Advanced Hardware Troubleshooting

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Introductions

Owen Parry: Firmware Supervisor

William Corbalis: Firmware Engineer

Erik Ostigaard:

Configuration Deployment Supervisor

Mark Harkins:

Sr. System Application Engineer

Nathan Brown: Infrastructure Deployment Supervisor

Taylor Barto: Firmware Engineer

George Koufaliotis: System Application Engineer

Austin Mercado:

System Application Engineer



Agenda

- Introductions
- Gateway Troubleshooting
- Wifi Products troubleshooting
- Relay Troubleshooting
- 10 minute Break
- Electric Meter Troubleshooting
- Water Node Troubleshooting
- Field Tool Troubleshooting
- Questions and Answers



Gateway Troubleshooting



Infrastructure Warnings

- Generated by Yukon or Gateway Alarms
- Monitors and Alerts can be configured for any Infrastructure Warnings

	Home / Infrastructure Warnings
	* Infrastructure Warnings
	All Types: 68 31 🔛
	Gateways: 3 25 Relays: 65 5
	CCUs: 0 1
Status	
Gateway secu	irity alarm, SSH service enabled.
Gateway's tot	al ready node count (0) is lower than the warning threshold (10).
Gateway dete	ecting low voltage on UPS battery.
GWY-801	Gateway communications interrupted since 05/09/2024 12:54:38.



Gateway Events

- History of Alarms generated by Gateways
- Standing Alarms should be noted
 - Time Sync Failed
 - High Disk Usage
 - o RTC Battery Failure

Gateway Events

Timestamp	Event	State
05/08/2024 17:49:20	AC Power Failure	Cleared
05/08/2024 17:49:20	Certificate Expiration	Cleared
05/08/2024 17:49:20	Door Open	Cleared
05/08/2024 17:49:20	High Disk Usage	Cleared
05/08/2024 17:49:20	Node Count Exceeded	Cleared
05/08/2024 17:49:20	Power Failure	Cleared
05/08/2024 17:49:20	RTC Battery Failure	Cleared
05/08/2024 17:49:20	Radio Failure	Cleared
05/08/2024 17:49:20	Security Alarm	Cleared
05/08/2024 17:49:20	Time Sync Failed	False



Gateway

Figure 4. Gateway 801 radio frequency gateway







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Gateway RF Network/Radio Issues

- Indicated by the Radio Alarm, if standing for several hours
- Indicated by the total Ready node count dropping substantially on a Gateway
- Neighbor View in Yukon Comprehensive Map
 - Gateway should have ETX Band 1 Neighbors for ideal Networking
 - All traffic to/from the Gateway must transit the Gateway's Neighbors
- A loss of RF sensitivity may be Radio board or Antenna related



Gateway Comms IP Network

- Verify bi-directional communication with IT
- Confirm that the Gateway is receiving valid time
 - NTP server connectivity
- Confirm Windows Firewall Working properly



Network Manager GW Logs - What to Look For

- Lack of logging
- Missed 6 hour time adjustments
- Connection Errors
- Socket Read Errors
- Connection Timeout
- Connection Aborted
- Connection Forcibly Closed

"Gateway time adjusted"

8/14/2022 22:14:43	Gateway time adjusted: Mon Aug 15 02:05:33 UTC 2022:	: -1.354047 sec
8/14/2022 16:14:46	Gateway time adjusted: Sun Aug 14 20:05:03 UTC 2022:	: -0.490073 sec
8/14/2022 10:14:48	Gateway time adjusted: Sun Aug 14 14:05:03 UTC 2022:	: 0.799218 sec
8/14/2022 04:14:52	Gateway time adjusted: Sun Aug 14 08:04:33 UTC 2022:	: 0.396522 sec

Socket read error, closing connection

Warning Log

• "Error connecting to /<IP_Addr>:32030: Connection timed out: connect "

 2022-06-28 00:45:37,255
 WARN [GatewayComm] Error while reading data from
 Gateway(742) java.io.IOException: An existing connection was forcibly closed by the remote host



Backhaul Troubleshooting





Backhaul Troubleshooting Tips & Tricks

What's Implicated?

