9. PC operation

## 9.1. File

1) **File Play:** To play a regular echo recorded file (idx)

   (Refer "2) Acquisition" on 9.3.1.)

2) **Snapshot:** To indicate captured radar screen (jpg).

3) **Exit:** To exit the software of RainMap.

4) **Operation mode: (**Click "File" + [Ctrl] + [Alt] at

   same time to Indicate the menu)

   Do this operation mode after changed some parameters to operate a radar.

   - **Observation:**
     Select the entered values at "Setting" menu with regular mode.
   - **Verify operation during installation:**
     Change some parameters automatically to verify operation during installation.
     All parameters will set back to previous setting (before this verify operation) if go back to "Observation"
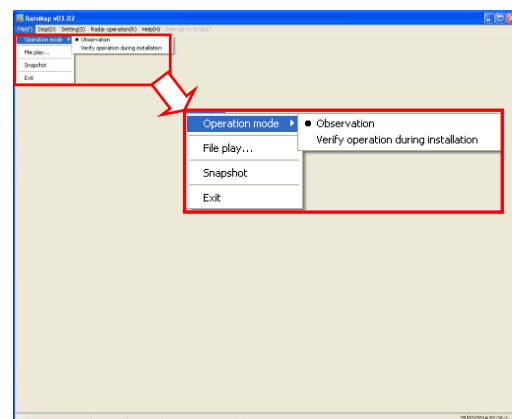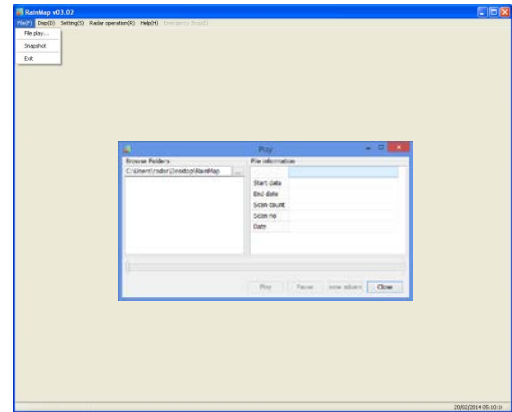
9.2. Disp

1) **DispSelect**

   - **2D:** Indicate the echo by 2 dimension.

   - **3D:** Indicate the echo by 3 dimension.

2) **Sub echo:** To show another screen to indicate the echo

3) **Information Indication:** *Under construction.
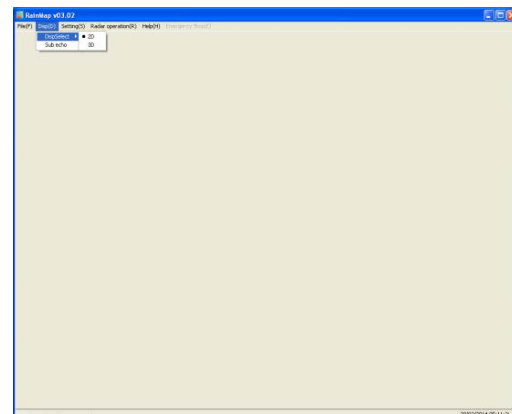
9.3. Setting

### 9.3.1. Setting

1) **View**

   Range [km]
   To setup an indication range.
   ♦ Confirm and setup the value before shipping.

   DataType
   To select an indication of the radar parameter.

   ・ **Rainfall intensity:** Intensity of rainfall [mm/h]

   ・ **Reflective intensity (H):** Reflection factor of the horizontal polarimetric radar [dBz]

   ・ **Reflective intensity (V):** Reflection factor of the vertical polarimetric radar [dBz]

   ・ **Doppler speed:** Doppler speed [m/s]

   ・ **Zdr [dB]:** Radar reflection factor difference.

   ・ **Kdp [deg/km]:** Propagation phase difference rate of change.
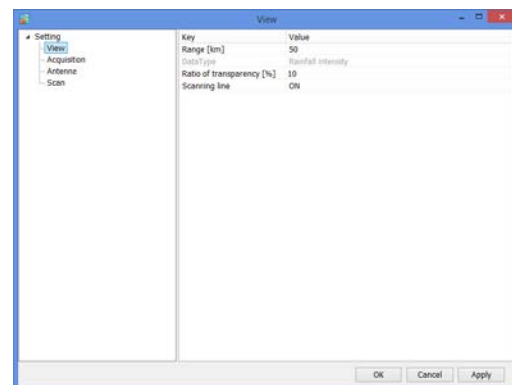
Ratio of transparency [%]
To setup a Transmittance of the indication echo.

2) Acquisition
Notice: Turn "OFF" all the setting before shipping.

Rec echo
Turn ON or OFF a Log of echo data.

Rec file type
To select a log form of echo data.
(dat (idx) / ZIP / dat (idx) + ZIP)

Echo folder
To setup a log folder of echo data.

Echo zip folder
To setup a log folder of echo zip data file.

Rec interval [sec]
To setup a recording interval of echo data.

Rec time [hour]
To setup a time of recording echo data.

Screen capture
Turn ON or OFF a screen capture.

Capture folder
To setup a folder of capture (jpg).

Rec interval [sec]
To setup an interval time of capture.

Rec CSV
Turn ON or OFF a recording of CSV data.

**Echo folder (CSV)**
To setup a folder of CSV data.

CSV Rec interval [sec]
To setup an interval time of CSV data.

CSV Rec parameter
To select a weather parameter of recording CSV.
- **Rain [mm/h]:** Intensity of rainfall
- **Zhh [dBz]:** Reflection factor of the horizontal polarimetric radar
- **Zvv [dBz]:** Reflection factor of the vertical polarimetric radar
- **DS [m/s]:** Doppler speed
- **Zdr [dB]:** Radar reflection factor difference
- **Kdp [deg/km]:** Propagation phase difference rate of change.

Scanning line
Turn ON or OFF a scan line of screen.
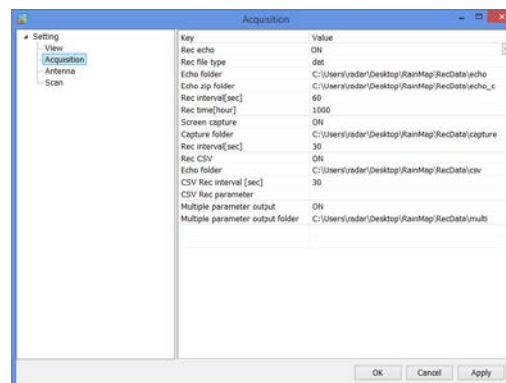
Multiple parameter output
Turn ON or OFF an output record of multi-parameter.
(*It could setup only when Echo data mode of TRX is applied)

Multiple parameter output folder
To setup a folder of recording multi-parameter (scn).
(*It could setup only when Echo data mode of TRX is selected)

Rainfall information output
(*It will indicate during factory setting)
Turn ON or OFF an output record of rainfall information.

Rainfall information output folder
(*It will indicate during factory setting)
To setup a folder of recording rainfall information.

3) Antenna
Notice: Follow a value of the management list to setup.

Latitude [deg]
To setup a latitude of the installed point.

Longitude [deg]
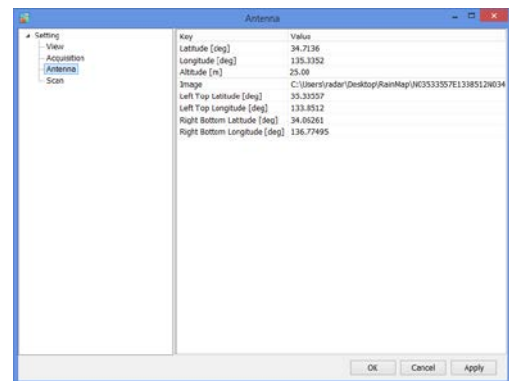To setup a longitude of the installed point.

Altitude [m]
To setup an altitude of the installed point.

Image
To setup a filename of map.
This program treats as the equidistant cylindrical projection.

Left Top Latitude [deg]
To setup a latitude of left top corner of Map Image.

Left Top Longitude [deg]
To setup a longitude of left top corner of Map Image.

Right Bottom Latitude [deg]
To setup a latitude of bottom right corner of "Map Image".

Right Bottom Longitude [deg]
To setup a longitude of bottom right corner of "Map Image".

4) Scan
There are 5 scan patterns that could customize and save a setting.
Notice: Follow a value of the management list to setup on scan pattern 1.

ScanMode
To select a scan mode of antenna.

- **PPI scan:** Equiangular elevation with horizontal rotation mode. It generates 2 dimension data.
- **Spiral scan:** The mode to rotate horizontal while shifting elevation continuously, and scans in a spiral. It generates 3 dimension data.
- **Sector RHI scan:** The mode to scan elevation direction on special direction area, and generate 3 dimension of rectangular solid angle.
- **HSQ scan:** The mode to activate PPI scan while shifting an elevation. It generates 3 dimension data.
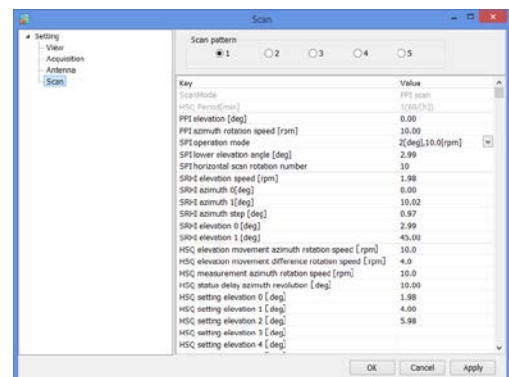
HSQ Period [min]
To select an periodic movement of HSQ during HSQ mode.
(1(60/(H)) / 2(30/(H)) / 3(20/(H)) / 4(15/(H)) / 5(12/(H)) / 6(10/(H)) / 10(6/(H)) / 12(5/(H)))
e.g. HSQ will activate every 2 minutes if select 2/30/(H). (It turns 30 times per hour)

PPI elevation [deg]
To setup an angle of antenna's elevation during PPI mode.

