WORLDWIDE ELECTRIC CORPORATION

VFD Remote Operating Module: ROM 1

INSTALLATION GUIDE

FOR MONITORING AND CONTROLLING VARIABLE FREQUENCY DRIVES

REVISION 1

Do I have what I need?

- You will need:
  - Username / password for website wwe-rom.com
  - Tools for unit installation
  - A device connected to the internet (i.e., phone, laptop, tablet)

TOOLS NEEDED:

- Basic Hand Tools:
  - Crimper
  - Flat-head Screwdriver
  - Phillips Screwdriver
  - Wire Stripper
- Basic Crimping Ends
  - Fork Terminals
  - Wire Ties
- Drill with Step Bit
- Spare Wire
- Multimeter

Is this the right installation guide?

This installation guide specifically covers the installation of a **ROM 1** in combination with a Worldwide Electric VFD (specifically models VFD-WDFC, VFD-WDGP, VFD-WD4X) as well as the Hyundai N700 series. However, most other non-Worldwide Electric VFDs can be used as well with limited functionality and necessary adaptation.

IMPORTANT: This installation is to be performed by qualified personnel only. All applicable codes and regulations must be followed. If this installation guide inadvertently contradicts any local code or regulation, the local code or regulation needs to be followed.

What is in the box?

1x ROM 1 Device
1x Adapter Kit Harness
1x 4G Permanent Mount Antenna (incl. cables)

Installing the unit:

- Preparation for installation:
  - Ensure that all local policies and procedures are followed.
  - Prepare a safe workspace in respect to fall prevention and other factors, following all local policies and procedures.
  - Turn off all power sources to the cabinet, mains supplies as well as potential backup power sources.

Example of installed ROM 1 at an industrial facility.

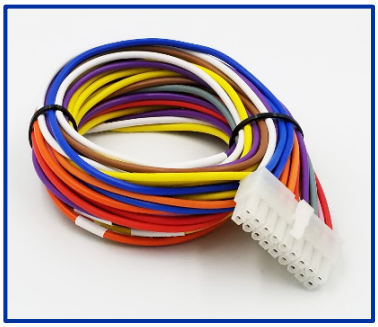
- Mounting considerations:
  NOTE: Generally speaking, the 4G antenna is comparable to a regular cell phone antenna. It works best outdoors but should have decent coverage in most indoors locations. However, concrete walls and heavy machinery can quickly degrade the signal. If signal quality is doubtful, we recommend a temporary installation and a quick signal test before drilling holes and routing all cables.
  - Choose a mounting location for the antenna and for the device and ensure that the antenna cable is long enough to reach the device.
  - Ensure that status LEDs lights (located between the two antenna connectors) can be seen easily once installed.
  - Ensure that all connections are easily accessible.

- Mount the ROM 1 device:
  - Permanently install the device in the chosen location inside the cabinet.

Wiring Instructions (Worldwide Electric and Hyundai VFDs):

Note: We produce many different wiring harnesses for a variety of manufactures, and many harnesses look very similar.

These instructions are for the ***20-pin wiring harness*** which is designed for use with Worldwide Electric and Hyundai VFDs.



The 20-pin wiring harness.

- Preparation for Wiring:
  - **Verify that you have the correct harness and the correct installation guide required for your application.**
  - Wait with connecting the main 20-pin connector that goes into the ROM 1 device until the very end. It is easier to connect everything else first.

NOTE: All wires are individually color coded and labelled. Consult the **I/O Allocation and Wiring Harness Description** at the end for additional wiring information.

IMPORTANT: Strip all wires just before installation to the correct length and apply a crimping sleeve / wire ferrule.

- Wiring the connections:
  - Using the included installation schematics and the wiring diagram of your unit, connect all required wires to the appropriate connection points of the VFD.
  - Properly protect all unused wires with shrink wrap tubes or wire nuts.
  - If you are not sure how to wire certain connections, please contact your local Sales Engineer for additional support or contact Worldwide Electric at 844-993-7378.