- Core Networks / Edge Networks
 - Firewalls
 - VLAN's
 - VPN's
- Cellular APN's
 - Public
 - Private





Backhaul Troubleshooting Tips & Tricks (Cont'd)

- What to do?
- Confirm cables and physical connectivity
- Can I ping the Gateway (not the modem/backhaul)?
 - From Server
 - From Switch/ONT/Modem
 - Confirm MTU
 - Possible Fragmentation required
 - Confirm round-trip times
- Cellular APN's
 - Public
 - Private





Backhaul Troubleshooting Tips & Tricks (Cont'd)

- Media Converter in place?
- What is in the Firewall Logging?
- Have we looked at Antivirus/Security Logging?
- Confirm Network Traffic Exclusions for Yukon Server to Gateway Traffic
- Confirm Allowed Executables and Scripts for EDR/XDR/Machine Learning solutions





When Rebooting a Gateway

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





Other Considerations..

- Have we replaced a gateway without replacing the old?
- Route Color is a critical component for Network Manager- are there duplicates?
- Old Gateways that need to be removed/deleted?

All of these will create confusion in Network Manager





We've Rolled a Truck..

Troubleshooting back at the office:

- Again- confirm Ethernet port
 - Connect Ethernet cable directly to Gateway from another computer (should show indication of no connection prior to connecting cable)







After





Ethernet Troubleshooting

Setting an IP address on a Windows Computer:

 Windows Start Menu- type 'network connections'



 Right-click Ethernet Adapter- select 'Internet Protocol Version 4(TCP/IPv4)' and then click 'Properties'





Ethernet Troubleshooting (Cont'd)

Now let's ping the IP address of our Gateway to ensure we can talk to it.

Ping replies indicate no issues with the IP configuration or Ethernet port

Command Prompt

Microsoft Windows [Version 10.0.19044.2846] (c) Microsoft Corporation. All rights reserved.
C:\Users\>ping 192.168.1.100
Pinging 192.168.1.100 with 32 bytes of data: Reply from 192.168.1.100: bytes=32 time<1ms TTL=128 Reply from 192.168.1.100: bytes=32 time<1ms TTL=128 Reply from 192.168.1.100: bytes=32 time<1ms TTL=128 Reply from 192.168.1.100: bytes=32 time<1ms TTL=128
Ping statistics for 192.168.1.100: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 0ms, Maximum = 0ms, Average = 0ms



Wifi Products Troubleshooting



IPLink Architecture



Self-Organizing Smart Grid Network





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Wi-Fi in the Meter

Utility Side

- What % of meters might have Wi-Fi access?
- 30% take-rate
- ¹/₂ own their own router or are out of range of the meter

RF Mesh

Connections

15% or at least 1 in 10 meters?



Homeowner



Wi-Fi IPLink Meter deployment in the utility FTTH network



High-level end-to-end connectivity

- Access Point configured as a VLAN tagged / layer 2 bridged connection
- Utility edge router VLAN setup to both Yukon server router and port/interface going to the IPLink Meter
- New private IPv6 address route to the Yukon server
- Router advertises private IPv6 prefix (e.g. user@Router#set interface fe-1/1/2/0.1 prefix FD00::/64)
- IPv6 is only between the Virtual Gateway and Wi-FiIPLink Meter

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New Virtual Gateway

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View Wi-Fi connected devices

Powering Business W	AMI - Dei orldwide	mand Response 👻 Volt/Var 👻 As	sets 🔻 To	ols - Admin -	
Home / Gateways	/ QA6200VGW / Connected D	evices			
☆ Connected	d Devices				
Filter By: All C	ommunication Statuses	▼			
Filtered Results:	6 device(s) 🔅 ▼				
Name 🔺	Communication Status	Status Last Updated	RSSI	RSSI Last Updated	\$
330745785	Connected	09/14/2020 06:11:44	-29	09/14/2020 06:11:44	
311973872	Connected	09/14/2020 06:12:27	-20	09/14/2020 06:12:27	
311973873	Connected	09/14/2020 06:13:33	-36	09/14/2020 06:13:33	
330950125	Connected	09/14/2020 06:13:54	-33	09/14/2020 06:13:54	
330745784	Connected	09/14/2020 06:12:44	-31	09/14/2020 06:12:44	
330950124	Connected	09/14/2020 06:12:38	-25	09/14/2020 06:12:38	

