INSTALLATION AND USER GUIDE

VerticalPoint RTK

CORRECTION SERVICE FOR GRADE CONTROL

Version 1.00
Revision A
November 2016
Part number 107805-90-ENG

Trimble

LEGAL NOTICES

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Release Notice
This is the November 2016 release (Revision A) of the *Vertical RTK System Installation and User Guide,* part number 107805-90-ENG.

Official Language
The official language of these terms and conditions is English. In the event of a conflict between English and other language versions, the English language shall control.

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- proof of purchase
- this Trimble warranty card
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- an explanation of the problem.

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Notice to Our European Union Customers
For product recycling instructions and more information, please go to:
www.trimble.com/ev.shtml
Recycling in Europe:
To recycle Trimble WEEE, call +31 497 53 2430, and ask for the "WEEE Associate", or
mail a request for recycling instructions to:
Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Safety Information

Always follow the instructions that accompany a Warning or Caution. The information they provide is intended to minimize the risk of personal injury and/or damage to property. In particular, observe safety instructions that are presented in the following format:

WARNING – This alert warns of a potential hazard, which, if not avoided, can cause severe injury.

CAUTION – This alert warns of a hazard or unsafe practice which, if not avoided, can cause injury or damage.

Note – *An absence of specific alerts does not mean that there are no safety risks involved.*

Warnings

WARNING – When you are working on the vehicle's hydraulic systems, vehicle attachments that are suspended can drop. If you are working around the vehicle, you could suffer serious injury if an attachment dropped on you. To avoid this risk, lower all vehicle attachments to the ground before you begin work.

WARNING – If someone else attempts to drive the vehicle while you are working on or under it, you can suffer serious or fatal injuries. To avoid this possibility, install a lockout box on the battery terminal to prevent the battery from being reconnected, remove the key from the vehicle's ignition switch, and attach a "Do not operate" tag in the cab.

WARNING – Vehicle cabs can be quite high in the air. To avoid potentially serious injury through falling from this height, always use the steps and handrails, and face the vehicle, when you enter or exit it.Add the following warnings.

Cautions

CAUTION – When the vehicle has been running, parts of the vehicle, including the engine and exhaust, can become extremely hot and can cause serious burns. To avoid burns, allow hot machine parts to cool before you begin working on them.

CAUTION – The system installation may bring you into contact with chemical substances, such as oil, which can cause poisoning. Wash your hands thoroughly after you finish working on the system.

CAUTION – Battery posts, terminals, and related accessories contain lead and lead compounds, which can cause serious illness. To avoid ingesting lead, wash your hands thoroughly after touching the battery.

CAUTION – Always wear protective equipment appropriate to the job conditions and the nature of the vehicle. This includes wearing protective glasses when you use pressurized air or water, and correct protective welder's clothing when welding. Avoid wearing loose clothing or jewelry that can catch on machine parts or tools.

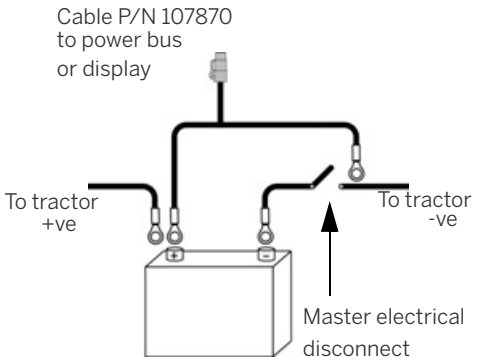
CAUTION – Parts of the vehicle may be under pressure. To avoid injury from pressurized parts, relieve all pressure in oil, air, and water systems before you disconnect any lines, fittings, or related items. To avoid being sprayed by pressurized liquids, hold a rag over fill caps, breathers, or hose connections when you remove them. Do not use your bare hands to check for hydraulic leaks. Use a board or cardboard instead.

CAUTION – Do not direct pressurized water at:
- electronic or electrical components or connectors
- bearings
- hydraulic seals
- fuel injection pumps
- any other sensitive parts or components

Set the hose pressure as low as practicable, and spray at a 45° to 90° angle. Keep the nozzle of the power washer away from the machine at the distance recommended by the manufacturer.

CAUTION – To avoid malfunctions, or damage to cables:
- route cables away from areas where they may be pinched or rubbed.
- do not alter cable lengths and connections. If you must alter the length of the power cable do not remove the fuse or fuse holder from the cable.

CAUTION – If the vehicle has a master electrical disconnect, make sure that the basic power cable (P/N 107870), is not directly attached to the battery terminal that is disconnected by the master switch - the negative pole in this example.
Attach this terminal side just past the main disconnect so that it is as close as possible to the battery but still gets disconnected.
Failure to do so can result in damage to the display.



CAUTION – To avoid injury, handle sharp knives with care.

Contents

Chapter 1

SETTING UP THE RECEIVER

This chapter describes how to set up the supplementary rover, the Trimble® AG-542 rover(s) as well as the portable AG-542 base station.

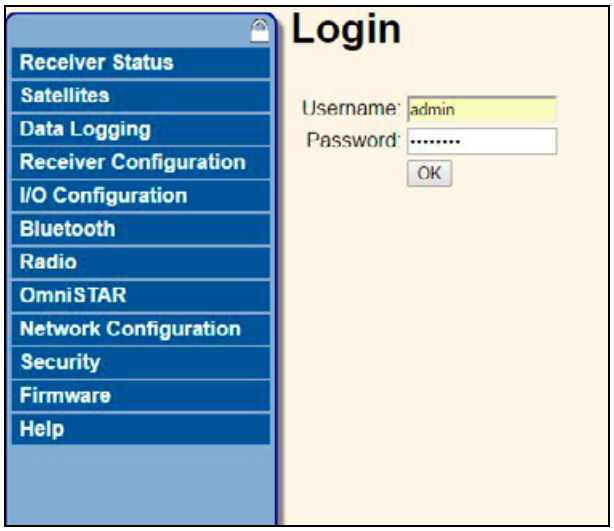
Even if you have used another Global Navigation Satellite System (GNSS), such as the United States' Global Positioning System (GPS) products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product. If you are not familiar with GNSS, visit the Trimble website (www.trimble.com) for an interactive look at Trimble and GNSS.

Setting up the supplemental rover

Note – *ONLY AG-542 supplemental rover receivers are supported with VerticalPoint RTK correction services.*

Connecting the rover to the web interface

1. Connect the AG-542 rover adapter to the DE-9 USB adaptor.
2. Use an Ethernet cable to connect the AG-542 rover to a personal computer.
3. Set the AG-542 rover up using the Web interface:
   a. On the receiver, press the up arrow once to obtain the IP address.
   b. Enter the IP address into the computer's web browser.
   c. Enter the *Username* (admin) and *Password* (password).



Updating the firmware

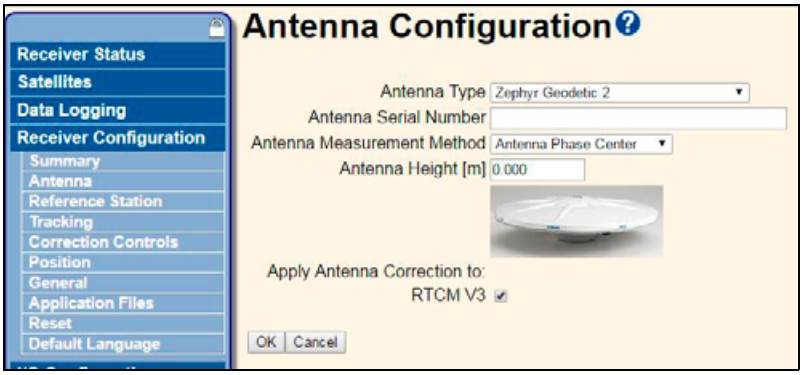
Make sure that firmware version 5.20 or later is installed on the AG-542 rover:

1. Go to *Receiver Status / Identity / Verify Firmware Version*

2. If you need to upgrade the firmware, go to *Firmware / Choose File* (for example, select the v5.20.timg file) / *Install New Firmware.*
3. Reboot the rover and then log back into the Web Interface.

Setting up the antenna type

1. In the Web interface go to *Receiver Configuration / Antenna* and then set the following values:

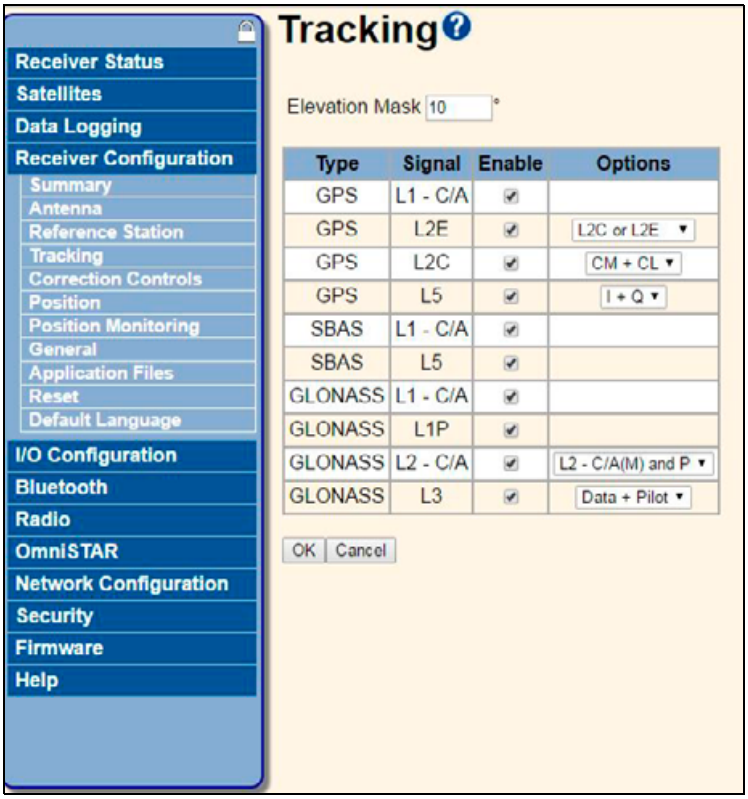


Field	Value
Antenna type	Select the correct antenna
Antenna Measurement Method	Select *Antenna Phase Center*
Antenna Height	Set to 0

2. Click **OK.**

Enabling GNSS tracking

1. In the Web interface go to *Receiver Configuration / Tracking* and then set the following values:

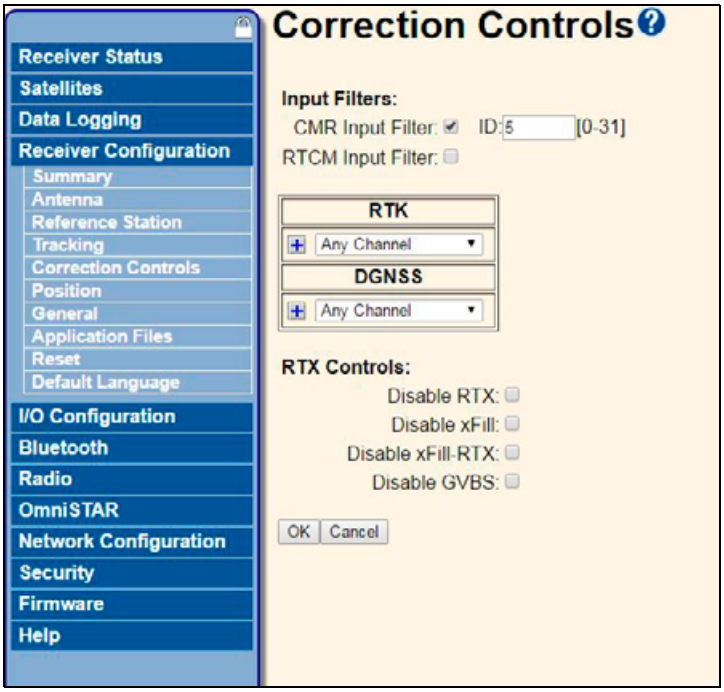


Field	Value
GPS L2E	L2C and L2E
GPS L2C	CM + CL
GLONASS L2 - C/A	L2 - C/A(M) and P

2. Click **OK.**

Correction controls

1. In the Web interface go to *Receiver Configuration / Correction Controls* and then set the following values:

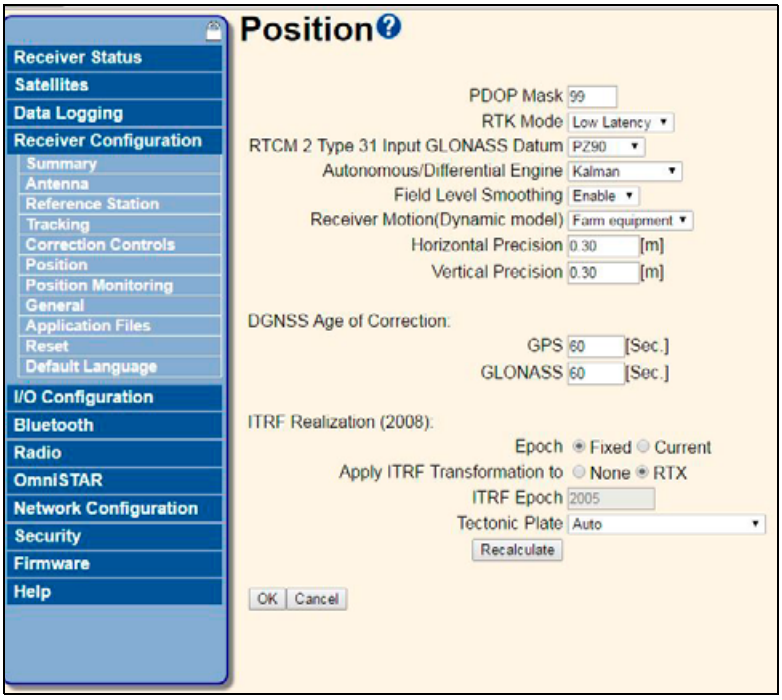


Field	Value
CMR Input Filter	Selected (ticked)
CMR Filter ID	Set to required value (0 - 31) **Note –** *Make sure Base Station and other Rovers/Displays are set to Same CMR ID Filter.* **Note –** *Best practice is to assign each customer their own CMR-ID*

