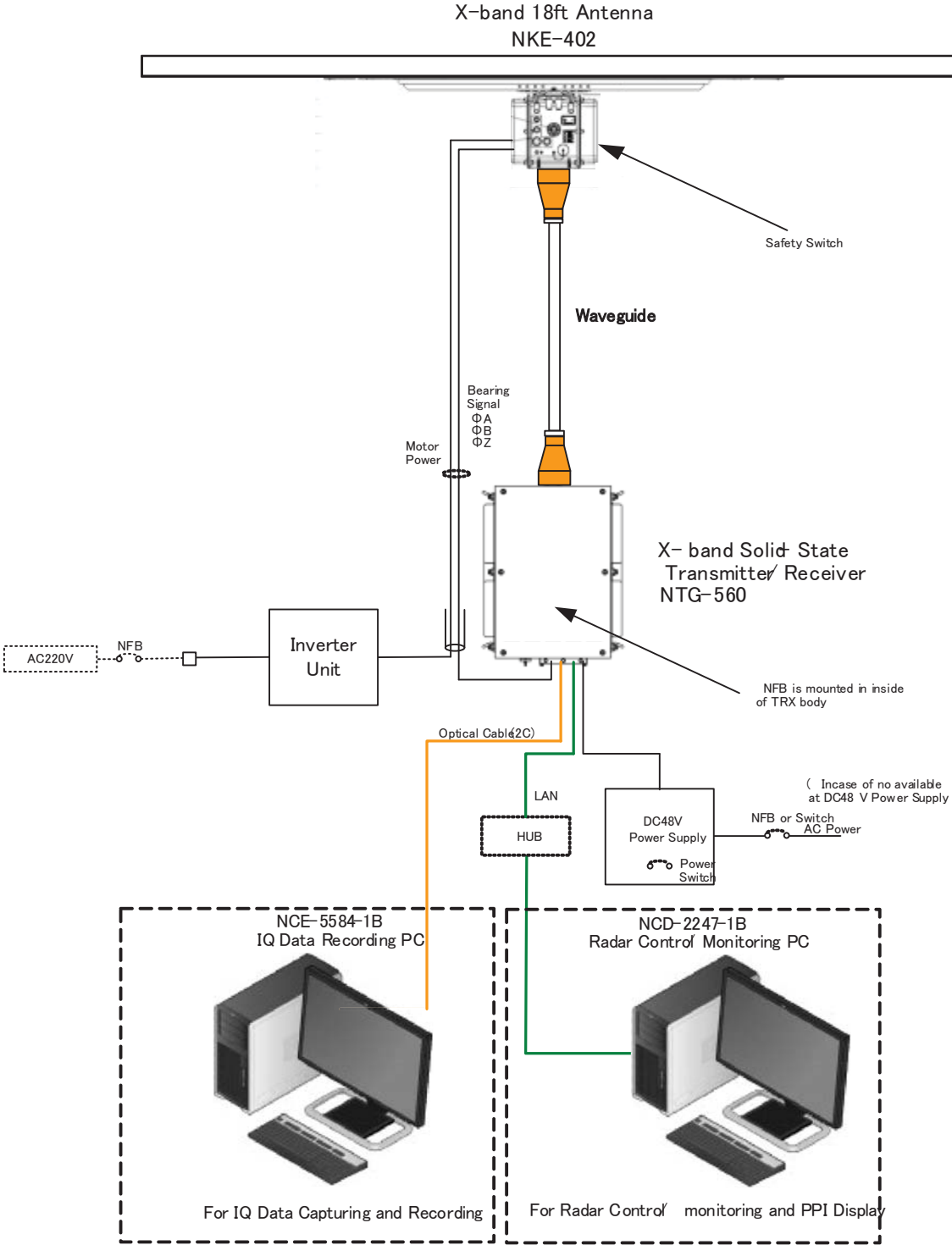


Fig.6-3 Waveguide and Cable Installation Diagram for NTG-560 with peripheral equipment

Table 6-2 Waveguide Materials List (for Example)

| (No.) | WAVEGUIDE                                                                                                    | Flange A           | Flange B           | Remarks |
|-------|--------------------------------------------------------------------------------------------------------------|--------------------|--------------------|---------|
| ①     | Tapered Transit Waveguide                                                                                    | (Flat): UG-51/U    | (Flat) : UG-39/U   |         |
| ②     | Flexible Waveguide<br>ANDREW<br>Model :Elliptical Waveguide<br>Type: EW85<br>Frequency Range :<br>7.7-9.8GHz | (Choke) : No.185BC | (Choke) : No.185BC |         |
| ③     | Tapered Transit Waveguide                                                                                    | (Flat): UG-39/U    | (Choke) : UG-52B/U |         |

## Notes:

For detailed assembling method, please contact waveguide manufacturer(s) including required special tools and materials

