Riometer Install Manual

(For Marion Island)

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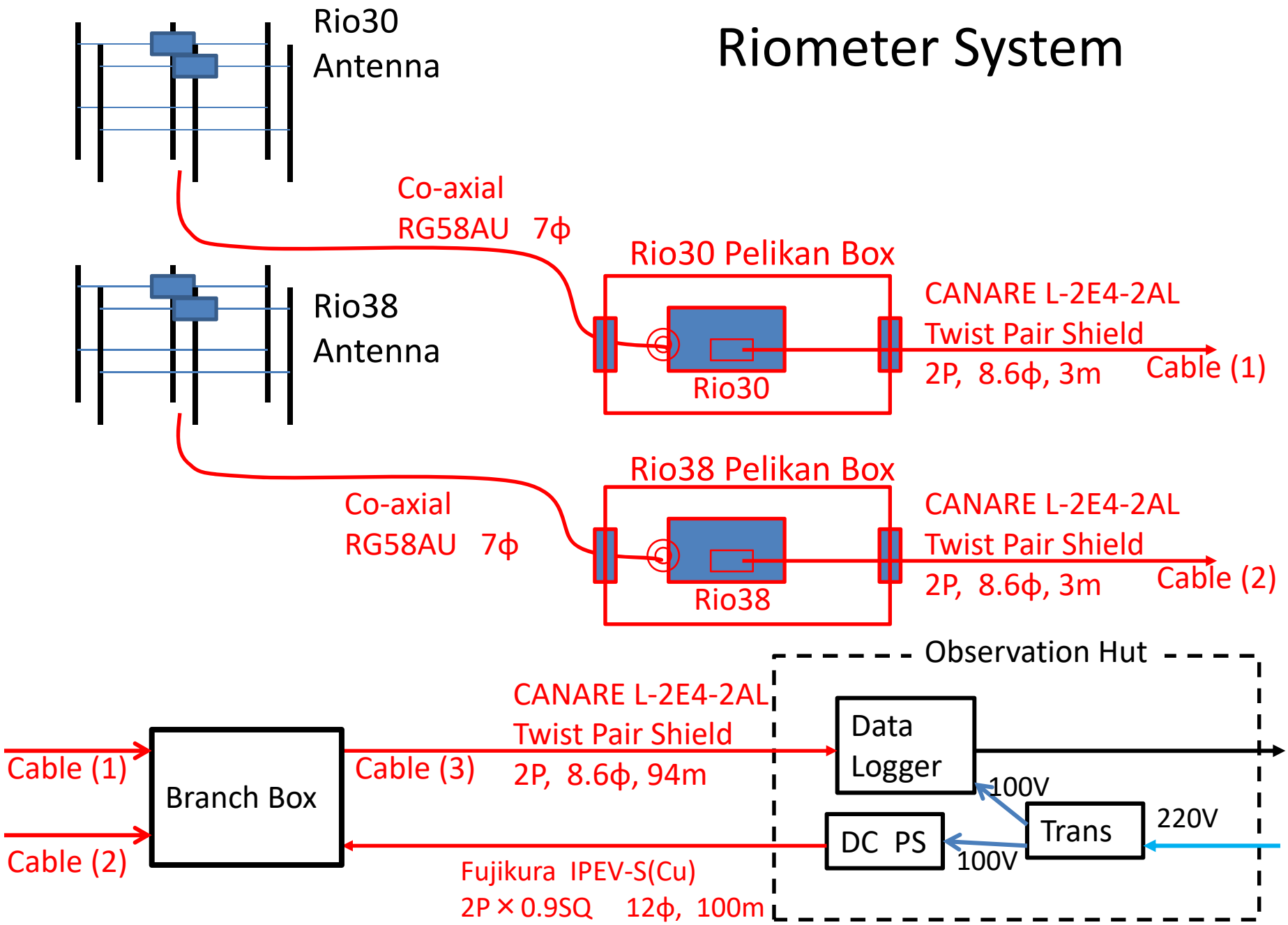
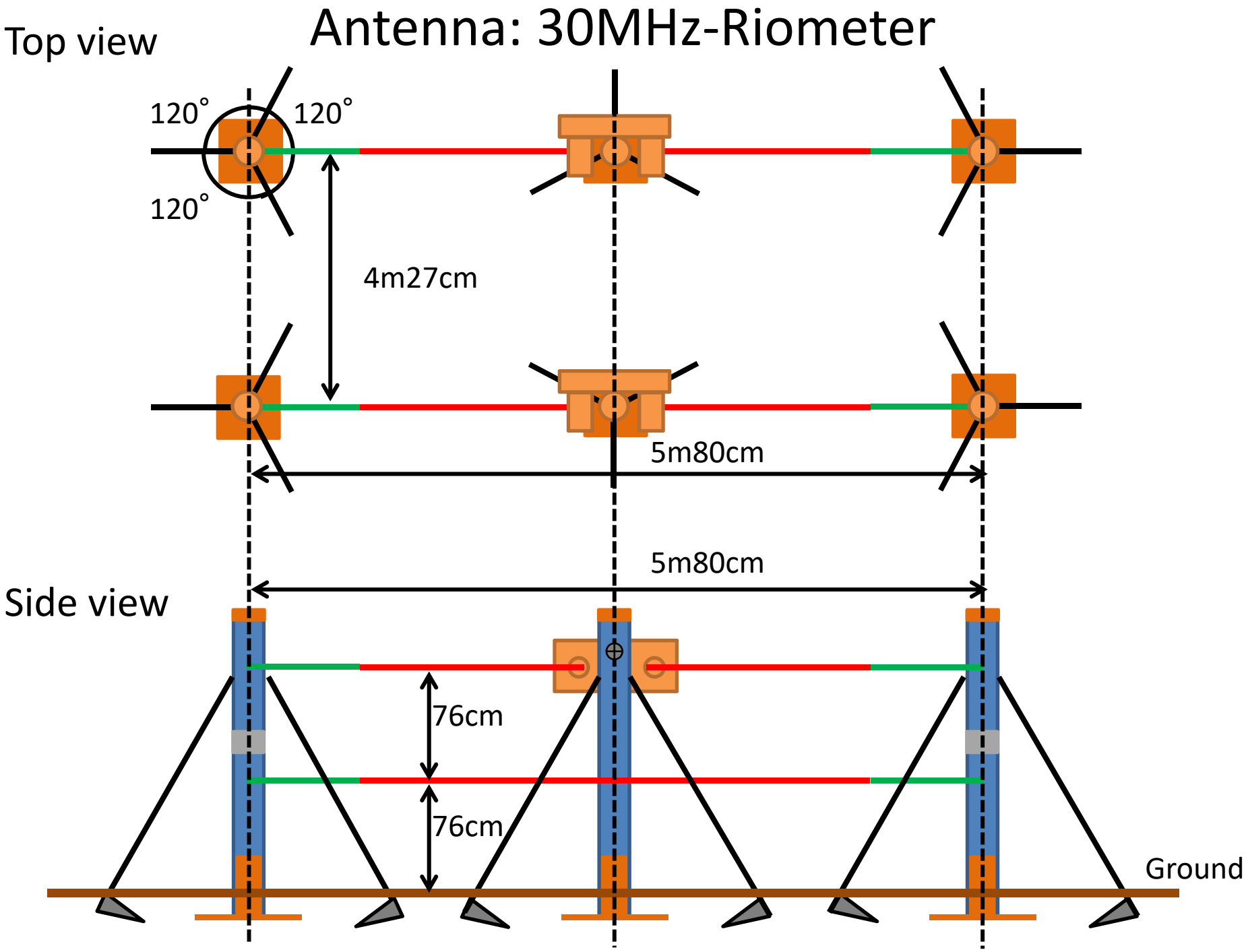
Tools

- Tape measure (50m)
- Level
- Hammer
- Screwdrivers (phillips, flathead)
- Wrenches
- Ropes to tie cables
- Self-bonding tape
- Electrical tape
- Steel wire to fix turnbuckles.
- Needles to fix the antenna bases