ROM Activation Process:

To gain access to our website, you need to complete a registration form. Use the QR code to open the form or visit http://wwec.co/rom1-activate

- The easiest way is for you to fill out the online registration form above, but alternatively, you can call customer service and we will fill out the Activation Form for you.
- The account will typically be available in 4 hours, and the Alerts / Advanced Options will be typically set up in 48 hours.
- When the Account setup is complete, you will receive an email with
  - your temporary password
  - a welcome message saying that you now log in
  - instructions to reset your Password
  - a link to the dashboard (wwe-rom.com)
- Please change the password and store it in a secure location
- Your device is now ready! See the next section about conducting a functional test.

Testing of signal strength and installation of antenna:

It is recommended that the cellular signal strength of the Cell/GPS antenna is tested prior to permanent antenna installation. This requires the following preliminary steps:

Choosing antenna positioning:

- Choose the installation location for the Cell/GPS antenna:
  - Position the antenna at a suitable location.
  - Verify that the antenna cables reach the ROM device without strain.

Connecting the antenna and powering the unit:

- Connect the antenna cables to the appropriate position.
  - GPS wire to the GPS port.
  - Cell wire to the Cell port.

- Power the unit and **WAIT** for communication to start:
  - Restore power to the cabinet and connect the batteries.
  - Observe the two green LEDs located between the antenna connectors:
    - "H/beat" (heartbeat) should flash at regular intervals when the device is powered.
    - "Modem" should flicker irregularly while the unit is actively communicating.

NOTE: *It may take as much as 30 seconds before communication starts.*

Verifying signal strength on our website:

The following steps will ensure that the device is able to communicate with our web site.

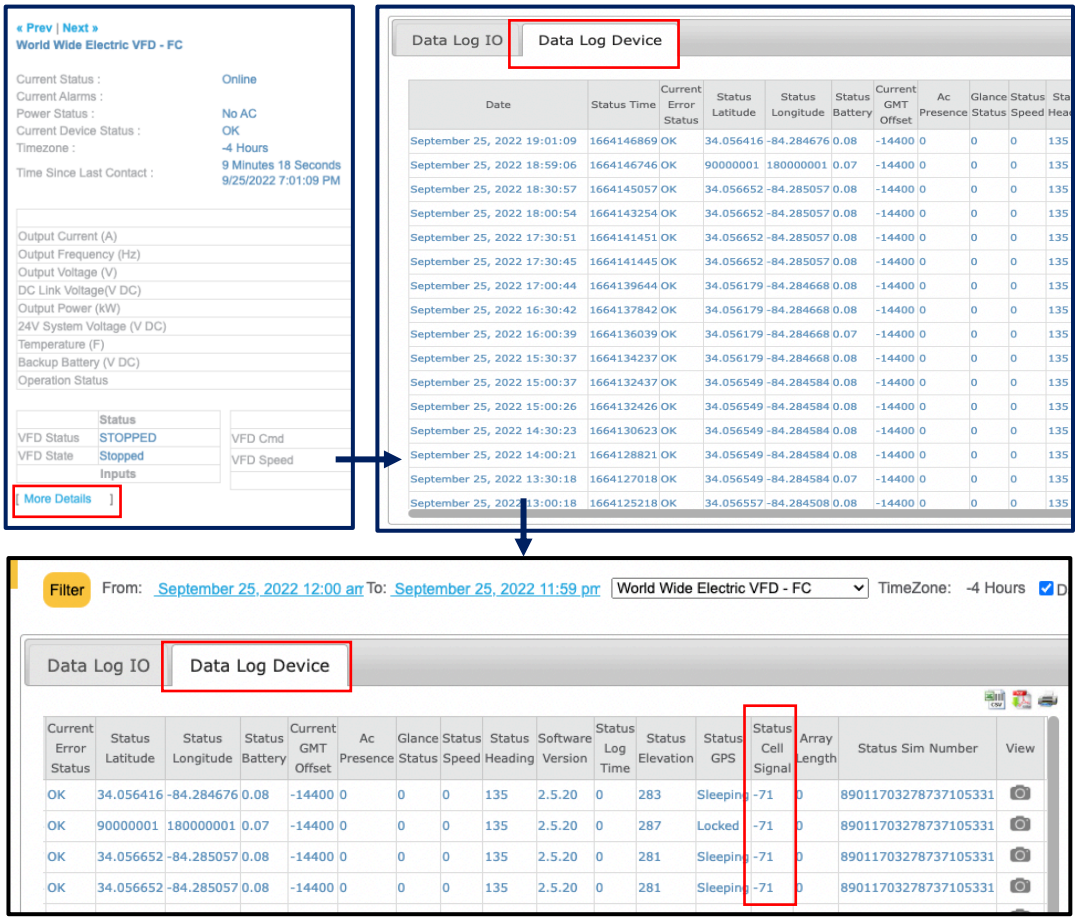
- Open web browser (Chrome recommended) using your phone, tablet, or laptop:
  - Visit our website at **wwe-rom.com**
  - Enter Username and Password.
    (As previously mentioned, you should have received this from your Worldwide Electric Corporation contact).