## APPENDIX

### Drawing

#### OUTLINE DRAWING

NTG-560 X-BAND SOLID STATE TRANSMITTER-RECEIVER

NKE-339 X-BAND RADAR 9FT ANTENNA

NKE-402 X-BAND RADAR 18FT ANTENNA

#### BLOCK DIAGRAM

NTG-560 X-BAND SOLID STATE TRANSMITTER-RECEIVER

NKE-339 X-BAND RADAR 9FT ANTENNA

NKE-402 X-BAND RADAR 18FT ANTENNA

#### WIRING DIAGRAM

INTERCONNECTION FOR NTG-560 X-BAND SOLID STATE TRANSMITTER-RECEIVER

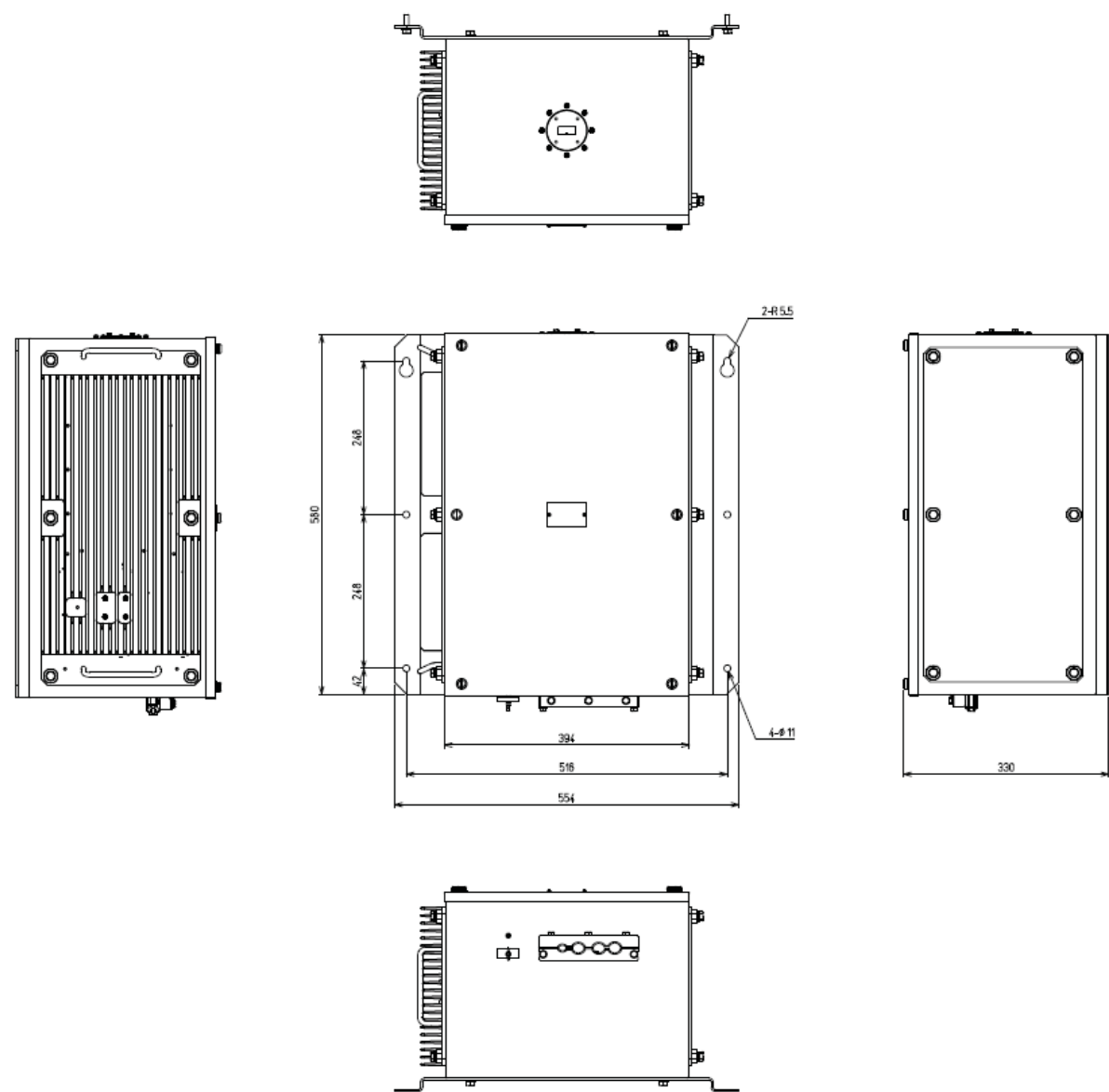
AND NKE-339 9FT ANTENNA (REFERENCE)

