AMI Training: Hardware Troubleshooting 101 and Field Tool Training May 14th, 2024



Speaker Introductions





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So...your meter isn't working like it's supposed to...

...you're missing reads...

...billing is tomorrow...

What do you do?



Step 1: Don't Panic







Troubleshooting Toolkit



Field Tool



Yukon

9



Network Communications

Visual Cues



Frequently Asked Questions:

- Why is this meter not reading?
 - Is there an issue with the device?
 - Is there an outage?
- Why am I seeing this Infrastructure Warning?
 - Why is this gateway disconnected?
- This water node was installed this morning. Why is it not in Yukon?
- Others?



Field Tool/Network Runner



Network Scout – Yuma Tablet







Direct RF Communication To Nodes Using Field Tool



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Network Runner Uses

- Gateway Commissioning (Required)
- Water and Gas Node Commissioning (Required)
- Field Troubleshooting
 - Electric Meters
 - Load Control Receivers
 - Water/Gas Nodes
 - Infrastructure Gateways and Relays





Gateway 801



Figure 4. Gateway 801 radio frequency gateway



Gateway, Backhaul, and Enclosure





Typical Gateway Installation





Gateway Commissioning: Required

- Required process when a new gateway is installed
- Obtain IP settings and configure gateway to these settings using field tool





- Open the Network Runner program
- Connect Device





Locate MAC Address on device with QR Code



EATON Powering Business Worldwide

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Click/Select Import Marriage file:

A Marriage file is generated from EATON which lists all the RF Node Serial Numbers with their MAC Addresses for your Network/Project. Once imported the list will be populated and displayed as below:

← Network Runner			N ¥	- o ×	Open						×
=					\leftarrow \rightarrow \checkmark \uparrow 📕 > Thi	s PC > Documents > Marriage Files > Glence	be	× ت	Search Glene	:oe	م
					Organize New folder	r				- ==	• •
	Search by Serial or MAC ID		٩		💺 Windows (C:) \land	Name	Date modified	Туре	Size		
\longrightarrow	🕞 Import Marriage File	Add Device	Erase Device List		 OneDrive 	marriagefile.csv	10/12/2022 5:31 AM	CSV File	178 KB		
	Name	Castal	Aslahasas		interview and the second secon						
	IName	Serial	Address		3D Objects						
	22176047	4300032260	00:14:08:10:54:98		Desktop						
	22176048	4300033598	00:14:08:10:9A:85		🔁 Documents						
	22176049	4300031551	00:14:08:10:51:D3		Downloads						
					Music						
	22176050	4300033572	00:14:08:10:9A:6B		E Pictures						
	22176051	4300032192	00:14:08:10:54:54		Videos						
	22176052	4300032255	00:14:08:10:54:93		🐛 Windows (C:)						
				G	File nam	e:			 All files 		~
			+ × Connect Disconne	cct Delete					Open	С	Cancel



Click Select Add Device

Camera Application opens. Use rear camera to scan QR Code and import MAC Address.









Network Runner		
Gateway Commissioning		
Configuration Activation		
NTP Servers		
10.106.171.161 129.6.15.29 151.110.126.15	1	
Ethernet IP		
10.106.171.217		
Ethernet Mask	_	
255.255.254.0		
Ethernet Default GW		
10.106.170.1		
APN	1	
	1	
Arri Usel	1	
APN Password	i	
	1	
Interface	i.	
Cellular Modem		
ICMP		
Disabled		
	Ö	⊳ Sat
	opulate	
		



Let's Practice!



Exercise 1: Gateway Commissioning

- 1. Connect to a gateway using the field tool
 - Use either the camera or QR app reader to capture the MAC address
- 2. Capture the current IP settings on the gateway



Gateway Troubleshooting



Common Gateway Questions and Issues

- 1. Gateway is **Disconnected** in Yukon
- 2. Gateway is Connected in Yukon, but it shows that there are 0 (or very few) devices connected
 - Read Rate has also decreased
- 3. Others?