- Observe reported signal strength on the website:
  - Navigate to the "Device Details" page of the device to be installed.
  - This can be done one of two ways:
    - Clicking on the device ID/name in the list of devices seen in the left-hand panel of the home screen.
    - Locating device in the map view and clicking on the device icon, then selecting "more details."

- Once on the "Device Details" page of the correct device:
  - Click again on "More Details."
  - Go to the "Data Log Device" tab.

- Determine the status of the cell signal strength:
  - Scroll along the “Data Log Device” table to find recorded signal strength.
  - Signal should be better than -115:
    -100 .. 0: Strong signal
    -115 .. -100: Signal is low but sufficient
    -120 .. -115: Signal is unreliable, service interruption possible
    under -120: Signal is insufficient for operation

IMPORTANT: Note that signal strength is a **negative number** (how much is the strength reduced), for example, -60 is much stronger that -120.



Date	Status Time	Current Error Status	Status Latitude	Status Longitude	Status Battery	Current GMT Offset	Ac Presence	Glance Status	Status Speed	Sta Hea
September 25, 2022 19:01:09	1664146869	OK	34.056416	-84.284676	0.08	-14400	0	0	0	135
September 25, 2022 18:59:06	1664146746	OK	90000001	180000001	0.07	-14400	0	0	0	135
September 25, 2022 18:30:57	1664145057	OK	34.056652	-84.285057	0.08	-14400	0	0	0	135
September 25, 2022 18:00:54	1664143254	OK	34.056652	-84.285057	0.08	-14400	0	0	0	135
September 25, 2022 17:30:51	1664141451	OK	34.056652	-84.285057	0.08	-14400	0	0	0	135
September 25, 2022 17:30:45	1664141445	OK	34.056652	-84.285057	0.08	-14400	0	0	0	135
September 25, 2022 17:00:44	1664139644	OK	34.056179	-84.284668	0.08	-14400	0	0	0	135
September 25, 2022 16:30:42	1664137842	OK	34.056179	-84.284668	0.08	-14400	0	0	0	135
September 25, 2022 16:00:39	1664136039	OK	34.056179	-84.284668	0.07	-14400	0	0	0	135
September 25, 2022 15:30:37	1664134237	OK	34.056179	-84.284668	0.08	-14400	0	0	0	135
September 25, 2022 15:00:37	1664132437	OK	34.056549	-84.284584	0.08	-14400	0	0	0	135
September 25, 2022 15:00:26	1664132426	OK	34.056549	-84.284584	0.08	-14400	0	0	0	135
September 25, 2022 14:30:23	1664130623	OK	34.056549	-84.284584	0.08	-14400	0	0	0	135
September 25, 2022 14:00:21	1664128821	OK	34.056549	-84.284584	0.08	-14400	0	0	0	135
September 25, 2022 13:30:18	1664127018	OK	34.056549	-84.284584	0.07	-14400	0	0	0	135
September 25, 2022 13:00:18	1664125218	OK	34.056557	-84.284508	0.08	-14400	0	0	0	135