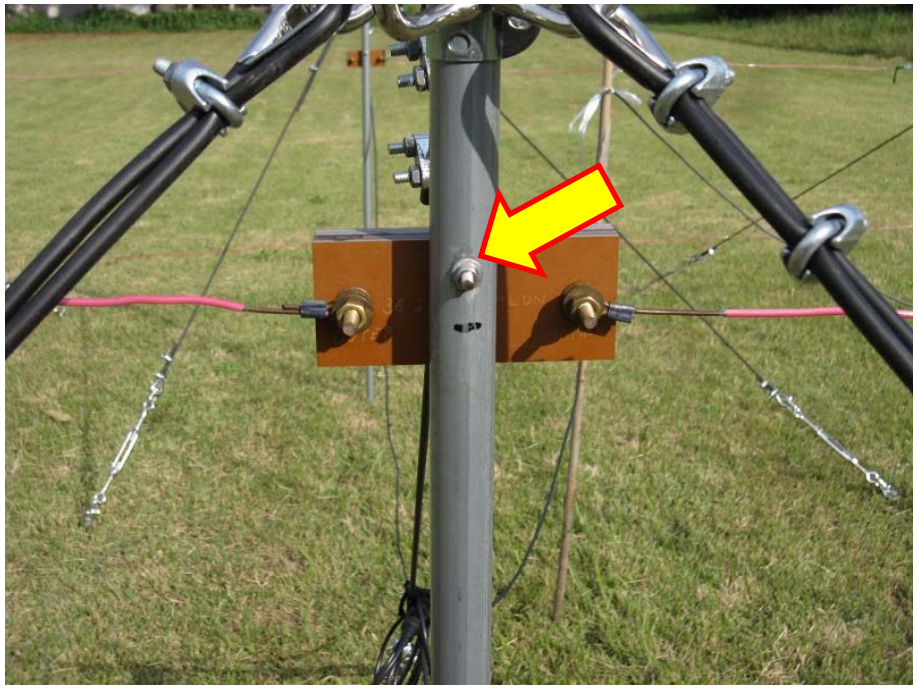
Riometer System



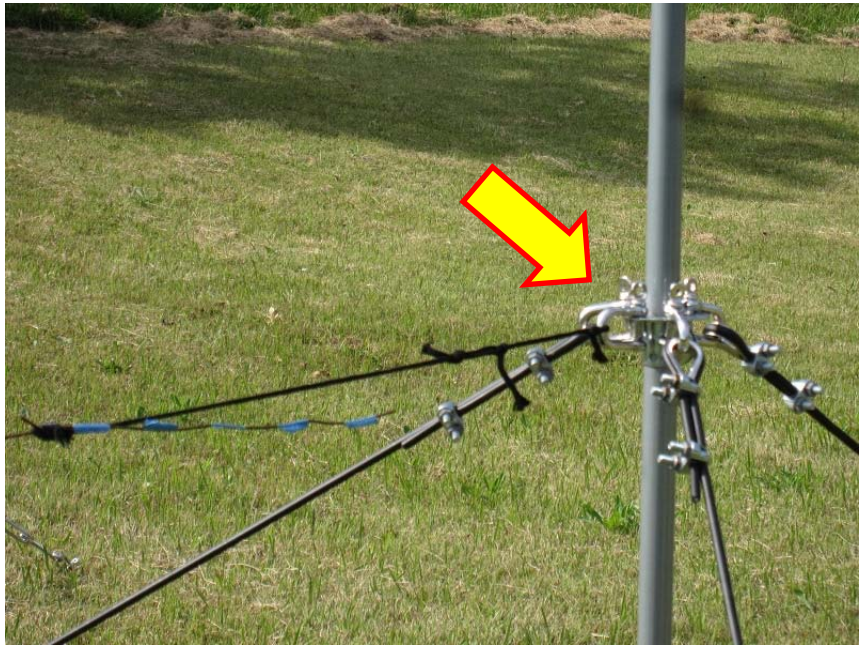

Antenna: 30MHz-Riometer
Top view
120°
120°
120°
4m27cm
5m80cm
5m80cm
Side view
76cm
76cm
Ground

Antenna: 30MHz-Riometer

Antenna poles



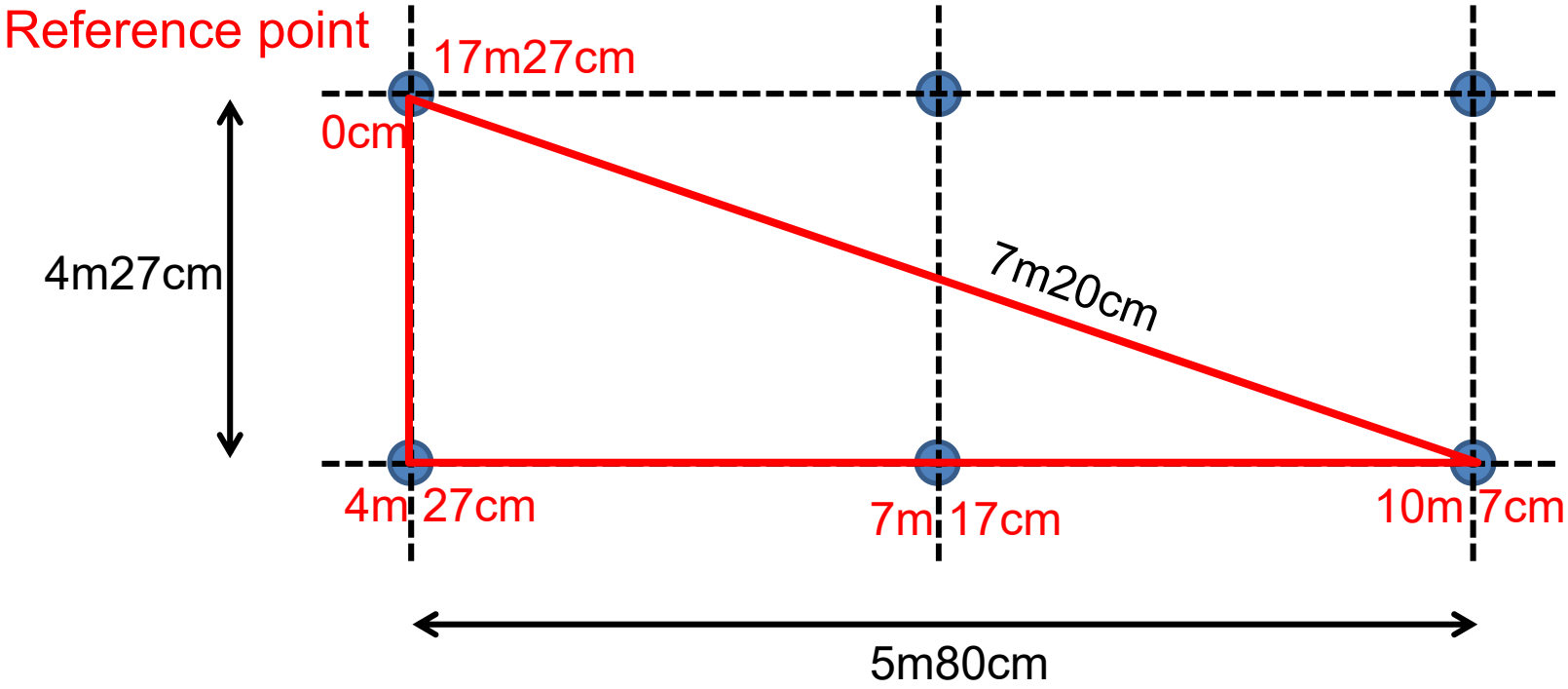
The poles at the center have a hole for fixing the balun.



The rings for the poles at both ends are used to fix the ropes with antenna elements, so the rings should be positioned at the height of the elements (i.e., 152cm for 30MHz and 120cm for 38.2Mhz).

Positioning of Antenna Poles (30MHz)