1. Gateway is Disconnected in Yukon

Use Field Tool to attempt to communicate directly to the gateway in the field

- If NO-Cycle Power (*capacitor wait times) then attempt to communicate again using Field Tool.
 - If NO-Node is defective, request RMA from EATON.
- If YES-then communications are established, this tells us that the RF module & Node are working and communicating
 - Stand 25 feet away from gateway and attempt communications again
 - Check backhaul and connectivity



2. Gateway is Connected in Yukon

Use Field Tool to attempt to communicate directly to the gateway in the field

- If NO-Cycle Power (*capacitor wait times) then attempt to communicate again using Field Tool.
 - If NO-Node is defective, request RMA from EATON.
- If YES-then communications are established, this tells us that the RF module & Node are working and communicating
 - Stand 25 feet away from gateway and attempt communications again could be antenna



Gateway Lights

Confirm Lights on Radio Board

- 1. Flashing Red Light (Bad)
- 2. Flashing/Solid Green (Good)
- 3. Flashing Blue Light (Good)
- Radio LED
- 12 V Carrier Board LED
- 5 V CPU & Modem LED
- Processor Board LED
- Ethernet Port





Bonus Exercise: Gateway Troubleshooting

• What are the lights on the PSEC gateway?



Water/Gas Node Overview



Water/Gas Node Overview

- Supported on the RF Network
 - Captures data from the water/gas register
 - Communicates to Yukon through electric meters, relays, and LCR's (Default Reporting: Every 24 hours)
 - Battery Life: ~8 years (w/ default reporting)
- Field Replaceable Battery
 - If no communication after 30 days, reverts to ship mode
- Flexible Installation (Water Node)





Water Node Mounting Options

- Wall-mount
 - Recommend as high as possible in basements, typically near floor joists
- Surface-mount
 - Mount on top of a surface
- Pipe-mount
 - Wire tie it on to pipe in basement as high as possible
- Pit-mount
 - Stake-mount
 - Lid Lock Kit
 - Through lid
 - In lid
 - Both support optional spacer





Connector Option

- Gel Cap Connector (used for Sensus Connections)
 - Can be used with burial pods as well
 - Universal Support
 - Itron-Nicor Connection
 - "Plug-n-Play" Quick Connection





Water/Gas Node Commissioning Process



Water Node Commissioning

- Water nodes arrive in ship mode to conserve battery life
- Commissioning: pairs water node with water meter register/encoder
 - Wakes up battery and takes node out of ship mode





Water/Gas Node Commissioning Process

- Start the Network Runner application by selecting the "hardhat" icon.
- The Network Runner landing page is displayed.
- Select the Direct
 Commands button




Select the Batt
 Commissioning
 command.





- Enter the serial number of the node
 - Serial Number Marriage File
 - QR Code Reader MAC Address
- Select the **Set Target** (circle) button at the bottom right corner.

=				
	00:14:08:0A:BF:4A		م	
	🗊 Add New Device(s) 🧭	Erase Device List		
	Meter # 310415700	4310000022	00:14:08:04:EA:5F	
	Meter # 88638086	4210000004	00:14:08:03:A2:CD	
	Meter # 068498683	4110000003	00:14:08:04:86:65	
	Sensor # 38	MAC001408014819	00:14:08:01:48:19	
	Sensor # 28	4510000074	00:14:08:04:28:86	
	Sensor # 8	4510000052	00:14:08:04:20:D0	
	Sensor # 1	4510000048	00:14:08:04:20:CC	
	Sensor # 800000502	MAC001408041B65	00:14:08:04:18:65	
	Meter # 133058804	5010000099	00:14:08:0A:8F:1D	
	Meter # 138046101	5010000396	00:14:08:0D:71:31	
	Meter # 133374541	5010000103	00:14:08:0A:8F:21	



- RFW-201 Water Encoder
- Select node type under Node Type To Be Commissioned.
- Change the toggle switch to **Confirmed**.
- To set a GPS location for the node, select the blue GPS coordinates button.
- When you have completed these steps, place your **magnet** on the bottom of the node to activate the battery
- Select the **Start** (triangle) button.

