RF G5 Fast system
Installation Instructions

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1. Introduction to RF G5 MCP SYSTEM

The **MCP** (wirelesses Multilayer Communication Protocol) used to convey information between the Master unit and RF RTUs. The RF G5 system units used for operation of irrigation heads which installed away from the Dream 2 controller. The advantage of the RF G5 on the previous RF generations is the ability to add to the RF system up to 11 layers. It means that the user can define a repeater to repeater 11 times. In this way, the RF system can handle irrigation heads which are more than 20 km far away from the Dream 2. Another advantage, the RF G5 system use an asynchronous communication protocol. In other words, the RF G5 system transmits information when there is a change in outputs or inputs state. In this way, the RF system saves energy and does not send unnecessary information to the air. In order to make a good RF communication between the **Master unit** to the End units, three preconditions (FDL) must be met:

1. **Free frequency**-the frequency which has been used by the RF system must be free and clear.
2. **Distance**- the Distance between the **RF Master** to the **Routers** or **End units** which communicate directly with the **RF Master**, must be not more than 3km. (3km for 3 & 5m antenna coax / 2-2.5km for 8m antenna coax)

Line of sight- to achieve the most reliable communication there must be a **Clear Line of sight** between the **RF Master** to the **Routers** or **End units** which communicate directly with the **RF Master**

2. Scope

This document describes specific installation instructions for RF radio parts. Implementation of these instructions ensures reliable and high-quality operability of data transmission in RF G5 system.

3. References

3.1 Acronyms and Abbreviations

- ID Identification Number
- Master Unit RF G5 Master Unit
- RTU Remote Terminal Unit
- Router RTU Router (repeater)
- RSSI Receive Strength Signal Indicator

4. Installation of antennas

Antennas should be installed at a height of at least 3 meters dependent on crop height (at least 500mm above max vigor). If there is a tall tree or a metal fence near the Master Unit or RTU, then the antenna should be installed at an altitude higher than the height of the obstacle. If it is necessary to place RTUs near very tall trees, for example in a palm grove, then you should install an antenna below the crown to provide direct visibility between Master Unit and the suggested Router.

Antennas should be oriented in a strictly vertical position.

The coax cable needs to connect to the antenna from the bottom and down vertically to the Master Unit or RTU.

Do not use a cable with an excessive length because it introduces additional attenuation and reduces the range and reliability of the radio link.

The antennas should be attached to the upper end of the pole (metallic or not) so that the end of the pole is below the connection of the antenna and the cable.

5. Network ID selection

The choice of the network ID made with rotary switches “NETWORK ID” on MU and each RTU. Its value is from 1 up to 99. A zero is not used.

All Irrigation Dealers will be supplied a range (10) of network ID numbers. Using numbers outside this range could overlap another Irrigation dealers number range causing communication overlap and errors.

When choosing it is important that the selected network ID does not coincide with surrounding systems. If the neighboring system has the same network ID, then there is high probability that one of the two RF networks will steal RTUs from the other.

If there is no information of ID numbers of surrounding systems, check by the RF sniffer at four peripheral RTUs, which IDs are used by the neighbors. You may connect the RF sniffer to the antenna cable and check the IDs that can achieve be picked up.

The selected number should be set in the Master Unit and in all RTUs.

If the ID number you intend to use is above 99, set the rotary switches of thew Network ID to zero and use the "Workbench" application and the programmer interface to set the desired network ID.

Please make a record of each systems network ID number.
On the latest firmware version on the Dream controller (version 4.110.1305 & higher) this number can be entered into the PC Console to future reference:
> **Configure** > **System** > **Hardware** > **Net ID**

6. RTU ID selection

The choice of the RTU ID made with rotary switches “RTU ID” on each RTU. Its value is from one up to 500. A zero is not used. Alternatively, set the rotary switches of the RTU identifier to zero and use the "Workbench" application and the programmer interface to set the device's identification number.