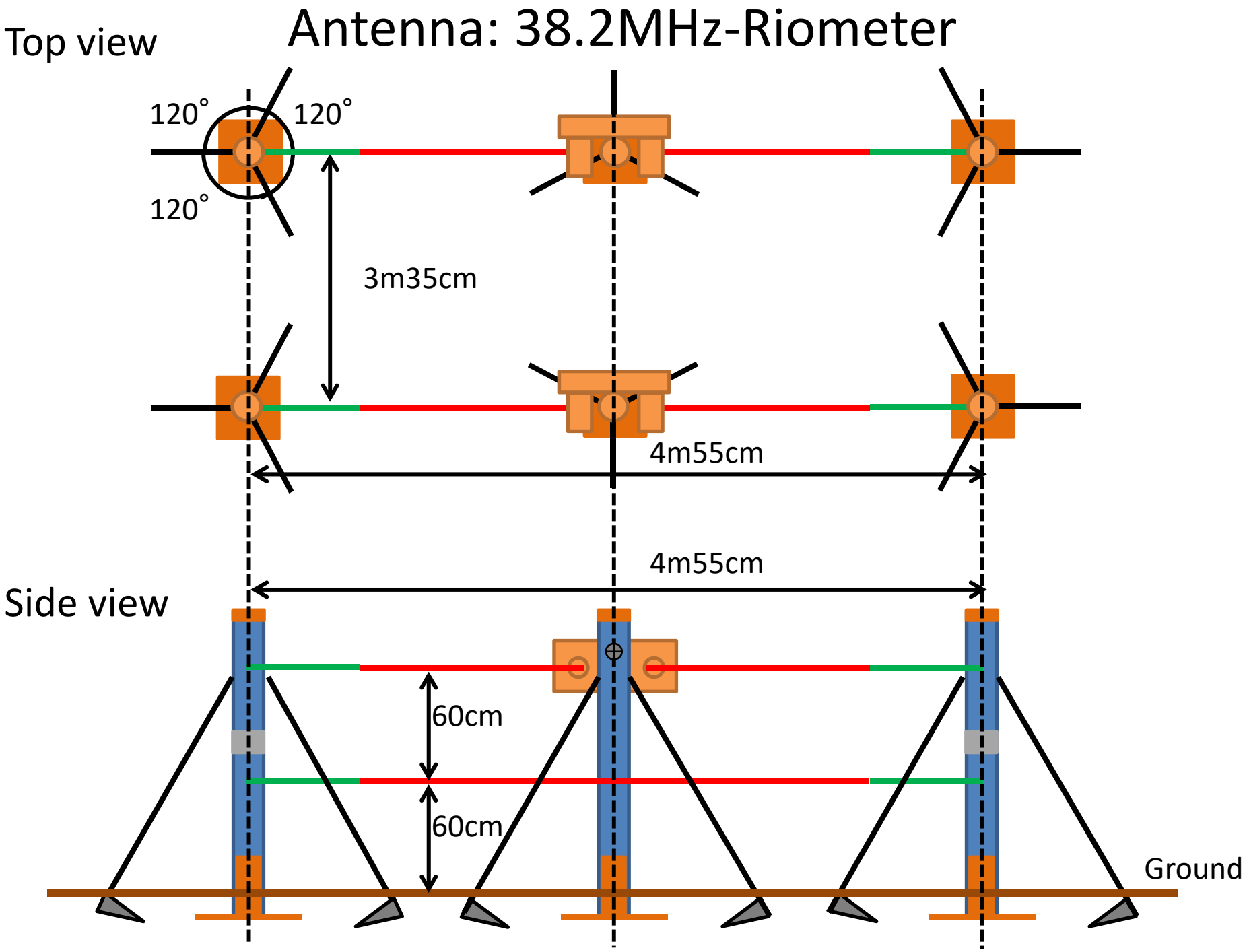
Make a triangle by using a tape measure



Red letters indicate the distance from the reference point.

Set antenna bases at the pole positions.

Fix the bases with nails.

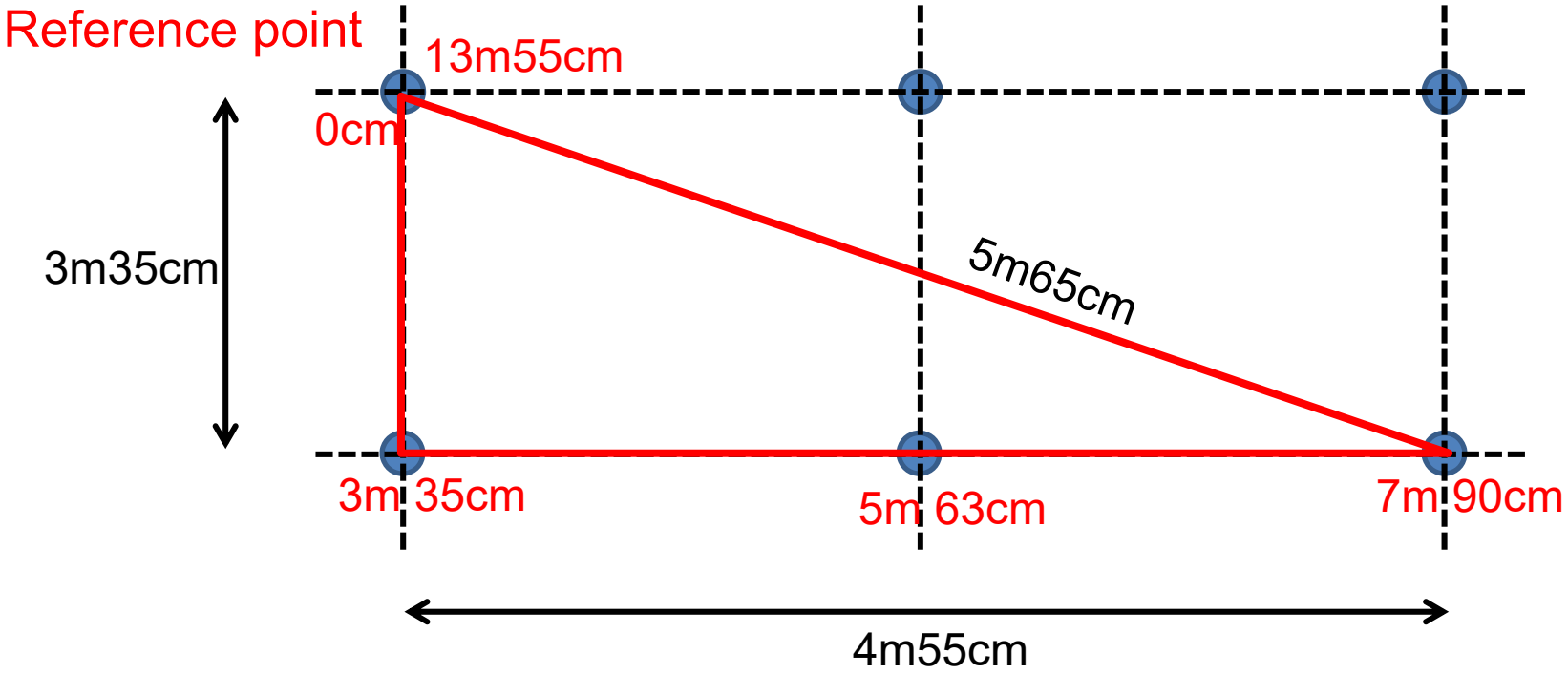

Top view
Antenna: 38.2MHz-Riometer
120°
120°
120°
3m35cm
4m55cm
4m55cm
Side view
60cm
60cm
Ground

Antenna: 38.2MHz-Riometer

The ring with stays at the center poles are fixed above the balun.

Positioning of Antenna Poles (38.2MHz)

Make a triangle by using a tape measure



Red letters indicate the distance from the reference point.

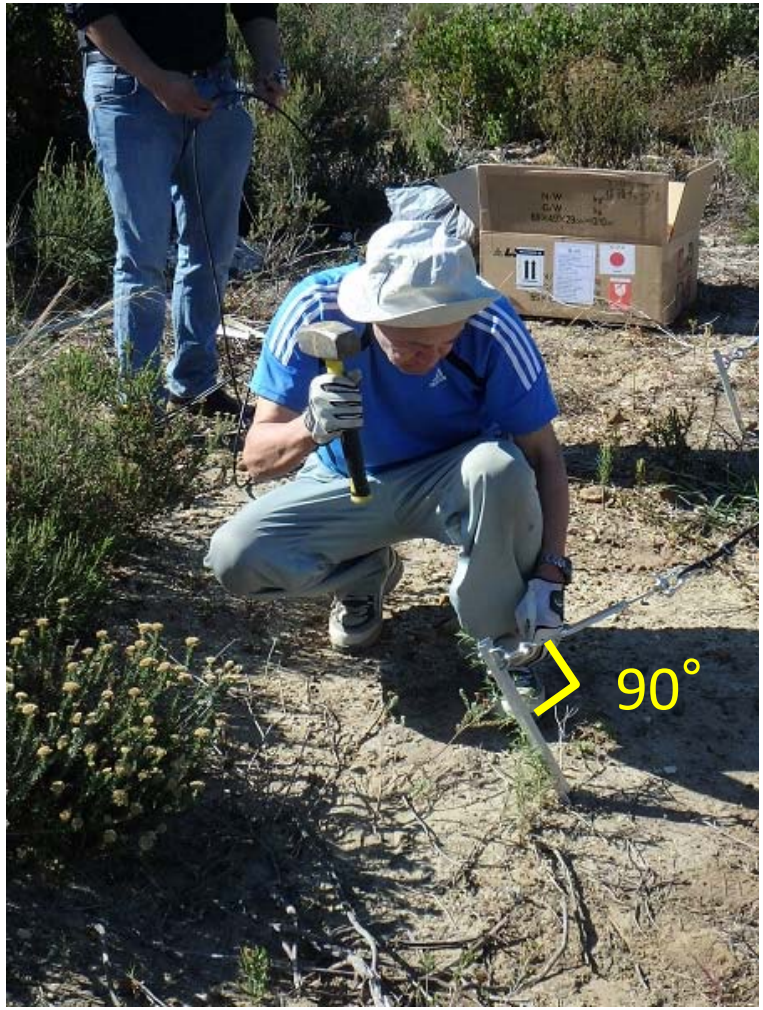
Set antenna bases at the pole positions.

Fix the bases with nails.