PPI azimuth rotation speed [rpm]
To setup a rotation speed of azimuth in rotation per minutes (rpm).
Parameters affect only to PPI mode.

SPI operation mode
To setup an elevation angle step and azimuth rotation speed.
For example, when the setting is shown as below table 1, antenna will rotate at 2.99, 3.99 and 6.99 degrees.

table 1 (Example of SPI (Spiral) operation)

Parameter	Settings
SPI operation mode	2 [deg], 10 [rpm]
SPI lower elevation angle	2.99 [deg]
SPI horizontal scan rotation	3

SPI lower elevation angle [deg]
To setup an angle of SPI lowest elevation.
SPI mode will start from setup angle to upper angle.

SPI horizontal scan rotation number
To setup a number of rotation in horizontal direction of SPI scan.
It will move upward/downward as setup number while rotating on azimuth direction.

SRHI elevation speed [rpm]
To setup an elevation speed of SRHI (Sector RHI).

SRHI azimuth 0 [deg]
To setup an angle of azimuth.
It will observe RHI in between azimuth 0 to 1 continuously.

SRHI azimuth 1 [deg]
To setup an angle of azimuth during SRHI observation.

SRHI azimuth step [deg]
To setup a quantity of antenna rotation while changing an angle of azimuth.

SRHI elevation 0 [deg]
To setup an angle of elevation.
SRHI will start from elevation 1 to 2.

SRHI elevation 1 [deg]
To setup an angle of elevation in HSQ (Horizontal Sequence) observation.

HSQ elevation movement azimuth rotation speed [rpm]
To setup an azimuth rotation speed until the elevation movement in HSQ (Horizontal Sequence) observation.

HSQ elevation movement difference rotation speed [rpm]
To setup a rotation speed of elevation direction during elevation change in HSQ (Horizontal Sequence) observation.
Rotation speed of elevation direction = [HSQ elevation moving direction of rotation speed] + [HSQ elevation movement difference of rotation speed]
Notice: [HSQ elevation moving direction of rotation speed] $\geqq$ [HSQ elevation movement difference of rotation speed]

HSQ measurement azimuth rotation speed [rpm]
To setup an azimuth rotation speed at fixed elevation angle.

HSQ status delay azimuth revolution [deg]
To setup an angle of shifting elevation in HSQ (Horizontal Sequence) observation.

HSQ setting elevation 0 – 31 [deg]
To setup an elevation variation.
It is possible to setup 32 elevation.

9.3.2. Service
Press [Ctrl] + [Alt] and click [Setting] simultaneously to indicate service menu.
Service menu has two types:
1. Maintenance setting: Regular menu for maintenance service engineer.
2. Factory setting: Adjust the setting of installed station use only for installation engineer.
Notice: Follow the management list to setup all values.

1) Network
Command transfer IP
To setup the IP address of command transfer.
♦ Constant value: 192.168.1.101

Command transfer port
To setup the port number of command transfer.
♦ Constant value: 51000

Data transfer IP
To setup the IP address of data transfer.
♦ Constant value: 192.168.1.101

Data transfer port
To setup the port number of data transfer.
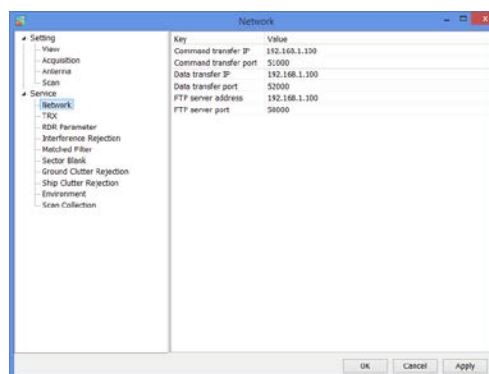♦ Constant value: 52000

FTP server address
To setup the IP address of FTP server.
♦ Constant value: 192.168.1.100

FTP server port
To setup the port number of FTP server.
♦ Constant value: 50000

2) TRX
Echo data mode
To select Echo data mode.
- **IQ Data:** Use amplitude of Horizontal wave only.
- **Multiple Parameter:** Use all information of reflected wave such as H/V amplitude and phase.

Rainfall intensity calculation method
To select a calculation method of Rainfall intensity calculation.

· **Zh method:** Use horizontal amplitude information only.

· **Zh,Kr Attenuation correction method:** Zh is calculated from the value that corrected rain attenuation by the amplitude.

· **Zh, ϕ dp method:** Zh is calculated from the value that corrected rain attenuation by the ϕ dp.

· **Zh, Zdr method:** Calculated from Zh and Zdr.

· **Zdr, Kdp+Zh method:** Add into Zh after calculated from Kdp and Zdr.

· **Kdp+Zh:** Use complex information, amplitude, and phase.
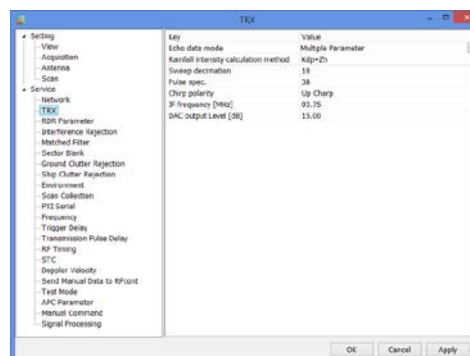
Sweep decimation
To setup a number of decimation.
Size of transfer data. It uses the setting table when to determine a factor.

Pulse spec.
To setup a pulse number.
Refer to the setting table as details of pulse settings.

Chirp polarity
(*It will indicate during factory setting)
To select frequency shift direction.
Up Charp: Sweep frequency to upward.
Down Charp: Sweep frequency to downward.

IF frequency [MHz]
(*It will indicate during factory setting)
To setup an IF (Intermediate Frequency) signal frequency.

DAC output Level [dB]
(*It will indicate during factory setting)
To setup an amplitude of transmission signal output from SPU.

3) RDR Parameter

RF frequency [MHz]

It indicates only when Factory setting is on

(*It will indicate during factory setting)
To setup a carrier frequency of transmitting signal.

Light speed [m/s]
(*It will indicate during factory setting)
To setup a propagation speed of radio wave.

Antenna rotation speed (H) [rpm]
To setup a horizontal rotation speed of antenna.

Beam width (H) [deg]
(*It will indicate during factory setting)
To setup an angle (Beam width) that -3dB beam width of antenna in horizontal polarization.

Beam width (V) [deg]
(*It will indicate during factory setting)
To setup an angle (Beam width) that -3dB beam width of antenna in vertical polarization

Azimuth offset
(*It will indicate during factory setting)
To setup an azimuth offset angle from origin to north.
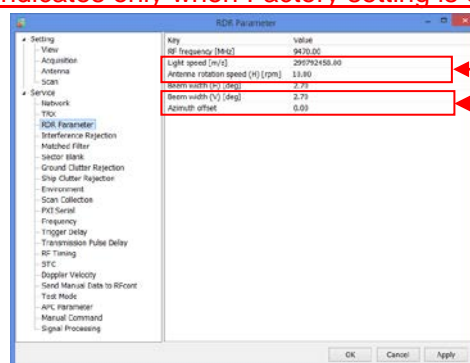
4) Interference Rejection

Interference rejection 0 - 1

It indicates only when Factory setting is on

Turn On or OFF an interference rejection function from other radar.

Power adjustment
(*It will indicate during factory setting)
To select High or Low to adjust the power of IR0 -1.

Threshold
(*It will indicate during factory setting)
To setup a threshold of judging interference wave.

Interpolation
(*It will indicate during factory setting)
Turn On or OFF an interpolation.
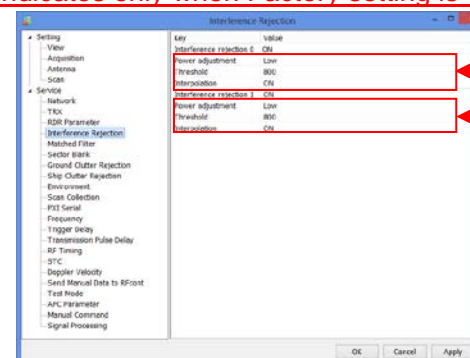
5) Matched Filter

Matched Filter

Turn "ON" when to use QON and VON.
This is a setting of receiving digital filter.
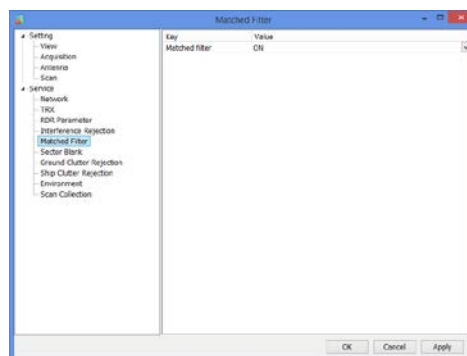
6) Sector Blank

Sector Blank 1 -2

Turn ON or OFF a setting of transmission prohibited area. (Setup a rectangular solid angle area of Azimuth and Elevation)

Azimuth Start angle [deg]

To setup a starting angle point of azimuth direction. Starting point of azimuth is 0 degree on this unit. Follow a clockwise direction.

Azimuth End angle [deg]

To setup an ending angle point of azimuth direction.

Elevation Start angle [deg]

To setup a starting elevation angle. Horizontal direction is 0 degree. Follow a zenithal direction.

Elevation End angle [deg]

To setup an ending angle point of elevation.

7) Ground Clutter Rejection

It indicates only when Factory setting is on
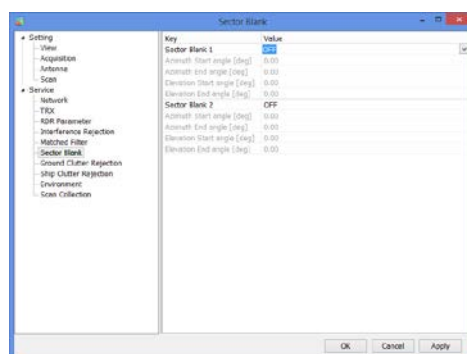
Ground clutter rejection

Turn ON or OFF a judgment to remove ground clutter as a target if moving speed is lower than setting speed.