2. Click **OK.**

Configuring the position

1. In the Web interface go to *Receiver Configuration / Position* and then set the following values:

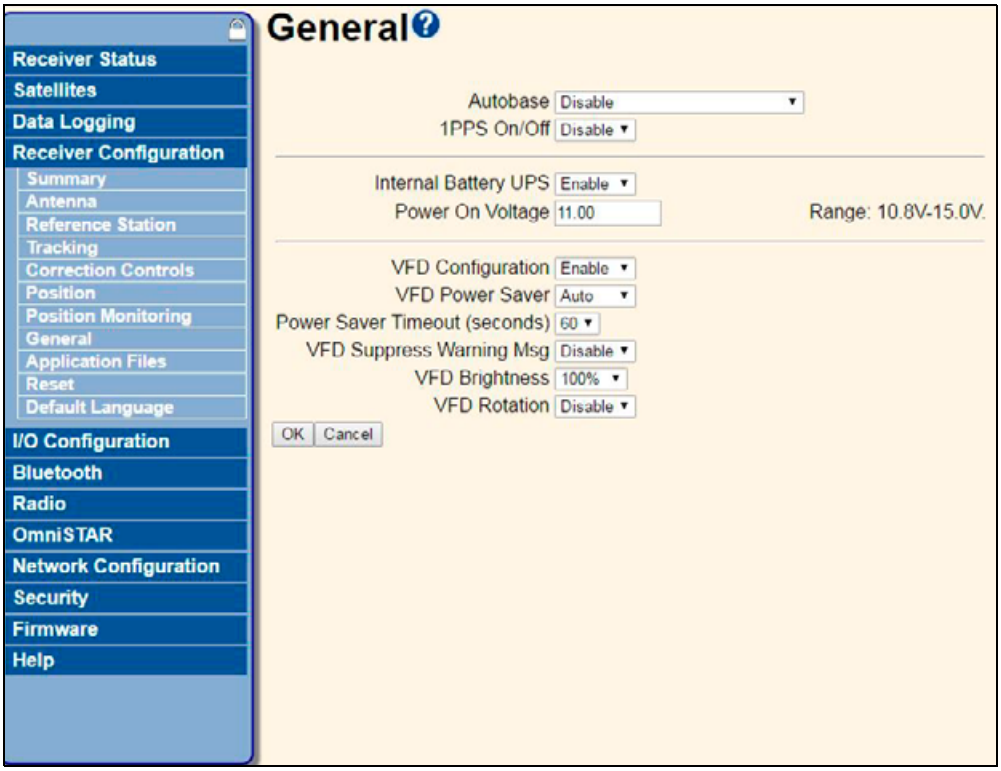


Field	Value
Field Level Smoothing	Set to *Enable*.
Receiver Motion (Dynamic model)	Set to *Farm Equipment*

2. Click **OK.**

Disabling Autobase

1. In the Web interface go to *Receiver Configuration / General* and then set the following values:

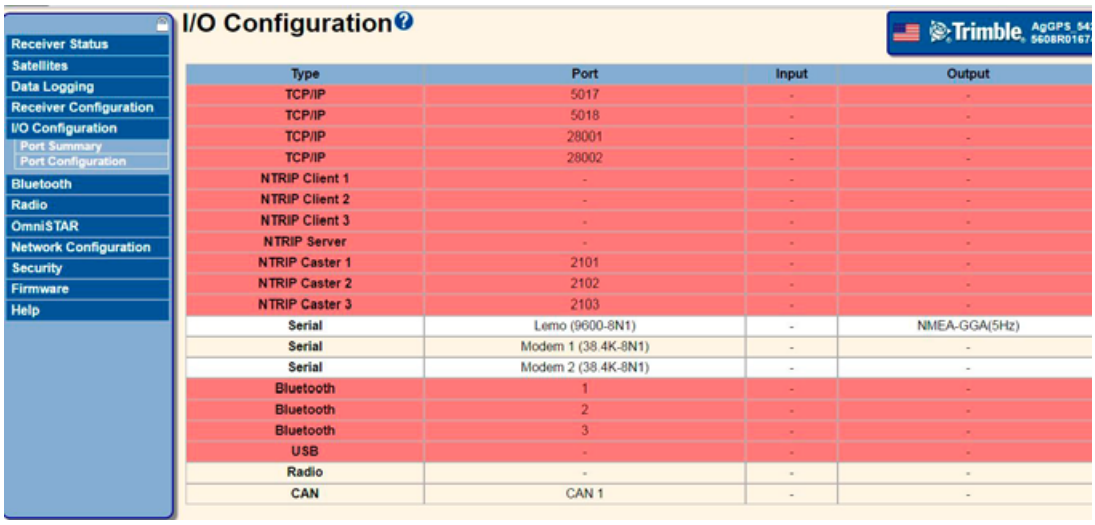


Field	Value
Autobase	Disable (clear the checkbox)

2. Click **OK.**

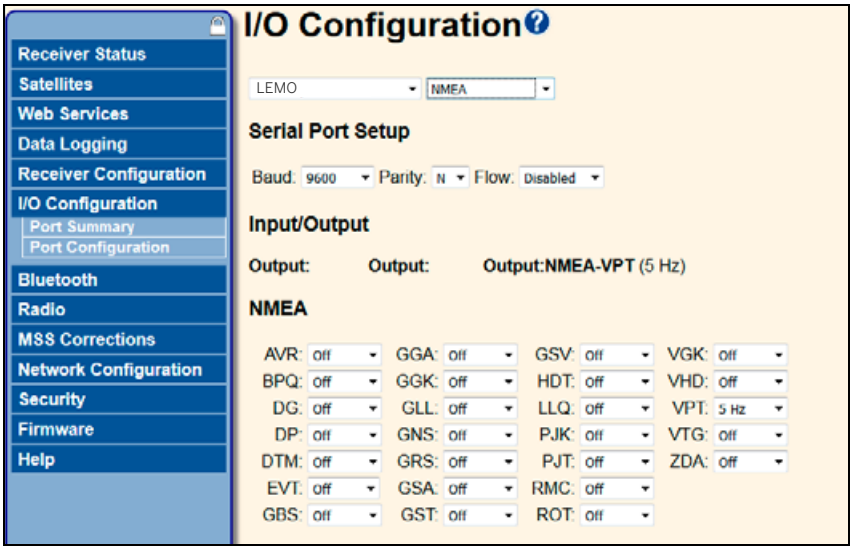
Configuring I/O settings

1. In the Web interface go to *I/O Configuration / Port Summary*:



Type	Port	Input	Output
TCP/IP	5017	-	-
TCP/IP	5018	-	-
TCP/IP	28001	-	-
TCP/IP	28002	-	-
NTRIP Client 1	-	-	-
NTRIP Client 2	-	-	-
NTRIP Client 3	-	-	-
NTRIP Server	-	-	-
NTRIP Caster 1	2101	-	-
NTRIP Caster 2	2102	-	-
NTRIP Caster 3	2103	-	-
Serial	Lemo (9600-8N1)	-	NMEA-GGA(5Hz)
Serial	Modem 1 (38.4K-8N1)	-	-
Serial	Modem 2 (38.4K-8N1)	-	-
Bluetooth	1	-	-
Bluetooth	2	-	-
Bluetooth	3	-	-
USB	-	-	-
Radio	-	-	-
CAN	CAN 1	-	-

2. Select *LEMO* from the drop-down list and then set the following values:



Field	Value
LEMO	Select NMEA from the drop-down list
Baud	9600 **Note –** *If there are more than 6 rovers, a rate change is required on DigiRadio and Supplemental Rover.*
VPT	5 Hz

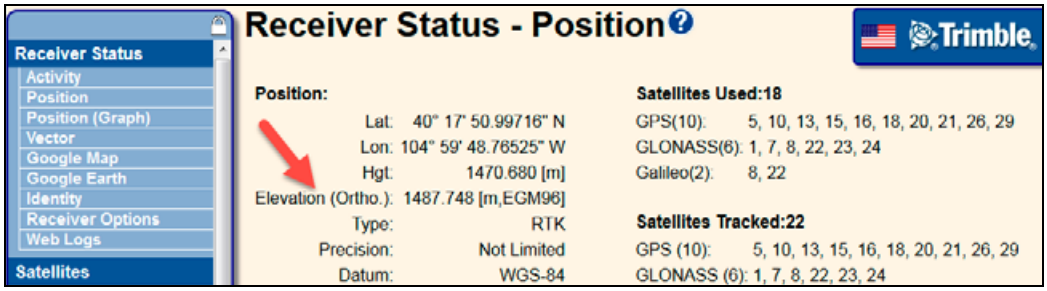
3. Click **OK.**

Viewing surveyed base positions

Note – *This step is required only if the Manual option is used to set up the supplemental rovers in the display.*

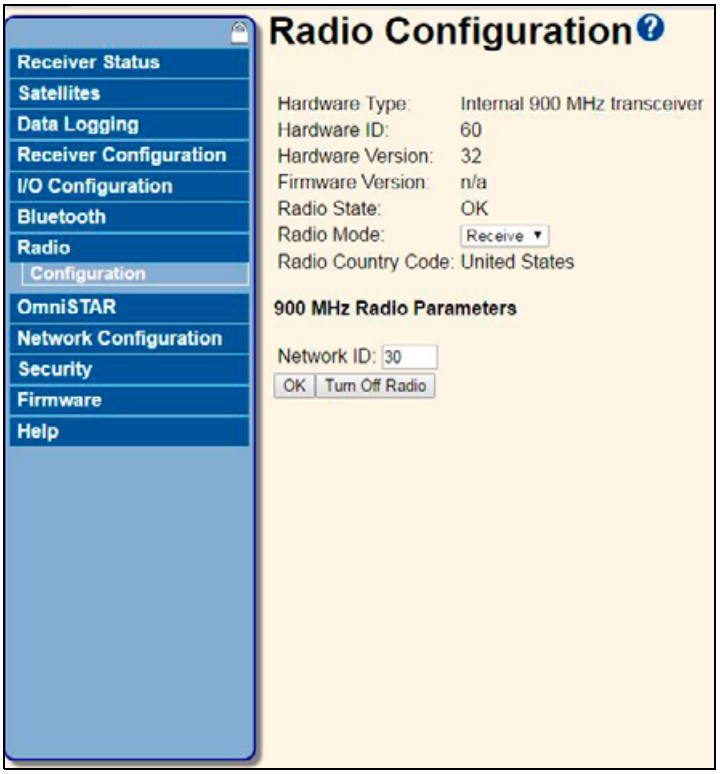
After at least 5 minutes of averaging, record the average RTK position of the supplementary rover.

In the Web interface go to *Receiver Status* and then make a note of the Ortho elevation:



Configuring the radio

1. In the Web interface go to *Radio / Configuration* and then set the following values:



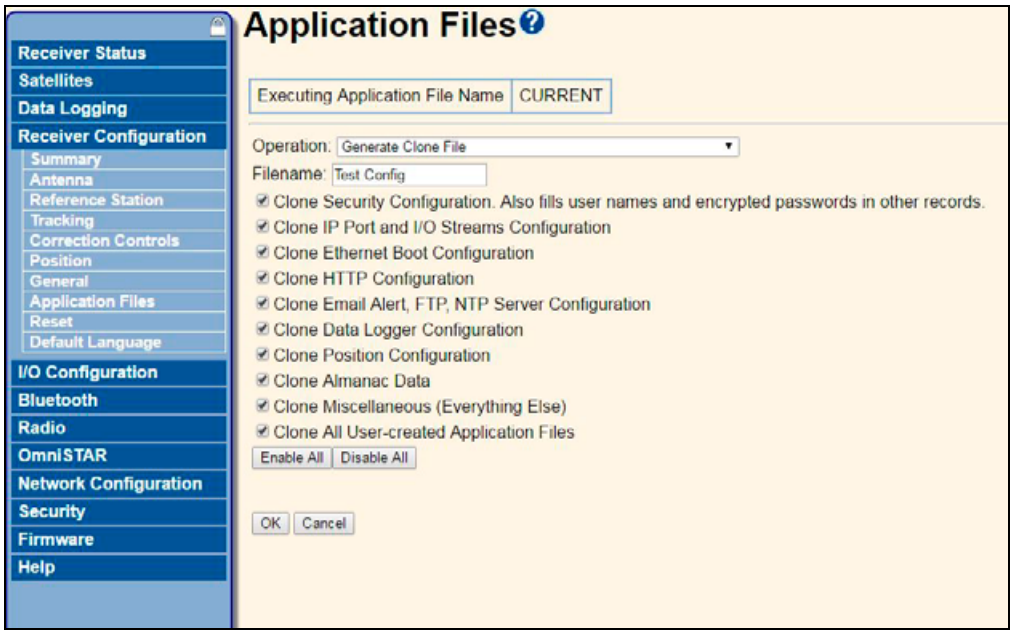
Field	Value
Radio Mode	Set to Receive
Network ID	Set to radio Network ID of the base station.

2. Click **OK.**

Generating and saving a clone file

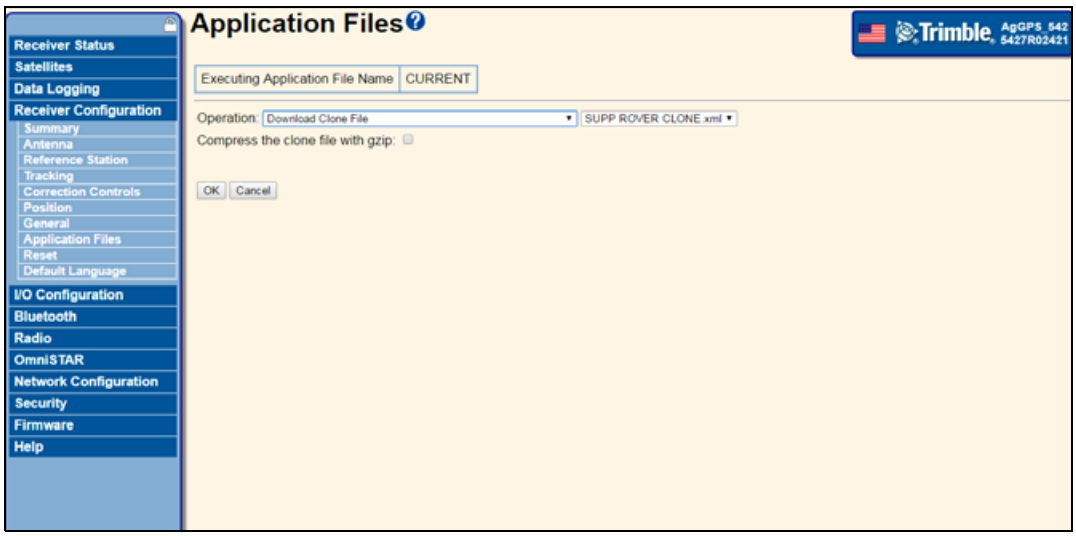
A clone file can be generated and saved after the setup is complete of all the settings. The clone file can be used to configure future receivers.