Build antenna poles 1

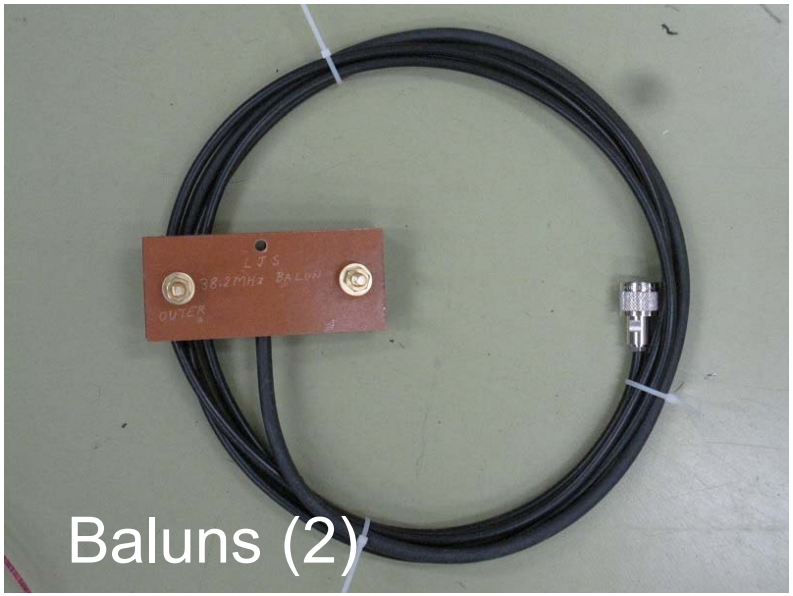
① Fasten the metal parts with Phillips head screwdriver.
② Set a ring with stays to the poles.
③ Connect stays with anchors by using Shackles. Before the connection, please adjust the length of turnbuckles.

Build antenna poles 2



④Fix poles with stays and anchors.
Set the anchors with a hammer.
⑤Adjust the length of turnbuckles to make the pole vertical by using level.

Fix antenna elements 1

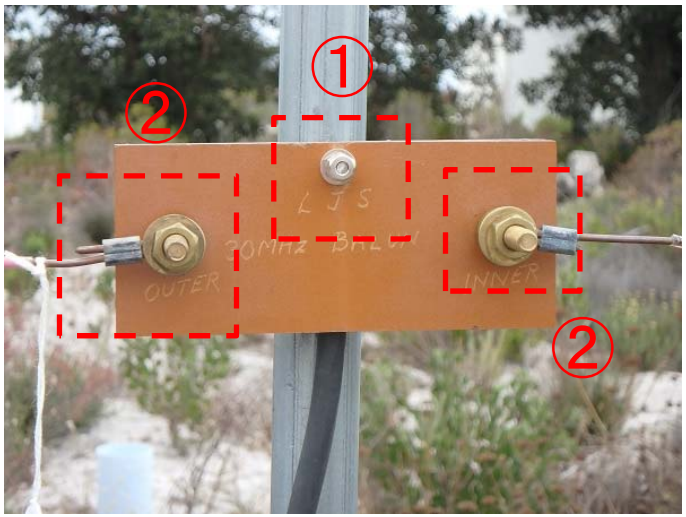


Baluns (2)

Antenna elements (4)

Reflectors (2)

Fix antenna elements 2

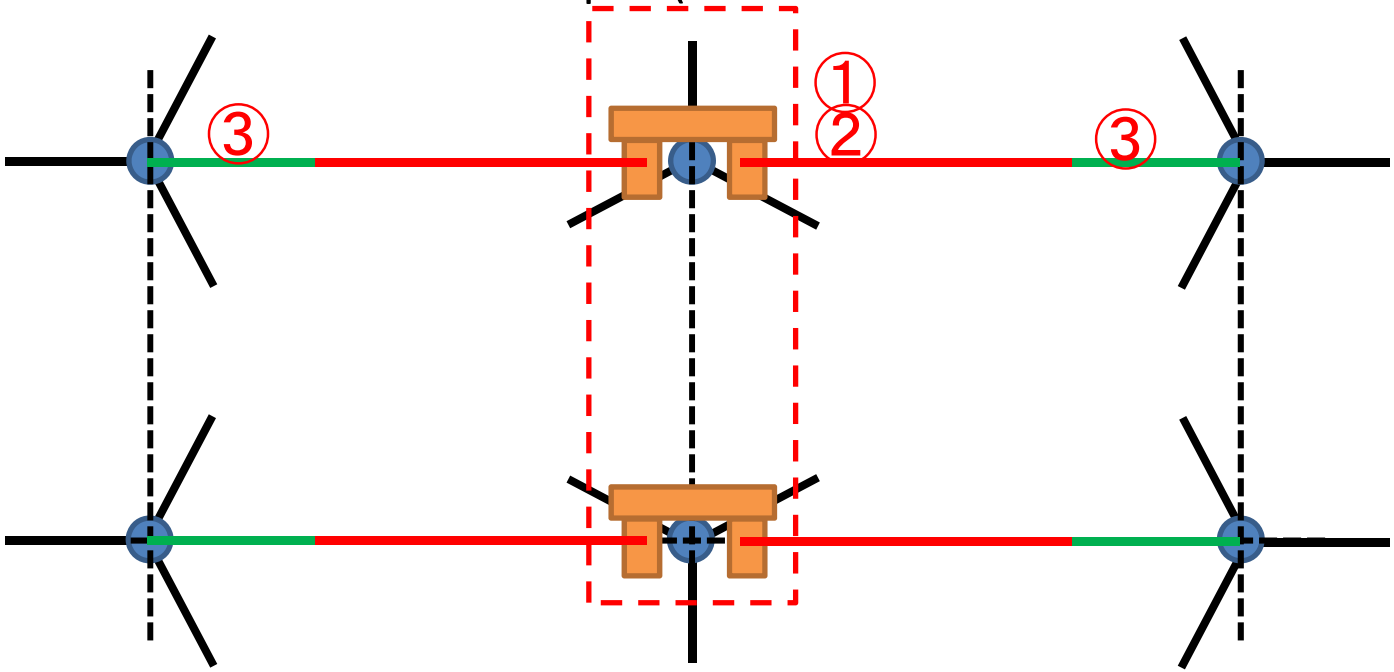


①Attach baluns to the center poles with screws and nuts.

※Both two baluns must be located on the same sides of the poles (see the figure below). If you put them on the opposite sides, the output signal becomes very small.

②Fasten the antenna elements with screws and nuts.

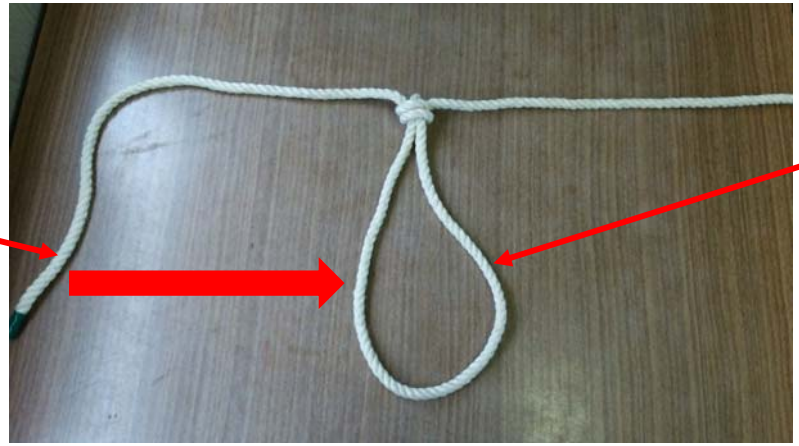
③Tighten antenna elements with ropes (see next page)



Fix antenna elements 3

1. Tie the rope here.

3. Pass a rope through the shackle attached to the pole and the loop of the rope, and tighten the antenna elements with the rope. Finally fix the rope using a taut-line hitch.