6.1 DREAM Fast interface

1. Use the dip switches block called **INTERFACE ID** to set up the RF Master G5 **INTERFACE ID** as described in **Image 7**. The **INTERFACE ID** should be identical to the RF G5 Interface address as defined in the configuration.
2. Every **RF G5** system must use a unique **NETWORK ID**. Make sure that the **NETWORK ID** is not used by another RF system in this area. Use the **Sniffer** or the **Radio Modem** and **TreeView PC software** to identify other RF Systems in this area. To set up the **NETWORK ID,** use the **NETWORK ID** rotary switches. When using the Rotary switches, the range of the **NETWORK ID** is **1** to **99.**
   There is an option to set up a software **NETWORK ID.** To set up the software **NETWORK ID**, set the **NETWORK ID** Rotary switches to 0 and use the **Workbench PC software** to change the software **NETWORK ID.** The range of the software **NETWORK ID** is **1** to **65535.**
3. To improve the **RF** communication, install the **Antenna** in a high place. Do not install the **Antenna** behind a metal pipe. The Antenna must be installed on a pipe made of non-metallic material. For example, use a PVC pipe to hold the Antenna. Make sure that the **RF G5 MASTER Antenna** has the best **Line of sight** to the most RTUs.
4. Connect the **RS485** two wires to the **RF G5 MASTER.** The **Green** wire should be connected to the **P** (Positive). The **White** wire should be connected to the **N** (Negative).
5. Connect the two wires of the **12V DC** Power supply to the **RF G5 MASTER.**
   The **Red** wire should be connected to the **+ BATTERY** (+12V DC).
   The **Black** wire should be connected to the **– BATTERY** (-12V DC).
6. Connect the **RS485** two wires to the **orange** port in the **Dream 2** called **Remote I/O Fast.**
   The **Green** wire should be connected to the **P** (Positive).
   The **White** wire should be connected to the **N** (Negative).
7. Connect the two wires of the **12V DC** Power supply to the **12V DC** Plug on the **Dream2 Motherboard.** The **Red** wire should be connected to the **+ 12V DC**.
   The **Black** wire should be connected to the **- 12V DC**.

Selecting an available Frequency: After connecting the power supply plug, the **Master** unit starts to check the frequencies and select automatically the first frequency that is clear and not in use by another RF system in the vicinity. After finding the best frequency to work, the Master will receive TEST packets from the RTUs and start to join the RTUs to the RF system. When detecting that 10% of RTUs are disconnected for 10 minutes, the **RF MASTER G5** skips to another available frequency automatically to improve communication. The RTUs will skip to the new frequency automatically.