New icon and detail

- View all Wi-Fi meters color coded by Wi-Fi connection status
- See where active takeout points are available
- New mapping icon identifies IPLink meters from others



•••••••••••••••••••••••••••••••••••••••				
				All Gateways
494				 All Relays
Device:	330745785	÷\$		 All Primary Rout
Meter Number:	330745785		3	STU AVE IN
Туре:	WRL-420cL			
Sensor S/N:	330745785			
Primary Forward:	QA6200VGW (10.106	.46.200)	Z	
Node S/N:	4210475682		5	
Wi-Fi AP Configured BSSID:	8A:77:46:1A:AC:07		E	
Wi-Fi AP Connected BSSID:	8A:77:46:1A:AC:07		<u> </u>	4
Wi-Fi AP Configured SSID:	Eaton002		er	32nd Ave
Wi-Fi Security Type:	WPA2-Personal		-	
Status:	Ready			
Path Cost:	0			
Hop Count:	1			
Descendant Count:	0			
Flags:	Valid route, Primary fo	rward route		

View Virtual Gateways on Comprehensive Map



See all Wi-Fi connected
 IPLink Meters along with
 connected RF Mesh
 devices

 Understand where Wi-Fi is being used vs RF Mesh links

Wi-Fi / RF Mesh IPLink meter





Recent Archived Communication	Status Readings	x
Timostamo A	1 Month	• 🖻
08/27/2020 22:17:12	Connected	262
08/27/2020 20:33:38	Disconnected	
08/25/2020 12:33:37	Connected	
08/24/2020 12:23:31	Disconnected	

Network Information	×
Battery Node Associations	3
Comm Status:	Ready
Comm Status Obtained At:	02/02/2018 10:17
Groups:	Simulated Group Value
Hardware Version:	1.1.1 (Sim)
Hostname.	Hostname
IPv6 Address:	1234 1234 1234 1234 1234 1234 1234 1234
Joined Network At:	02/02/2018 10:17
Neighbor Count:	2
Node Address:	123456789 (Sim)
Node Firmware Version:	Simulated Firmware Version
Node Names:	Node (Sim)
Node Serial Number:	101
Node Type:	Nodetype (Sim)
Primary Gateway:	Gateway 7500000019 (123.123.123.123)
Primary Gateway Hop Count:	1
Primary Neighbor:	123
Primary Neighbor Data Timestamp:	07/26/2019 09:52
Primary Neighbor Link Cost:	3.0
Product Number:	123456789 (Sim)
Sub-Module Firmware Version:	1.1.1 (Sim)
Wi-Fi Channel Number:	8
RSSI:	-64.0
WI-FI AP BSSID:	12:34:56:78:90:ab
WI-FI AP SSID:	ExampleUtilityISP
WI-FI Security Type:	WPA2







Relay Deployment Tips

- What does it do?
- Relays "Bridges" gaps in RF communication
- Mount at least 18" away from pole
- Don't forget to note GPS location!
- Relay Case study



Figure 3. RLY-856 relay (external antenna connection)



Relay Troubleshooting

- Is the relay in "Ready" status?
- If not, can you connect to Relay with field tool? If not, look at hardware (next slides)
- If you can connect yet still not ready check RF infrastructure. Can it reach a reliable device on the RF mesh network?