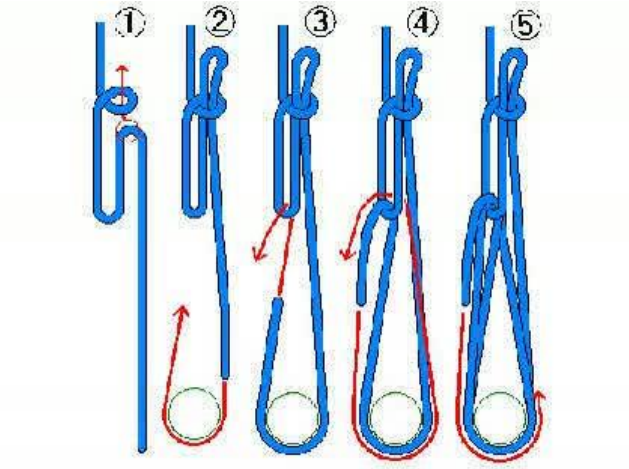


2. Make a loop in the rope

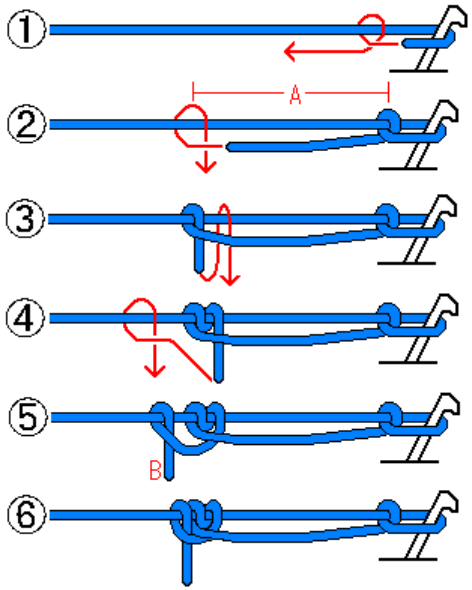
Fix antenna elements 4

Examples of how to tie a rope

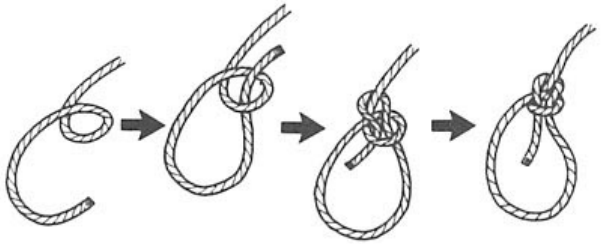
Trucker's hitch



Taut-line hitch



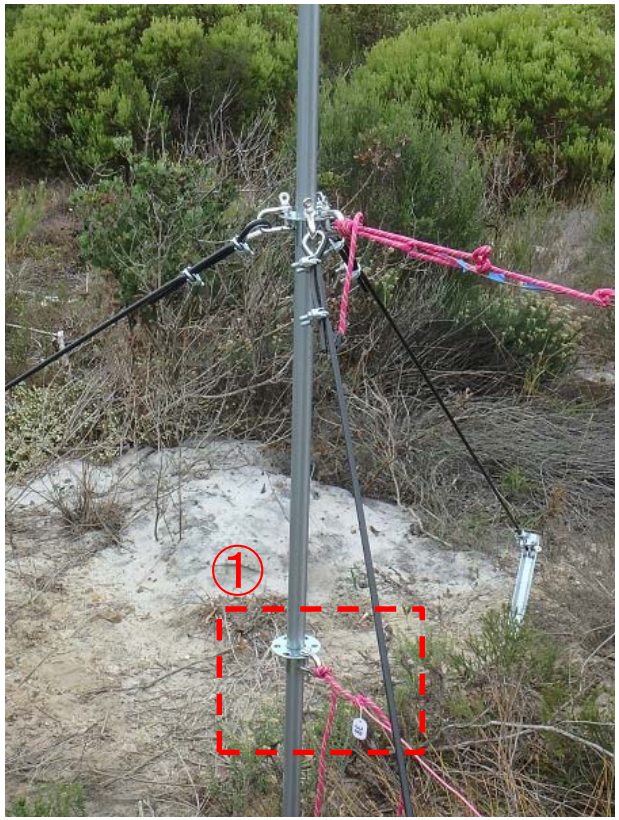
Bowline knot

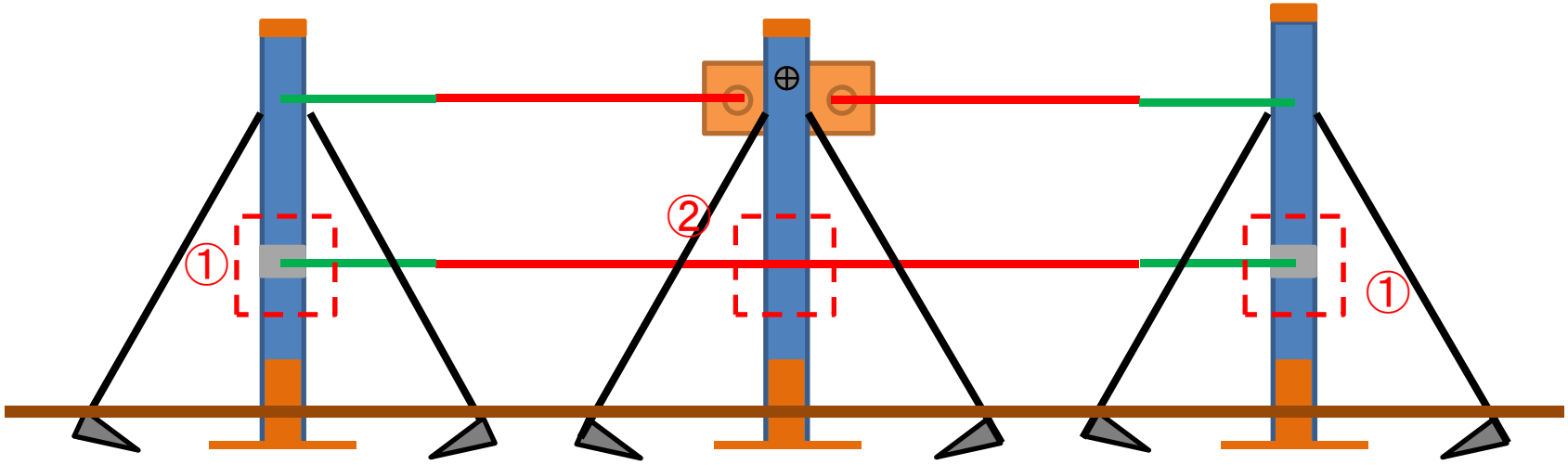


Fix reflectors 1

①Tighten the reflectors with the ropes. Fix the ropes to the metal parts of the poles in the same way as the antenna elements.

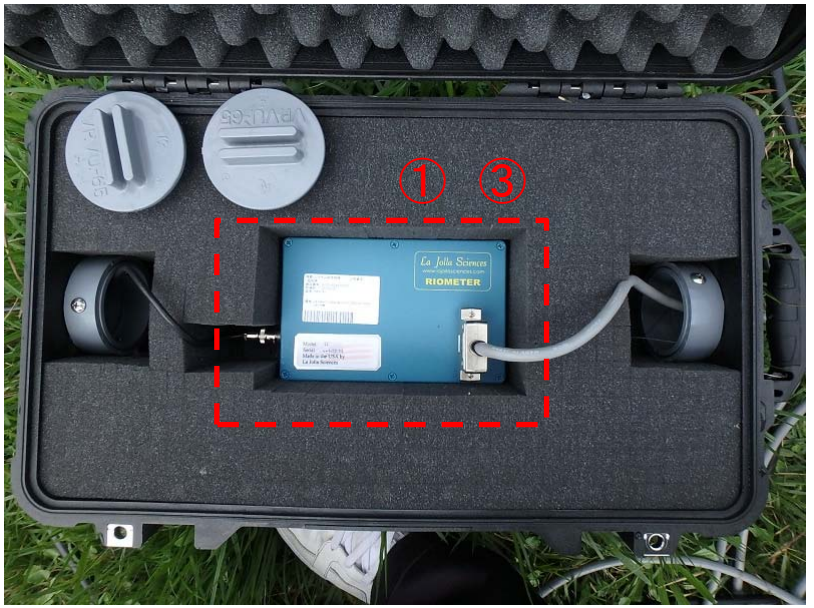
②Fix the reflectors to the center pole with tape.