1. In the Web interface go to *Receiver Configuration/Application Files.*



Field	Value
Operation	Generate Clone File
Filename	User selected file name.

2. Click **Enable All.**
3. Click **OK.**
4. In the Web interface, go to *Receiver Configuration/Application Files*.



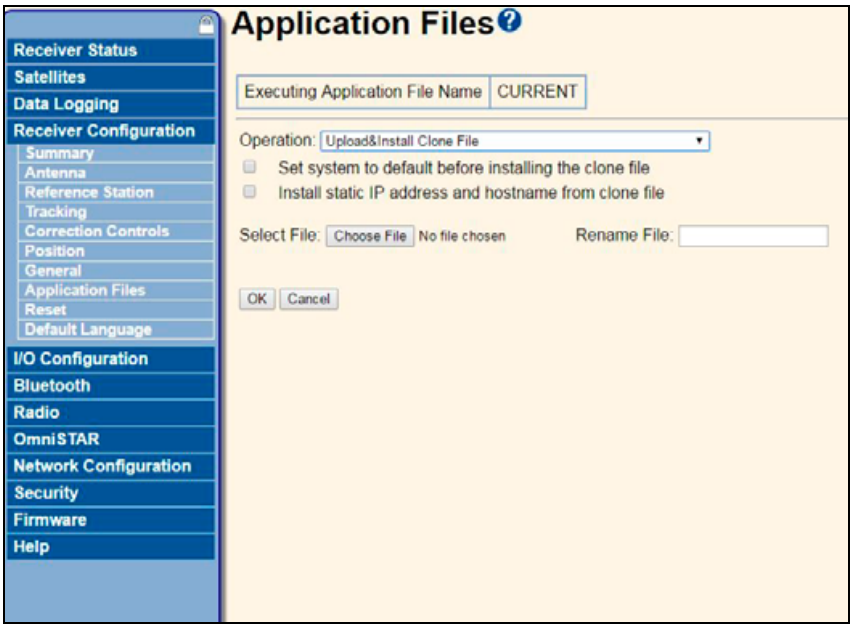
5. From the *Operation* drop-down list select *Download Clone File*.

6. Select the file name from the drop down list that was generated in the previous step to download to the computer for future use and then click **OK**.

Loading a clone file

A clone file can be installed to duplicate all the settings between each rover.

1. In the Web interface go to *Receiver Configuration/Application Files.*



Field	Value
Operation Value	Upload & Install Clone File

2. Click **Choose File** and then select the saved clone file.
3. Click **OK.**

Setting up the base station

Note – *ONLY AG-542 supplemental rover receivers are supported with VerticalPoint RTK corrections.*

Note – *Ensure that your AG-4X2/542 RTK base station is configured to output CMRx packets. At this time CMR+ packets output is not supported with VerticalPoint RTK corrections.*

Note – *Secure RTK base station security is not supported with VerticalPoint RTK corrections as this requires CMR+ packets output support.*

Prior to setting up the base station in the field verify the main RTK base stations (AG-4X2/542) are running firmware version 4.93 or later so that they can be used with VerticalPoint RTK corrections.

Verify that Autobase has been disabled.

Refer to:

- The *AG-542 RTK Base Station User Guide* for the correct configuration and setup of the main base station.
- The *System Setup Requirements for Best Vertical GPS Performance Quick Reference Card* for optimal base station vertical accuracy settings.

To connect the base station receiver to the Web Service Tool, see Connecting the rover to the web interface, page 8.

To update the firmware running on the AG-542 portable base station, see Updating the firmware, page 9.

To confirm that Autobase is disabled, see Disabling Autobase, page 13.

Vertical accuracy best practice

- GLONASS is required on both the base and the rover receiver.
- VDOP should equal 2.0 or less.
- Elevation masks should be set at 10°. Satellites above the field are more important than satellites at the horizon.
- Number of SVs should be 14 or more.
- Level the base and supplemental rover antennas.
- Correction age should be 1 sec or less.
- No repeaters should be used.
- It is highly recommended that you use the Zephyr™ 2 rugged antenna (instead of the AG-25 receiver) for improved vertical performance.

Setting up the base station best practice

Notes:

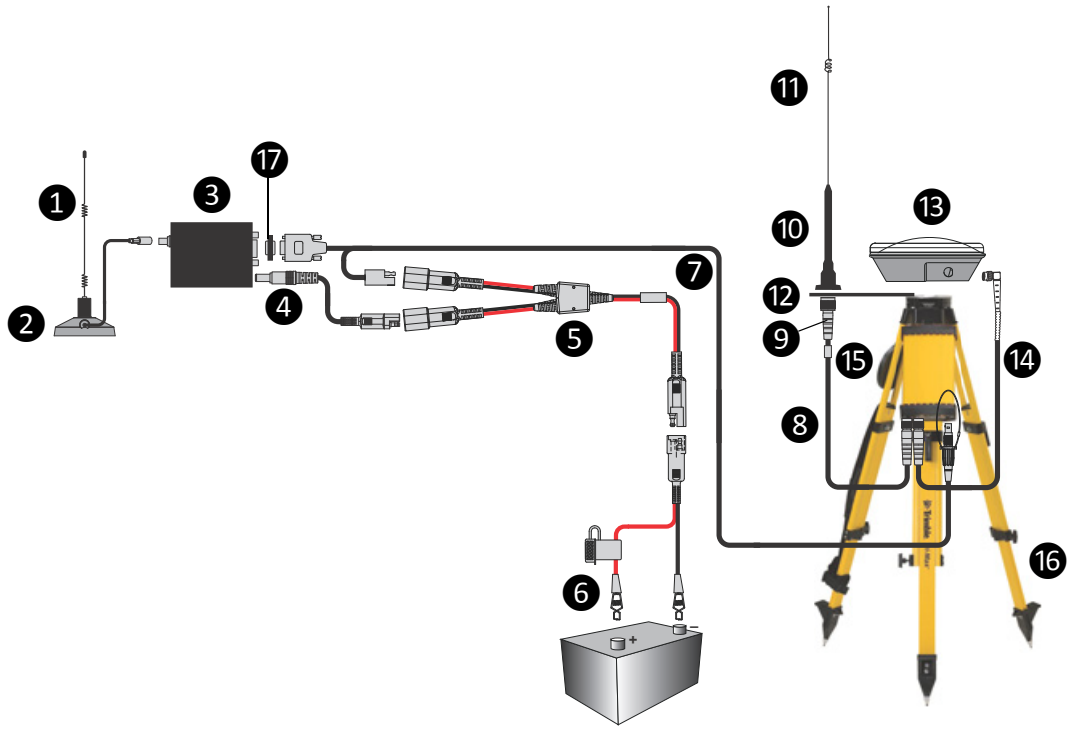
  - *Mount the base and supplemental rover antennas level (within 1-2 degrees, using the P/N 108803 Tribrach Stationary 5/8" Base/Rover Kit that is available for order).*
  - *Do not use network RTK base stations for any vertically sensitive operation.*
  - *Do not use any repeaters, regardless of the distance from the base. A repeater in the radio chain adds latency and vertical position instability.*
  - *Do* ***NOT*** *use Autobase.*
- Install the base receiver on a tripod and ensure that the antenna is more than 100 feet (35 m) away from any metal objects or structures (such as laser trailers, pump structures, aluminized crop covering), regardless of their height relationship to the antenna.
- Make sure that the remote radio antenna that is included in the mobile base station kit points down, or is placed at least 3 meters (approximately 6 feet) away.
- Place the base receiver and supplemental rovers for VerticalPoint RTK corrections in the field of operation as close as possible to the FieldLevel™ II operation.
- Complete a 5 minute average each time a new base location is established by doing the following:
  a. Press **Enter** three times.
  b. Press the right arrow once (New base AVG should appear).
  c. Press **Enter** again - this will start the 300 second averageing.

Chapter 2

INSTALLING THE SUPPLEMENTAL ROVER RECEIVER

This chapter describes how to connect the VerticalPoint RTK™ supplemental rover. These steps would need to be repeated if multiple rovers are used.

VerticalPoint RTK Rover



	Description	Part Number
1	ANTENNA ISM 900MHZ OMNI 5DBI N-MALE CONNECTOR	103092
2	MAG MOUNT N-FEMALE MOUNT RPSMA CABLE 10 FEET	103093
3	MODEM XBEE 900HP 200K RS-232 AUS	107473
4	Cable - Adapter, SAE to 2.1mm barrel 6"	107864
5	ADLV/ADLP SPLITTER SAE 1:2 12AWG 12in	84799
6	Cable - Power, 1.8m, SAE to Battery Clips	83223-02
7	Cable, Assy Ag RTK Base w/SAE & DE9	61158
8	CABLE - RADIO, 5M, RP-TNC TO RP-N	51980
9	ADAPTER - RP-N TO NMO, SNB900 ANTENNA MOUNT	51653
10	ANT BASE ELEV FEED 890-960 MHz	32922
11	3dB Radio Antenna Tip	32316
12	Bracket, Remote SiteNet™ 900 or SiteNet 450 radio antenna	49102
13	Antenna - GPS, Zephyr Model 2, L1/L2/L5/G1/G2 rover	57970-10
14	Cable - GPS, 1.6m, TNC/TNC Rt. Angle	58957-02
15	AG-542 GNSS Rover Only with 900 MHz radio, US/Canada	93605-90-11
16	TRIPOD, HEAVY DUTY WOOD,SCREWLOCK	AG 1161
17	ADAPTER, NULL MODEM LP	60130
	CASE MS750/SNB900/SITENET (*not shown*)	54325-00
	ADAPTER MULTIPORT 26 PIN DSUB TO USBA POWER AND ETHERNET (*not shown*)	58339

Installing the supplemental rover receiver

1. Set up the tripod taking care to ensure that the upper flush bracket is close to level and that all the tripod feet are firmly embedded in the ground.
2. Locate the radio antenna bracket P/N 49102 and install the tribrach adapter P/N 78607007 and antenna—the radio bracket should be located between the tribrach and the tripod.
3. Connect the coax cable to the GPS antenna and thread the GPS antenna adapter P/N 12180 into the antenna
4. Install the radio antenna adapter P/N 51653 on the bracket:
   a. Make sure that the adapter is installed so that the radio antenna is pointing to the sky.
   b. Attach the 3 dB antenna to the adapter.
   c. Attach the radio antenna cable P/N 51980 to the adapter.

5. Connect the radio antenna cable and the GPS antenna coaxial cable to the supplemental receiver.
6. Connect the LEMO connector labeled **Radio** on cable P/N 61158 to the receiver.
7. Installing and setting up the Digi radio:
   a. Connect a null modem adapter (P/N 60130) to the Digi radio serial port.
   b. Locate the Digi radio serial, antenna cable (P/N 103093), and power cables (P/N 107864). Attach the provided antenna to the antenna cable (P/N 103093.)
   c. Connect the serial connector labeled **Laptop** on cable P/N 61158 to the null modem adapter and tighten the thumbscrews.

d. Connect the Digi radio power adapter P/N 107864 to the Digi radio:

e. Connect the Digi radio antenna to the radio:

f. Connect the two pin connector on cable P/N 107864 to the power cable splitter P/N 84799.
   - Connect the second female adapter on the cable P/N 84799 to the two-pin connector labeled 'Power' on cable P/N 61158.
   - Connect the male connector on cable p/n 61158 to the battery cable p/n 83223-02.

g. Turn on the AG-542 supplementary rover receiver.