INTERCONNECTION FOR NTG-560 X-BAND SOLID STATE TRANSMITTER-RECEIVER

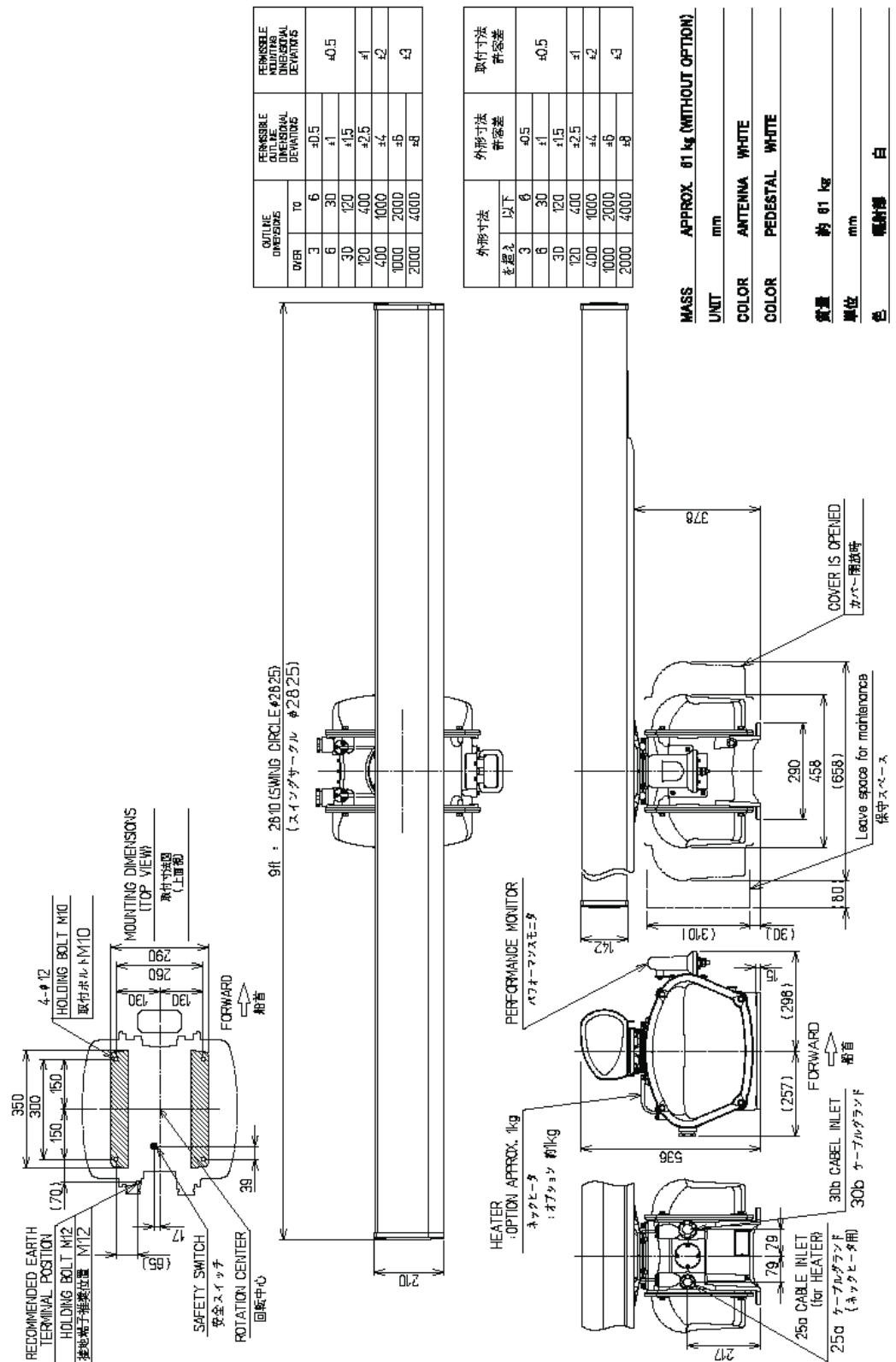
AND NKE-402 18FT ANTENNA

#### WAVEGUIDE CATALOGUE

Outline Drawing of NTG-560 X-Band Solid State Transmitter-Receiver

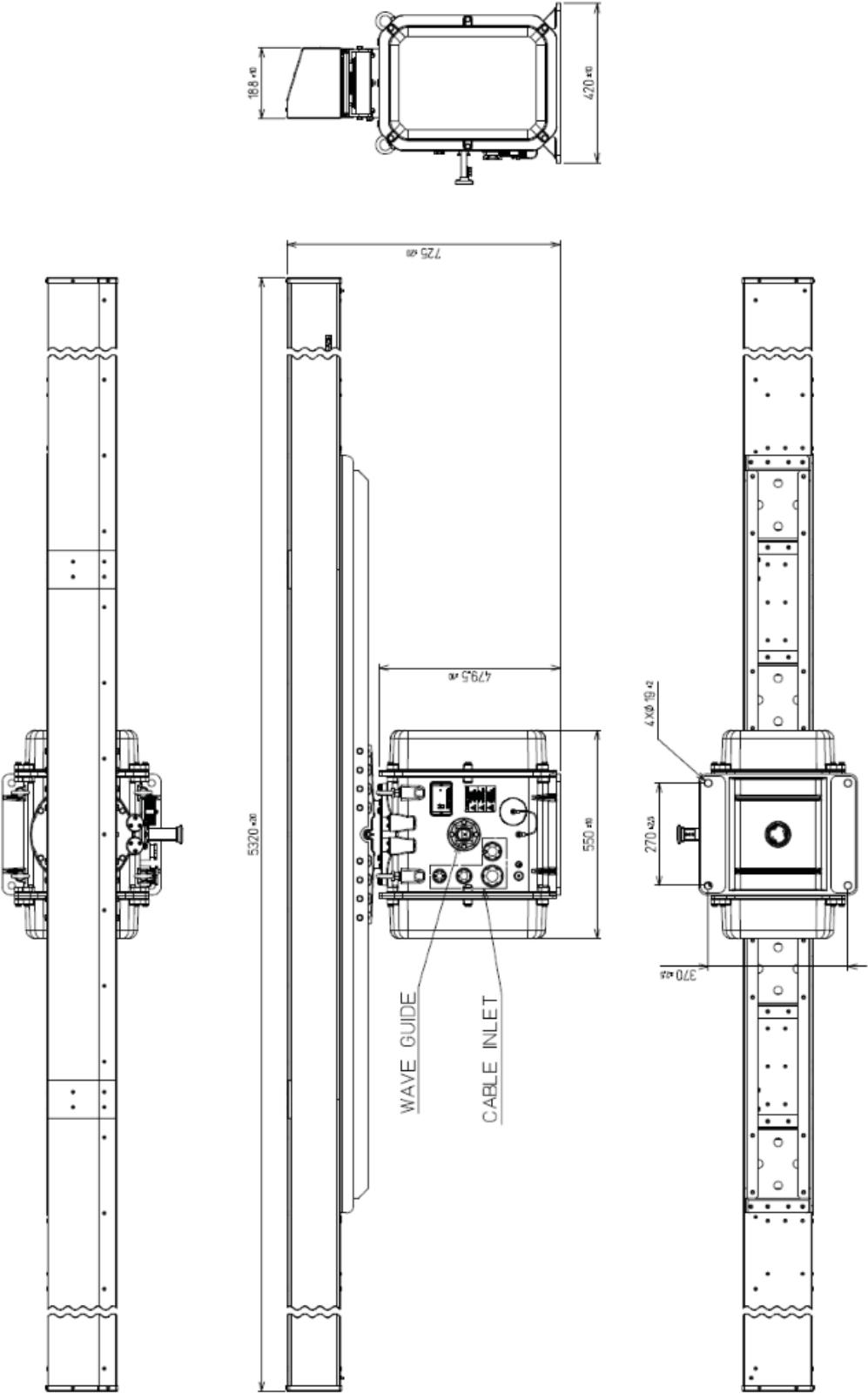