Rejection speed [m/s]

(*It will indicate during factory setting)
To setup a removal speed (upper limit) of judging ground clutter.

Auto ground clutter rejection

(*It will indicate during factory setting)
Turn ON or OFF an auto ground clutter rejection. Turn it "OFF" if elevation is above setting value.

Elevation of auto ground clutter rejection [deg]

(*It will indicate during factory setting)
To setup an angle of boundary elevation to turn off ground clutter rejection.

8) Ship Clutter Rejection

Ship clutter rejection

Turn ON or OFF for determine whether a target is a ship and to eliminate.

Range direction expansion coefficient

(*It will indicate during factory setting)
To setup a range to expand a ship and the data to judge in the range direction.

SW direction continuity judge point

(*It will indicate during factory setting)
To setup a point to judge the continuity of the sweep direction

RainCFAR threshold

(*It will indicate during factory setting)
To setup a threshold to judge as a ship.

Auto ship clutter rejection

(*It will indicate during factory setting)
To setup a threshold to judge as a ship.

Elevation of auto ship clutter rejection [deg]

(*It will indicate during factory setting)
To setup an angle of boundary elevation to turn off ship clutter rejection.

9) Environment

Serial number

Enter the serial number.

Product number

Enter the product number.

Product name

Enter the product name.
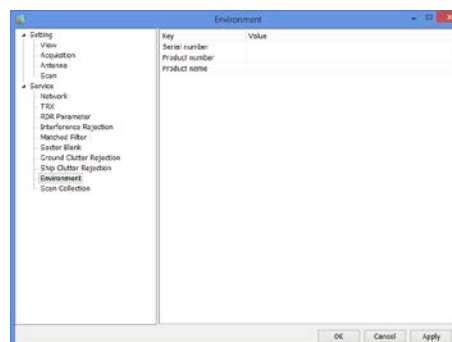
10) Scan Collection

Azimuth level collection [deg]

To setup an azimuth offset from initial position.
Parameters affect to elevation angle calibration.
It adjusts the offset of magnet sensor by elevation calibration.

Elevation level collection [deg]

To setup an elevation offset from horizontal level.
Measure the elevation angle after antenna initialization and set a field.
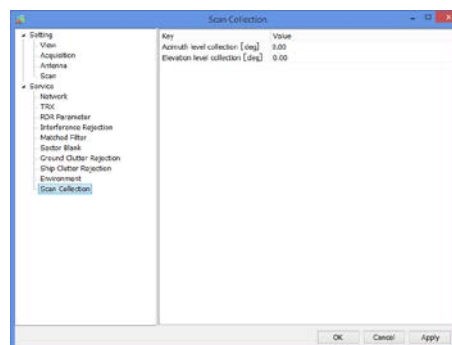
9.3.3. Factory setting

1. Click "Setting" + [Ctrl] + [Alt] simultaneously to Indicate the equipment setting of Service menu.
2. [Factory setting] button will indicate on the right side menu when clicked [Service] in the left menu.
3. Pop-up menu of [Enter password of Factory setting] will indicate when clicked [Factory setting] button.

Enter Password:
rainmap
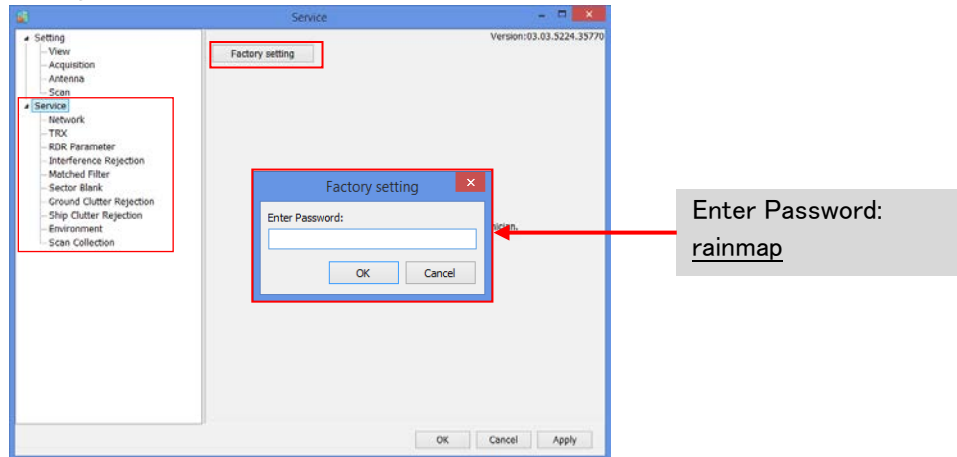
4. Factory setting menu will indicate below Service menu after entered the password
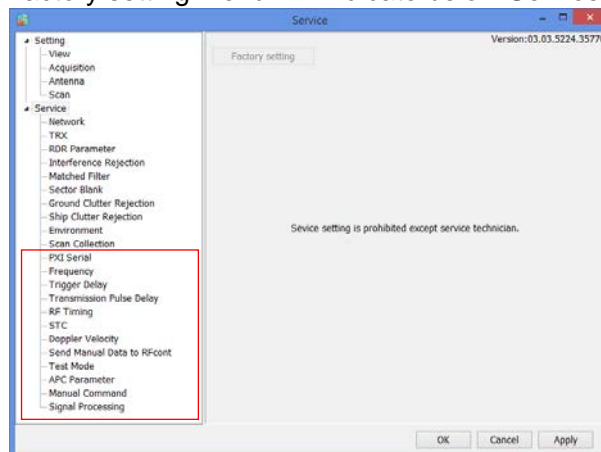
1) PXI Serial

RF control port
To Open or Close RF control port.

Port number
To setup a port number.

Baud rate [bps]
To setup a baud rate.

Data bit [bit]
To setup a data bit.

Stop bit [bit]
To setup a stop bit.

ANT control port
To Open or Close ANT control port.

Parity
To select the setting.
(none / odd / even / mark / space)

ANT monitor port
To Open or Close ANT monitor port.

2) Frequency

ADC sampling frequency [MHz]
To setup a sampling frequency of AD converter.

DAC output rate [MHz]
To setup an output rate of DA converter.
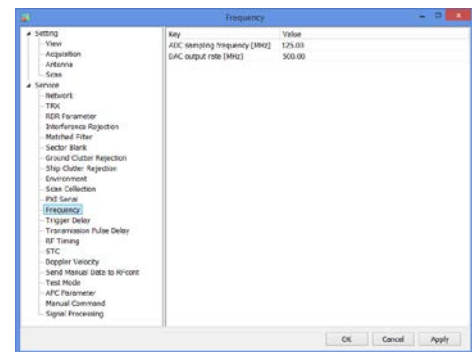
3) Trigger delay

Trigger delay 1 - 4
To setup a trigger delay timing #1 - #4 of transmission signal.
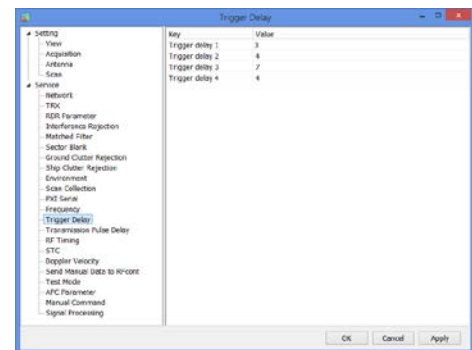
4) Transmission Pulse Delay

Transmission Pulse Delay
To setup a clock frequency (normally 125MHz) of transmission pulse delay.
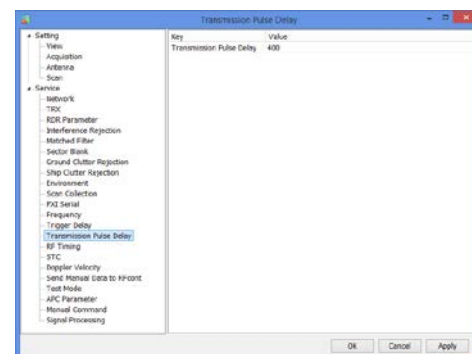
5) RF Timing

RFC pulse ON on rise delay
To setup a clock frequency (normally 125MHz) of RFC pulse on rise delay.
It turns "OFF" a pulse of LNA bias during a period of transmission. RF_trig rise against delay time.

RFC pulse ON on fall delay
To setup a clock frequency (normally 125MHz) of RFC pulse on fall delay.
It turns "OFF" a pulse of LNA bias during a period of transmission. RF_trig fall against delay time.
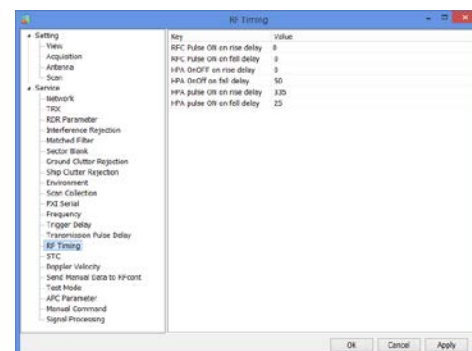
HPA OnOff on rise delay
Control signal (the power is "OFF" during HPA receiving period) of HPA power switch (drain voltage) could setup a rise delay time for RF_Trig.

HPA OnOff on fall delay
Control signal (the power is "OFF" during HPA receiving period) of HPA power switch (drain voltage) could setup a fall delay time for RF_Trig.

HPA pulse ON on rise delay
Control signal (the power is "OFF" during HPA receiving period) of HPA power switch (pulse voltage) could setup a rise delay time for RF_Trig.

HPA pulse ON on fall delay
Control signal (the power is "OFF" during HPA receiving period) of HPA power switch (pulse voltage) could setup a fall delay time for RF_Trig.

6) STC

STC function
Turn ON or OFF a STC (Sensitivity Time Control) data transmission.