Network Information	
Comm Status:	Ready



Relay – Hardware examination

- Open Relay and look for burned or damaged components.
- Moisture Intrusion?
- When powered on, Green light should blink every second
- Red light should be on during boot up or communication





Testing Voltage on Relay

- While powered on and Using Digital Multimeter, check DC voltage on Relay
- Location J3-13 and J3-2 should equal about 5V
- J3-13 and J3-14 should equal 3.3V
- *Use proper PPE and safety standards



Lippes


Testing Supercap on Relay

- Disconnect power to relay and wait 15 min or more for supercap to discharge
- Test voltage on J3-13 and J3-14. They should be less than .5V
- Power up Relay again, you should see steady green light





Electric Meter Troubleshooting



Troubleshooting Electric Meters

A Meter is not "reading" in Yukon

- Most likely reason is communication
- Is the meter "Ready" in Yukon

Note: A node is READY when the gateway receives both the discovery message and it has a route to the gateway in last 6 hours

Network Information	2 ^
Comm Status:	Ready
Comm Status Obtained At:	05/10/2024 20:37
Hop Count:	2
Neighbor Count:	17



RF Network Troubleshooting

- Node Details screen in Network Manager gives a lot of information about the node
- Node Serial Number
- RF Firmware version
- Communication status
- Link cost
- Power and data rate
- Current Primary Neighbor important to find if primary neighbor is having issues

Node Details	- 8
INFO	L
Node Serial Numbe	er: 4210805466
Node Type	: Electric node
Sensor Info	: 343567936 (ITRN , C2SX-SD) [5/2/2024 03:18:34
Product Number	: RFN420CL
Hardware Version	: RFN420CL
Software Version	: R11.4.0Kp
Node Names	
Groups	:
Commissioned ?	: Yes
Commissioned Tim	e :
In Network ?	: Yes
In Network Time	: 10/10/2022 14:06:56
Latitude	: pro-222-1
Longitude	
GPS Source	: RE Node

NODE VERSIONS

Backup Eka Software Version : R11.4.0Kp

COMMUNICATIONS

Node Address	: 00:14:08:25:4D:8E
Reverse Lookup (formerly Primary Gateway	r) :
Communication Status	: Ready
Communication Status obtained at	: 5/10/2024 21:07:06
Number of Hops to Gateway	: 2
Current Number of Neighbors	: 13
Current Primary Neighbor	: 00:14:08:25:4D:91 (Node 4210805469)
Link Cost to Primary Neighbor	: 1.0 (ETX band: 1)
Current Link Rate to Primary Neighbor	: 2x
Current Link Power to Primary Neighbor	: 0.5 Watt
Current Neighbor Data Timestamp	: 5/9/2024 21:00:54
Number of Associations	: 0



RF Network Troubleshooting: Routes

Gateways 🛛 🛛	Routes 🔹 🕄					
Row	Data Timestamp 🔹	Dest. Address	Next Hop Address	Hop Count	Cost	Flags
40	4/8/2014 22:33:52	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	2	PF,VR
41	4/8/2014 02:26:33	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	2	PF,VR
42	4/7/2014 22:32:04	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	2	PF,VR
43	4/7/2014 02:27:27	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	2	PF,VR
44	4/6/2014 22:31:05	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	2	PF,VR
45	4/6/2014 02:33:04	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	1	PF,VR
46	4/5/2014 22:31:32	00:14:08:03:5F:A5	00:14:08:03:5F:A5	1	1	PF,VR
47	4/5/2014 02:24:53	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
48	4/4/2014 22:29:43	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
49	4/4/2014 02:29:10	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
50	4/3/2014 22:34:08	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
51	4/3/2014 02:24:24	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
52	4/2/2014 22:34:45	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
53	4/2/2014 02:23:17	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
54	4/1/2014 22:26:40	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR
55	4/1/2014 02:22:53	00:14:08:03:44:62	00:14:08:03:44:62	1	2	PF,VR

- Check if the primary forward is also "not ready".
- Can the node no longer reach its primary forward?