Note – *When using an AG-542 supplementary rover receiver, if either the P/N 50449 GPS antenna cable or the GPS antenna are not connected when you turn on the rover receiver no GPS satellites will be tracked on the rover. Make sure that both the antenna and antenna cable are attached to the supplementary rover receiver before powering up to ensure GPS satellites are tracked successfully.*

8. Ensure the Digi Transmit light (green) is flashing. The lights on the unit are as follows:

Light	Meaning
Red	Power
Single green	Transmit
Yellow light -	Receive
Three green lights	Signal Strength

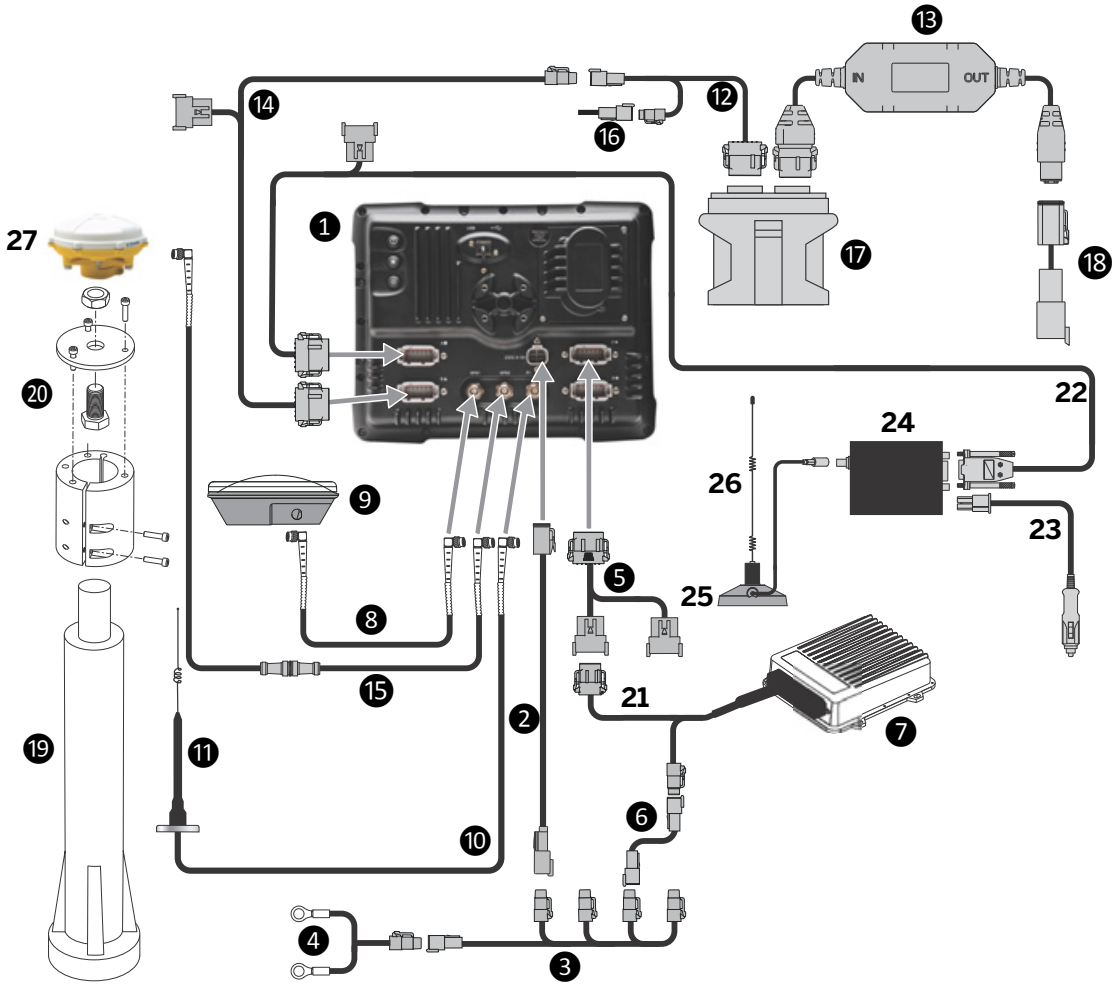
Chapter 3

DISPLAY INSTALLATION

This chapter describes how to install the components and firmware for an FmX integrated display or a TMX-2050 display that is running the FmX Plus software.

It also provides instructions on updating the firmware on these devices.

FmX / Autopilot / Fieldlevel II / CNH Direct Connect / VerticalPoint RTK

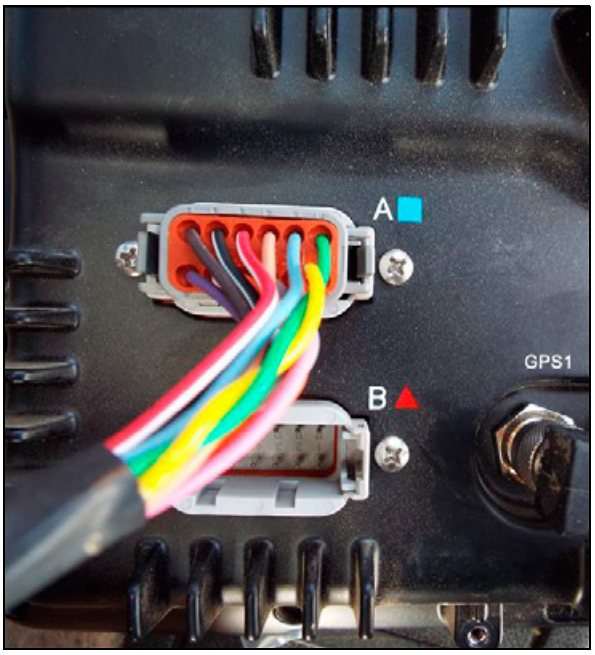


Item	Description	Trimble Part Number
1	FmX integrated display	93100-02
2	FmX power cable	66694
3	FmX power cable with relay and switch (power bus)	67259
4	Basic power cable	67258
5	FmX to NavController II cable with port replicator	75741
6	2 pin DTM to 2 pin DT power adaptor	67095
7	NavController II	55563-00
8	8 m GPS TNC/TNC RT angle cable	50449
9	Ag25 GNSS antenna (x2)	77038-00
10	NMO to TNC 20ft antenna cable and base	62120
11	900 MHz radio antenna kit	22882-10
12	Cbl Assy, Field Level II, FMX to VM431, VM415 emulation	101622
13	Cable- VM431 to Analog Converter, Dual Channel	90882

Item	Description	Trimble Part Number
14	FmX to CAN cable with port replicator	75407
15	Coaxial 160" N/f + TNC/m-ra cable	68295
16	CAN terminator	59783
17	VM-431	96585-00
18	Cable - Valve, VM431, Case, 3.0m	143130
19	Mast	MM2E-T
20	GPS mount	0367-3440
21	Main NavController II cable	54601
22	Cable Assy, CFX-750/FMX/FM-750/FM-1000 to DE9 RS232	67091
23	Adapter, Auto Power Plug to 2.1mm DC Plug, 12V 3A 6	107551
24	MODEM XBEE 900HP 200K RS-232 AUS	107473
25	MAG MOUNT N-FEMALE MOUNT RPSMA CABLE 10 FEET	103093
26	ANTENNA ISM 900MHZ OMNI 5DBI N-MALE CONNECTOR	103092
27	Antenna - Zephyr Model 2 Rugged	AG 66241-00
28	Coaxial 480" N/m + TNC/m-ra cable	67472

Connecting the FmX integrated display

1. Locate cable P/N 67091 and connect connector P1 'Display' to port A or B on the FmX integrated display.



2. Connect the P2 RS232 connector on cable P/N 67091 to the serial connector on the Digi radio.
3. Connect the Digi radio power cable P/N 107551 to the radio.

4. Connect the radio antenna to the radio and then place the antenna on the cab. Make sure that the antenna is at least 3 feet away from any other antennas.

5. Connect the auto power plug on cable P/N 107551 to an available power port in the vehicle.

Updating the FmX firmware

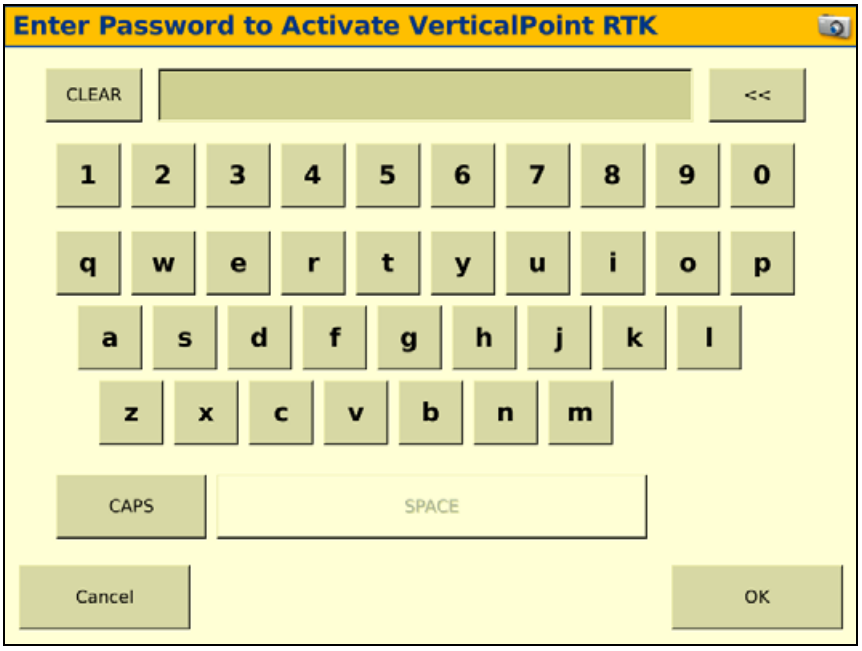
The FmX display must be running the following builds or higher:

- Gemini_0067_Puma_5259_Pollux_10_10_005_4

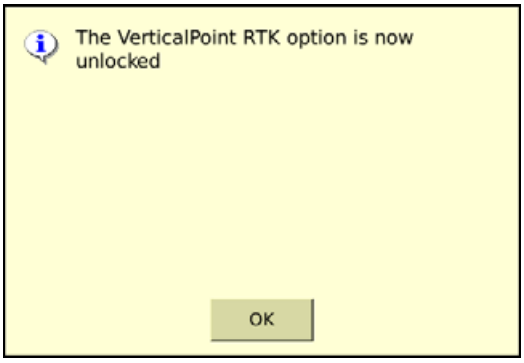
Unlocking VerticalPoint RTK for the FmX integrated display

1. On the *Support* tab, tap **Unlocks**.

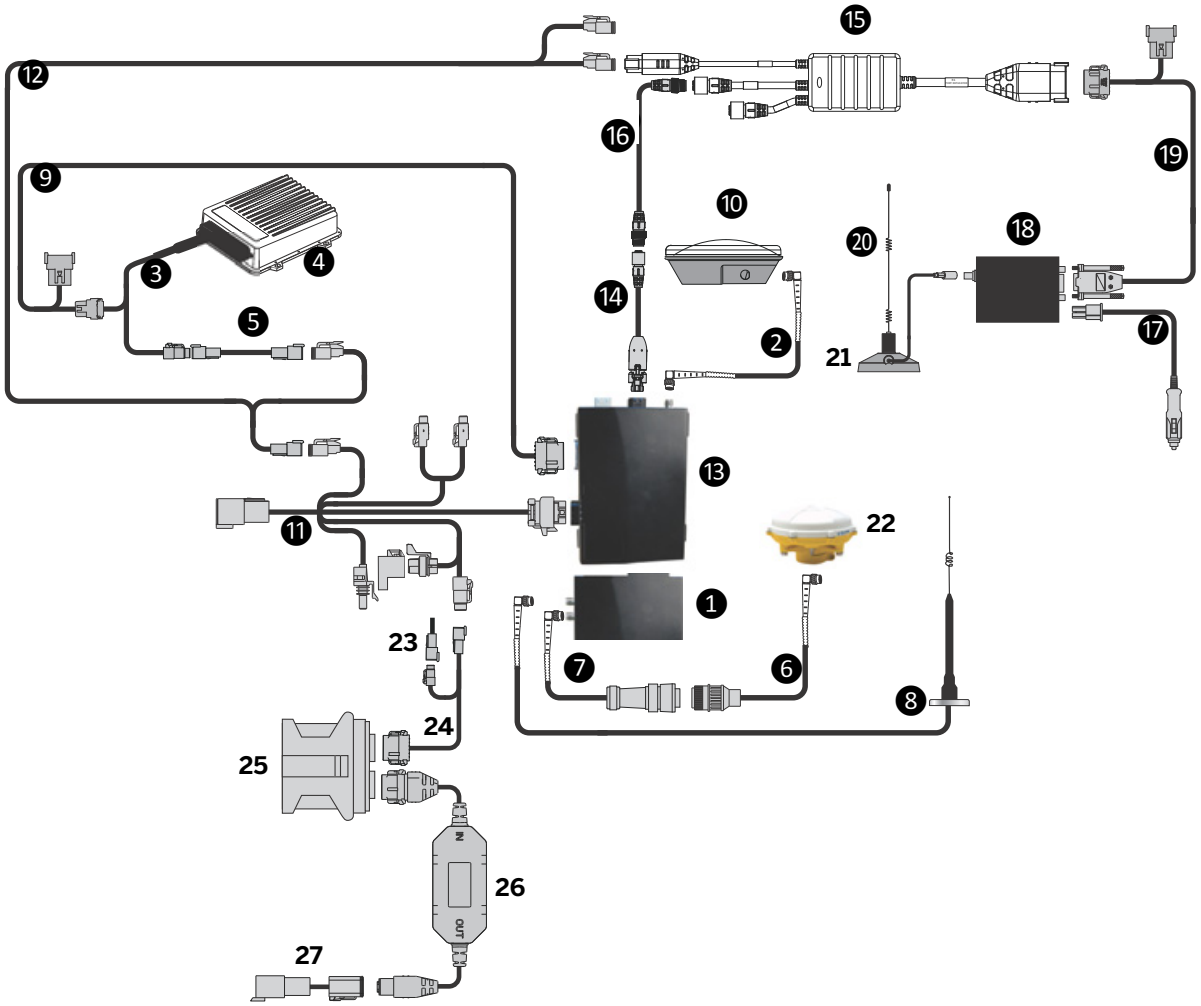
2. Tap **VerticalPoint RTK** and then enter the password required to activate this option:



3. A message appears that the option is unlocked. Tap **OK**.



TMX-2050 / Autopilot / CNH Direct Connect / VerticalPoint RTK



	Description	Part Number
1	AG-815 with integrated radio and GNSS receiver	95093-xx, 95094-xx, or 95095-xx
2	Cable, antenna 8M TNC	50449
3	Cable, NavController main	54601
4	55566-00 NavController	55563-00
5	Cable, 2-pin DTM to 2-pin DT power adapter	67095
6	Cable, coaxial N/m + TNC/m-ra	67472
7	Cable, coaxial N/f + TNC/m-ra	68295
8	Cable, antenna with magnetic base	72122
9	Cable, Display to NavController	75741
10	AG-25 GNSS antenna	77038
11	Cable, TM-200 Module power, CAN and input/output	92676

	Description	Part Number
12	Cable, Multi-power accessory	94645
13	TM-200 Module	95060-00
14	Cable, EXP-100 adapter, TM-200 Module to Ethernet	100904
15	EXP-100 port expander	101895-00
16	Cable, EXP-100 patch 1 meter	102730
17	Adapter, Auto Power Plug to 2.1mm DC Plug, 12V 3A 6'	107551
18	MODEM XBEE 900HP 200K RS-232 AUS	107473
19	Cable Assy, CFX-750/FMX/FM-750/FM-1000 to DE9 RS232	67091
20	ANTENNA ISM 900MHZ OMNI 5DBI N-MALE CONNECTOR	103092
21	MAG MOUNT N-FEMALE MOUNT RPSMA CABLE 10 FEET	103093
22	Antenna - Zephyr Model 2 Rugged	AG 66241-00
23	CAN terminator	59783
24	Cbl Assy, Field Level II, FMX to VM431, VM415 emulation	101622
25	VM-431 valve module	96585-00
26	Cable- VM431 to Analog Converter, Dual Channel	90882
27	Cable - Valve, VM431, Case, 3.0m	143130

Connecting the TMX-2050 display

Note – *An EXP-100 unit is required to work with VerticalPoint RTK corrections on the TMX-2050 display Follow the install instructions provided with the EXP-100 unit to connect it to and configure the port for use on the TMX-2050 display.*

1. Locate cable P/N 67091 and connect connector P1 Display to the 12-pin port on the EXP-100 unit:

2. Connect the P2 RS232 connector on cable P/N 67091 to the serial connector on the Digi radio.
3. Connect the Digi radio power cable P/N 107551 to the radio.