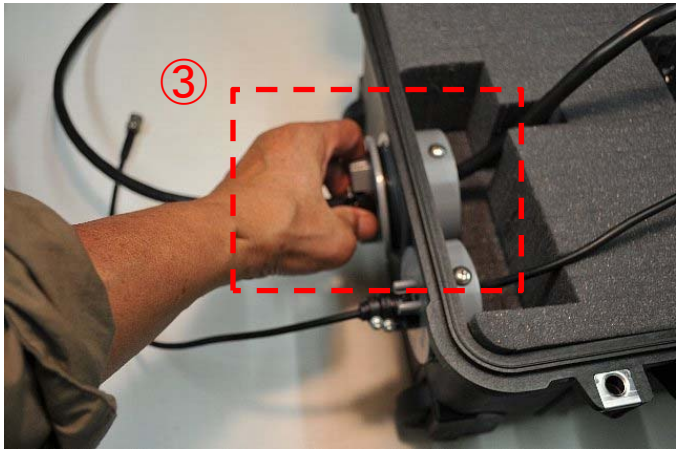




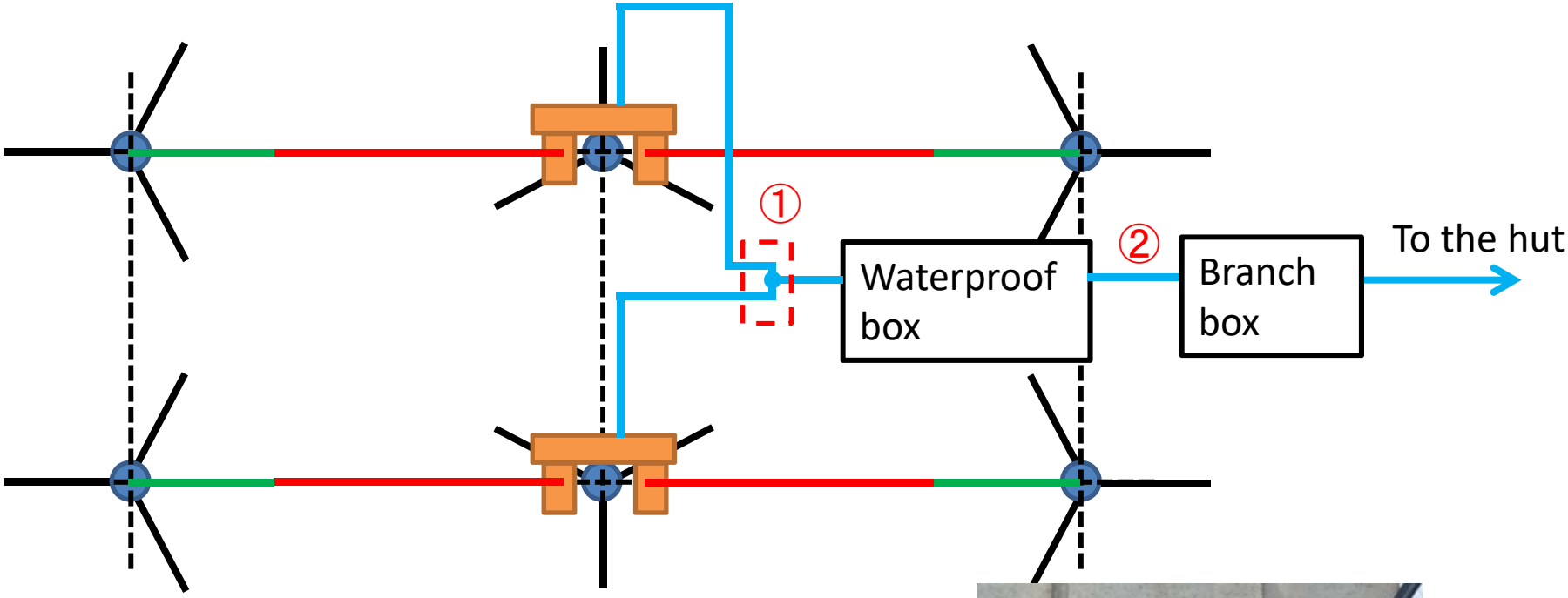
Set receiver 1

①Put the riometer receiver into the waterproof box.
②Loosen the capcon and adjust the length of coaxial cable.
③Fasten the cap on the waterproof box, and connect the cables with the receiver (one connector is BNC and the other is Dsub).
④Tighten the capcon.

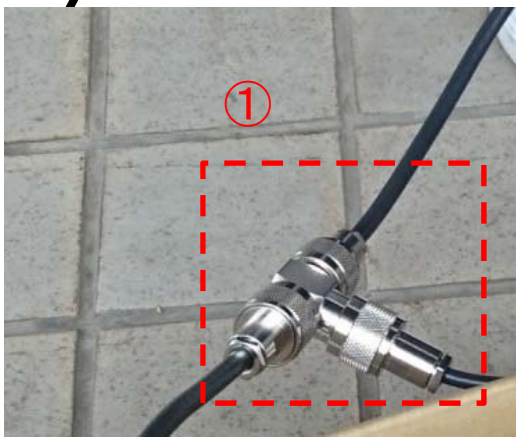




Set receiver 2



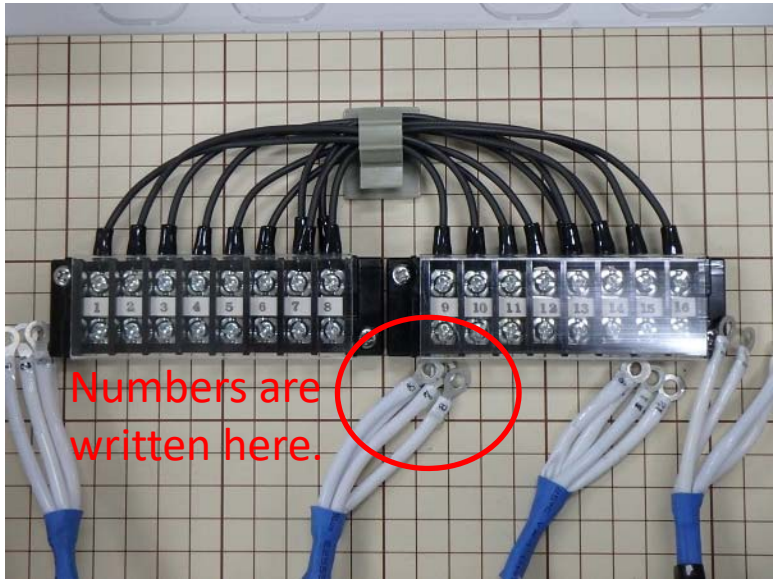
①Connect the coaxial cables from the baluns with the T-type connector. Also, connect the coaxial cable from the receiver with the T-type connector.
②Connect the power&signal cable (with Dsub connector) with the branch box (see the next page).

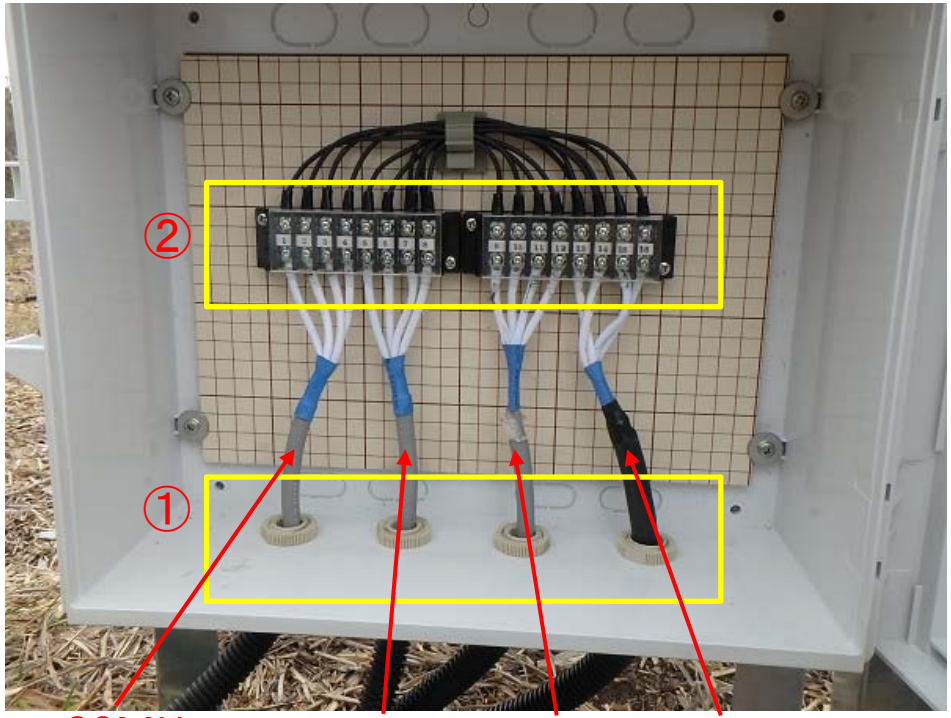


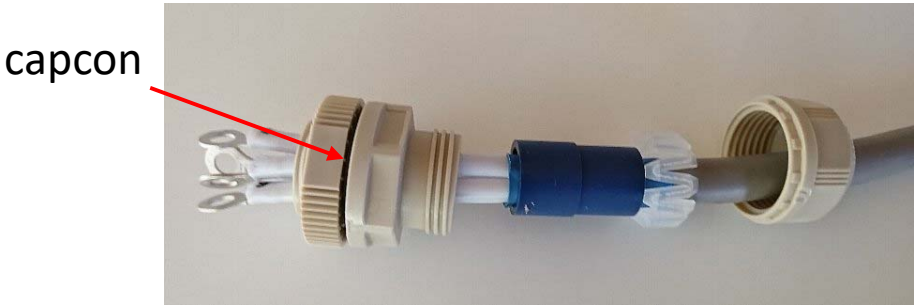
Connect the cables with the branch box

①Fasten the cables (from 30MHz & 38.2MHz riometers, and signal & power cables from the hut) with capcons.

②Connect the cables to the terminal block. Please match the numbers between the cables and the terminal block.