RF Network Troubleshooting

Issue: Node reporting Communications Status "Not Ready"

- Backhaul connection may be down Are there lots of "Not Ready" nodes?
- Not Ready may be a temporary condition because a node is in the process of switching to a new Gateway OR a firmware upgrade is in progress
- If node continues to be Not Ready for 24 hours or more:
 - Check Node logs:
 - If data reports are being sent, node is able to communicate with its neighbors
 - Original route to Gateway is reforming or has an issue



RF Network Troubleshooting

Issue: Node reporting Communications Status "Not Ready" (Continued)

- If there are no data reports from the node for 3 days:
 - Check Routing table of Node to determine last known Primary Forward Node
 - Locate the Primary Forward in the node's neighbor table and check its link cost.
 - Review the link cost history of this node in the Primary Forward node's neighbor table
 - If the link cost has degraded, the node may be in the process of switching to another Primary Forward.
 - Review the problem node's neighbor table to verify link costs with other neighbors
 - If all neighbors have degraded link cost, visit the node to verify OTA with Field Tool
 - Bottom line, lots of troubleshooting can be done but takes a lot of time.



Testing RF Connectivity

Meter is not Ready and other nodes around it are fine. Test RF node by connecting with field tool.

- Connect about 20 feet away
- Test RSSI, if -30 dBm or better means good signal strength
- Signal strength of -40 dBm or worse could be antenna issue
- Unable to connect- possible RMA issue



Checking if Node is connected inside meter

Symptom: Itron meter will not connect or boot up, check node

- Verify connection tabs are not loose
- Sometimes these can become loose during shipping or installation







Itron meters with display issues

Check the meter to make sure the display housing and elastomeric connector are fully seated







Checking Ultracapacitor

- Loose connections
- Swelling ultracap
- Does it hold a charge?
 - Power up on a test board
 - When power is removed, does green LED on RFN board still flash for a few minutes?







Honeywell Elster Meters with Error messages

- Errors 1, 2 and 3 are normal for time-keeping meters that have been stored for extended periods of time or are shipped without batteries or batteries that are intentionally not connected.
- Proceed as following to clear the error codes:
 - Verify that the battery is installed, check the battery voltage and replace it if needed.
 - Power up the meter at appropriate voltage
 - Start Metercat app, select your preferred program and program the meter.





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Honeywell Elster Meters

- Zero-ing out Elster A3 meters
 - Connect with metercat software and optical cable
 - Select function "clear values and statuses" then hit go
 - Select OK to "Clear Data Task" pop-up

Perform the following steps to set Elster meters to Zero:

- Connect Metercat
- Select the function "clear values and statuses" and select "Go"





Honeywell Elster A3 meter: Checking Battery

- Check the battery's voltage on All Elster A3 Alpha meters:
 - Connect a resistive load of 18.6Kohm (three 56Kohm resistors connected in parallel) for no more than 10 seconds to minimize battery duress, battery voltage under this load should remain above 3.3VDC. Replace the battery if this reading is below 3.3VDC.



Honeywell Elster A3 meter: Checking Battery pt 2

- IMPORTANT: If the battery needs to be replaced, first energized the meter without the battery for at least a minute to ensure that the supercap is properly charged, then turn off the meter and install the new battery.
- Check the battery's voltage on All Elster A3 Alpha





Time Clock Source

- Make sure you have Internal Oscillator in system preferences.
- In Metercat, go to Tools

 System preferences.
 Under "Programing Op tions" choose "Internal Oscillator



Alternate Display List at Power Up



L&G (Time Clock Source)

S4x

Ave

Program Name: EAION S4x Default_CST			
Meter and Program Information	Test Mode Configuration:		
Program Information Device Identification		Test Mode Demand (Minutes):	15
Metrology Configuration		Test Mode Timeout (Minutes):	30
Energy Metrics Demand Configuration	Cal. Pulse Ratio:	12 Pulses / 1 Kh 🗸	
Register Readings Controls		0	
External Inputs Configuration Scheduling	Maximum Allowed Full Load Adjustment:		
Local Display	Meter Configuration:		
Security		Demand Reset Type:	Type I: No Sub-Intervals Will Be Cleared 🗸
Diagnostics and Logging Load Profile		Clear Overload Error During Demand Reset:	Do Not Clear
Meter Operations Manufacturer's Feature Parameters		Sag and Swell Detection Option:	Use Nominal Voltage 👒
User Defined Services Service Type Entries		Timekeeping Source:	32kHz Crystal V
Service Type Entry 1		Battery Error Control:	Battery Errors Enabled ~
Service Type Entry 3		Specify Values * Make Value List	
Service Type Entry 5	Transformer Factor:	CT Ratio: 1	
Alerts and Relays		PT Ratio: 1	
		Specify Values * Make Value List	
	Meter Multiplier:	0	
	Voltage Log Sample Interval:	5 minute interval	