### Outline Drawing of NKE-339 X-band Radar 9ft Antenna

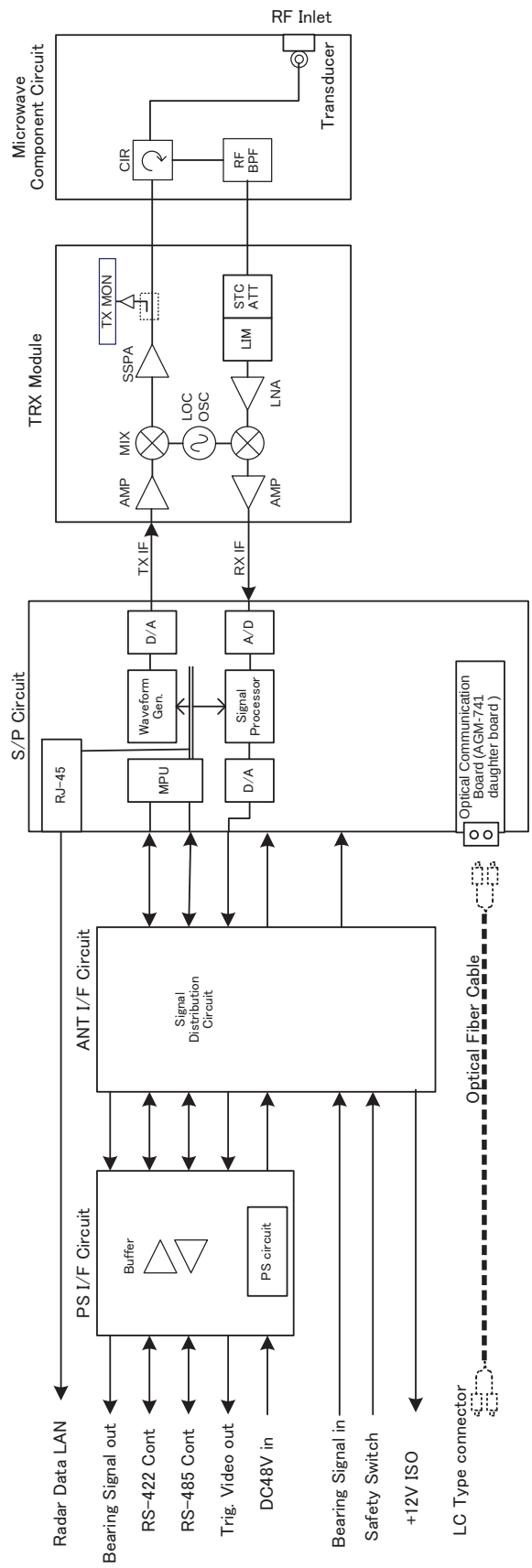


Note: Performance Monitor does not included in this system.

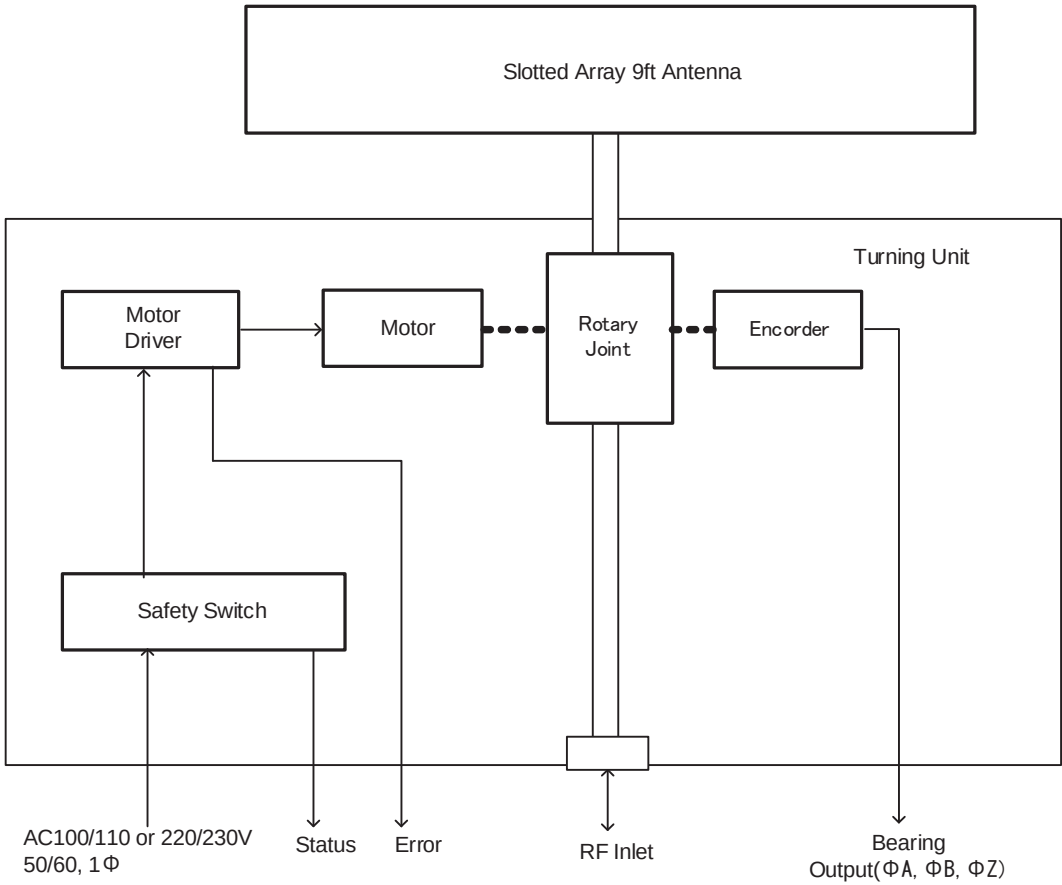
Outline Drawing of NKE-402 X-band Radar 18ft Antenna