	®
Battery Commissioning	
00:14:08:13:8B:3B	
Options	
Node Type To Be Commissioned Legacy Water (Encoder) Water (Pulse) Gas (Pulse)	
Confirm the Configuration Confirmed Select confirm	
GPS Location 40° 8' 30.047731" N 82° 56' 46.272843" W	set the GF location
	Aftery you changed the setting



- If the process is successfully proceeding, the P or B icon in the top right corner of screen will turn green for a few moments.
- Upon a successful commission, you will see a Complete! Message
- Optional: verify that the battery is no longer in ship mode and the serial number for the node is correct.
 - Best practice for first few nodes that are commissioned



- Start the Network Runner application by selecting the "hardhat" icon.
- The Network Runner landing page is displayed.
- Select the Connect
 Device button





- Enter the serial number of the node.
- Select the **Connect** (+) button at the bottom right corner.
- If the process is successfully proceeding, the P or B icon in the top right corner of screen will turn green for a few moments.
- Upon a successful commission, you will see a Complete! message

		U	
00:14:08:0A:BF:4A		م	
Add New Device(s)	Erase Device List		
Meter # 310415700	4310000022	00:14:08:04:EA:5F	
Meter # 88638086	4210000004	00:14:08:03:A2:CD	
Meter # 068498683	4110000003	00:14:08:04:B6:65	
Sensor # 38	MAC001408014819	00:14:08:01:48:19	
Sensor # 28	4510000074	00:14:08:04:28:86	
Sensor # 8	4510000052	00:14:08:04:20:D0	
Sensor # 1	4510000048	00:14:08:04:20:CC	
Sensor # 800000502	MAC001408041B65	00:14:08:04:18:65	
Meter # 133058804	5010000099	00:14:08:0A:8F:1D	
Meter # 138046101	5010000396	00:14:08:0D:71:31	
Meter # 133374541	5010000103	00:14:08:0A:8F:21	



Once connection
 is established, navigate
 to the menu button in
 the top left corner and
 select Commands.





• Select Configure

	Network Runner	®	
Search	Commands	م	
0	Node Time		
(5)	Read Meter		
0	Reporting Parameters		
0	Recording Parameters		
0	Location		
•	FW Upgrade		
\odot	Configure		
e	Association		



- Select Refresh
- Verify that the serial number is correct, and the node is no longer in ship mode.
- Make sure ship mode is
 Disabled and serial number is updated
- Optional: verify a meter reading
 - Best practice for first few
 nodes that are commissioned

	A Notwork Ruppor	
		[®]
	Configure Battery Node	
	Action Description Retieve and update RF battery node's configuration items Mode, Recording and Reporting Periods, among many ot	s such as Ship hers.
	Meter/Device Serial Number 63604088	
	Meter/Device Type WTR2 Encoder-201	
	Node MAC Address 00:14:08:13:8B:3B	
	= ·*	🕞 Unselect All
		Č ⊳ × ··· Refresh Configure Cancel
	Configure Battery Node	
Serial Number	Configure Battery Node	
Serial Number Type !01	Configure Battery Node	
Serial Number Type 101 Idress A:7A	Configure Battery Node	
Serial Number Type 101 Idress A:7A de	Configure Battery Node	
Serial Number Type 101 Idress A:7A de fo	Configure Battery Node © Disabled	



Meter/Dev 62584004

WTR2 Pul

00:14:08:0C:DA:7 Options: Ship Mode Meter Info Serial Description

Optional: Read Meter

Select Read Meter

	Network Runner	B
Searc	n Commands	م
0	Node Time	
(Read Meter	
0	Reporting Parameters	
0	Recording Parameters	
0	Location	
	FW Upgrade	
0	Configure	
•	Association	



Optional: Read Meter

 Navigate to the menu button in the top left corner and select
 Commands.





Optional: Read Meter

 The circled reading should equal reading on meter register

Meter Channel Data 7/8/2019 6:21:21 AM						
ŧ	Name	Description	Vaive			
1	Translation Not Available	(Unit: 0x7f, Mod 1: 0x0000, Mod 0x0000)	I 2: 0x0000, Mod 3: ₀			
2	Voltage	(V, milli)	3511			
3	Temperature	(C)	24			



Water Node Commands

- Read meter
- Reporting & Recording parameters
- Location
- Firmware upgrade
- Configure
- RSSI*
- Association

Search	Commands	Q
0	Node Time	
(ð)	Read Meter	
0	Reporting Parameters	
0	Recording Parameters	
0	Location	
	FW Upgrade	
0	Configure	
•	Association	



Let's Practice!