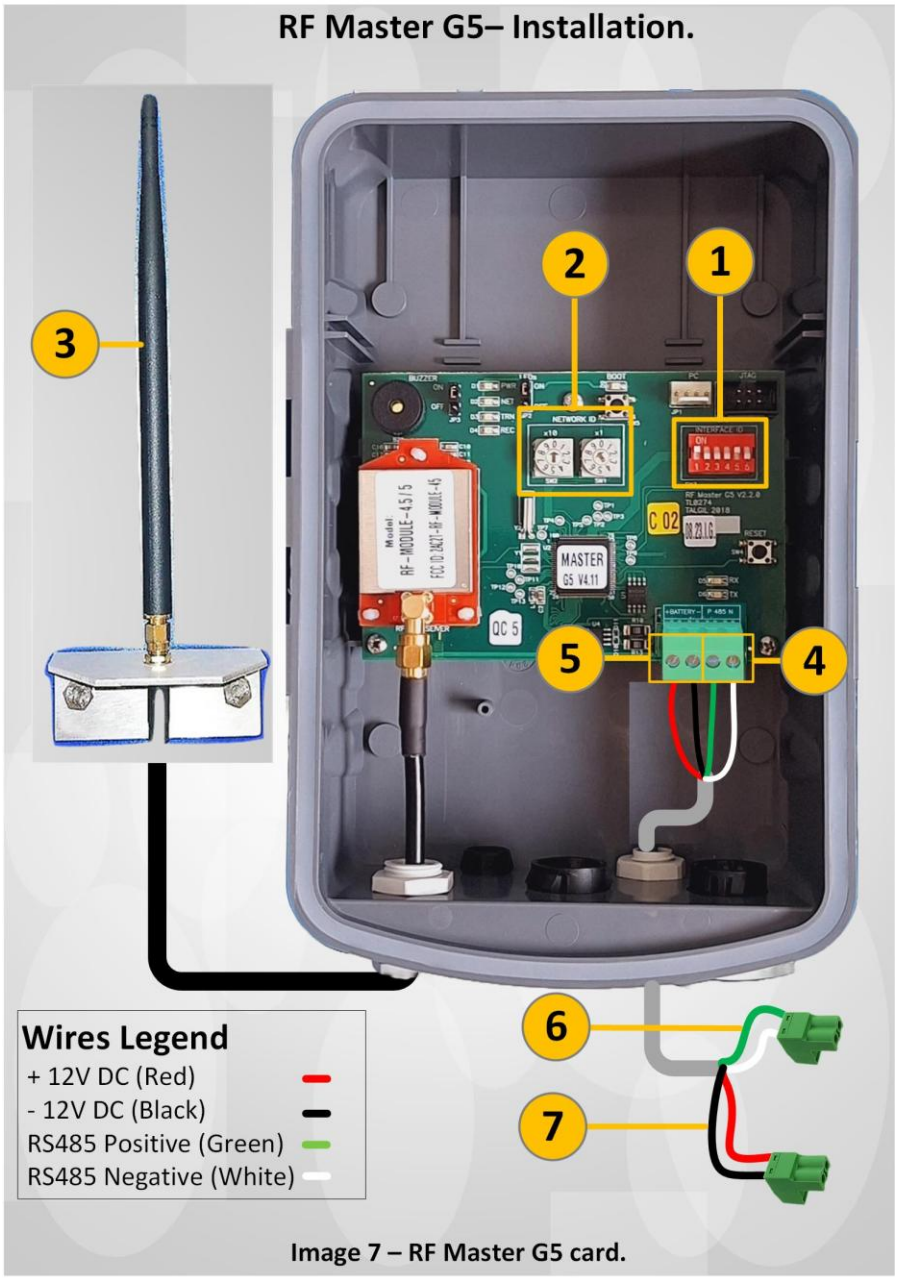


Image 7 – RF Master G5 card.

7. Master Unit installation

For each RF G5 system to operate reliably and have minimal impact on the operation of neighboring RF G5 systems, the placement of the Master Unit is of great importance.
Ideally, the Master Unit should be placed in the geometric center of the irrigated area. In this case, the total distance between the Master Unit and the RTUs will be minimal, the number of repeaters will be minimized, the concentration of RF messages in the Master Unit will be maximized, and interference to neighboring RF G5 systems will be minimized.
When there is no alternative and the Master Unit must be installed close to a neighboring system, maintain at least 20 meters from the Master Unit to the other system.
When operating multiple RF G5 systems, try to avoid that the RTUs of different systems will be closely located, and make sure that the Master Units are placed as much as possible apart from each other.

8. RTU installation

RTUs that can communicate directly with the Master Unit are said to be on layer one. Distant RTUs that are located far from the Master Unit or RTUs hidden by obstacles will have to use Routers to help the communication. Such RTUs are said to be on higher layers.
The following table shows the expected layer related to the distance range based on 3 & 5m antenna coax:

Distance range from MU [m]	Expected RTU layer
< 3000	1
3000 - 6000	2
6000 - 9000	3
9000 - 12000	4
12000 - 15000	5
15000 - 18000	6
18000 - 21000	7
21000 - 24000	8
24000 - 27000	9
27000 - 30000	10
30000 - 23000	11

9. Activation order.

To achieve the best results, it is recommended to activate the system components in the following order:

- Master Unit
- Routers of the first layer
- Routers of the second layer
- ……
- Routers of the last eleven layer.

- RTUs of the first layer
- RTUs of the second layer
- ……
- RTUs of the last eleven layer.

Routers first and RTUs after.

9.1 Master Unit activation

The Master Unit order of activation is following:

- Turn on power Master Unit power supply
- Check that the “NET” LED starts flashing
- The Master Unit will start looking for the less occupied frequency, the process may take between 1 to 17 minutes. When the Master Unit decides on the frequency to be used, it switches off the NET LED.

Note

If the first frequency channel is free, then waiting time is 1 minute.
If all frequency channels are busy, then the maximum waiting time is 17 minutes for Aust variant.

9.2 Router activation

The order of activation of the Routers is the following:

- Turn on the power to the RTU.
- Check that the “PWR” LED starts flushing.
- While the LEDs are ON make sure that the ROUTER LED is ON if not push the ROUTER BUTTON to turn it ON.
- The Router will start looking for connection to the network, it will keep flushing the NET LED until the connection is established. It may take 7 to 398 seconds.
- If the “NET” LED stays constantly on, it indicates high quality connection.
- If the “NET” LED is flashing (almost on), then the link quality is medium quality.
- If the “NET” LED is flashing (almost off), then the link quality is poor
- If the “NET” LED is off, then there is no communication with the RF network

Routers play an important role in the network, they serve other RTUs by supplying them a link to the center, therefore they must have high quality connection.