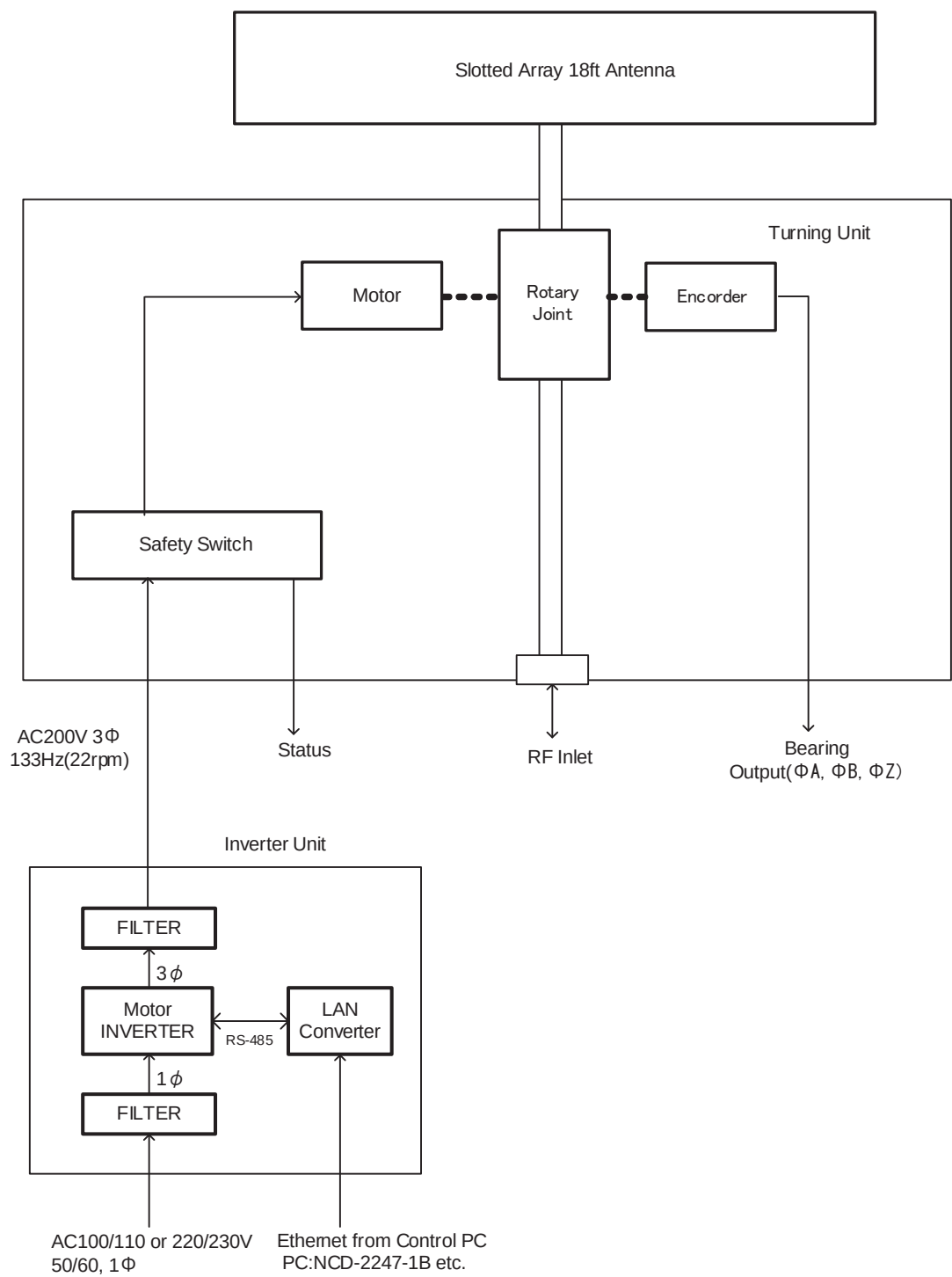
Block Diagram of NTG-560 X-Band Solid State Transmitter-Receiver



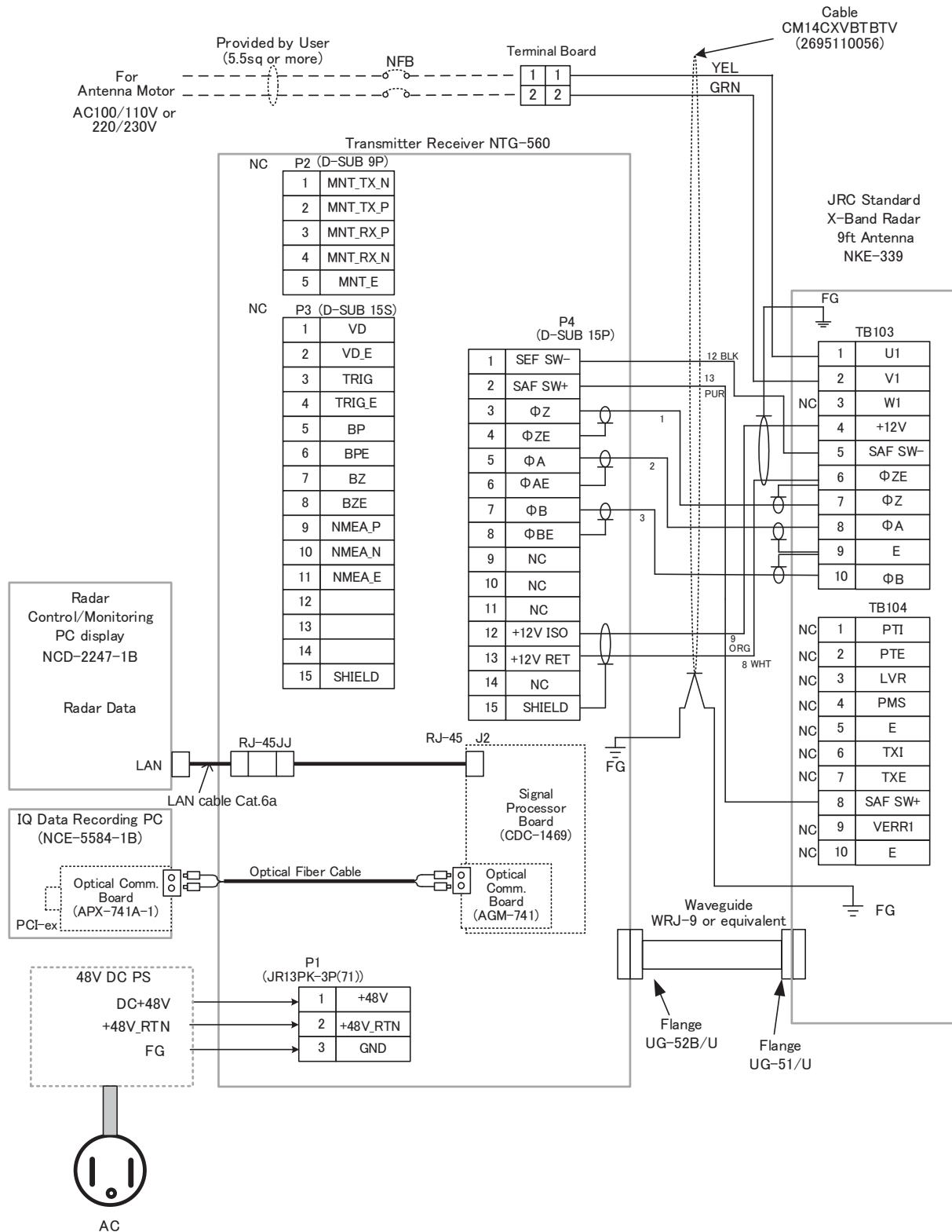
Block Diagram of NKE-339 X-band Radar 9ft Antenna