STC curve order #1 - 3
To setup a degree of 1 - 3 STC curve order area.

STC range #1 [km]
To setup a distance of 1st and 2nd STC area.

STC range #2 [km]
To setup a distance of 2nd and 3rd STC area.

STC range # 3 [km]
To setup the last distance of 3rd STC area.

STC Receiving Gain #1 – 3 [dB]
To setup a value of STC receiving gain #1 - 3.

STC Time delay #1 – 3 [us]
To setup a value of STC time delay #1 – 3.
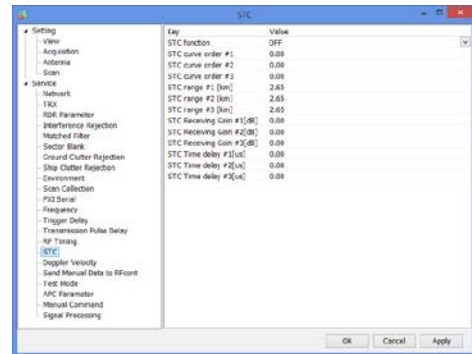
7) Doppler Velocity

Doppler velocity
Turn ON or OFF a doppler velocity calculation.

Phase function
To setup a correlation coefficient when calculate doppler velocity.

Scale output value
For spare.

Velocity threshold
For spare.
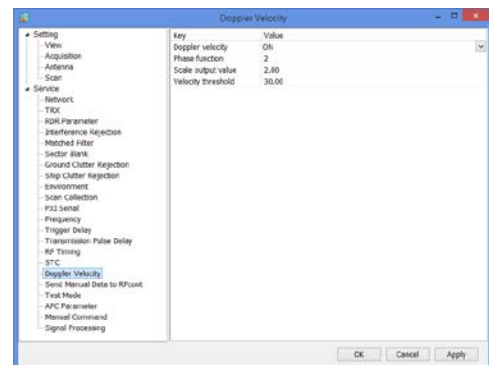
8) Send Manual Data to RFcont

Input manual setting data
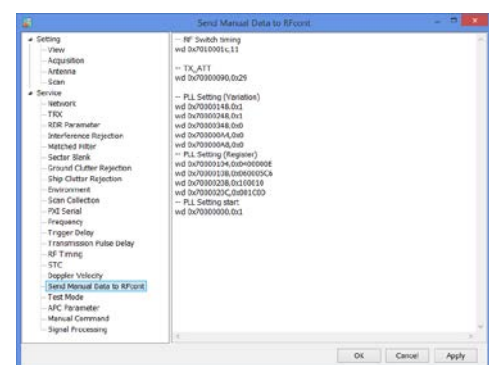
9) **Test Mode**

D00 (RFcont disconnect)
Turn ON or OFF a Rfcont board connection.

D01 (Loop back test)
Turn ON or OFF a loopback test.
Fix setting value of receiving area as each control signal affect to a receiving system.

D02 – 07 (Reserve)
For spare.

D08 (Formed HP, BP inside)
For spare.

D09 – 15 (Reserve)
For spare.

STCIF fixed value
To setup a fixed value of STCIF for the gain of the receiver in the most far distance point.

PXI Loop back
Turn ON or OFF a PXI loopback.
It will receive even during transmitting by shifting forward the start timing if turns "ON".

Antenna mode
To select an antenna mode.
Normal: Use actual machine data
Test mode (PXI internal formation): Use PXI internal formation as an angle for a test.
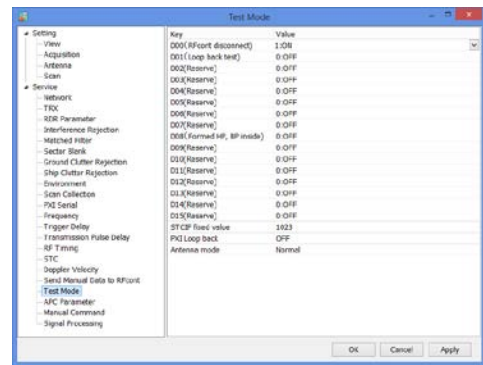
10) **APC Parameter**

Auto transmission power control
Turn ON or OFF an auto transmission output control.

APC coefficient (T5 – 0)
To setup 5th – 0th power of APC coefficient.
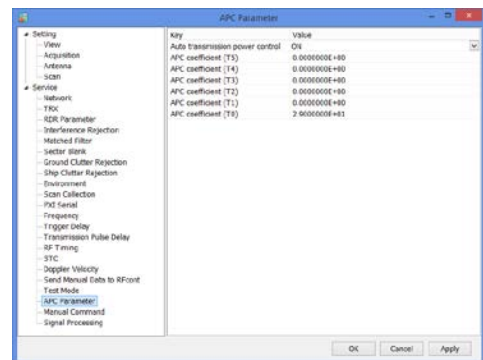
11) Manual Command

It has to select [All Files(*.*)] at extension instead of [*.txt] to open [*.conf] file.

Filter transfer
Open parameter file which is necessary for compact weather radar.
The setup value is for compact weather radar.
However it must have to turn OFF on Ground Clutter Rejection for using selected file because it is not for regular operation.
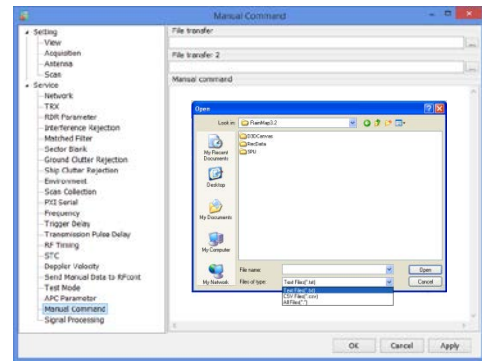
File transfer 1
FAR3000SSD_kisyou_No_32_P0N_GCR_OFF_yyyymmdd.conf
（yyyymmdd means Year/Month/Date）

File transfer 2
FAR3000SSD_kisyou_RFCONT_SNxxxx_ yyyymmdd.conf
（xxxx means a serial number of radar, yyyymmdd means Year/Month/Date）

Manual command
To setup radar command directory

12) Signal Processing

Delta R [km]
To setup a delta range that calculation of Kdp.

Sweep point [ZDR]
To setup a sweep point that calculate Zdr.

Range direction point [ZDR]
To setup a range direction point that calculate Zdr.

Drawing filter coefficient (Rainfall intensity)
To setup a value of drawing filter coefficient (Rainfall intensity).
It convert indication data into LPF in the azimuth direction and improve the visibility of the echo.

Drawing filter coefficient (Doppler speed)
To setup a value of drawing filter coefficient (Doppler speed).
It convert indication data into LPF in the azimuth direction and improve the visibility of the echo.

Drawing filter coefficient (Kdp + Zh)
To setup a value of drawing filter coefficient (Kdp + Zh).
It convert indication data into LPF in the azimuth direction and improve the visibility of the echo.

Noise level (H) [dB]
To setup a noise level (Horizontal).

Noise level (V) [dB]
To setup a noise level (Vertical).

Range direction resolution [m]
To setup a range direction of resolution.

Output power (H) [W]
To setup an output power of transmission (Horizontal).
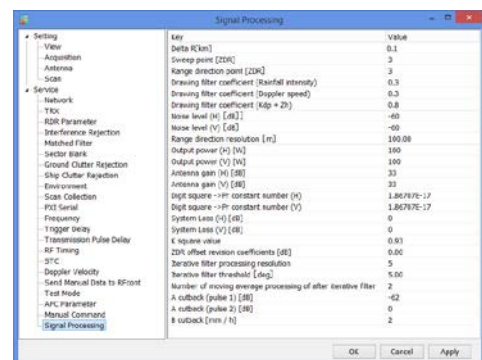
Output power (V) [W]
To setup an output power of transmission (Vertical).

Antenna gain (H) [dB]
To setup a value of antenna gain (Horizontal).

Antenna gain (V) [dB]
To setup a value of antenna gain (Vertical).

Digital square -> Pr constant number (H)
To setup a constant number to convert it into the electricity (Pr) of the antenna edge from a digital data level sampled in ADC (Horizontal polarized wave).

Digital square -> Pr constant number (V)
To setup a constant number to convert it into the electricity (Pr) of the antenna edge from a digital data level sampled in ADC (Vertical polarized wave).

System Loss (H) [dB]
To setup a value of system loss (Horizontal).

System Loss (V) [dB]
To setup a value of system loss (Vertical).

K square value
To setup a K square value (Typical weather radar multiplier).

ZDR offset revision coefficient [dB]
To setup a value of Zdr to revise amplitude deviation of horizontal and vertical.

Iterative filter processing resolution
To setup a number of iterative filter processing for ϕdp calculation.

Iterative filter threshold [deg]
To setup an angle of iterative filter threshold for ϕdp calculation.

Number of moving average processing of after iterative filter
To setup a number of moving average processing of after iterative filter for ϕdp calculation.

A cutback (pulse 1 -2) [dB]
To setup a threshold value for removing (not to indicate on a screen) noise (Pulse 1 - 2).

B cutback [mm/h]
To setup a value of B cutback for removing (not to indicate on a screen) noise.

Notice: Reboot RainMap for saving data which is in "ini" file.

9.3.4. Management list

The management list would be attached with the RainMap to every location for setting.
Sample of default setting is shown below:

- Please setup the correct values belong to the location.
- Key & Value with yellow columns would indicate during factory setting.