Program Values 1	Program	n Values 2	Ĺ	Program Values 3	Program Va	lues 4 🎽	Reactive Values
Program Name: Concord AX	(e			Demand Calculation: Block	/Rolling		
Dmd Reset Lockout Time (minutes):	0					
Display Time in Seconds:		4	_				
Energy Display Format:		######	•		k Display on Ph	ase Error	
Demand Display Format:		###.###	•	Disj	olay EOI		
Cum. Dmd. Display Format:		###.###	•	Ena	ble Reed Switc	h	
Date Display Format:		MM/DD/YY	-	Syn	ch time to line fr	equency 🚽	
Error Code Masks:			1	▼ Dis	able Battery Erro	IS The met	r will depend on an AMP.
Low Battery:	No Displ	ay 🔻		✓ Allo	w Stand By Moo	device to	o set the time after an
Unprogrammed:	No Displ	ay 🔻		🗔 Dis	able Load Profile	extender Integration	1 power outage
Memory Failure:	No Displ	ay 💌		Stand By F	Rate: Rate A	•	
Demand Overload:	No Displ	ay 🔻		Power On Delay Time (minu	tes): 0		
Stuck Switch:	No Displ	ay 🔻		PODT Trigger Minutes:	0		
Phase Error:	No Displ	ay 🔻			,		
Meas. Diagnostic:	No Displ	ay 🔻		Outage Length:	10		
				V D	sable AMR Eve	nt Notificatio	n
Extended Errors	None	•	•	I En Temperature A	hable Temperatu Jert Threshold	ure Alert	dea C
	,			Configure E	xcessive Leadi	ng Current E	vents







L&G (AXe Voltage Profile)





L&G (AXe Calendar Settings – No TOU w/ DST)

🛱 Time-Of-Use Dates Schedule	- 🗆 X	
k Record 1 of 1 >>I Go C D N Save Show Program	rams	🗅 Time-Of-Use Rates Schedule — 🗆 🗙
Calendar Dates Calendar Pre-Defined Perpetual Dates User Perpetual Dates	Daylight Savings Time	K< Record 1 of 4 >>1 Go C D N Save Show Programs Define TOU Schedule Define Season Define Day Types View Schedule
Dates Schedule: User Perpetual Dates: (mm/dd)		TOU Schedule Name: Concord AXe Rate ID: 1 Notes: Concord AXe Time of Use (No TOU)
Operation Date Actuation Mode S2 10/01 This Day Only S1 05/01 This Day Only	Add	No. of Seasons: 2 Compatibility No. of Day Types: 1 C DX C S4 AX/RX Focus AX/RX No. of Holiday Types: 0 ✓ DX C S4 AX/RX Focus AX/RX Max ANSI Switch Points: 224



L&G (S4x Anchor Date)

C D			1 5 4 - 0 -	landar		F . PA	
Sub-Record		JICOIC	1 04X C0	iciiuai		Edit	
	_						_
1						1	
nchor Date:	1/1/2	2023 🔶		1	5		
					-		

Anchor date is the time that the meter uses when it goes into standby mode. If [ANCHOR_DATE] specified, any recurring date using the PERIOD/OFFSET type shall use this date as a starting date to make meter validation consistent.



L&G (Meter Programming)