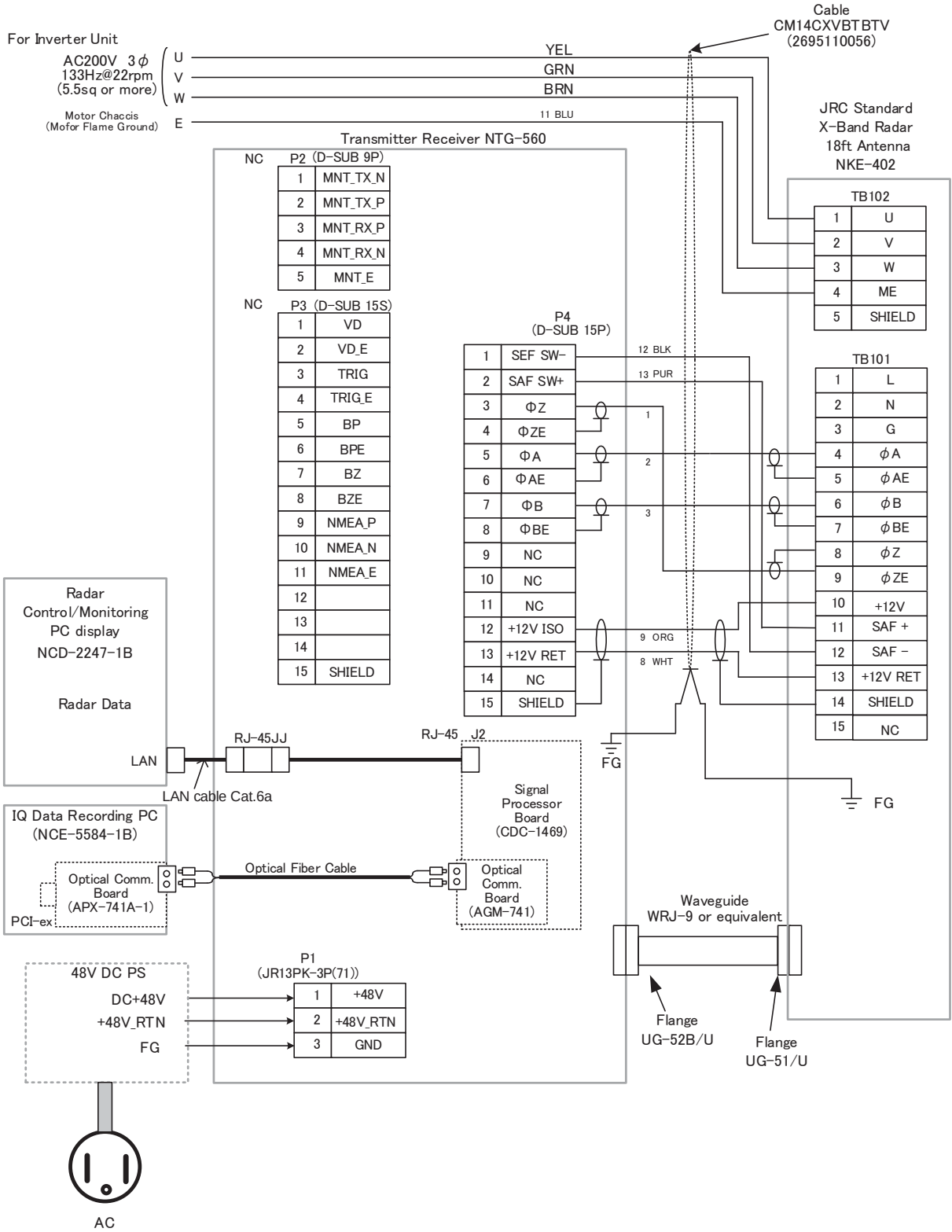
Block Diagram of NKE-402 X-band Radar 18ft Antenna



Interconnection for NTG-560 X-Band Solid State Transmitter / Receiver and NKE-339 9ft Antenna  
(Reference)  
(Confirm the antenna motor power before installation)



Interconnection for NTG-560 X-Band Solid State Transmitter / Receiver and NKE-402 18ft Antenna  
(Confirm the antenna motor power before installation)



Waveguide Catalogue  
(1) Taper Waveguide

Andrew Wireless Solutions ezGuide

File Options Units About

ezGuide

Wizard - Screen 1 of 2

Select Product Type



Family Family Type

I Tapered Transist...

Select Waveguide

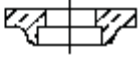
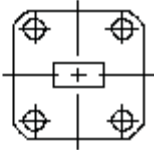
Code WR US Military British IEC

WR90 - WR112

Flange A

Code Flange Type Model

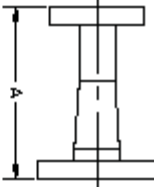
UG-39/U



Length

Preset Length

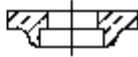
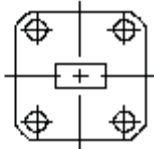
152 mm



Flange B

Code Flange Type Model

UG-51/U



Elliptical Waveguide Side

Antenna Side

<< Back

Next >>

## (2) Elliptical Waveguide



## Elliptical Waveguide

### Types EW85



#### Characteristics

| Type Numbers                                              |                           |
|-----------------------------------------------------------|---------------------------|
| Premium Waveguide, Standard Jacket                        | EW85                      |
| Standard Waveguide, Fire Retardant Non-Halogenated Jacket | 35409-17**                |
| Electrical                                                |                           |
| Max. Frequency Range, GHz*                                | 7.7-9.8                   |
| TE <sub>11</sub> Mode Cutoff Frequency, GHz               | 6.46                      |
| Group Delay at 9.2 GHz, ns/100 ft (ns/100 m)              | 142 (465)                 |
| Peak Power Rating at 9.2 GHz, kW                          | 38.9                      |
| Mechanical                                                |                           |
| Minimum Bending Radii, without rebending, inches (mm)     |                           |
| E Plane                                                   | 8 (200)                   |
| H Plane                                                   | 19 (480)                  |
| Minimum Bending Radii, with rebending, inches (mm)        |                           |
| E Plane                                                   | 8 (200)                   |
| H Plane                                                   | 19 (480)                  |
| Maximum Twist, degrees/foot (m)                           | 1 (3)                     |
| Dimensions over Jacket, in (mm)                           | 1.29 x 0.88 (32.8 x 22.4) |
| Weight, pounds per foot (kg/m)                            | 0.33 (0.50)               |

\* Actual usable range is limited by the connecting rectangular waveguide.

\*\* UL® listed Type CATV-R.