1. Setting

Order number	Initial value
Model / Serial number	
Radio station license number	
Name	
Location	

Main menu	sub menu	Key	Value
	View	Range [km]	10
		DataType	Rainfall intensity <Rainfall intensity / Reflective intensity(H) / Reflective intensity(V) / Doppler speed / Zdr [dB] / Kdp [deg/km]>
		Ratio of transparency [%]	50
		Scanning line	ON <ON / OFF>
	Acquisition	Rec echo	ON <ON / OFF>
		Rec file type	dat <dat / ZIP / dat+ZIP>
		Echo folder	C:\Documents and Settings\USER\Desktop\RecData\echo
		Echo zip folder	C:\Documents and Settings\USER\Desktop\RecData\echo_c
		Rec interval [sec]	60
		Rec time [hour]	1000
		Screen capture	ON <ON / OFF>
		Capture folder	C:\Documents and Settings\USER\Desktop\RecData\capture
		Rec interval [sec]	30
		Rec CSV	ON <ON / OFF>
		Echo folder (CSV)	C:\Documents and Settings\USER\Desktop\RecData\csv
		CSV Rec interval [sec]	30
		CSV Rec parameter	BLANK <Rain[mm/h] / Zhh[dBz] / Zvv[dBz] / DS[m/s] / Zdr[dB] / Kdp[deg/km]>
		Multiple parameter output	ON <ON / OFF>
		Multiple parameter output folder	C:\Documents and Settings\USER\Desktop\RecData\multi
		Rainfall information output	ON <ON / OFF>
		Rainfall information output folder	C:\Documents and Settings\USER\Desktop\RecData\rain
	Antenna	Latitude [deg]	34.7136
		Longitude [deg]	135.3352
		Altitude [m]	0.00
		Image	BLANK <Open file>
		Left Top Latitude [deg]	33.0
		Left Top Longitude [deg]	134.0
		Right Bottom Latitude [deg]	35.0
		Right Bottom Longitude [deg]	136.0
	Scan	ScanMode	PPI scan <PPI scan / Spiral scan / Sector RHI scan / HSQ scan>
		HSQ Period [min]	5(12[h]) <1(60[h]) / 2(30[h]) / 3(20[h]) / 4(15[h]) / 5(12[h]) / 6(10[h]) / 10(6[h]) / 12(5[h])>
		PPI elevation [deg]	0.00
		PPI azimuth rotation speed [rpm]	10.00
		SPI operation mode	2[deg], 10.0[rpm] <1[deg],10.0[rpm] / 2[deg],10.0[rpm] / 4[deg],10.0[rpm] / 1[deg],16.0[rpm] / 2[deg],16.0[rpm] / 3[deg],16.0[rpm]>
		SPI lower elevation angle [deg]	2.99
		SPI horizontal scan rotation number	10
		SRHI elevation speed [rpm]	1.98
		SRHI azimuth 0 [deg]	0.00
		SRHI azimuth 1 [deg]	10.02
		SRHI azimuth step [deg]	1.98
		SRHI elevation 0 [deg]	2.99
		SRHI elevation 1 [deg]	39.95
		HSQ elevation movement azimuth rotation speed [rpm]	10.00
		HSQ elevation movement difference rotation speed [rpm]	4.0
		HSQ measurement azimuth rotation speed [rpm]	10.0
		HSQ status delay azimuth revolution [deg]	10.00
		HSQ setting elevation 0 [deg]	0.0
		HSQ setting elevation 1 [deg]	BLANK <Input directly>
		HSQ setting elevation 31 [deg]	BLANK <Input directly>

Enter the correct value belong to the location in RainMap,
and please write down the adjusted values on this management list for your record.

2. Service (Maintenance setting)

Service — MAINTENANCE SETTING	Network	Command transfer IP	192.168.1.100
		Command transfer port	51000
		Data transfer IP	192.168.1.100
		Data transfer port	52000
		FTP server address	192.168.1.100
		FTP server port	50000
	TRX	Echo data mode	IQ Data <IQ Data / Multiple Parameter>
		Rainfall intensity calculation method	Zh method <Zh method / Zh,Kr decay correction method / Zh, dp method / Zh,Zdr method / Zdr,Kdp+Zh method / Kdp+Zh method>
		Sweep decimation	10
		Pulse spec.	21
		Chirp polarity	Up Chirp <Up Chirp / Down Chirp>
		IF frequency [MHz]	93.75
		DAC output Level [dB]	15.00
	RDR Parameter	RF frequency [MHz]	9470.00
		Light speed [m / s]	299792458.00
		Antenna rotation speed (H) [rpm]	10.00
		Beam width (H) [deg]	2.70
		Beam width (V) [deg]	2.70
		Azimuth offset [deg]	290
	Interference Rejection	Interference rejection 0	ON <ON / OFF>
		Power adjustment	Low <High / Low>
		Threshold	800
		Interpolation	ON <ON / OFF>
		Interference rejection 1	ON <ON / OFF>
		Power adjustment	Low <High / Low>
		Threshold	800
		Interpolation	ON <ON / OFF>
	Matched Filter	Matched Filter	ON <ON / OFF>
	Sector Blank	Sector Blank 1	OFF <ON / OFF>
		Azimuth Start angle [deg]	0.00
		Azimuth End angle [deg]	0.00
		Elevation Start angle [deg]	0.00
		Elevation End angle [deg]	0.00
		Sector Blank 2	OFF <ON / OFF>
		Azimuth Start angle [deg]	0.00
		Azimuth End angle [deg]	0.00
		Elevation Start angle [deg]	0.00
		Elevation End angle [deg]	0.00
	Ground Clutter Rejection	Ground clutter rejection	ON <ON / OFF>
		rejection speed [m / s]	2.00
		Auto ground clutter rejection	ON <ON / OFF>
		Elevation of auto ground clutter rejection [deg]	20.00
	Ship Clutter Rejection	Ship clutter rejection	ON <ON / OFF>
		Range direction expansion coefficient	0.40
		SW direction continuity judge point	5
		RainCFAR threshold	12.00
		Auto ship clutter rejection	ON <ON / OFF>
		Elevation of auto ship clutter rejection [deg]	20.00
	Environment	Serial number	1
		Product number	2
		Product name	3
	Scan Collection	Azimuth level collection [deg]	0.00
		Elevation level collection [deg]	0.00

Enter the correct value belong to the location in RainMap,
and please write down the adjusted values on this management list for your record.

3. Service (Factory setting)

Service ---------- FACTORY SETTING ----------	PXI Serial	RF control port	Open <Open / Close>
		Port number	9
		Baud rate [bps]	19200
		Data bit [bit]	8
		Stop bit [bit]	1
		Parity	none <none / odd / even / mark / space>
		ANT control port	Open <Open / Close>
		Port number	6
		Baud rate [bps]	38400
		Data bit [bit]	8
		Stop bit [bit]	1
		Parity	none <none / odd / even / mark / space>
		ANT monitor port	Open <Open / Close>
		Port number	8
		Baud rate [bps]	460800
		Data bit [bit]	8
		Stop bit [bit]	1
		Parity	none <none / odd / even / mark / space>
	Frequency	ADC sampling frequency [MHz]	125.00
		DAC output rate [MHz]	500.00
	Trigger Delay	Trigger delay 1	3
		Trigger delay 2	4
		Trigger delay 3	7
		Trigger delay 4	4
	Transmission Pulse Delay	Transmission Pulse Delay	400
	RF Timing	RFC Pulse ON on rise delay	0
		RFC Pulse ON on fall delay	0
		HPA OnOFF on rise delay	0
		HPA OnOff on fall delay	50
		HPA pulse ON on rise delay	335
		HPA pulse ON on fall delay	25
	STC	STC function	OFF <ON / OFF>
		STC curve order #1	0.00
		STC curve order #2	0.00
		STC curve order #3	0.00
		STC range #1 [km]	2.65
		STC range #2 [km]	2.65
		STC range #3 [km]	2.65
		STC Receiving Gain #1 [dB]	0.00
		STC Receiving Gain #2 [dB]	0.00
		STC Receiving Gain #3 [dB]	0.00
		STC Time delay #1 [us]	0.00
		STC Time delay #2 [us]	0.00
		STC Time delay #3 [us]	0.00
	Doppler Velocity	Doppler velocity	ON <ON / OFF>
		Phase function	2
		Scale output value	2.00
		Velocity threshold	30.00
	Send Manual Data to RFcont		-- RF Switch timing wd 0x7010001c,11 -- TX_ATT wd 0x70000090,0x34 -- PLL Setting (Variation) wd 0x70000148,0x1 wd 0x70000248,0x1 wd 0x70000348,0x0 wd 0x700000A4,0x0 wd 0x700000A8,0x0 -- PLL Setting (Register) wd 0x70000104,0x0400000E wd 0x70000108,0x060005C6 wd 0x70000208,0x100010 wd 0x7000020C,0x001C0D -- PLL Setting start wd 0x70000000,0x1

Enter the correct value belong to the location in RainMap,
and please write down the adjusted values on this management list for your record.

Service ——— FACTORY SETTING ———	Test Mode	D00(RFcont disconnect)	1:ON <0:OFF / 1:ON>
		D01(Loop back test)	0:OFF <0:OFF / 1:ON>
		D02(Reserve)	0:OFF <0:OFF / 1:ON>
		D03(Reserve)	0:OFF <0:OFF / 1:ON>
		D04(Reserve)	0:OFF <0:OFF / 1:ON>
		D05(Reserve)	0:OFF <0:OFF / 1:ON>
		D06(Reserve)	0:OFF <0:OFF / 1:ON>
		D07(Reserve)	0:OFF <0:OFF / 1:ON>
		D08(Formed HP, BP inside)	0:OFF <0:OFF / 1:ON>
		D09(Reserve)	0:OFF <0:OFF / 1:ON>
		D10(Reserve)	0:OFF <0:OFF / 1:ON>
		D11(Reserve)	0:OFF <0:OFF / 1:ON>
		D12(Reserve)	0:OFF <0:OFF / 1:ON>
		D13(Reserve)	0:OFF <0:OFF / 1:ON>
		D14(Reserve)	0:OFF <0:OFF / 1:ON>
		D15(Reserve)	0:OFF <0:OFF / 1:ON>
		STCiF fixed value	1023
		PXI Loop back	OFF <ON / OFF>
		Antenna mode	Normal <Normal / Test mode(PXI internal formation)>
	APC Parameter	Auto transmission power control	OFF <ON / OFF>
		APC coefficient (T5)	3.421758E-08
		APC coefficient (T4)	-4.281629E-07
		APC coefficient (T3)	-2.259742E-05
		APC coefficient (T2)	3.822006E-03
		APC coefficient (T1)	1.186899E-01
		APC coefficient (T0)	4.086327E+01
	Manual Command	File transfer	BLANK <Open file>
		File transfer 2	BLANK <Open file>
		Manual command	BLANK <Input directly>
	Signal Processing	Delta R [km]	0.1
		Sweep point [ZDR]	3
		Range direction point [ZDR]	3
		Drawing filter coefficient (Rainfall intensity)	0.3
		Drawing filter coefficient (Doppler velocity)	0.3
		Drawing filter coefficient (Kdp + Zh)	1.0
		Noise level (H) [dB]	0
		Noise level (V) [dB]	0
		Range direction resolution [m]	100.00
		Output power (H) [W]	100
		Output power (V) [W]	100
		Antenna gain (H) [dB]	34
		Antenna gain (V) [dB]	34
		Digit square →Pr constant number (H)	7.76427E-16
		Digit square →Pr constant number (V)	7.76427E-16
		System Loss (H) [dB]	0
		System Loss (V) [dB]	0
		K square value	0.93
		ZDR offset revision coefficients [dB]	0.00
		Iterative filter processing resolution	5
		Iterative filter threshold [deg]	5.00
		Number of moving average processing of after iterative filter	2
		A cutback (pulse 1) [dB]	-60
		A cutback (pulse 2) [dB]	-60
		B cutback [mm / h]	2