New Meter

1132Com - Reader/Program File Connect Read View	mmer (Version	n 5.17)	m Meter Tools H	Help			-		×	File	132Com Connec
Kan ta bar bar bar bar bar bar bar bar bar ba	Cold Sta	n Meter Int & Program Meter	F8	😽 🖆 Rd-R Pre	el Contents	Support	% About	E xit		Log	is (
Meter Information < <single meter="" n<br=""><new meter=""> Connect to a New Me Device Type: Serial Number: Last Connection:</new></single>	Verify M Offline F Activate	eter Program Program Verification Pending Tables nding Tables	formation mmunications 2024 2:21:40 F] °M - Meter Acce	ss Level = AN	SI L5 / DGC	:0M L2			Meter N D S La	Informatic 85382 ew Me evice Ty erial Nur ast Conr
/ DEVICE ID	TYPE	DATE TIME									DEVICE I
<new meter=""></new>	new meter FAX(Dmd)	4/16/2024 7.48:39						Direct		GROUPS	 Cnew m 185382
<		>	1			0 Zound	~	22000	in need:		t Partie
USER: Default FILE: Concord -	L&G Databas	e (13Mar2024)Great	L5/L2 FP: Eaton D	efault					10	USER:	Default

Existing Meter

ogon R-Rd Read (DmdRst SetTin	me Sala Change M	eter ID	Pref	Contents	Support	About	E xit	
n Information < <single meter<br="">1853823860000000 New Meter Device Type: FAXR Serial Number: 1853823 .ast Connection: 5/7/20</single>	Mode>> 100 86 24 2:27:53 Pt	Add User S Add User S Set Time 8 III Transform Update Se C E650 (S4x) E650 (S4x)	ignostics Configuration Service Type 2 Date F er Loss Configuration curity Codes Ethernet Live Modify Ethernet Script Generation	5 eter gnost play L tion () play S	ic Table (M ist (Std. 33 Std. 22): Re Source (Mfg	Data Vie fg. 14): Wri Read. sad. 16): Writte	ew tten. en.		,
DEVICE ID	TYPE	/ DATE TIMEA	5/7/2024 2:27:49 PM . 11cm	play L	ist (Std. 33)	Written	19: 1.00	-	
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Water Node Troubleshooting



Water Node Overview

- Supported on the RF Network
 - Captures data from the water 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 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 node Troubleshooting-connections

- Connections to Water Meter
- May use longer cable if needed
- Verify communication on commissioning

Table 2	. RFW-201	water	node	signa	s
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RFW-201 water node wire color	Signal	
Red wire	Power/Clock	
Black wire	Ground	
Green wire	Data	

Table 3. Color coded wiring for Badger Meter (ADE, HR-E, HR-E LCD, E-series and RTR Model 25) and Sensus (ECR II and ICE) encoder registers

RFW-201 water node	Encoder register connections	
Red wire (Power/Clock)	Red wire/terminal	
Black wire (Ground)	Black wire/terminal	
Green wire (Data)	Green wire/terminal	

Table 4. Color coded wiring for Sensus SR II and Neptune (ProRead, E-coder) encoder registers

RFW-201 water node	Encoder register connections	
Red wire (Power/Clock)	Black terminal	
Black wire (Ground)	Green terminal	
Green wire (Data)	Red terminal	

Table 5. Color coded wiring for Badger Meter RTR model 70 two-wire pulse meters

RFW-201 water node	Pulse register connections	
Red wire	Red wire	
Black wire	Black wire	
Green wire	Optionally used as a feedback loop to detect if the cable was cut	



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
- Don't forget your magnet when commissioning



Node Commissioning

			®
	Config	ure Battery Node	
	00:14:08:1A:09:77	Conception of the Conception o	
	Options:		
1.	🗹 Ship Mode	Enabled	
	Meter Info		
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Water Node Troubleshooting Checklist

- If a water node isn't reporting:
 - 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?



Water Node Case Study example

- Water node in the basement of church not reporting
 - Unable to connect to water node from outside
 - Can connect to water node with field tool inside church

Conclusion: Water node unable to reach electric meter outside.

Solution: Installed an LCR directly above water node on first floor.