Current Error Status	Status Latitude	Status Longitude	Status Battery	Current GMT Offset	Ac Presence	Glance Status	Status Speed	Status Heading	Software Version	Status Log Time	Status Elevation	Status GPS	Status Cell Signal	Array Length	Status Sim Number	View
OK	34.056416	-84.284676	0.08	-14400	0	0	0	135	2.5.20	0	283	Sleeping	-71	0	89011703278737105331	
OK	90000001	180000001	0.07	-14400	0	0	0	135	2.5.20	0	287	Locked	-71	0	89011703278737105331	
OK	34.056652	-84.285057	0.08	-14400	0	0	0	135	2.5.20	0	281	Sleeping	-71	0	89011703278737105331	
OK	34.056652	-84.285057	0.08	-14400	0	0	0	135	2.5.20	0	281	Sleeping	-71	0	89011703278737105331	

- If the cell signal strength is within the desired range:
  - Mark the location of the antenna position.
  - Drill holes for cable connection (if required), install necessary mounting brackets, etc. and securely install the antenna at the desired location.

Improving a weak signal:

- If the cell signal is not strong enough:
  - Reposition the antenna.
  - Refresh the device from the website "Device Detail" page.
  - Refresh the browser page (F5).
  - Repeat as necessary until the desired signal range is achieved.

If the desired cellular signal strength cannot be achieved, contact your Worldwide Electrical Corporation contact to discuss alternative mounting options or the use of a special antenna.

Programming the VFD units Matrix

NOTE: *Programming the VFD requires familiarity with the respective model. Please consult the VFD user manual for further details.*

The following VFD settings have been tested with the ROM 1 device. Your specific situation may require different settings, but the values below should be a good starting point.

Control	N700E ROM-1	WDFC ROM-2	WDGP ROM-3	WD4X ROM-4	Generic (non-WWE) ROM-1
Command Source	A02 = 1 Terminal	DRV 06 = 1 FX/RX1	Dru = 1 FX/RX1	Dru = 1 FX/RX1	Start/Stop Input
Frequency Source	A01 = 1 Terminal	DRV 07 = 5 I2 (4-20mA)	Frq = 4 I (4-20mA)	Frq = 5 I2 (4-20mA)	Analog 4-20mA In
	C03 = 13 Volt/Current				
	C09 = 1 NC NO->Voltage NC->Current				
Run Relay	C15 = 0 Relay 3 ***	OUT32 = 14 Relay 2	I54 = 12 Relay MO	OU33 = 14 Relay Q	Relay for RUN
Fault Relay	C13 = 5 Relay 1	OUT31 = 23 Relay 1	I55 = 17 Relay 3	OU31 = 29 Relay 1	Relay for Fault
Communications					
Unit Address	b17 = 1 Address	COM 01 = 1 Address	I60 = 1 Address	CM 01 = 1 Address	Not Applicable
Protocol	Fixed to Modbus RTU	COM 02 = 0 Modbus RTU	I59 = 0 Modbus RTU	CM 02 = 0 Modbus RTU	Not Applicable
Speed	b31 = 4 19200 bps	COM 03 = 4 19200 bps	I61 = 4 19200 bps	CM 03 = 4 19200 bps	Not Applicable
Format	Fixed to 8/N/1	COM 04 = 0 Parity 8/N/1	I65 = 0 Parity 8/N/1	CM 04 = 0 Parity 8/N/1	Not Applicable

Functional testing:

NOTE: *Testing details depends on your specific application. This chapter only provides a general overview.*

Minimally required test:

NOTE*: In some situations, a full test is either not safely feasible or not necessary. The following procedure describes the absolute minimal testing that should be done on site. With just two quick tests, the entire chain from power, antenna, network, to the website can be verified.*

WARNING: Make sure it is safe to start or stop the VFD before actually doing so!