Enter the correct value belong to the location in RainMap,
and please write down the adjusted values on this management list for your record.

9.4. Radar Operation

1) Turn on the power of Display Unit (PC)

2) Software will start automatically.

3) Click [Connect] button to start radar operation.

    [Connect] will be indicated in the left bottom.

4) Click [TX] button to start observation.

    Radar echo will indicate with rotate scanning line

    after the message of [Initializing] on the screen.

5) Click [STBY] button to stop observation.

6) Click [Disconnect] button to stop connecting with radar.

Notice) The following command could not operate

    without connecting radar:

- Radar operation

    (Connect/Disconnect, TX/STBY)

- Screen capture

This white line is a scanning line
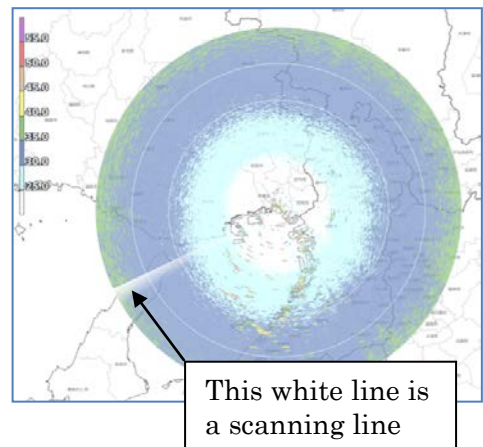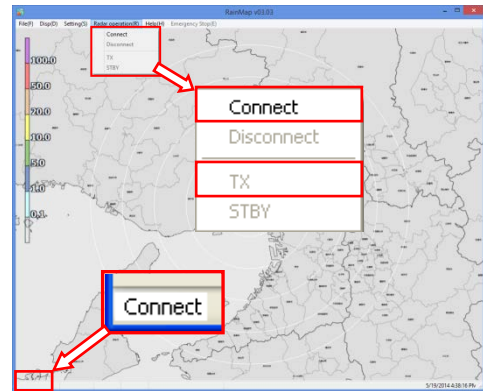
9.5. Help

- Version:

To indicate the version information of software .
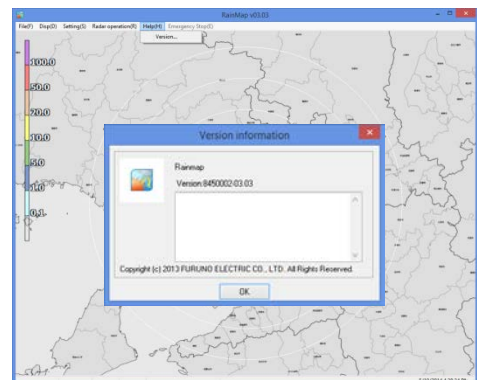
9.6. Emergency Stop

- Stop motor:

To stop motor of radar and TX at once.
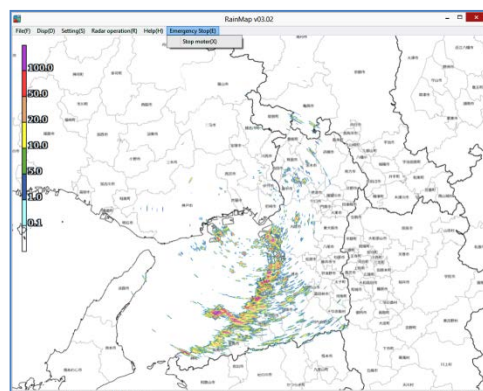
9.7. Adjustment of Azimuth

The real geographical feature and azimuth are different with the initial echo indication, therefore it has to make an adjustment.

Notice: Ground Clutter Rejection must be "OFF" during this operation.

1) Use a map of geographical features around the place installed the radar unit. (e.g. Google map)

2) Setup "Range [km]", "Data Type", in [View] setting menu of RainMap.

View		
Setting	Key	Value
View	Range [km]	10
Acquisition	DataType	Rainfall intensity
Antenna	Ratio of transparency [%]	50
Scan	Scanning line	ON
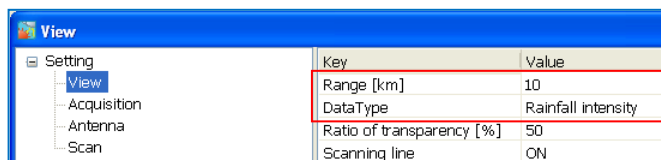
3) Setup "PPI elevation" in [Scan] setting menu of RainMap.

Scan
Setting
View
Acquisition
Antenna
Scan

Scan pattern: ⊙1 ○2 ○3 ○4 ○5

Key	Value
ScanMode	HSQ scan
HSQ Period[min]	5(12/[h])
PPI elevation [deg]	0.00
PPI azimuth rotation speed [rpm]	10.00
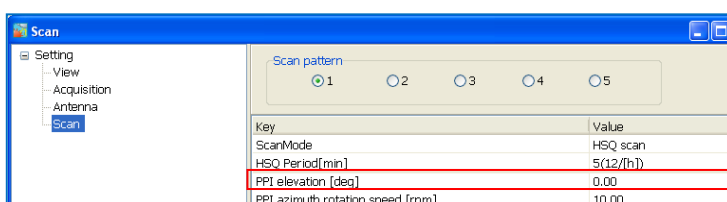
4) Setup "Azimuth Offset" in [RDR Parameter] setting menu of RainMap.

RDR Parameter
Setting
View
Acquisition
Antenna
Scan
Service
Network
TRX
RDR Parameter
Interference Rejection

Key	Value
RF frequency [MHz]	9470.00
Light speed [m/s]	299792458.00
Antenna rotation speed (H) [rpm]	10.00
Beam width (H) [deg]	2.70
Beam width (V) [deg]	2.70
Azimuth offset	290

〈Image screen〉
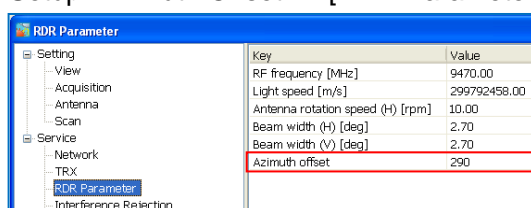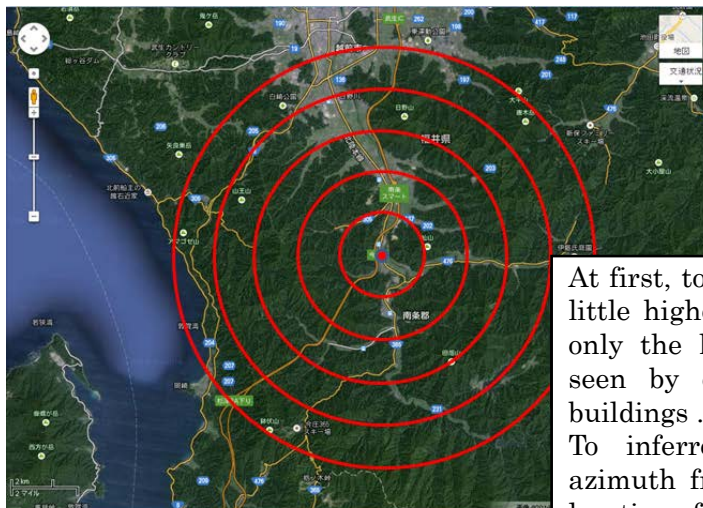
Location
(Date)

At first, to setup an Antenna elevation a little higher to 5 degree. Next, to make only the higher mountain that can be seen by echo instead of surrounding buildings .
To inferred a correct echo indicate azimuth from characteristic echo and a location of mountain map.

Zh echo
Elevation 5 degree
Range 10km
No.32 P0N transfer
GCR OFF
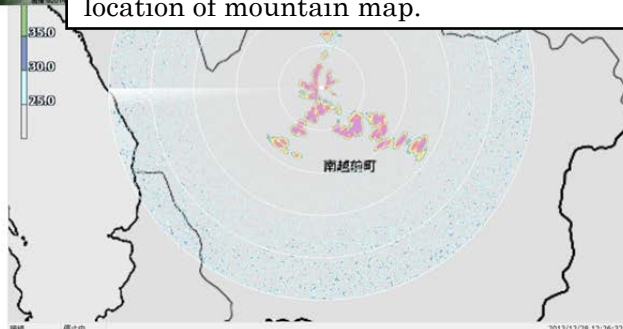
5) Click [STBY] from [Radar operation] to Stop TRX.

6) Indicate a map and RainMap on a screen (or use other PC to see a map).