Exercise 2: Water Node Commissioning

- 1. Connect to a water node
- 2. Perform the water commissioning process
- 3. Read the water node
- 4. Verify that the device is not in ship mode
- 5. Put device back into ship mode



Water Node Best Practices and Troubleshooting



Water Deployment Best Practices

- Water Commissioning Process
 - Verify node serial number and ship mode is disabled
 - Capture a meter reading
- Install nodes in areas with nearby electric meters, relays, or LCR's
- Install water node as high as possible
- Do NOT force connector if quick connector is supplied
- Ensure node antenna is upright
- Ensure node is securely fastened on pit lid
- Bring your magnet



Common Water Node Questions and Issues

- Why is this water node not reporting in Yukon?
- Others?



Water Node Troubleshooting Checklist

- If a water node isn't reporting in Yukon:
 - Can you connect using the field tool?
 - If yes, can you capture a meter read and does it match the water meter?
 - If yes, is the water meter in ship mode?
 - If no, see below
 - Can you connect to electric meter nearby?
 - What is RSSI Signal Strength?
 - Is the node upright and connected to the register?
 - If the node is in a basement, is it in the highest location possible?



Point Name 个	Attribute	Value/State	Date/Time	Point Type	Point Offset	:
Battery End Of Life	Battery End Of Life	False !	01/01/2010 12:00:00	Status	90	
Battery Voltage	Battery Voltage	3.670 Volts	05/12/2024 02:00:00	Analog	5	

< 3.0V; Very Low Battery 3.0 – 3.2V; Low Battery



Home / Support

* Support

Support Pages

Battery Node Analysis

Database Migration Device Definitions Error Codes Event Log File Export History Localization Helper Log Explorer Manage Indexes Route Usage System Health System Info System Performance Metrics Third Party Libraries Thread Dump

Manuals

Yukon Manuals (Portal) Yukon 9.4 What's New Yukon9.4AMIUserManual Yukon9.4DRUserManual

Contact Customer Support

Email: EAS-Support@Eaton.com

Phone: 1-800-815-2258 Hours: Mon-Fri 8:00 AM to 4:30 PM Central

Support Website Energy Automation Solutions RMA



Home / Support / Battery Node Analysis

★ Battery Node Analysis

Battery Condition	•	Pre-existing Voltage Data Analysis
Interval End: 05/11/2024		The second secon
Generate		Choose File
By Generate		Interval End: 05/11/2024
Voltage Data	? ^	Generate
Interval End: 05/11/2024		
Generate		



Device Name	Meter Number	Serial Number [Device Type	Depletion Category	High Sleeping Current Indicator	Most Recent Reading	UOM	Date	Time
		F	RFW-201	Normal	FALSE	3.696	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.691	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.696	olts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.698	olts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.692	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.694	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.68 \	olts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.691	olts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.692	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.678	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.691	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.68	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.687	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.676	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.683	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.674	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.689	olts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.683	olts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.689	volts	5/12/2024	0:00
		F	RFW-201	Normal	FALSE	3.694	olts	5/12/2024	0:00



Electric Meter: Field Tool Commands and Troubleshooting





METERING/LCR COMMANDS



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No Configuration Required at Installation









Locate MAC Address on device with QR Code



Manually Type the MAC Address in the Search Window, if device is in the list, it will auto-populate

Click/Select +Connect Button

	÷	Network Runner				-	٥	×
	=			er	P			
			Search by Serial or MAC ID		٩			
			☐ Import Marriage File :	Add Device	Erase Device List			
			Name	Serial	Address			
			22176047	4300032260	00:14:08:10:54:98			
			22176048	4300033598	00:14:08:10:9A:85			
			22176049	4300031551	00:14:08:10:51:D3			
_			22176050	4300033572	00:14:08:10:9A:6B			
e			22176051	4300032192	00:14:08:10:54:54			
			22176052	4300032255	00:14:08:10:54:93	1		
								9
ton					+ Connect Disc	×	Delete	



Click/Select Import Marriage file:

A Marriage file is generated from EATON which lists all the RF Node Serial Numbers with their MAC Addresses for your Network/Project. Once imported the list will be populated and displayed as below:

÷	Network Runner			2C ¥	- 0 ×	Open						×
=						\leftarrow \rightarrow \checkmark \uparrow \blacksquare > This	PC > Documents > Marriage	Files > Glencoe	~	ර Search Glencoe		م
						Organize New folder						7
		Search by Serial or MAC ID		Q		💺 Windows (C:) 🔷	Name	Date modified	Туре	Size		
-		🗈 Import Marriage File	Add Device	🐼 Erase Device List		OneDrive	marriagefile.csv	10/12/2022 5:31 AM	CSV File	178 KB		
		Name	Carial	Addrose		🧢 This PC						
		Name	Serial	Address		3D Objects						
		22176047	4300032260	00:14:08:10:54:98		Desktop						
		22176048	4300033598	00:14:08:10:9A:85		Documents						
		22176049	4300031551	00:14:08:10:51:D3		Downloads						
		22476050	4200022572	0044004004.50		Music						
		22176050	4300033572	00:14:08:10:9A:6B		E Pictures						
		22176051	4300032192	00:14:08:10:54:54		Videos						
		22176052	4300032255	00:14:08:10:54:93		🐛 Windows (C:)						
					C	File name	e:			✓ All files		~
				+ × Connect Disconn	ect Delete					Open	Cance	el



Click Select Add Device

Camera Application opens. Use rear camera to scan QR Code and import MAC Address.





Network Runner Pages

Device Identification Page

Click/Select on Menu Button to display the Navigation Menu

÷	Network Runner			-	σ	×
=] 🗕 🛶 🖌 🖓 🗛	Network Runner (8)				
	Sensor Se 74276605 Sensor Ma ITRN Sensor Mo C2SX-W Device Tyr ELECTRIC	ial Number nufacturer del re				
	RFN MAC 00:14:08: WiFi Radic 0C:B2:87:1	Address F:CD:AB MAC Address J5:68:65				
	WiFi IPv6 / FCAA::EB2	\ddress :B7FF:FE05:6B65				
	Device Sei 42103012	ial Number 28				
	Firmware Q11.3.1.1	/ersion 2.S1r				
			+ ×]	







Metering Commands (RFN 400 & 500 only)

- Read meter
- Reset demand
- Remote disconnect
- Network reset
- Voltage profile control
- Reporting & Recording parameters
- Reset watt-hours

- Network data
- Fast network join
- Location
- Firmware upgrade
- Association
- RSSI*
- Factory reset



RSSI

- Received Signal Strength Indicator" : measurement of the signal strength received by the RF node in dBm
 - 0 to -30 dBm Excellent
 - -30 to -60 Good
 - -60 to 85 Fair
 - -85 or less Poor/No Signal
 - Error message = 0 dBm
- Measurement of signal strength between field tool and the device it's connected to
 - Use Cases: Water Node Installation, infrastructure locations



Let's Practice!



Exercise 3: Connect to Electric Meter

- 1. Connect to a meter (C1SX)
- 2. Read the meter
- 3. Perform a Network Reset
- 4. Set the Location of the device
- Stand ~10 feet away from the device and calculate the RSSI signal quality
- 6. Repeat with C2SX-D meter
- 7. Repeat with A3 meter


Common Electric Meter Questions and Issues

- Meter has stopped reporting in Yukon
- Others?



Electric Meter: Yukon Troubleshooting

- 1. What is the Comm Status? – Not Ready, Ready, Unknown
- Ready: meter is communicating to Yukon
- Not Ready: check device with field tool
- Unknown: PF/RL are different, device could be switching gateways

Network Information 2 ^	
Comm Status:	Not Ready
Comm Status Obtained At:	02/22/2024 12:01
Groups:	GW186_nodes, Release 9.1 Buffered, Release 9.1.2 (Buffered), Release 9.3.1 (buffered), Release_9_7, Union
Node Serial Number:	4110032331
Primary Forward:	Unknown
Reverse Lookup:	GW219
Show All	🗘 Refresh



Electric Meter: Field Tool Troubleshooting

When Electric Meter/Node Fails to report/read into Yukon:

1. Use Field Tool to attempt to communicate directly to the node in the field

- If NO-Cycle Power (*capacitor wait times) then attempt to communicate again using Field Tool.
 - If YES execute a Fast Network Join and/or Network Reset.
 - If NO-Node is defective, request RMA from EATON.

2. If YES-then communications are established, this tells us that the RF module & Node are working and communicating.

3. If YES-attempt to connect to neighboring devices (gateway, meters or relays)

4. If YES-Check RSSI Signal Quality (Received Signal Strength Indicator)









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