4. Connect the radio antenna to the radio and then place the antenna on the cab. Make sure that the antenna is at least 3 feet away from any other antennas.

5. Connect the auto power plug on cable P/N 107551 to an available power port in the vehicle.

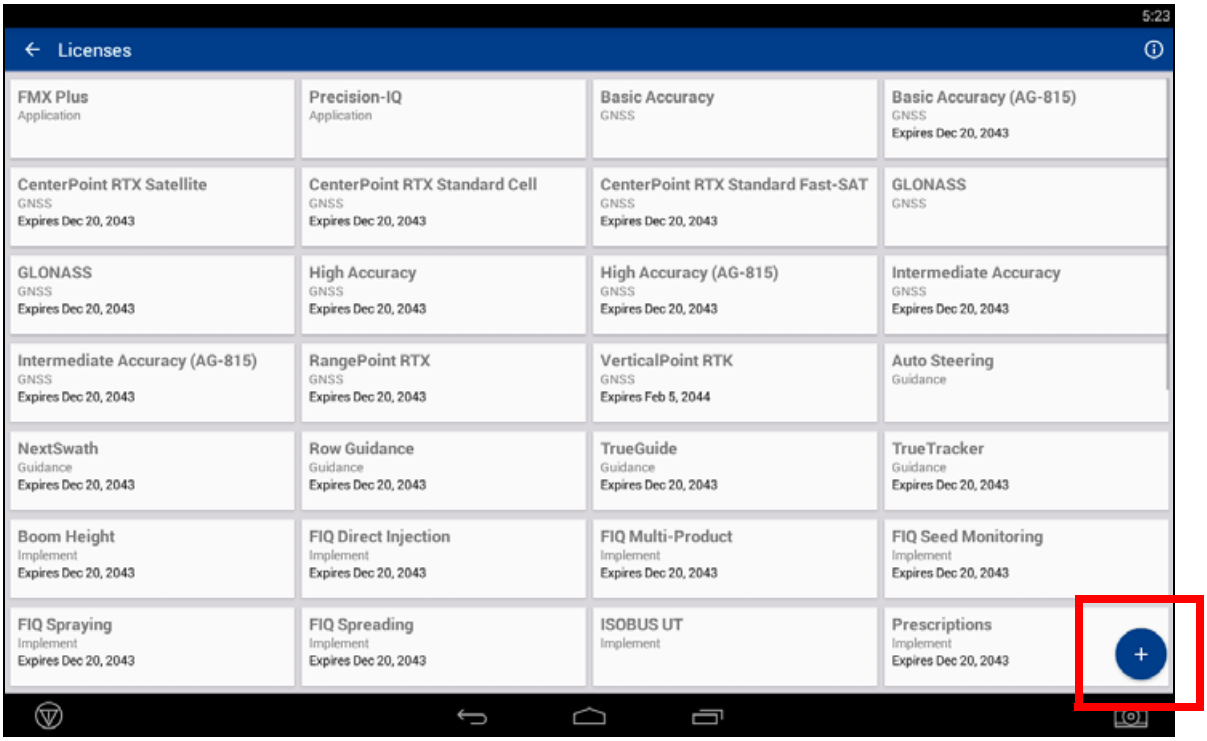
Updating the FmX Plus firmware

The TMX-2050 display must be running build 4.3.1 or higher of the FmX Plus firmware.

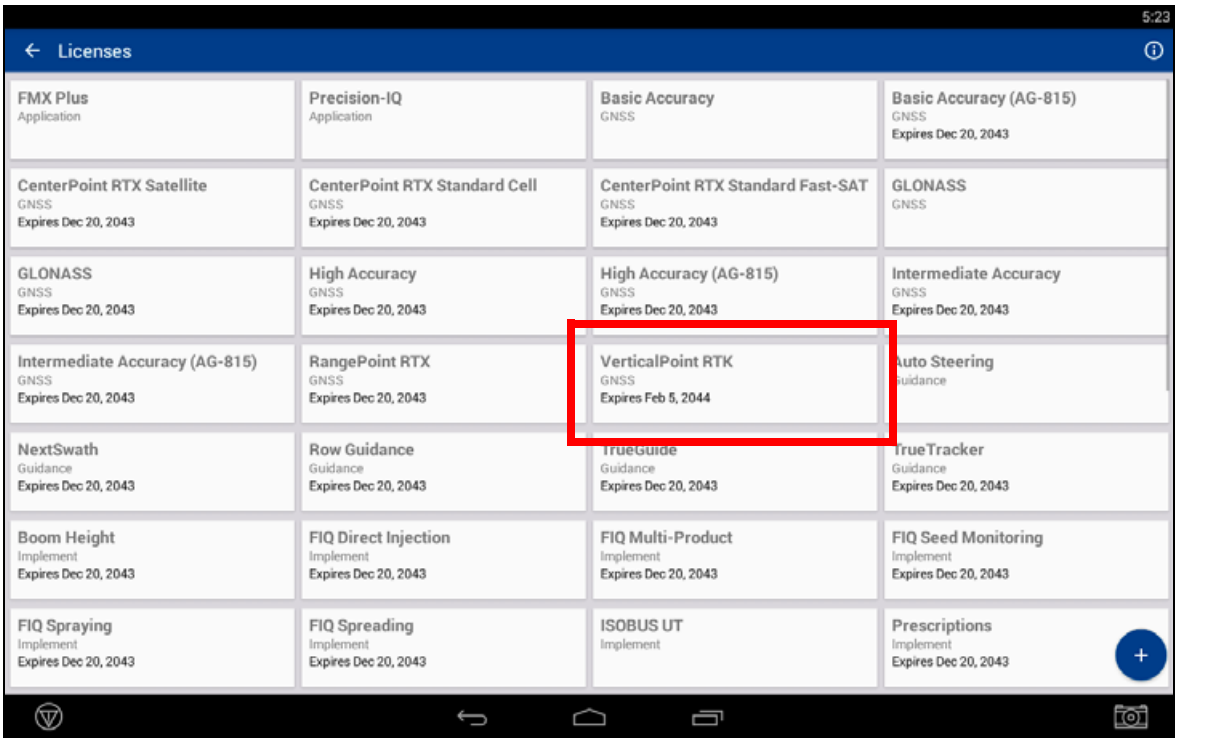
Unlocking VerticalPoint RTK in the FmX Plus app

1. On the main screen, tap **AppCentral**.

2. Tap the + button at the bottom right of the *Licenses* screen:



3. Tap the **QR Scan** button and then scan the QR Code for VerticalPoint RTK:
4. Scan the QR code to unlock VerticalPoint RTK.



Chapter 4

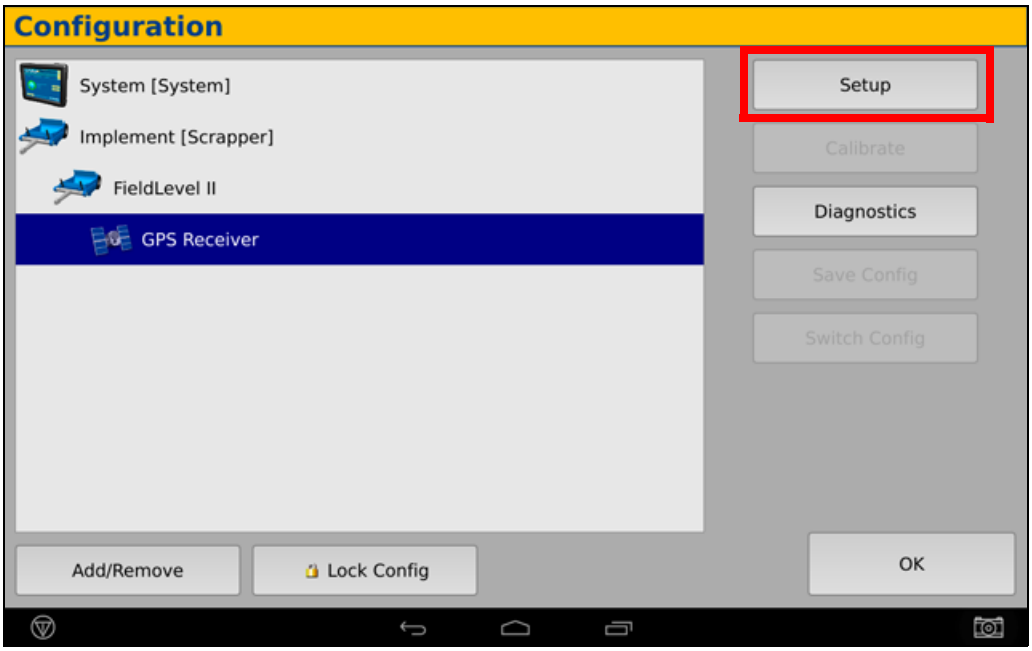
CONFIGURING THE DISPLAY FOR VERTICALPOINT RTK CORRECTIONS

- Configuring the display to use VerticalPoint RTK corrections
- Digi radio setup (Tractor)

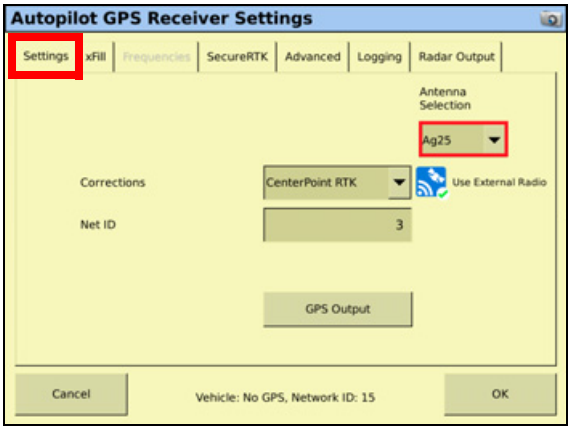
Configuring the display to use VerticalPoint RTK corrections

Note – *This procedure is carried out on an FmX integrated display (running firmware version 10.0 or later) or the FmX Plus app running on the TMX-2050 display (running firmware version 4.3.1 or later).*

1. On the FmX display or on the FmX Plus app, go to the *Configuration* screen, tap **GPS Receiver** and then tap **Setup**:



2. In the *Settings* tab, select the correct antenna type from the drop-down list:



FmX display

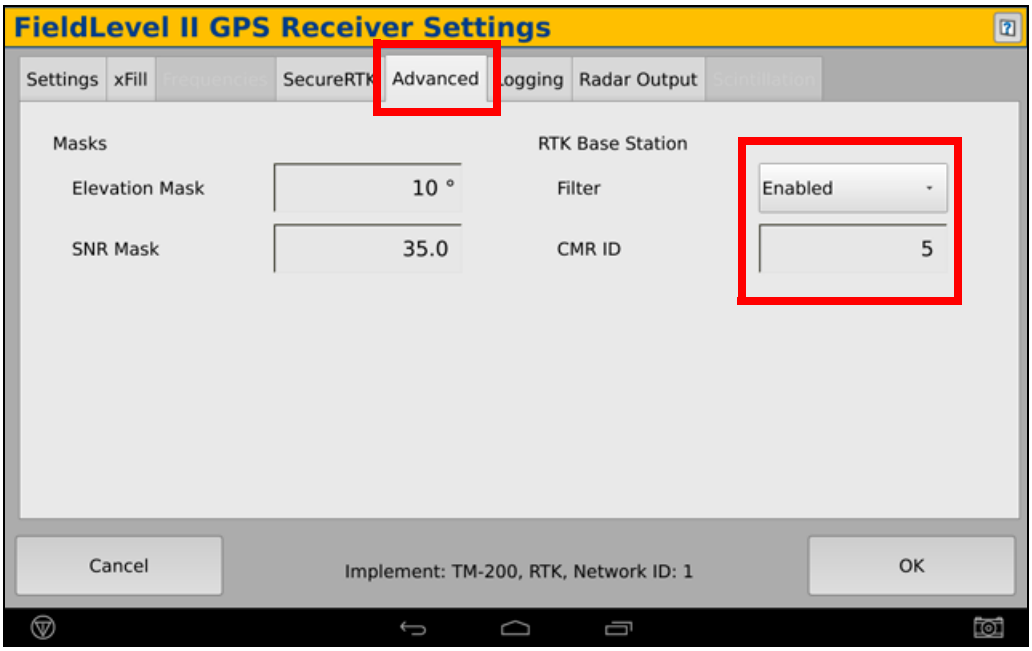
FmX Plus app

3. Select the required RTK network ID in the *Net ID* field:

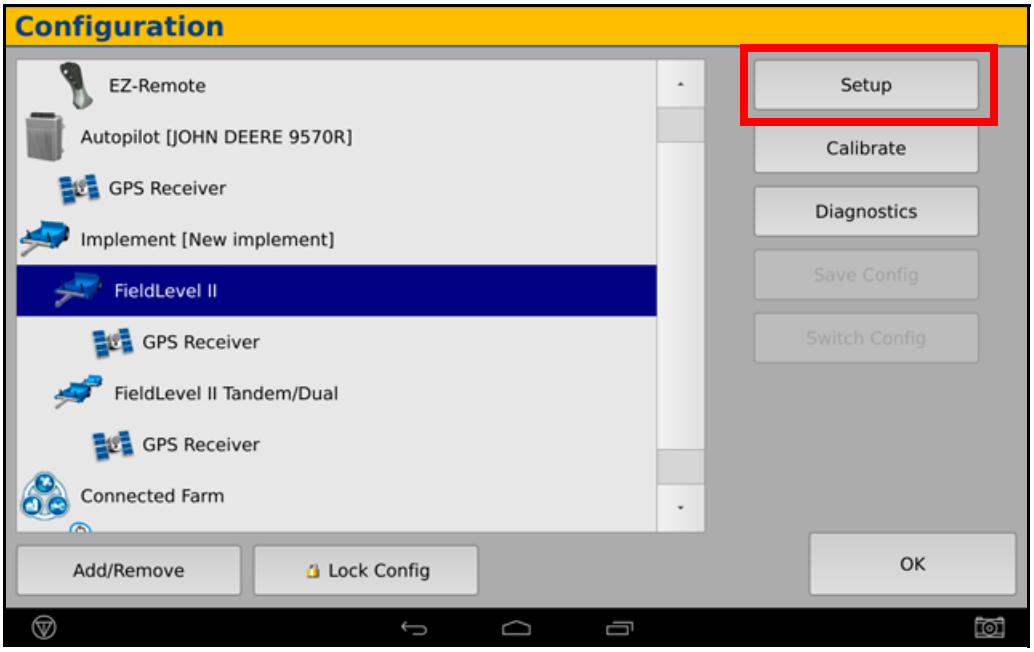
FmX display

FmX Plus app

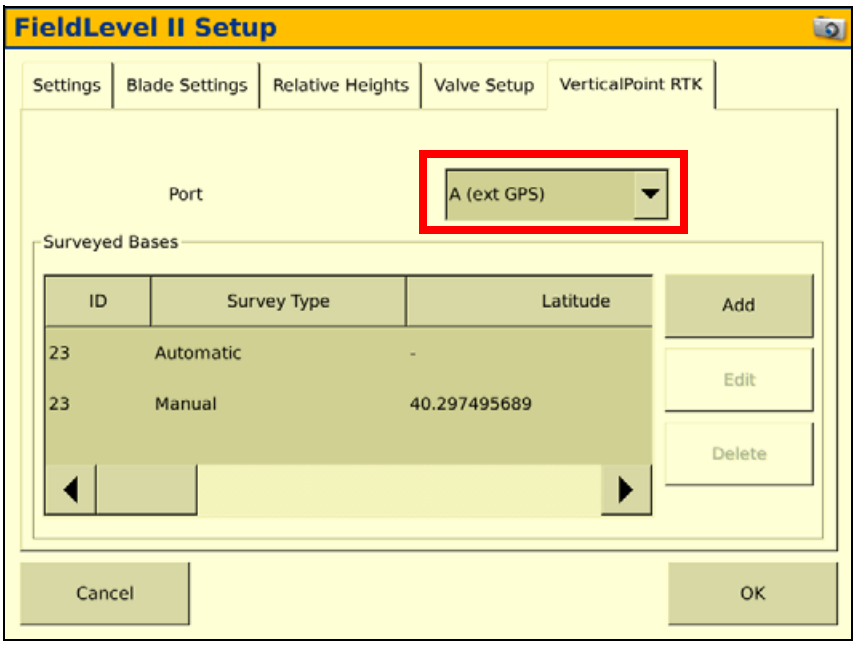
4. Select the *Advanced* tab. Enable the *CMR filter*. select the required *CMR ID* and then tap **OK**:



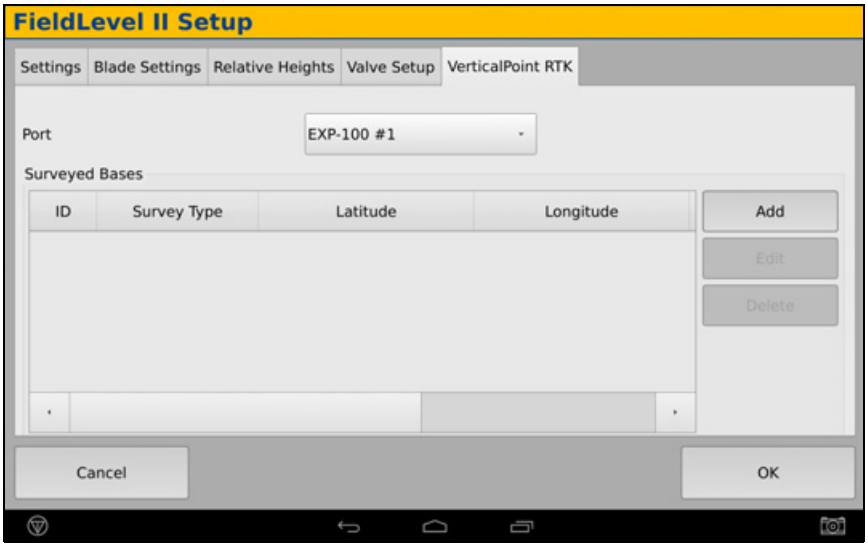
5. On the FmX display or on the FmX Plus app, go to the *Configuration* screen, tap *Fieldlevel II* and then tap **Setup:**



6. Configure the *Port* on the FmX or the Port Expander with FmX Plus that the supplemental base radio is connected to (for example, A (ext GPS), B (ext GPS), EXP-100 #1, or EXP-100 #2):



FmX display



FmX Plus app

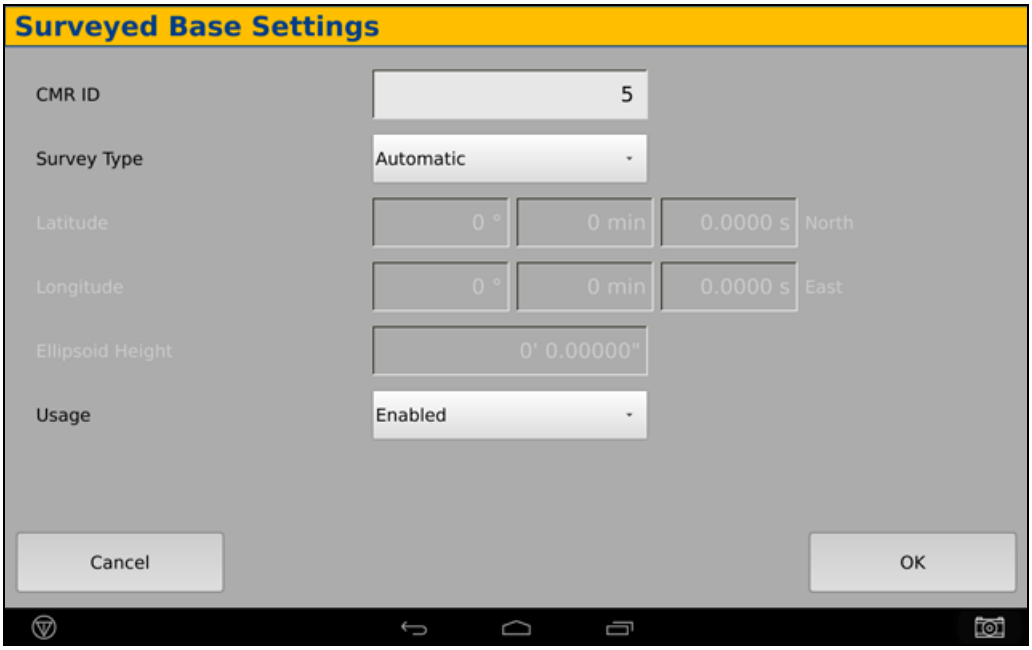
7. Select one of the two following methods to establish the supplemental rovers:

Note – *VerticalPoint RTK supports up to two (2) supplemental rovers.*

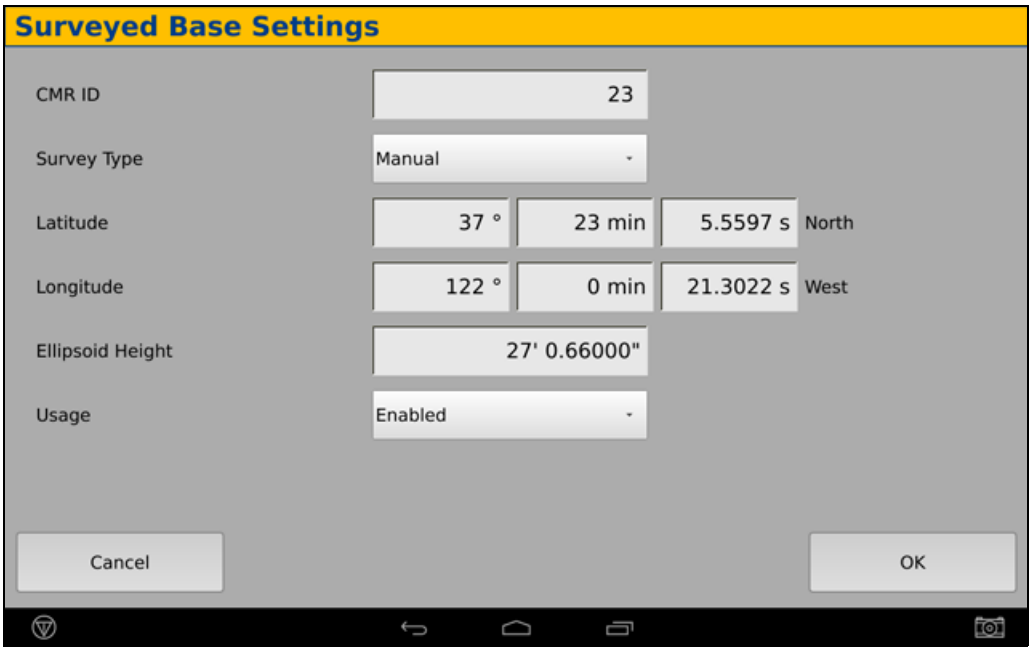
Note – *Repeat this step to add multiple supplemental rovers if more than one is being used.*

Note – *For option B (Manual) you must use the 'Ortho Height' from the WebUI of the AG-542 rover. See* Viewing surveyed base positions, page 14.

– **Option A (Auto):** Enter the CMR ID of the base station being used. If you want to disable this base within the array, change the *Usage* setting to *Disabled*.

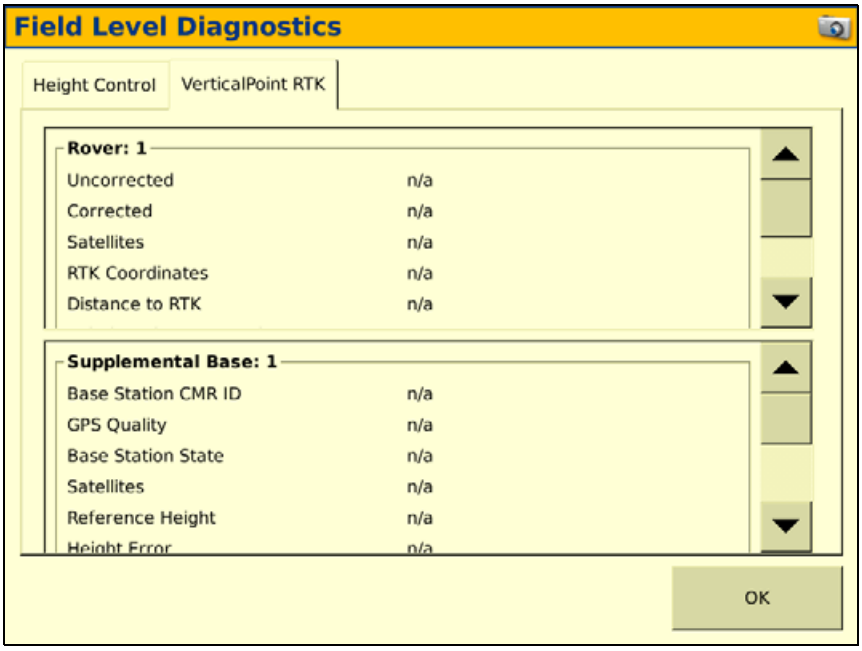


– **Option B (Manual)**: Enter the surveyed location of the supplemental rover. You must enter the CMR ID of the base being used, as well as the surveyed latitude, longitude, and Ellipsoid height coordinates. If you want to disable this base within the array, change the *Usage* setting to *Disabled.* See Viewing surveyed base positions, page 14

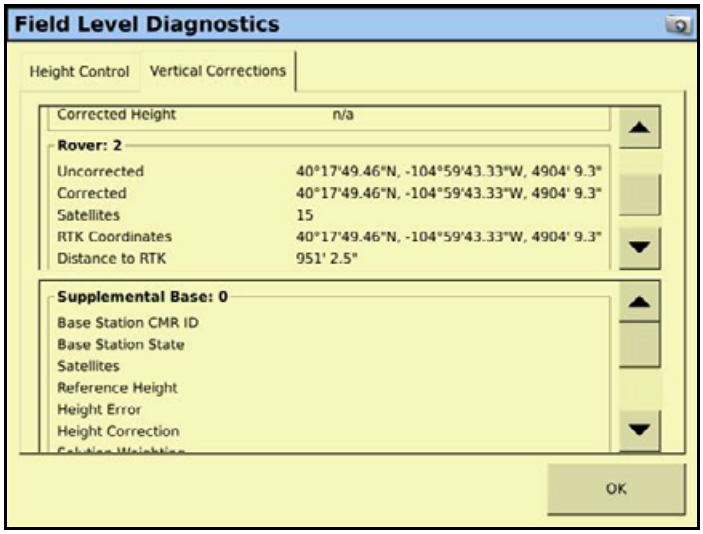


8. Once you have finished adding all of your supplemental rovers, go to *FieldLevel / Diagnostics / Vertical Corrections* and ensure that the display is tracking, converging, and then using corrections feedback from each of the supplementary rovers.