Note

Unlike regular RTUs, Routers stay continuously on, therefore they must be powered by solar panel and rechargeable batteries.

9.3 RTU activation

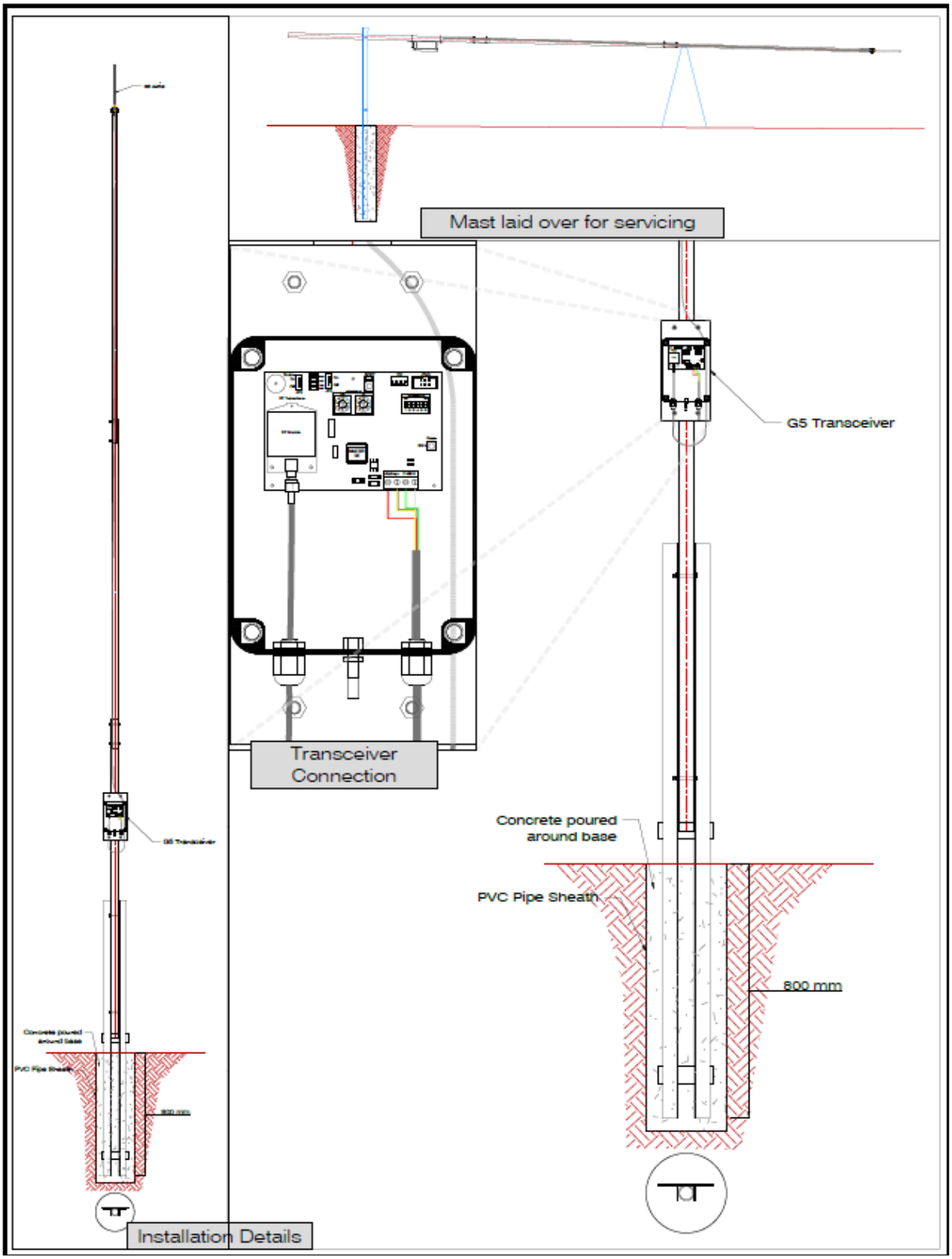
The order of activation of regular RTUs is the following:

- Turn on the power to the RTU.
- Check that the “PWR” LED starts flushing.
- The RTU will start looking for connection to the network, it will keep flushing the NET LED until the connection is established. It may take 7 to 398 seconds.
- If the “NET” LED stays constantly on, it indicates high quality connection.
- If the “NET” LED is flashing (almost on), then the link quality is medium quality.
- If the “NET” LED is flashing (almost off), then the link quality is poor
- If the “NET” LED is off, then there is no communication with the RF network