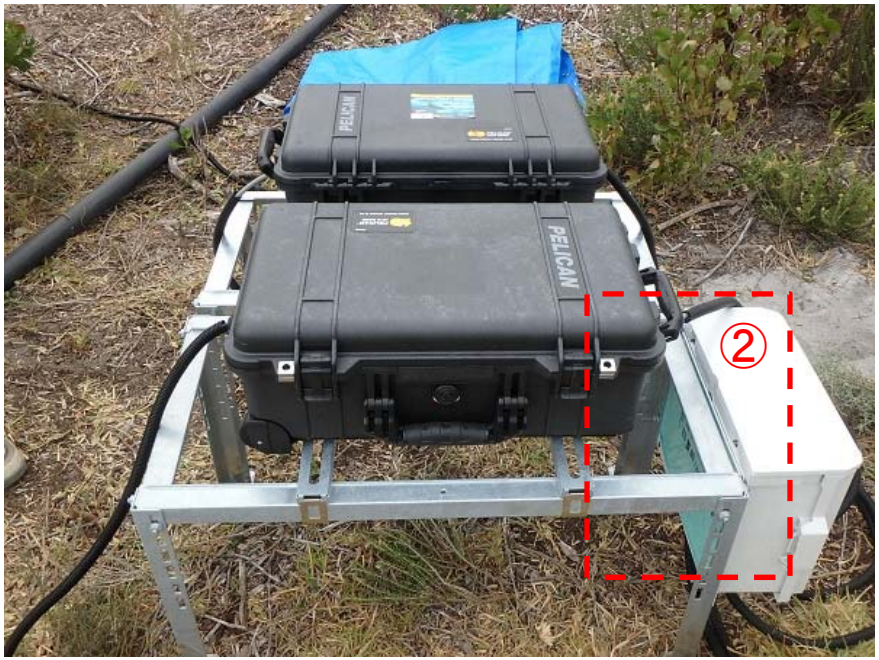




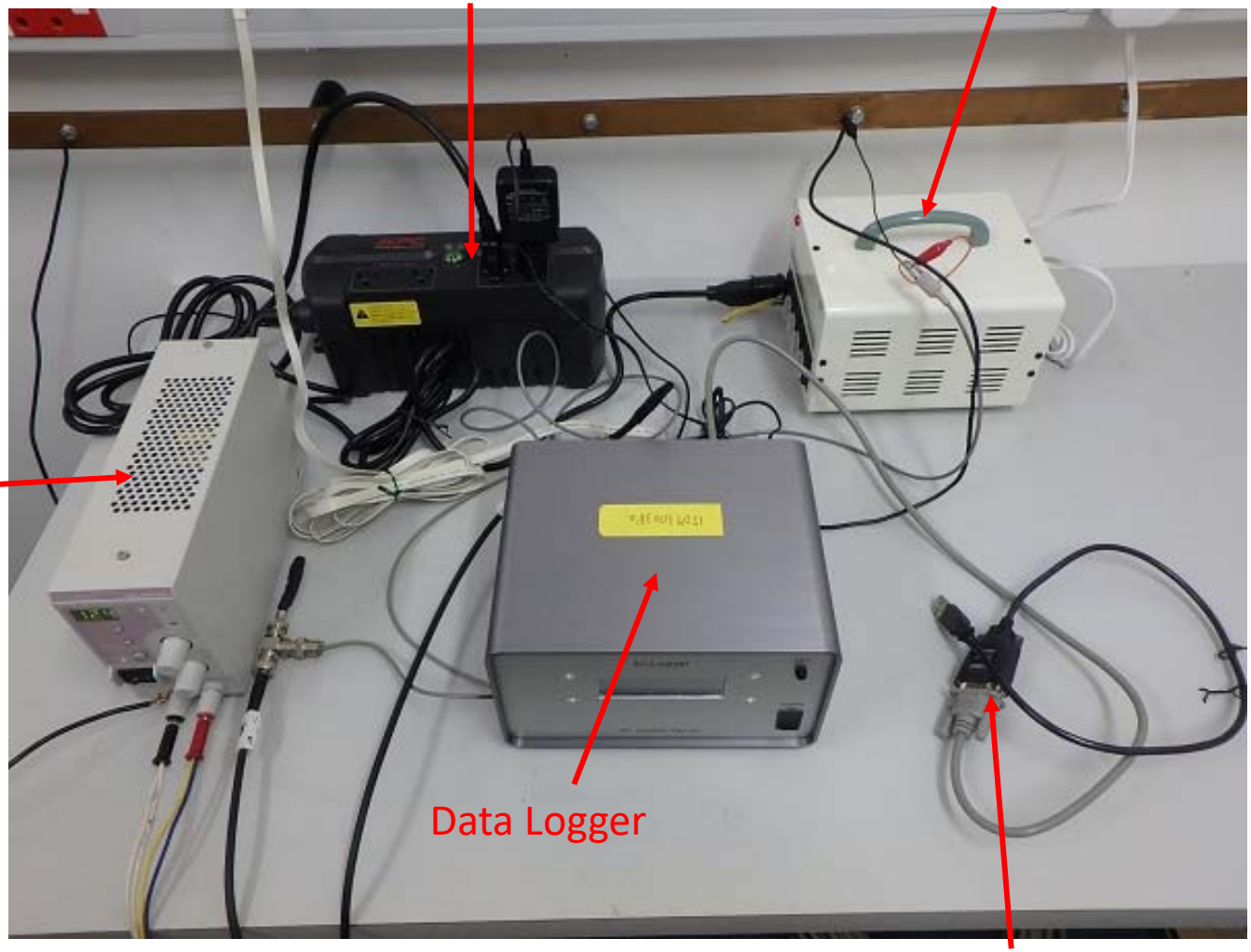
Put waterproof boxes and branch box on the metal framework

①Put the waterproof boxes on the metal framework.

②Fix the branch box to the metal framework.

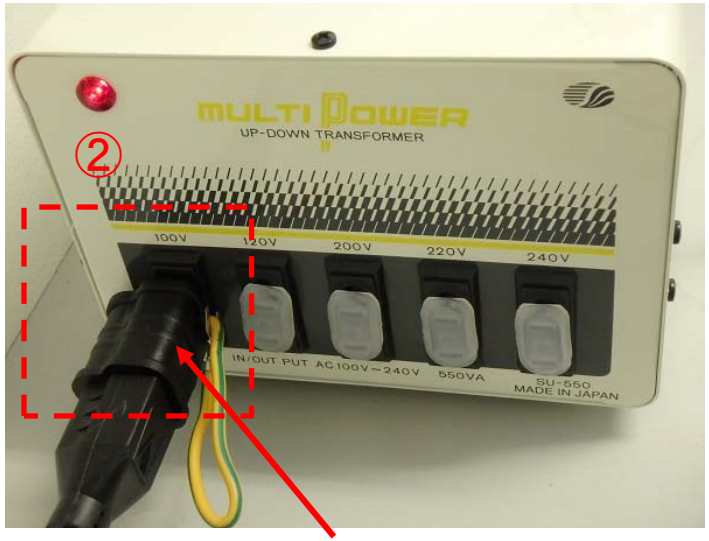


Set data logger system 1



Set data logger system 2

① Connect the power cable of Transfomer to power outlet.
② Connect the power cable of UPS to Transfomer (100V output).
③ Turn on the power of UPS.
④ Connect the power cable of DC power supply to UPS. Also, connect the AC adapter of Data Logger to UPS.
⑤ Connect the power cable from the riometers to DC power supply.



AC100V

Power cable of UPS

Power cable of DC power supply

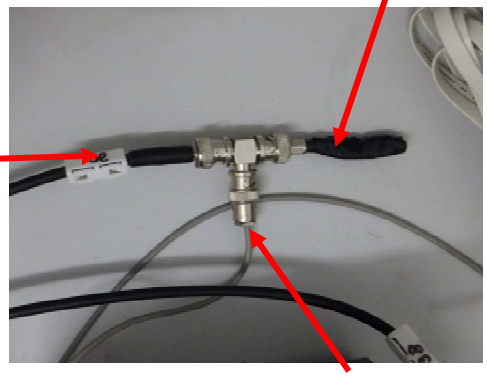
DC power supply

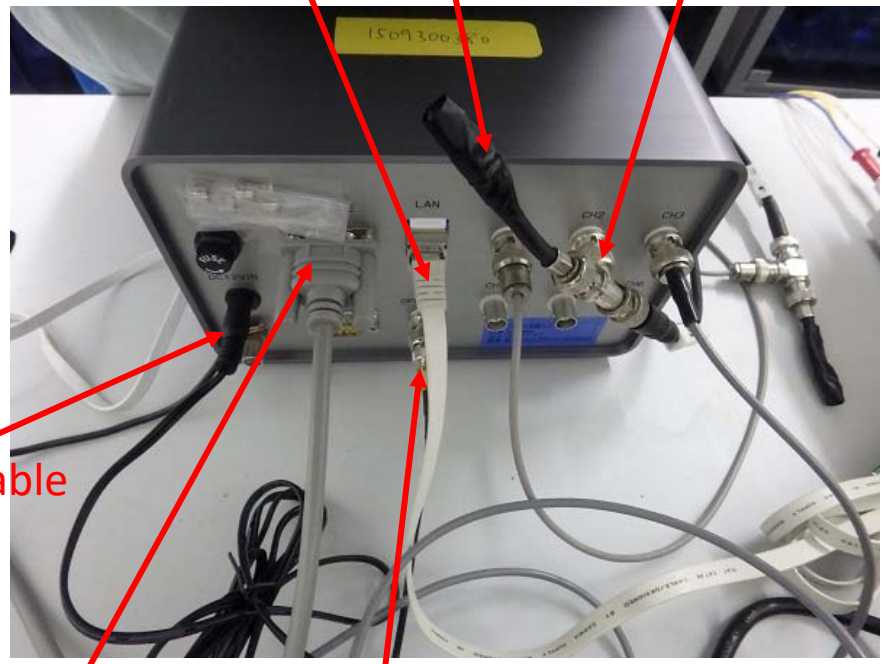
Power cable from the riometers

AC adaptor of data logger

Set data logger system 3

① Connect some cables to Data Logger (see the picture below).
Please connect the lowpass filter and signal cable from the riometer to Data Logger through the T-type connector.