Field Tool Troubleshooting



Direct RF Communication To Nodes Using Field Tool



Powering Business Worldwide

RFN Network Runner



Ranger 7

- Provides configurations and diagnostics field support
- RF Radio up to 1Watt with multiple data rates (9.6, 19.2, 38.4, 76.8, 153.6 kbps)
- Functions
 - Gateway Configuration
 - GPS provisioning for RF
 nodes
 - Meter management
 - LCR management
 - Water Commissioning
 - Node Firmware Upgrade
 - Network Diagnostics



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1. Types of Handheld Field Tools/Network Scouts

Types:

- "Hammer" (Ranger 7)
- Full Keyboard & Numeric Keypad
- Touch Screen

- "Yuma"
- Touch Screen Tablet







1. Network Scout – "Hammer"




1. Network Scout – "Yuma" Tablet







1. Network Runner Application-Revision





Network Runner Menu

- Device Identification Page
 - Click/Select on Menu Button to display the Navigation Menu

Network Runner				-	٥	\times
		er	®			
	Search by Serial or MAC ID		٩			
	🗈 Import Marriage File	Add Device	Erase Device List			
	Name	Serial	Address			
		670000029	00:14:08:11:28:75			
	Meter # 185382229	5010482692	00:14:08:35:80:F4			
		5010483137	00:14:08:35:82:B1			
		5010483096	00:14:08:35:82:88			
		5010483129	00:14:08:35:82:A9			
		5010482687	00:14:08:35:80:EF			
					151	
			Connect Disco	nect	Delete	



Navigation Menu - About

Click/Select About

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Ľ	Not Connected NO DEVICE	1						
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Application/Firmware Version 1.4.0.0

• On the About Page, the following is displayed:

~	Network Runner		-	٥	\times
		®			
	Application Serial Number:				
	001041				
	Application version: 1.4.0.0				
	Application Installation Date: 4/22/2024 9:05 AM				
	Radio Board Firmware Version: R1.1.0hp				•
	Upgrade				



2. Radio Module Error: :"U" or UART Radio Not Found

- Instead of Grey "P" or "B" there is a Red "U"
- "UART: Radio Not Found" error/notification



- Remove Radio Module, Clean Contacts
- Reinstall Radio Module, in other slot.





3. Stylus Not Working

- Open TouchControl Application: In search window type "touch control"
- Select mode: Finger / Glove / Stylus



When Meter/Node Fails to report/read into Yukon

- Make field visit to the node, using Field Tool attempt to communicate directly to the node.
- If YES-then communications are established, this tells us that the RF module & Node are working and communicating.
- If YES-attempt to connect to neighboring devices (gateway, meters relays)
- If YES-Check RSSI Signal Quality (Received Signal Strength Indicator)
- If NOT Connecting ->Cycle Power (capacitor wait times) then attempt to communicate again using Field Tool.
 - If YES execute a Network Reset.
 - If NO-Node is defective, request RMA.



Commands - RSSI Signal Quality

- From the Commands Page, Click/Select RSSI Signal Quality
 - Stand ~20 feet facing the meter/node, Hold Field tool vertically to align antennas.
 - Execute RSSI Signal Quality command multiple times, document readings/results-consistent
 - Good Reading = >-30 dBm
 - Bad Reading = < -35 dBm *note: A low RSSI can still communicate but signal is weak.

Effective Runner Image: Control of the section of				
RSSI Signal Quality Action Description Retrieves RSSI values from the field tool's radio board for the last connection. Meter/Device Serial Number Meter/Device Serial Number Meter/Device Stype Node MAC Address 00:14:08:21:62:4D Connection RSSI Values Time Min RSSI (dBm) Avg RSSI (dBm) 11/22/02:14:3859 FM -28 -10 11/22/02:14:3859 FM -28 -10				Ø
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11/22/0214.439.01PM -29 -10 -17 11/22/0214.43859.PM -29 -10 -17	Time	Min RSSI (dBm)	Max RSSI (dBm)	Avg RSSI (dBm)
11/23/2021 43859 PM -29 -10 -17	11/23/2021 4:39:10 PM	-29	-10	-17
	11/23/2021 4:38:59 PM	-29	-10	-17



Field Tool GPS

- To acquire satellite signals, make sure buildings or trees are not obstructing the field tool.
- Use the GPS location button to refresh coordinates
- Tip: you may get more accurate location if you use your phone as a hot-spot and have high accuracy enabled in windows

GPS Location 40° 8' 30.047731" N 82° 56' 46.272843" W





Thanks for coming to the Eaton Users Conference!

What questions do you have for us?







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