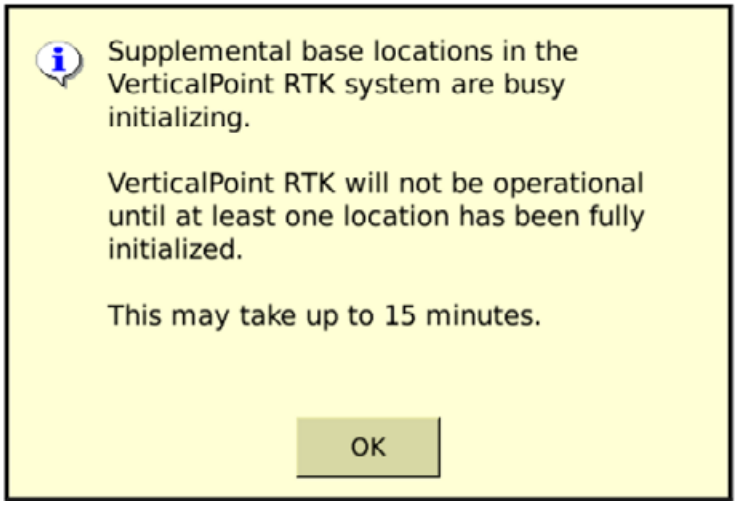
– **Screenshot 1** shows that the FmX display's internal GPS is not tracking any satellites and that the supplemental rover(s) are either not yet configured, or that the information is not yet being received from the supplemental rovers.



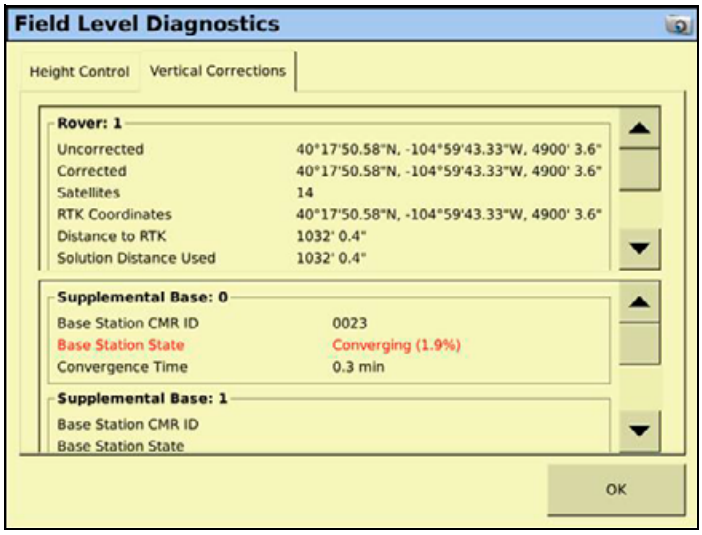
– **Screenshot 2** shows that the FmX display's primary and secondary receivers are tracking satellites, but that the supplemental rover(s) are either not yet configured, or that the information is not yet being received from the supplemental rovers.



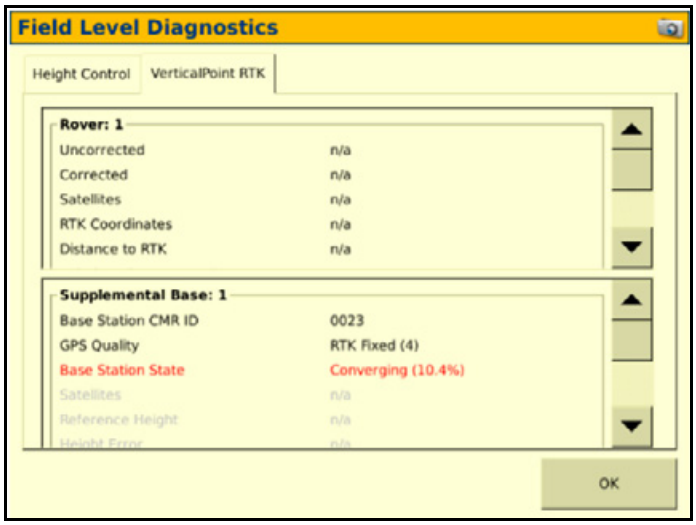
- **Screenshot 3:** Once the FmX display starts the Supplemental Rover(s) convergence process, the user is notified by the following messages of the current state of the convergence process. This process may take up to (15) minutes in order to complete. Upon completion the user is notified when the system is fully operational—tap **OK**.



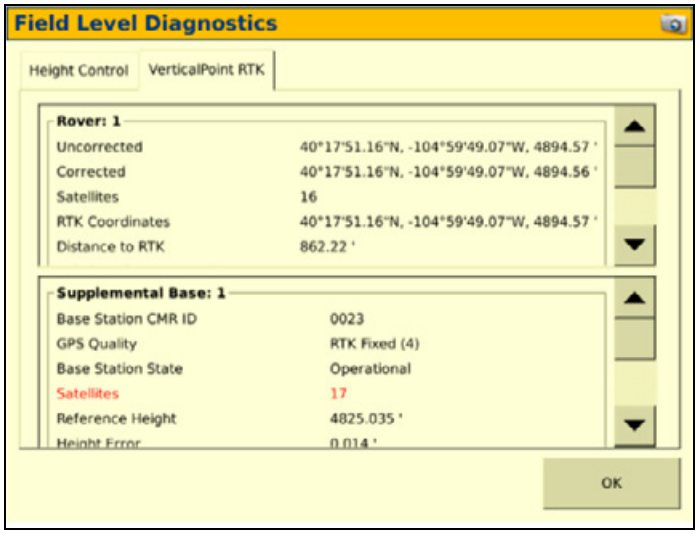
- **Screenshot 4** shows that the FmX internal primary and/or secondary receivers are tracking satellites, but the supplemental rover(s) are currently in the Converging state. .



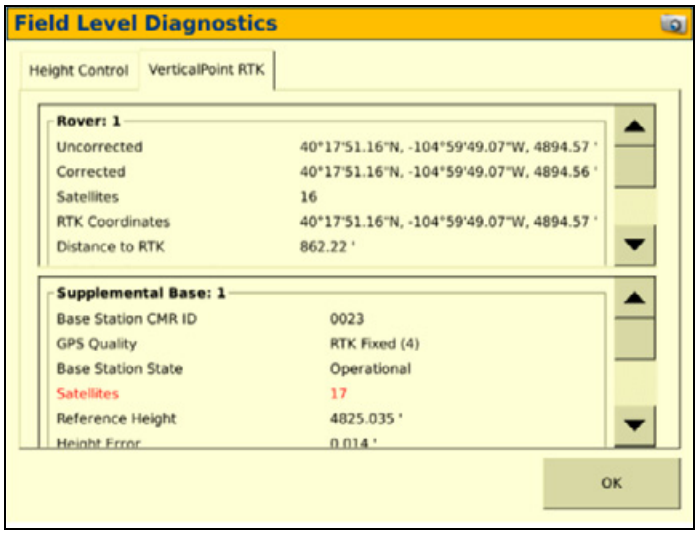
– **Screenshot 5** shows that each of the configured supplemental rover(s) information will be reported independently and the convergence status of each will also be displayed.



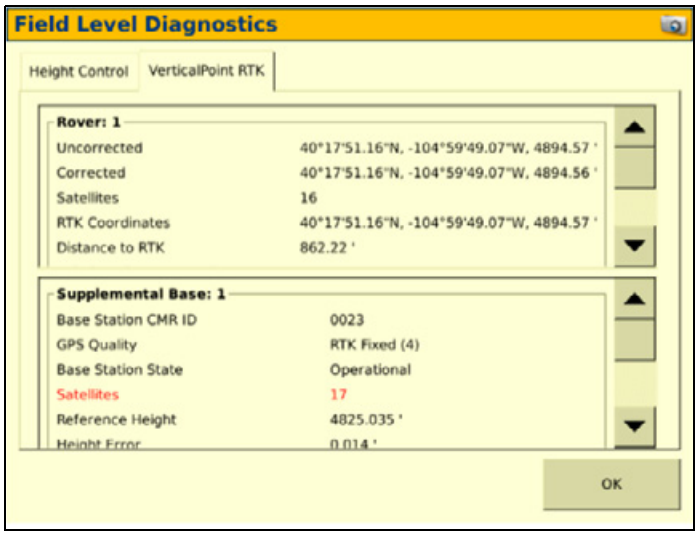
– **Screenshot 6:** Once the Supplemental Rover(s) have completed convergence, the *Base Station State* changes from *Converging* to *Operational*. Once the Supplemental Rover(s) report *Operational*, the FmX display uses the Supplemental Rover(s) information to correct the primary and secondary GPS positions.



- **Screenshot 7**: If any value(s) for a supplemental rover shows up in the *Diagnostics* screen as red text, this means that the information being reported by that supplemental rover for this particular item does not match that of the state(s) being reported on either the primary or secondary rover receivers. If any value is displayed in the diagnostics screen as red text for a supplemental rover, this means that the information being reported by that supplemental rover for this particular item does not match that of the state(s) being reported on either the primary or secondary rover receivers. In the example below, the number of satellites currently being reported by the supplemental rover does not match the number of satellites currently being tracked by rover 1..



- **Screenshot 8**: Use the directional sliders on the right side of the screen to scroll down through each of the Rovers (primary and secondary GPS) and the Supplemental Rovers listed in order to view all the available information for each of the systems' corresponding states.



Digi radio setup (Tractor)

1. With the AG-542 supplemental rover configured, ensure that the in-cab Digi radio's receive light (yellow) is flashing and the three green signal strength lights are lit, indicating a strong radio signal.
2. To verify that the FmX display is receiving serial NMEA messages, go to *Configuration / System / Diagnostics / Serial Comms* and check Connector A or B—you should see NMEA messages (plain text containing latitude, longitude, and so on) streaming in.

Chapter 5

OPERATOR INSTRUCTIONS

- Best practices for system setup
- Setting up a new job
- Status items, Optional: Configuring VerticalPoint RTK status items
- Starting operation

Best practices for system setup

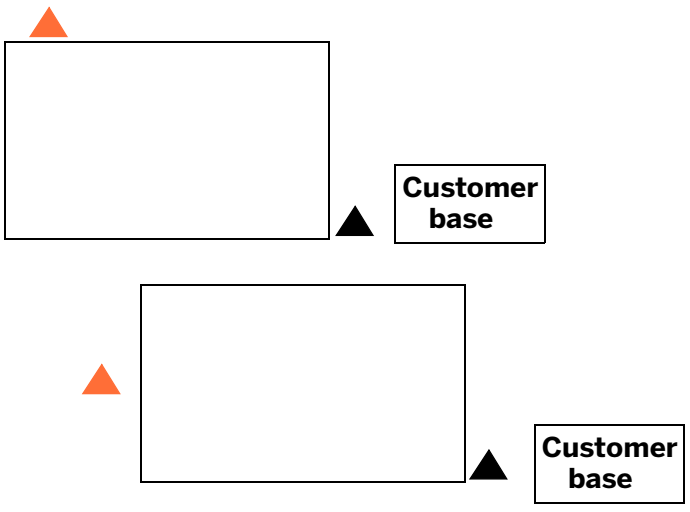
- Mount the base antenna level (within 1-2 degrees).
- Install the base receiver on a tripod and ensure that the antenna is more than 100 feet (35 m) away from any metal objects or structures (such as laser trailers, pump structures, aluminized crop covering), regardless of their height relationship to the antenna.
- Install the base and supplemental rovers in such a way that solar panels, charge controllers are not in the immediate are of the antenna. Make sure that all cables are located below the antenna and will not interfere with signal receptions.
- Make sure that the remote radio antenna that is included in the mobile base station kit points down, or is placed at least 3 meters (approximately 6 feet) away.
- Place the base receiver and supplemental rovers in the field of operation as close as possible to the FieldLevel II operation.
- Complete a 5 minute average each time a new base location is established by doing the following:
  a. Press **Enter** three times.
  b. Press the right arrow once (New base AVG should appear).
  c. Press **Enter** again - this will start the 300 second averaging.
- Verify that the radio antennas on the tractor are at least 3 feet away from each other.
- Verify that the Digi radio antenna and the 900 MHz antennas are at least 3 feet away from each other at the supplemental rovers.
- Make sure to set up the base station and supplemental rovers to cover the field as described below.

Setting up a new job

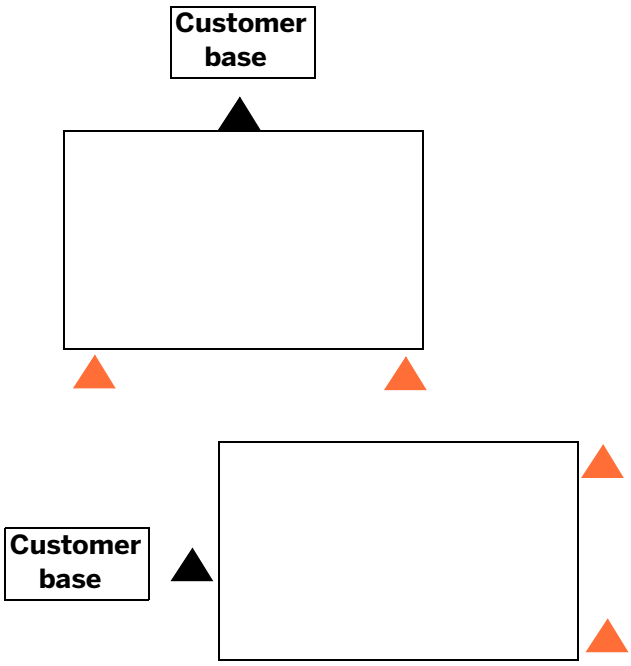
1. Set up Base Station.
2. Set up Supplementary Rover(s). Use the examples below as guides for placement of the equipment in the field.

CAUTION – For fields 40 acres or less then one (two recommended) or more supplemental rovers may be used. For 40 to 80 acres it is recommended to have at least two supplemental rovers. If field area is above 80 acres then it is recommended to split the field similar to the center base example below.