- On the web site, start or stop the VFD, and observe that the VFD follows the instruction (e.g., turn on, turn off, etc.).
- At a later point, perform all the remaining tests remotely, e.g., by verifying the correct values on the website.

Recommended functional test:

- For a thorough test, on the next page, complete the entire check list and record your findings in the checklist.
- Investigate and correct all problems found.

ROM 1 Installation Checklist:

NOTE: The Unit ID is found on the web site, top-left corner of device view. (“World Wide Electric VFD - FC” in the example on the right.)

Unit ID on web site

Unit ID:

_____

Unit Type:

_ROM 1_____

Tested By:

_____

Date:

_____

CHECKLIST DESCRIPTION	✓
The device is powered on: “heartbeat” LED flashes	
Cellular communication is enabled: “modem” LED flashes	
Device found on wwe-rom.com	
wwe-rom.com GPS Status reads “locked”	
Status Cell Signal reading on website is within specified limits	
Expected Power Voltage shown on web site	
VFD turns on when activated via web site	
VFD turns off when deactivated via web site	
VFD failure simulated and failure reported on the web site (to simulate a failure, consider disconnecting the fault input / connect input X to output 24V etc.)	

I/O Allocation and Wiring Description for VFDs

The following table shows where the various wired from the ROM-1 connectors (J1, a 20-pin-connector for analog I/O and power, and J3, a 4-pin connector for the Modbus) connect on the respective VFDs.

For example, the wire from J1-4 connects to terminal “1” on Hyundai VFDs, and terminal “P1” on Worldwide Electric VFDs.

This list shows only the connections used with Worldwide Electric VFD, refer to the next chapter for a full discussion of all connections on the ROM-1.

WARNING: High voltage (230VAC) is present on some wires!

ROM connectors			VFD models				Function
Wire label	Wire color	ROM connector	Hyundai N700E	WDFC	WDGP	WD4X	
O2	Blue/black	J1-4	1	P1	P1	P1	Start/Stop
A3	Blue	J1-5	FM	A01	AM	A01	Frequency Feedback 0-10VDC (Out)
O1	White/Black	J1-6	OI	I2	I	I2	Frequency Reference 4-20mA (In)
GND	White/Blue	J1-10	CM1	CM	CM	CM	Ground
D2	Blue	J1-12	AL1	A1	3A	A1	Alarm Relay
D1	Blue	J1-13	RN3	A2	MO	Q1	Run Relay
A5	Orange	J1-1	VAC 230 ONLY	VAC 230 ONLY	VAC 230 ONLY	VAC 230 ONLY	230VAC Monitor
A5	Orange	J1-11	VAC 230 ONLY	VAC 230 ONLY	VAC 230 ONLY	VAC 230 ONLY	230VAC Monitor
O1	Red/White	J1-16					+24VDC
VDC	Blue	J1-20					+24VDC

Modbus Connections:

ROM connectors			VFD models				Function
Wire label	Wire color	ROM connector	Hyundai N700E	WDFC	WDGP	WD4X	
I/O	Yellow	J9-1	RS485(+)				Modbus
I/O	Green	J9-3	RS485(-)				Modbus

Note: The ROM-1 can also be used with other VFDs, but the wiring has to be adapted. Please refer to the manufacturer’s manual of that model, and make sure that the following minimum connections are made:

- Digital Input (to receive run command)
- Digital Output (to send fault trigger)
- Analog Input (to receive speed change)
- Analog Output (to display running frequency)

I/O Allocation and Full Wiring Description – ROM1

For: **ROM 1 Device**

installed with: **Variable Frequency Drive (Worldwide Electric, Hyundai N700, or other)**

Notes: Determining the correct connections requires advanced engineering experience, and mistakes could lead to damage to the Low Power Device or the VFD Unit and associated equipment and could lead to injury or death. In doubt, please contact your local Sales Engineer.