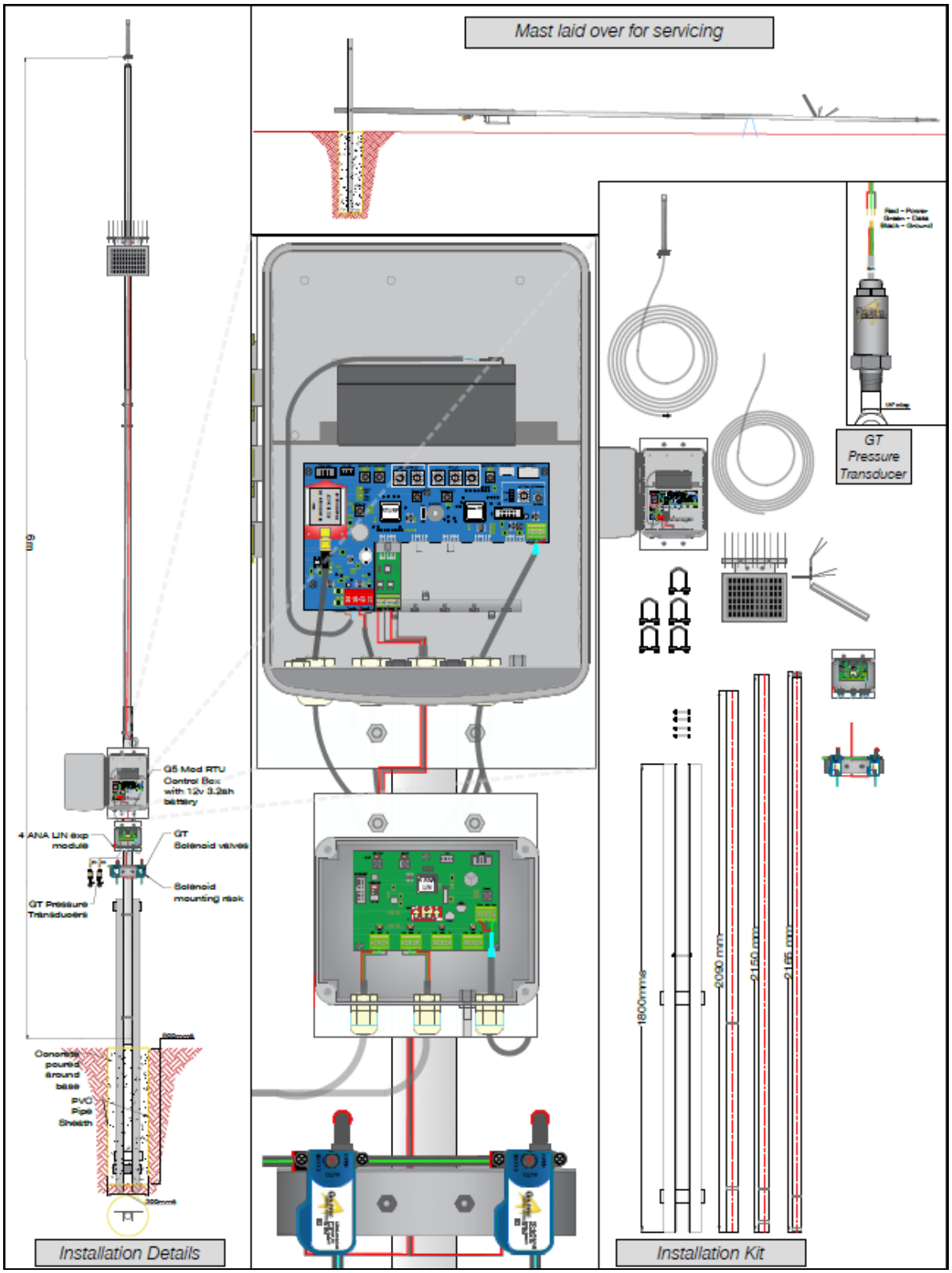
If the RTU link quality is poor or not existing, try to improve the communication by raising the antenna to a higher position. If this did not help, you have to look for another RTU that is well connected to its parent and that can be well heard by the current RTU. Go to the other RTU and turn it into an RTR.

10. Typical Installation Drawing

10.1 RF G5 Master Unit



10.2 RF G5 Modular RTU on Orchard Stand



10.3 RF G5 Economical RTU on Vineyard Stand