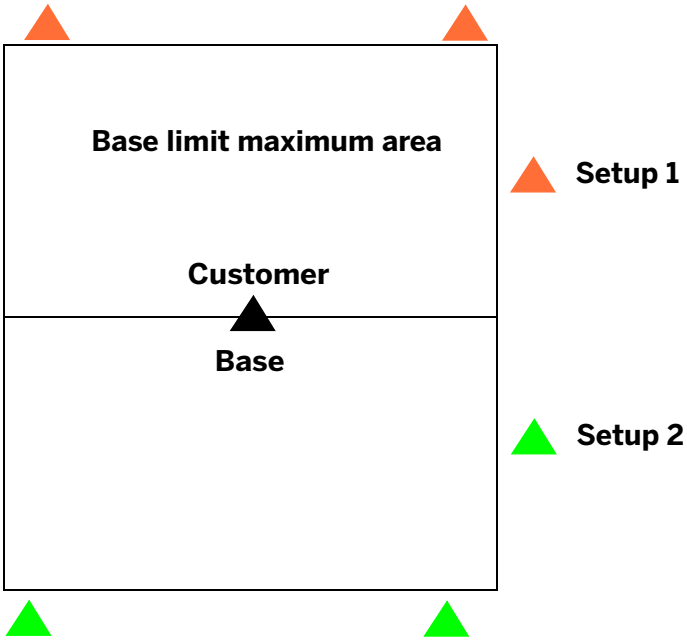
Example: Placement of single supplementary rover(s)



Example: Placement of two supplementary rovers

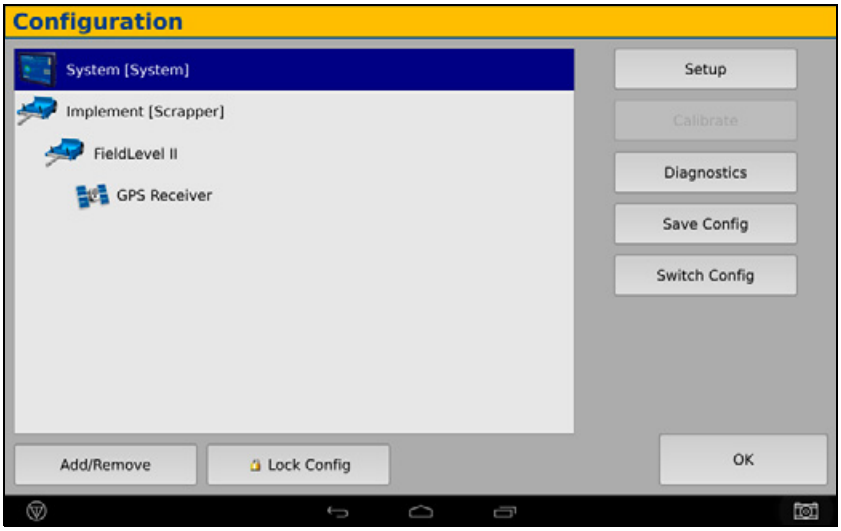


Example: Placement of center base and split field supplemental rovers

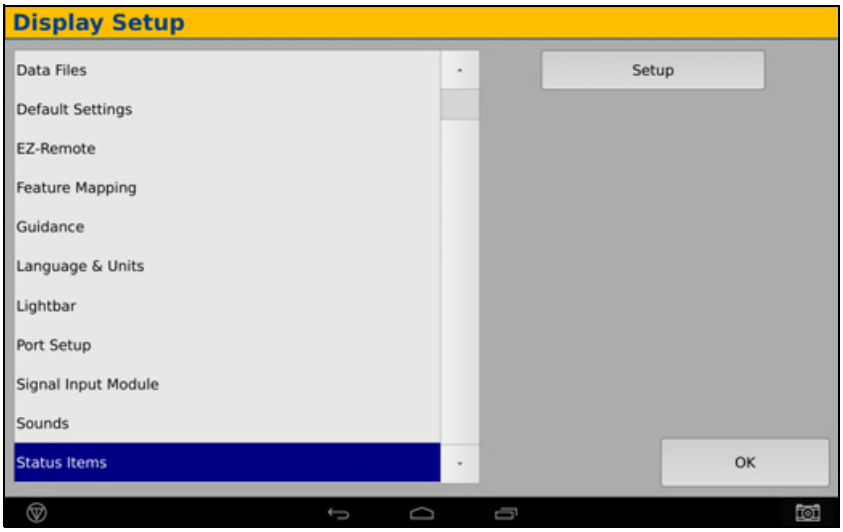


Status items, Optional: Configuring VerticalPoint RTK status items

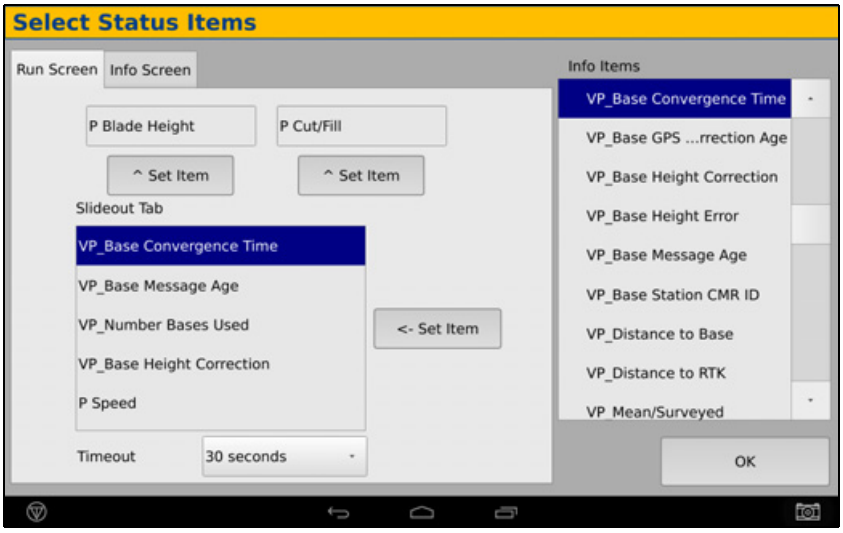
1. On the display go to *System/Setup*.



2. Select *Status Items* and then tap **Setup**.



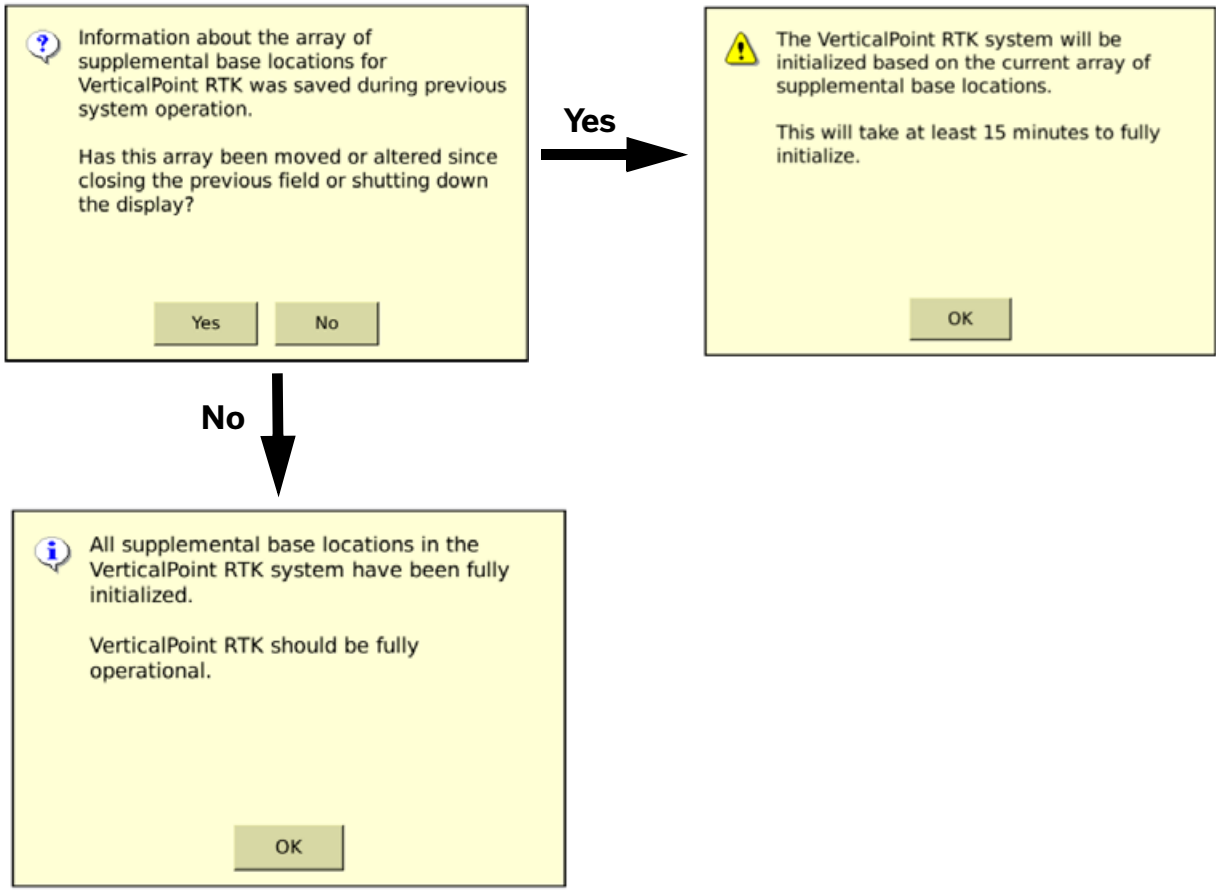
3. Select the status item to be displayed and tap **Set Item** to the location where the status item is to be displayed. The VerticalPoint RTK status items begin with VP_.



Starting operation

After turning off and then turning on the FmX display, you are prompted to select whether the previous Supplemental Rover(s) positions should be used once again from the previous session. If no Supplemental Rover(s) have been either moved or removed from the array, press **No**.

If you have moved or removed any of the Supplemental Rovers within the configured array, press **Yes** and require that all Supplemental Rovers reconverge on their positions to ensure the most accurate Vertical Corrections.



Chapter 6

TROUBLESHOOTING AND DIAGNOSTICS

- Troubleshooting setup and operation
- Run screen diagnostics

Troubleshooting setup and operation

While the VerticalPoint RTK system will provide greatly-improved height accuracy to your field-leveling operations, care is required in setting up the system in order to achieve maximum performance. Please take note of some of the following:

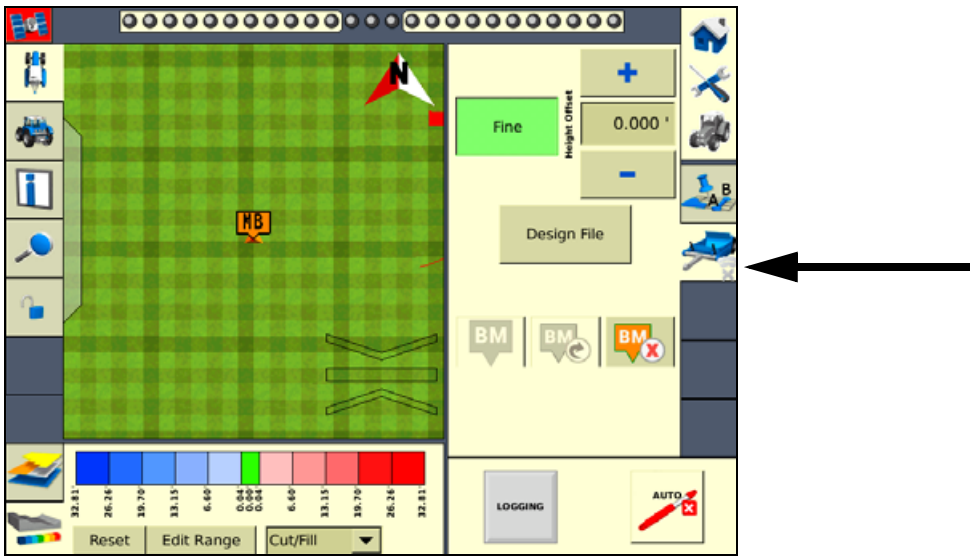
- Supplemental rovers must be > 1.5 meters apart. Antennas on vehicle need to be as far apart as possible. If the antennas are too close the correction age will start to climb.
- The positioning of the base and the supplemental rover should be such that they look like the 3 legs of a stool (assuming 2 supplemental bases). I.e. the base and supplemental bases should not be in a (more-or-less) straight line.
- RTK Base Station filtering must be turned on and the CMR ID must match the supplemental base array. The supplemental bases CMR ID must match the RTK base station.
- Make sure your elevation masks are set the same on the base, supplemental rovers, and rovers.
- VerticalPoint RTK requires RTK positions to converge.
- Vehicles must not be parked near the bases.
- If Status Items VP Base height correction or VP Rover height correction stop flickering, (cycling through values) user will need to reconfigure or reset the supplemental rovers. This will take about 15 minutes.
- If VP Base height correction or VP Rover height correction gets above 0.03 this indicates a problem. Check to see if one of the supplemental rover's external battery has died.
- If the Digi radio has one solid green and one blinking green LED, check that:
  - The antenna for the Digi is not sitting on the ground.
  - The Digi antenna and the supplemental rover antenna are not in the same horizontal plane.
  - Verify that the Digi directional antenna is in a vertical position and not leaning over.

The Digi radio will remain in search mode for 5 minutes after it is set up. If it does not receive a signal during this time period, it will stop searching. This will be indicated by the yellow LED being off. The solution is to press the Commissioning button next to the column of LEDs.

Run screen diagnostics

There are different aspects of diagnostics that may or may not be hidden to the user throughout the operational process of using VerticalPoint RTK such as the following:

- On-screen VerticalPoint RTK status icon(s):



  - Grey (shown above): The system has been enabled but is waiting to start.
  - Yellow: The system is either converging or operations have been paused.
  - Red: An error condition exists (such as loss of signal, incorrect CMR ID, or loss of corrections), the status icon will turn red and the background of the plugin control panel tab will also turn red to notify the user of this condition.
  - Green: The system is converged and operational for use.
- On-screen VerticalPoint RTK warning banners and popup dialogs to notify the user of any operational condition(s) which may need to be addressed with the system.