1. Most setups will not require all wires to be connected.
2. This I/O allocation table is for using the ROM 1 device as part of a Monitoring and Control System.

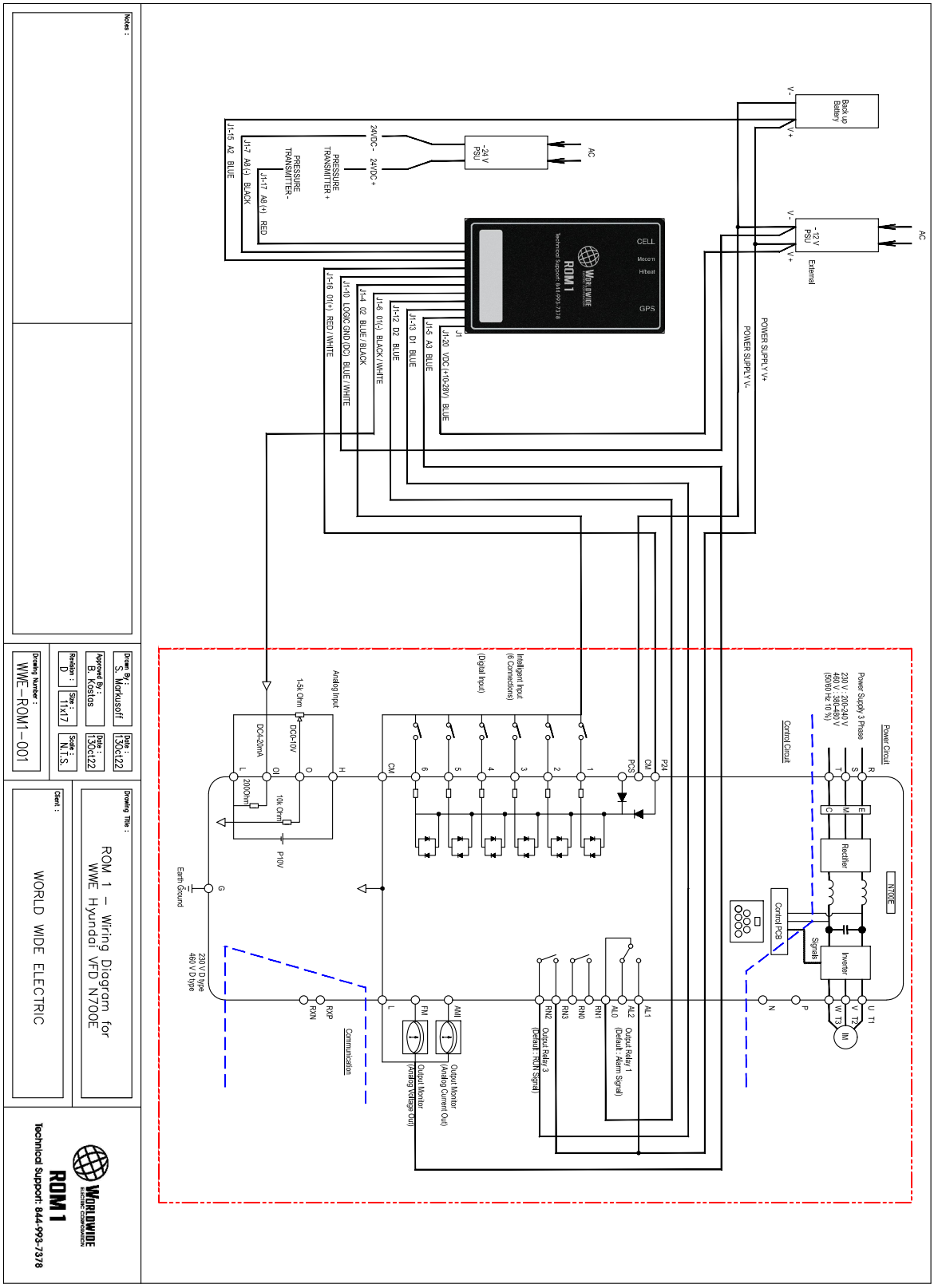
LABEL ON WIRE	TYPE	FUNCTION	PIN	COLOR	DESCRIPTION
A5	Analog	Voltage 0-280VAC	1	Orange	General purpose analog input for AC Voltage monitoring (Typically used for AC line monitoring)
D4	Input	Digital3 - 30VDC/Pulse	2	Blue	General purpose digital input
D3	Input	Digital3 - 30VDC/Pulse	3	Blue	General purpose digital input
O2	Output	Output – Open collector, Frequency, PWM	4	Blue/Black	Digital/Freq/PWM Output
A3	Analog	Voltage 0-30VDC	5	Blue	General purpose analog input for DC voltage monitoring
O1	Output	Output 4-20mA (-)	6	Black/White	Control Output
A8	Analog	Instrumentation 4-20mA (-)	7	Black	4-20 mA loop
A7	Analog	Instrumentation 4-20mA (-)	8	Black	4-20 mA loop
A6	Analog	Instrumentation 4-20mA (-)	9	Black	4-20 mA loop
GND	Power	Logic Ground (DC)	10	White/Blue	Logic ground (connect to GND of DC power source)
A5	Analog	Voltage 0-280VAC	11	Orange	General purpose analog input for AC voltage monitoring (typically used for AC line monitoring)
D2	Input	Digital3 - 30VDC/Pulse	12	Blue	General purpose digital input
D1	Input	Digital3 - 30VDC/Pulse	13	Blue	General purpose digital input
A4	Analog	Voltage 0-30VDC	14	Blue	General purpose analog input for DC voltage monitoring