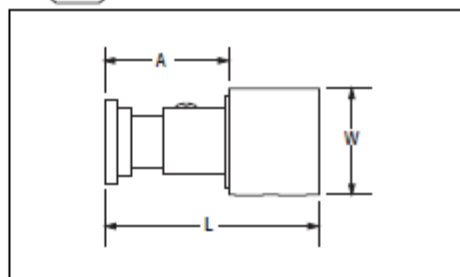
#### Attenuation, Average Power, Group Velocity

| Frequency<br>GHz | Attenuation<br>dB/100 ft (dB/100 m) | Average<br>Power<br>Rating, kW | Group<br>Velocity of<br>Propagation, % |
|------------------|-------------------------------------|--------------------------------|----------------------------------------|
| 7.7              | 4.32 (14.20)                        | 1.17                           | 54.4                                   |
| 7.9              | 4.01 (13.10)                        | 1.26                           | 57.6                                   |
| 8.1              | 3.78 (12.40)                        | 1.34                           | 60.3                                   |
| 8.3              | 3.59 (11.80)                        | 1.40                           | 62.8                                   |
| 8.5              | 3.45 (11.31)                        | 1.46                           | 65.6                                   |
| 8.7              | 3.33 (10.92)                        | 1.52                           | 67.6                                   |
| 8.9              | 3.23 (10.59)                        | 1.56                           | 69.4                                   |
| 9.1              | 3.14 (10.31)                        | 1.61                           | 71.0                                   |
| 9.3              | 3.07 (10.07)                        | 1.64                           | 72.4                                   |
| 9.5              | 3.01 (9.86)                         | 1.68                           | 73.8                                   |
| 9.7              | 2.96 (9.68)                         | 1.71                           | 75.0                                   |
| 9.8              | 2.93 (9.60)                         | 1.72                           | 75.6                                   |

Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (108°F) temperature rise over 40°C (104°F) ambient.

#### Connectors – Flange dimensions on pages 216-217

|                                                                                     | L<br>in (mm)  | W<br>in (mm) | A<br>in (mm) | Weight<br>lb (kg) |
|-------------------------------------------------------------------------------------|---------------|--------------|--------------|-------------------|
| Type No. 185BC                                                                      |               |              |              |                   |
|  | 4.75<br>(121) | 2.1<br>(52)  | 3.5<br>(89)  | 2.0<br>(0.9)      |



Connector Material: Brass

(3)Taper Waveguide

Andrew Wireless Solutions ezGuide

File Options Units About

ezGuide

Wizard - Screen 1 of 2

Select Product Type

Family

Family Type

T Tapered Transit...

Select Waveguide

Code

WR

US Military

British

IEC

WR90 - WR112

Flange A

Code

Flange Type

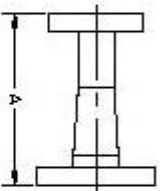
Model

UG-39/U

Length

Preset Length

152 mm



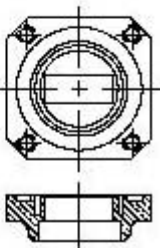
Flange B

Code

Flange Type

Model

UG-52B/U



Elliptical Waveguide Side

Transmitter Side

Next >>

## Maximum Permissible Exposure(MPE) Calculation

(1) NTG-560 with NKE-339 (9ft Slotted Array Antenna)

### Maximum Permissible Exposure(MPE) Calculation

FCC regulation 1.1310 Radiofrequency radiation exposure limits.(Frequency: 1,500 to 10,000MHz)

Limits for Occupational/Controlled Exposure(mW/cm<sup>2</sup>)=5.00

Limits for General Population/Uncontrolled Exposure(mW/cm<sup>2</sup>)=1.00

### NTG-560 Performance

#### Characteristics

Antenna gain(dB)= 31 Assumed 9feet Slotted Array Antenna

Output Average Power(W)= 25.601 (dBm)= 44.083

Frequency(MHz) = 9410

Cable Loss(dB) = 1 Assumed 10m Waveguide Length

Calculated EIRP mW) = 25601000 74.083 (dBm)

Power Density(SmW/cm<sup>2</sup>)=EIRP/4·π·r<sup>2</sup>  
(r=cm)

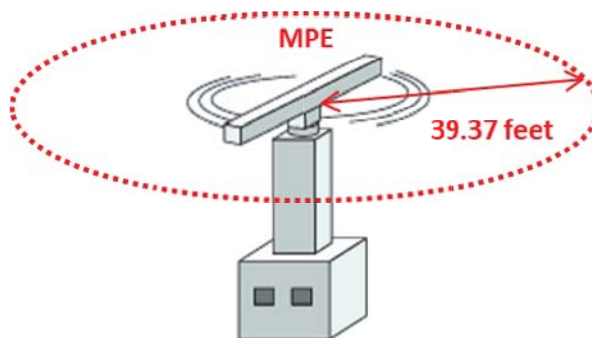
| EIRP<br>mW | Distance<br>cm | Distance<br>Feet | Power Density (S)<br>mW/cm <sup>2</sup> |                    |
|------------|----------------|------------------|-----------------------------------------|--------------------|
| 25601000.0 | 1500           | 49.21            | 0.90545                                 | General population |
| 25601000.0 | 1430           | 46.92            | 0.99627                                 |                    |
| 25601000.0 | 1400           | 45.93            | 1.03942                                 |                    |
| 25601000.0 | 1350           | 44.29            | 1.11784                                 |                    |
| 25601000.0 | 1300           | 42.65            | 1.20548                                 |                    |
| 25601000.0 | 1250           | 41.01            | 1.30385                                 |                    |
| 25601000.0 | 1200           | 39.37            | 1.41477                                 |                    |
| 25601000.0 | 1150           | 37.73            | 1.54046                                 |                    |
| 25601000.0 | 1100           | 36.09            | 1.68369                                 |                    |
| 25601000.0 | 1050           | 34.45            | 1.84786                                 |                    |
| 25601000.0 | 1000           | 32.81            | 2.03726                                 |                    |
| 25601000.0 | 950            | 31.17            | 2.25736                                 |                    |
| 25601000.0 | 900            | 29.53            | 2.51514                                 |                    |
| 25601000.0 | 850            | 27.89            | 2.81974                                 |                    |
| 25601000.0 | 800            | 26.25            | 3.18322                                 | Occupational       |
| 25601000.0 | 750            | 24.61            | 3.62180                                 |                    |
| 25601000.0 | 700            | 22.97            | 4.15768                                 |                    |
| 25601000.0 | 640            | 21.00            | 4.97379                                 |                    |
| 25601000.0 | 600            | 19.69            | 5.65906                                 |                    |
| 25601000.0 | 550            | 18.04            | 6.73475                                 |                    |
| 25601000.0 | 500            | 16.40            | 8.14905                                 |                    |