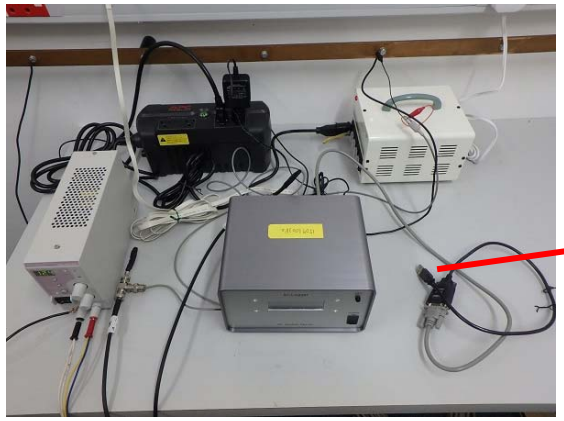


Turn on the power of riometers

① Turn on the power of DC power supply.
② Set the voltage of DC power supply to ~12.4V using “VOLTAGE” adjusting knob while pushing “PRESET” button.
③ Push “VOLT/CURR” button to change the display from voltage to current.
④ Set the current of DC power supply to ~1.0A using “CURRENT” adjusting knob while pushing “PRESET” button..
⑤ Push “OUTPUT” button to turn on the riometer receivers.

Turn on the power of data logger 1

① Before the power on of data logger, connect the USB-Serial cable to USB port of laptop PC.



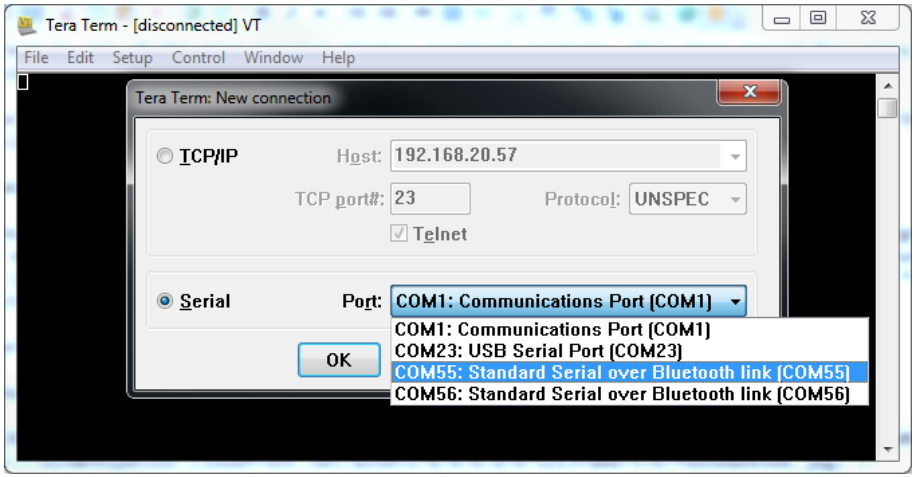
Connect USB-Serial cable to UBS port of laptop PC

Attention!!

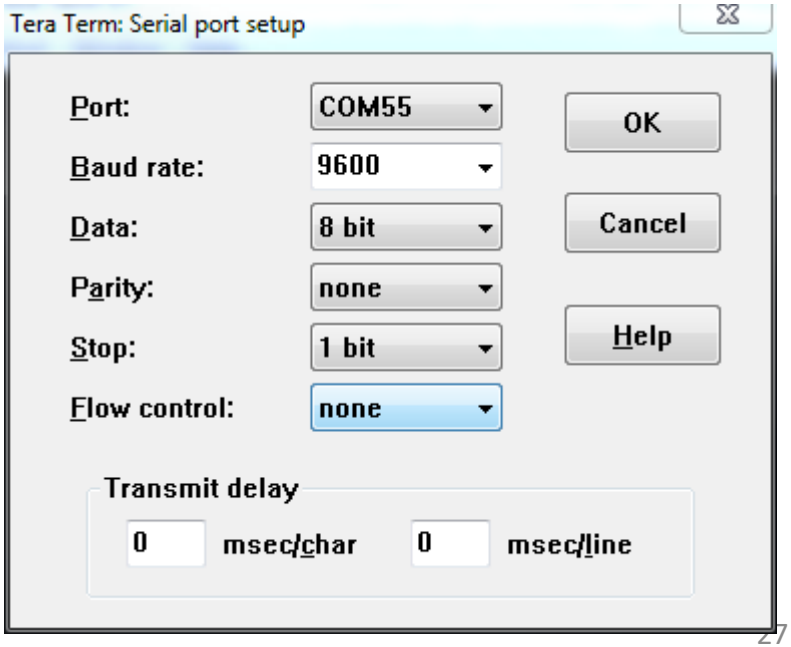
You need to install a terminal emulator, such as Tera Term (https://osdn.net/projects/ttssh2/releases/) to login the data logger through the serial communication.

Turn on the power of data logger 2

① Run Tera Term on the laptop PC.
② In the New connection window, select “Serial”. If the USB-Serial cable is connected, you can find some COM ports.
③ Choose a COM port and click “OK”.



④ Click “Setup” from the menu and select “Serial port”.
⑤ Select the COM port that you selected in ③ for “Port”.
⑥ Change “Baud rate” to 115200.
⑦ Click “OK”.



Turn on the power of data logger 3

① Turn on the power of data logger.

LCD of Data Logger:

YY/MM/DD HH:MM:SS GG
1+AAAAAAA 4+DDDDDDD
2+BBBBBBB 5+EEEEEEE
3+CCCCCCC 6+FFFFFFF

What is displayed in LCD

YY/MM/DD HH:MM:SS
GG Status of GPS clock （07=Corrected by GPS）
+AAAAAAA CH1 DATA (LSB) （±8,388,608）
+BBBBBBB CH2 DATA (LSB) （±8,388,608）
+CCCCCCC CH3 DATA (LSB) （±8,388,608）
+DDDDDDD ….

Setting of data logger 1

① Start-up process is displayed in the Tera Term window.
② After the login prompt is displayed, login the data logger.

user :	root
password :	uapuap

Directory

/home/root/programs/

There are some programs for copying and transferring data.

/home/data/YYYY/MM/

Save riometer data in this directory.

Saved data files

- YYYYMMDD.sec : ASCII file. 1sec sampling.
- YYYYMMDDHH.high : Binary file. 50Hz sampling

Setting of data logger 2

① Confirm the network connection.
Please login the data logger from your PC in the LAN through the network by SSH.

```
# ssh  root@154.114.8.50
```

② If necessary, change the network settings.

```
# vi  /etc/rc.local

# reboot
```

Current setting ↓

```
#!/bin/sh
# static IP
ifconfig eth0 154.114.8.50 netmask 255.255.255.248
# gateway
route add default gw 154.114.8.49

# measurement program
/usr/local/bin/mystart
```

Setting of data logger 3

① If necessary, change the setting of NTP server.

vi /etc/ntp.conf

Current setting may be as follows ↓

```
server ntp.nict.jp
```

② If necessary, change the setting of DNS server.

#vi /etc/systemd/resolved.conf

reboot

Current setting may be as follows ↓

```
[Resolve]
DNS=8.8.8.8
```

Setting of data logger 4

① If necessary, change the setting of crontab:

```
# crontab –e
```

Current setting may be as follows ↓

```
30 * * * * /bin/sh /home/root/programs/scp_data2crux_1hr.sh
40 0 * * * /bin/sh /home/root/programs/rm_data_3d_high.sh
```

- Transfer data files to the data server at NIPR at 30 minutes past the hour (0:30, 1:30, ….) by scp command.
- Remove the high-resolution (50Hz sampling) data at 0:40 UT, because the size of the high-resolution data files is very large.

Check observed data

① Transfer data files to your PC by scp:

```
# scp  root@154.114.8.50:/home/data/YYYY/MM/filename  .
```

② You can read and plot the 1-sec data file (YYYYMMDD.sec) by MATLAB program (read_scilog.m).

③ As for the 50Hz data files, you need to convert YYYYMMDDHH.high to ascii files (decode_sci.c). Then, you can read and plot the 50Hz data file by MATLAB program (read_scilog_high.m).

Cover & fix cables and waterproofboxes

①Cover the connectors by self-bonding tape.

②Cover the cables by flexible corrugated tubes.

③Cover waterproof boxes and jungction box by blue tarpaulin and fix them with lashing belts.

④Fix turnbuckles with steel wire so as not to rotate.