7) To grasp a characteristic geographical feature (check some top of the mountains' line form, distance, and relative bearing) from map.

8) To transfer the wavelength to a higher direction for not to receive an echo from lower building or structure after setting elevation to 5 degrees (It could be 3 to 7 degrees in some case) in RainMap.

9) To setup a distance that could be easier to confirm a geographical feature of "3)" to "Range [km]" in [View] setting menu of RainMap.

10) To setup "Reflective Intensity [H]" at "DataType" in [View] setting menu of RainMap.

11) To confirm an echo after starting [TX] from [Radar operation]. Purple part means a strong echo that might be came from a mountain.

12) Click [STBY] from [Radar operation] before make any change for setting. Then, to change an angle of "Azimuth Offset" in [RDR Parameter] service menu of RainMap by comparing a shape of echo with "3)" and "7)".   Echo indication will be rotated to clockwise if entered a large value at "Azimuth Offset".   (Available range: -360 to 360)

13) Repeat a step "7)" to "8)" until an echo accords with a geographic feature

14) Click [STBY] from [Radar operation] after finished "9)".

15) To set 0 degree at [Elevation] in [View] setting menu of RainMap.

16) To set a distance that suitable for the field at "Range [km]" in [View] setting menu of RainMap.

17) To select "Rainfall Intensity" at [DataType] in [View] setting menu of RainMap.

18) Finish a setting

9.8. Total operation test

Click [TRX] from [Radar operation] to confirm that a structure of a circumference is indicated.

1) To change a file which had changed at "11) Manual command" setting menu of RainMap. It changes only to [File transfer].
FAR3000SSD_kisyou_No_32_P0N_yyyymmdd.conf（yyyymmdd means Year/Month/Date）

2) To confirm that an echo appears when started [TRX] from [Radar operation].

3) Click [STBY] from [Radar operation] to stop TRX.

4) To follow the same process of "1)" to change a file.
FAR3000SSD_kisyou_No_29_Q0N_yyyymmdd.conf（yyyymmdd means Year/Month/Date）

5) To confirm that an echo appears when started [TRX] from [Radar operation].

6) Click [STBY] from [Radar operation] to stop TRX.

7) To follow the same process of "1)" to change a file.
FAR3000SSD_kisyou_No_36_P0N+Q0N_PPI_yyyymmdd.conf
（yyyymmdd means Year/Month/Date）.

8) Click [TRX] from [Radar operation] to confirm that an indication would shift an echo when a scanning line rotates in every round.

9) Click [STBY] from [Radar operation] to stop TRX.

10) To select the best file at last by the local situation. Or to change the necessary setting like as elevation to finish it.

Notice: To keep the setting according to the local situation at last. Make sure to turn ON/OFF the power of radome and /or PC, and TRX/STBY the radar operation.

10. Menu Tree

RainMap ── **Menu [File]** ───── **Menu [File Play.]**
                                   Menu [Snapshot]
                                   Menu [Exit]

── **Menu [Disp]** ───── **Menu [Disp select]** ── **Menu [2D]**
                                                 Menu [3D]

                         Menu [Sub echo]

                         Menu [Information Indication]

── **Menu [Setting]** ───── **Input [View]**
                           Input [Acquisition]
                           Input [Antenna]
                           Input [Scan]

── **Menu [Radar Operation]** ── **Menu [Connect]**
                                Menu [Disconnect]
                                Menu [TX]
                                Menu [STBY]

── **Menu [Help]** ───── **Menu [Version]**

── **Menu [Emergency Stop]** ── **Menu [Stop motor]**

RainPlay

```
├── Menu [File] ────────┬── Menu [File Play]
│                       │
│                       ├── Menu [Print] ──────┬── Menu [Main screen]
│                       │                      │
│                       │                      └── Menu [SRHI screen]
│                       │
│                       └── Menu [Exit]
│
├── Menu [Setting] ─────┬── Input [Scale]
│                       │
│                       └── Input [Azimuth Offset]
│
├── Menu [Disp] ────────┬── Menu [Select] ── Menu [View] ──┬── Input [Rain]
│                       │                                  ├── Input [Zhh]
│                       │                                  ├── Input [V]
│                       │                                  ├── Input [Zdr]
│                       │                                  ├── Input [Kdp]
│                       │                                  ├── Input [φdp]
│                       │                                  ├── Input [phv]
│                       │                                  └── Input [W]
│                       │
│                       ├── Menu [Transparency] ──┬── Input [0%]
│                       │                         ├── Input [25%]
│                       │                         ├── Input [50%]
│                       │                         ├── Input [75%]
│                       │                         └── Input [100%]
│                       │
│                       ├── Menu [Map]
│                       ├── Menu [SRHI screen]
│                       └── Menu [Clear]
│
├── Menu [Play] ────────┬── Menu [Start]
│                       ├── Menu [Stop]
│                       ├── Menu [Pause]
│                       ├── Menu [Fast Forward]
│                       ├── Menu [Rewind]
│                       └── Menu [Time Display]
│
└── Menu [Print screen ] ──┬── Menu [Main screen]
                           └── Menu [SRHI screen]
```

11. Specification

11.1. Antenna Unit

Parameter	Descriptions	Remarks
Transmit Frequency	9470 MHz	
Occupied Band Width	60 MHz or less	
Maximum range	Approx. 30km	
Doppler measurement	Max. 79m/sec	
Power supply	100-240VAC, Single Phase, 50/60 Hz	
Power consumption	Max. 350W	
Rated Ampere	1.5-3.5A	
Size	Φ1086mm×H1024mm	radome size
Weight	65kg (144lb)	
Operating Temperature	-10 to +50°C	
Storage Temperature	-20 to +60°C	
Water & Dust proof	IPX5	
Maximum wind survival	60.0m/sec	
Type of Emission	P0N(*1), Q0N(*2), V0N(*3)	
Peak Power	100 W	Horizontal and Vertical each
Duty Ratio	Up to 12 %	
Pulse Width	0.1 – 50μs	
Pulse Repetition Frequency	600 – 2500 Hz	
Frequency Shift	2 – 20 MHz	except P0N
Antenna Type	Cassegrain	
Aperture Size	Φ750 mm	
Antenna Gain	33.0 dBi	
Antenna Polarity	Dual polarimetric	Vertical and Horizontal
Beam Width	2.7 degrees	Both Horizontal and Vertical
Antenna Rotation Speed	2 to 16 rpm	Adjustable
Horizontal Scan Angle	360 degrees	Continuously-rotating
Vertical Scan Angle	-2 to 90 degrees	
Resolution of Angle	0.1 degrees	
Precision of Angle	0.2 degrees	

*1 P0N : Sequence of pulses without modulation.
*2 Q0N : Sequence of pulses, frequency modulation within each pulse.
*3 V0N : Combination of P0N and Q0N.

11.2. Signal Processing Unit

Parameter	Descriptions
Data Output	Reflectivity factor Zh (dBZ), Doppler velocity V (m/s),Doppler velocity width W(m/s), Cross polarization difference phase φdp(deg), Specific differential phase KDP(deg/km), Correlation coefficient between teo polarizations ρHV, Differential reflectivity factor ZDR,Rainfall intensity R (mm/h)
Scan modes	PPI,CAPPI,RHI(Sector Scacn availiable)
Ground clutter Rejection	Enable
Data Correction	Distance attenuation, Rain attenuation, Excessive Doppler velocity, Suppression of signal returns from lan, Clutter suppression
Interface	LAN 1 port, Ethernet 1000 Base-T (Cat5e or more)
Power supply	100-240VAC, Single Phase, 50/60 Hz
Power consumption	Max. 650W include Antenna Unit
Rated Ampere	2.7-6.5A
Size	W725mm×D300mm×H750mm
Weight	50kg (111lb)
Operating Temperature range	-10 to +50**°C**
Storage Temperature range	-20 to +60**°C**
Water & Dust proof	IPX5

11.3. Display Unit

Receive data from Signal Processing Unit (SPU) to indicate a picture of rainfall in real time.

Hardware	
Parameter	**Descriptions**
Main	General Laptop PC
Power supply	100-240VAC, 50/60Hz
Power consumption	Max. 200W
Rated Ampere	0.8-2.0A
CPU	Core-i7 (2.3GHz) minimum
RAM	4GB minimum
HDD	500GB minimum
OS	Windows8 64bit professional
Internal LAN	x1 port, 1000base-T (Connect to SPU)
LAN Adapter	USB3.0 1000base-T adapter x1 (Access with outside PC)
I/O	USB2.0×1 port, and USB3.0×1 port minimum
Video Tip	GeForce GTX 650M minimum
Display	17inch minimum
Resolution	1920×1080
Storage	DVD±R/RW
Display Data	Rainfall echo Doppler velocity (m/s)
Data Output	Rainfall strength (mm/h) data file, Output 1 to 5 per minutes.
Operating Temperature	+10 to +35**°C**
Display Software	
Name	Furuno RainMap.exe
Function	Receive data from Signal Processing Unit (SPU) to indicate a picture of rainfall in real time. And also to use cycle setting to make an observation data file.
Software of remote maintenance function	
Name	TeamViewer GmbH
Version	TeamViewer Host (For remote server) 8.0 minimum
Function	Download the observation data and/or to set up an indicated software connecting by remote.
Requirement	It must be connecting to internet

12. APPENDIX
12.1. Outline drawing
1) Antenna unit

2) Storage box

TABLE 1

DIMENSIONS (mm)	TOLERANCE (mm)
L ≦ 50	± 1.5
50 < L ≦ 100	± 2.5
100 < L ≦ 500	± 3
500 < L ≦ 1000	± 4

Over 900

Over 120°

Over 860

Door Open/Close space
(Scale 1:20)

NOTICE
CABLE INSTALLATION PORT: Connect by PF tube. PF-28 (4PCS)
MASS: External cable is not included.