A2	Analog	Voltage 0-30VDC	15	Blue	General purpose analog input for DC voltage monitoring
O1	Output	Output 4-20mA (+)	16	Red/White	Control Output
A8	Analog	Instrumentation 4-20mA (+)	17	Red	4-20 mA loop
A7	Analog	Instrumentation 4-20mA (-)	18	Red	4-20 mA loop
A6	Analog	Instrumentation 4-20mA (-)	19	Red	4-20 mA loop
VDC	Power	System power (+10 to 28VDC)	20	Blue	Primary power input for solar/DC option
A1	Analog	System Voltage 10-30VDC	Internal		Voltage measured on incoming VDC supply
A9	Analog	Temperature	Internal		Temperature in equipment enclosure (+/-2C)
D5	Input	External pushbutton	Internal		Multifunction, including KDS calibration
I/O	I/O	RS485 (A+)	J9-1	Yellow	RS485 Port A (RX+ and TX+)
GND		Logic Ground reference	J9-2	Black	Logic Ground Reference for RS485 port
I/O	I/O	RS485 (B-)	J9-3	Green	RS485 Port B (RX- and TX-)
V-OUT		System Power Output	J9-4	Red	System power output

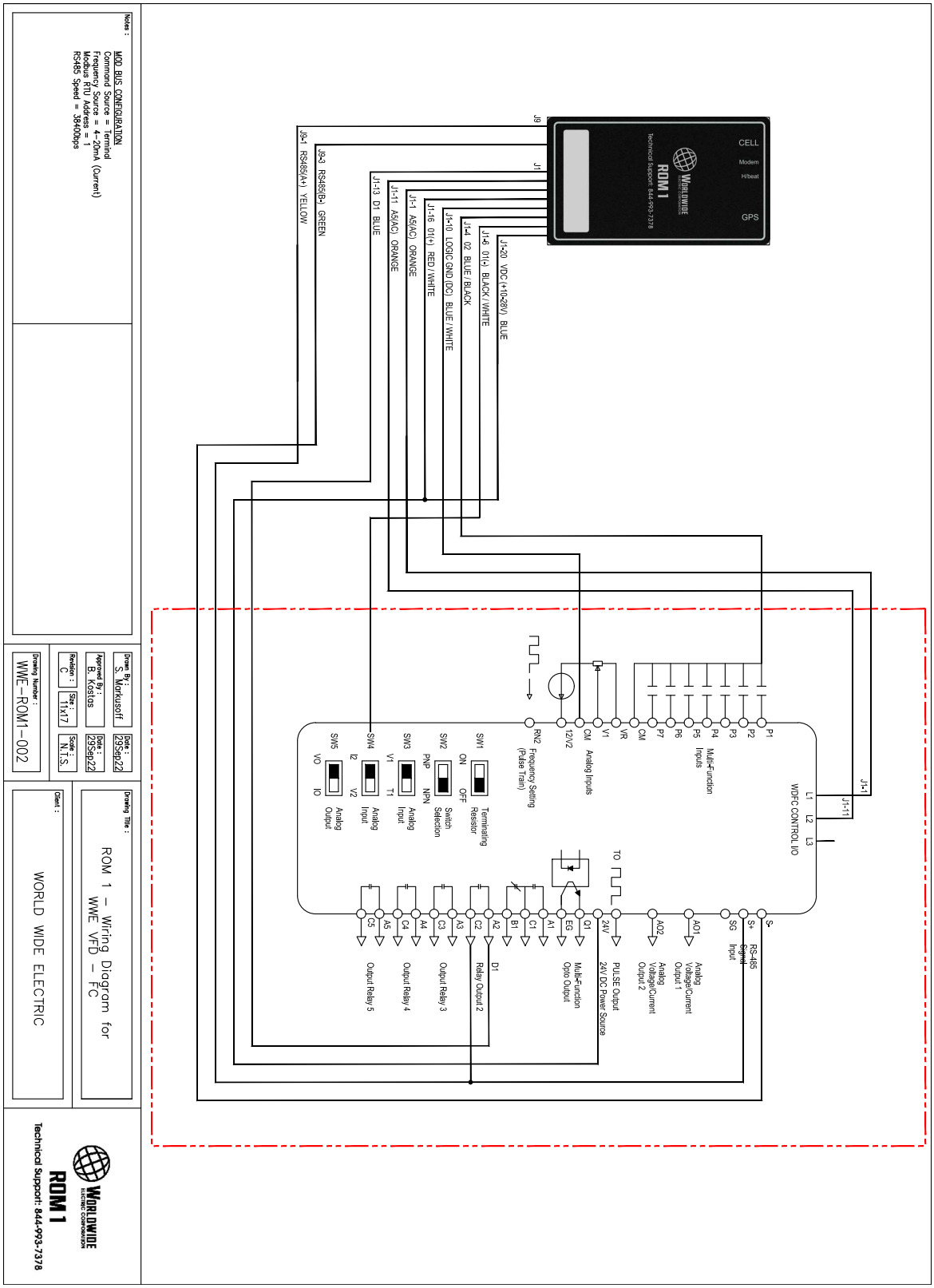
LIST OF ATTACHED ELECTRICAL DRAWINGS:

- WWW-ROM1-**001**: for use with VFD **Hyundai N700 series** and **non-WWE**
- WWW-ROM1-**002**: for use with VFD **WDFC series**
- WWW-ROM1-**003**: for use with VFD **WDGP series**
- WWW-ROM1-**004**: for use with VFD **WD4X series**

Electrical Drawing WWW-ROM1-**001**: for use with VFD **Hyundai N700 series**



Electrical Drawing WWW-ROM1-**002**: for use with VFD **WDFC series**



Electrical Drawing WWW-ROM1-**003**: for use with VFD **GP series**