|            |     |       |           |
|------------|-----|-------|-----------|
| 25601000.0 | 450 | 14.76 | 10.06056  |
| 25601000.0 | 400 | 13.12 | 12.73290  |
| 25601000.0 | 350 | 11.48 | 16.63072  |
| 25601000.0 | 300 | 9.84  | 22.63626  |
| 25601000.0 | 250 | 8.20  | 32.59621  |
| 25601000.0 | 200 | 6.56  | 50.93158  |
| 25601000.0 | 150 | 4.92  | 90.54503  |
| 25601000.0 | 100 | 3.28  | 203.72633 |
| 25601000.0 | 50  | 1.64  | 814.90531 |

Conclusion:

| Frequency (MHz) | General population Limit Minimum Distance(feet) | Occupational Limit Minimum Distance(feet) |
|-----------------|-------------------------------------------------|-------------------------------------------|
| 1,500–10,000    | 46.92                                           | 21.00                                     |

The NTG-560 is radar system for operating at the land based services.  
The radiating structure for the radar is typically mounted as following diagram.  
The radar system will satisfy the requirements of RF exposure per CFR rule.



Typical Installation of radar system

## (2) NTG-560 with NKE-402 (18ft Slotted Array Antenna)

Maximum Permissible Exposure(MPE) Calculation

FCC regulation 1.1310 Radiofrequency radiation exposure limits.(Frequency: 1,500 to 10,000MHz)

Limits for Occupational/Controlled Exposure(mW/cm<sup>2</sup>)=5.00Limits for General Population/Uncontrolled Exposure(mW/cm<sup>2</sup>)=1.00NTG-560 PerformanceCharacteristics

Antenna gain(dB)= 34 Assumed 18feet Slotted Array Antenna

Output Average Power(W)= 25.601 (dBm)= 44.083

Frequency(MHz) = 9410

Cable Loss(dB) = 1 Assumed 10m Waveguide Length

Calculated EIRP mW) = 51080711 77.083 (dBm)

$$\text{Power Density(SmW/cm}^2\text{)} = \text{EIRP} / 4 \cdot \pi \cdot r^2$$

(r=cm)

| EIRP<br>mW | Distance<br>cm | Distance<br>Feet | Power Density (S)<br>mW/cm <sup>2</sup> |
|------------|----------------|------------------|-----------------------------------------|
| 51080710.5 | 2200           | 72.18            | 0.83985                                 |
| 51080710.5 | 2150           | 70.54            | 0.87937                                 |
| 51080710.5 | 2100           | 68.90            | 0.92174                                 |
| 51080710.5 | 2050           | 67.26            | 0.96725                                 |
| 51080710.5 | 2020           | 66.27            | 0.99620                                 |
| 51080710.5 | 1950           | 63.98            | 1.06900                                 |
| 51080710.5 | 1900           | 62.34            | 1.12600                                 |
| 51080710.5 | 1850           | 60.70            | 1.18769                                 |
| 51080710.5 | 1800           | 59.06            | 1.25459                                 |
| 51080710.5 | 1750           | 57.41            | 1.32731                                 |
| 51080710.5 | 1700           | 55.77            | 1.40653                                 |
| 51080710.5 | 1650           | 54.13            | 1.49307                                 |
| 51080710.5 | 1600           | 52.49            | 1.58784                                 |
| 51080710.5 | 1550           | 50.85            | 1.69194                                 |
| 51080710.5 | 1500           | 49.21            | 1.80661                                 |
| 51080710.5 | 1450           | 47.57            | 1.93335                                 |
| 51080710.5 | 1400           | 45.93            | 2.07392                                 |
| 51080710.5 | 1350           | 44.29            | 2.23038                                 |
| 51080710.5 | 1300           | 42.65            | 2.40525                                 |
| 51080710.5 | 1250           | 41.01            | 2.60152                                 |
| 51080710.5 | 1200           | 39.37            | 2.82283                                 |
| 51080710.5 | 1150           | 37.73            | 3.07363                                 |
| 51080710.5 | 1100           | 36.09            | 3.35940                                 |

General population

|            |      |       |         |              |
|------------|------|-------|---------|--------------|
| 51080710.5 | 1050 | 34.45 | 3.68696 | Occupational |
| 51080710.5 | 1000 | 32.81 | 4.06487 |              |
| 51080710.5 | 950  | 31.17 | 4.50402 |              |
| 51080710.5 | 905  | 29.69 | 4.96307 |              |
| 51080710.5 | 850  | 27.89 | 5.62612 |              |
| 51080710.5 | 800  | 26.25 | 6.35137 |              |
| 51080710.5 | 750  | 24.61 | 7.22644 |              |

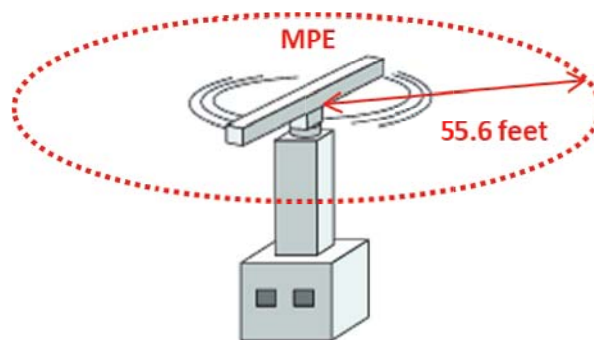
Conclusion:

| Frequency (MHz) | General population Limit Minimum Distance(feet) | Occupational Limit Minimum Distance(feet) |
|-----------------|-------------------------------------------------|-------------------------------------------|
| 1,500–10,000    | 66.27                                           | 29.69                                     |

The NTG-560 is radar system for operating at the land based services.

The radiating structure for the radar is typically mounted as following diagram.

The radar system will statify the requirements of RF exposure per CFR rule.



Typical Installation of radar system