TITLE	WR-2100		
NAME	Signal Processing Unit		
SCALE	1:10	MASS ±10%	50 kg
		OUTLINE DRAWING	

Date 2012/08/09

DWG.No. 52-037-202G-2

FURUNO ELECTRIC CO., LTD.

6 – φ9 (Rear side)

750
600
360
120
50
250
250
600
108
674
66
150
340
355

Cable installation port

4 – φ14
200
120
120
120
φ12
Air vent

300
268

120
85
36
17.5
282.5
235
640

φ20
Drain hole
"#" ONLY

FURUNO

3) Radome mount plate (Type A)

TABLE 1

DIMENSIONS (mm)	TOLERANCE (mm)
L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

FURUNO

NOTICE
SURFACE TREATMENT: Follow to RoHS basis of selection (07B-B-062.)
QUOLITY OF EXTERNAL APPEARANCE: 07A-Q-025 Standards Class 4.

TITLE: WR-2100
NAME: Mount Plate for Radome
SCALE: 1:5   MASS: ±10%   15 kg
OUTLINE DRAWING

TYPE A
Date: 2013/12/19
DWGNo.: 52-037-2301-1

FURUNO ELECTRIC CO., LTD.

10
800
720
40
20
60
60
220
60
60
900
460
250
100
450
100
120
5×φ30
8×φ16
10−φ20
6−C20
2−R50
φ300
φ500
φ600
8×φ9
100°
120°
120°
110°
120°
70°
45°
55°
30°
40°
67.5°
67.5°

19)　　Radome mount plate (Type B)

TABLE 1

DIMENSIONS (mm)	TOLERANCE (mm)
L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

NOTICE
SURFACE TREATMENT: Follow to RoHS basis of selection (07B-B-062.)
QUOLITY OF EXTERNAL APPEARANCE: 07A-Q-025 Standards Class 4.

TITLE		WR-2100
NAME		Mount Plate for Radome
SCALE	1:5	MASS ±10%　15 kg
		OUTLINE DRAWING
TYPE B		
Date	2013/12/19	
DWGNo.	52-037-2302-0	

FURUNO ELECTRIC CO., LTD.

12.2. System diagram
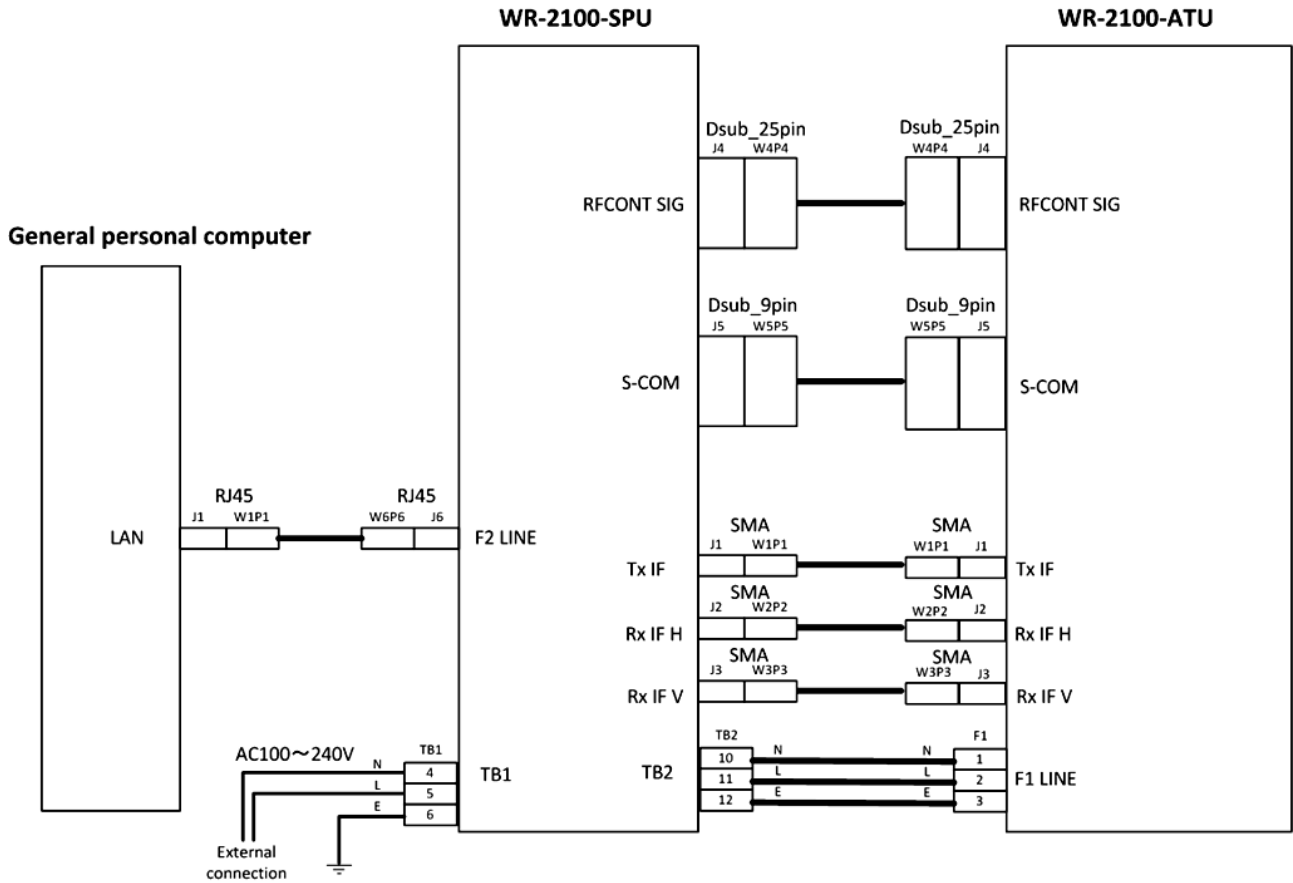
AC100～240V

Notice: Cable colors vary by country.

RJ45

Dsub 9pin

S-COM

Dsub_9pin Female	MOTOR CTRL	Dsub_9pin Male

SPU

Antenna Unit

S-COM

1	BLACK	1
4	ORANGE	2
5	YELLOW	3
8	GREEN	4
9	BLUE	5

Dsub_9pin Female — ANT ANGLE

1	BLACK	
4	ORANGE	6
5	YELLOW	7
8	GREEN	8
9	BLUE	9

Dsub 25pin

Dsub_9pin Female — RF CTRL

RFCONT SIG

Dsub_25pin Male

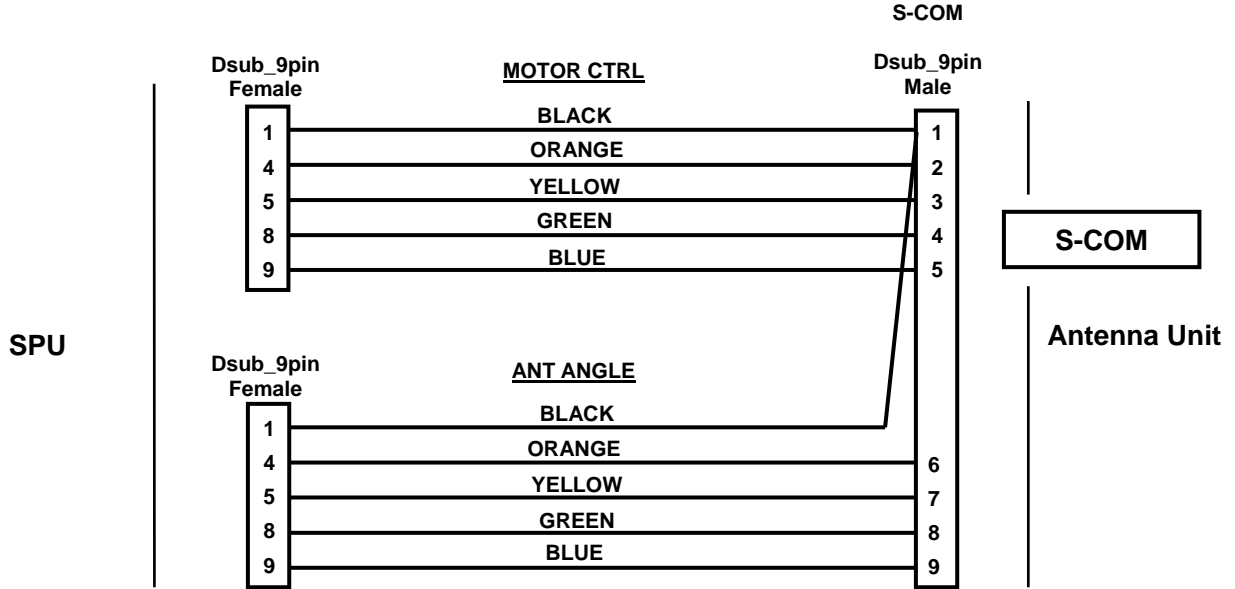| 1 | BLACK | 1 | SPU-TX-P |
4	ORANGE	14	SPU-TX-N
5	YELLOW	2	GND
8	GREEN	15	GND
9	BLUE	3	SPU-RX-P
		16	SPU-RX-N

RFCON SIG

SPU

Antenna Unit

Dsub_25pin Male

10	BROWN	4	RF_TRIG-P
22	RED	17	RF_TRIG-N
9	ORANGE	5	GND
21	YELLOW	18	GND
8	GREEN	6	TRIG-ACK-P
20	BLUE	19	TRIG-ACK-N
7	BROWN	7	Pulse_No(1)-P
19	RED	20	Pulse_No(1)-N
6	ORANGE	8	GND
18	YELLOW	21	GND
5	GREEN	9	Pulse_No(0)-P
17	BLUE	22	Pulse_No(0)-N
4	BROWN	10	TRX_ON-P
16	RED	23	TRX_ON-N
3	ORANGE	11	GND
15	YELLOW	24	GND
2	GREEN	12	Sector_Blank_N
14	BLUE	25	Sector_Blank_N
1	BLACK	13	GND

HDMI

Level Convert