

Ferguson Beauregard iMonitoring iNodes

TLMe

Ultrasonic Tank Level Monitor

User Installation and Operating Manual

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Introduction

What is an iMonitoring Tank Level Monitor (TLMe)?



Figure 1. The TLMe.

The Ferguson Beauregard Tank Level Monitor (TLMe) is used to measure fluid levels ultrasonically in tanks and silos. Part of the iNodes suite of wireless sensors, it delivers data remotely over the Internet or locally to any Compact Flash Radio-enabled computer. The TLMe eliminates the need for daily tank gauging, providing 24-hour production data with consistent daily data collection times.

Principal features of the TLMe

- Eliminates the need for manual daily tank gauging.
- Uses advanced ultrasonic sensing technology.
- Reports fluid depth or distance to fluid.
- Collects daily production data consistently.
- Provides consistent 24-hour production data with programmable data collection times.
- Includes power supply, data storage, processing and bidirectional radio communications in a small, integrated package.

- Certified intrinsically safe.
- Communicates with any Compact Flash Radio-enabled PC, including pen tablet PCs, PDAs and our Concentration & Communications Unit.
- Solar powered with backup battery.
- Rugged IP-65 rated enclosure.
- Field configurable and upgradeable.
- Low cost.
- Basic alarm capabilities (alarm service optional).

Additional support documentation

More detail on mounting options, calibration and other features can be found in the Ferguson Beauregard Installers' Guide, which presents in-depth information on all iNode devices. The Installers' Guide can be downloaded from the FB Customer Support website (http://sw.fergusonbeauregard.com) in the iNode Products section.

TLMe installation

The TLMe measures tank fluid levels ultrasonically, using a technique similar to radar. It transmits a pulse which reflects off the liquid surface and returns to the TLMe. The TLMe measures the pulse "flight time", then compensates for the effect of temperature on the speed of sound. It is important to mount and install the TLMe correctly to obtain the most accurate and reliable level measurements.

Tank mounting

- 1. For best accuracy the TLMe must be mounted at right angles to the fluid surface ± 2 degrees. This maximizes the signal strength of the reflected signal for best measurement accuracy.
- 2. At 260 inches (about 21 feet), there must be at least 15 inches of clearance from the center of the beam to any obstacles such as internal tank braces. This minimizes any reflections or weakening of the signal, improving measurement accuracy.

Figure 1 below shows a properly installed TLMe. Figure 2 and Figure 3 show two TLMe field installations. Figure 2 is the preferred mounting method.



Figure 2. Proper TLMe mounting angle.





Figure 3. Preferred mounting method on a 2" NPT non-vent pipe.



Figure 4 Mounting on a 2" NPT vent pipe.

Solar panel lighting

The TLMe power supply contains a solar panel, high-capacity rechargeable battery, charging circuit and regulator. When fully charged the TLMe will typically operate for at least two weeks without sunlight.

Manmade lighting such as fluorescent or incandescent lights will not generate sufficient power for continuous operation. The TLMe must be mounted so that the solar panel is exposed to ambient sunlight.

Installation procedure

When the TLMe is installed, it must be provisioned in its intended configuration. The installation must comply with all regulatory and safety requirements. With the exception of those items listed in the **TLMe installation instructions**, the TLMe is shipped with factory default calibration and configuration settings.

- 1. If you are unfamiliar with iNodeConfig or TLMe installation, review the **Site Calibration** and **iNodeConfig** sections of this manual before beginning.
- 2. Remove the TLMe from its packing box.
- 3. Remove the Phillips head reset button access screw on the bottom of the unit (Figure 5). Using a non-metallic tool, press and hold the reset button briefly to bring the unit out of sleep mode, then replace the screw and lightly tighten it.



Figure 5. Reset button access screw.

- 4. Drop a gauging tape into the pipe fitting where the TLMe will be attached. Measure and record the distance from the bottom of the tank to the top of the fitting. This is the <u>tank height</u>.
- 5. Screw the TLMe temporarily into the pipe fitting (Figure 2 or Figure 3). Mark the last exposed thread on the TLMe bushing and remove the unit. Measure and record the distance from the thread to the sensor face. This is the <u>head offset</u>.
- 6. Permanently mount the TLMe to the tank fitting.
- 7. Install the antenna.
- 8. Configure the TLMe as instructed in the iNodeConfig Configuration screen section.
- 9. Calibrate the TLMe as instructed in the **iNodeConfig Site Calibration** section.

iNodeConfig

Local communication with iNodes is necessary for setup and maintenance. The same radio system used to collect data from iNodes by the CCU also supports local communications. The local communications software, called **iNodeConfig**, allows you to configure iNodes, set controls and view or save data and configurations.

There are two versions of iNodeConfig: **iNodeConfig-PDA**, which runs on PDAs with the Windows CE operating system, and **iNodeConfig-PC**, which runs on laptops and PCs with Windows 2000, NT or XP. An iMonitoring Compact Flash Radio card (CFR) is required. The two versions are as similar as possible to minimize confusion when switching between a PDA and a laptop.

The following sections start with the leftmost user screen and move to the right, one screen at a time. Each user screen shown on the iNodeConfig screen toolbar is denoted by bold type, e.g. "**Data** screen". Configuration or selection items within each screen are denoted by bold type, e.g. "**Configure**".

In these sections you will often be be instructed to "tap" a button or location on the screen. On the PDA, this means tapping the button or location with the PDA stylus. On PCs, this means moving the cursor over the button or location, then tapping on a mouse pad, or clicking with the left mouse button.

Whenever possible, iNodeConfig PDA and PC screen figures are shown side by side so that you can see the similarities and differences between them. In larger screens, the PDA screen are shown first and the PC screen are shown second.

The main differences between iNodeConfig for the PC and PDA are:

- The PDA version uses the Windows CE standard tools and features, particularly the keyboard icon and OK button at the top right of the screen. The PC version uses the Windows standard tools: Minimize Maximize Close buttons at the top right of the screen, sizeable windows, etc.
- The PC version has no keyboard icon.
- The PDA page tabs run across the bottom of the screen. The PC page tabs run across the top of the screen.

PDA version

iNodeConfig requires about 800KB of storage space. There is no setup application; copy the iNodeConfig fileset into a folder on the PDA. Use File Explorer to browse to the iNodeConfig folder and tap the "iNodeConfig" icon to start iNodeConfig. See your PDA documentation for instructions on copying files to folders and creating start menu icons.

iNodeConfig PDA screen layout

PROPERTY OF THE OWNER.		Version	C	ode	
tlm3_cp	u 3.03.13.hex	00.03.0	3.13 T	L32	
Current	t Version Inform	nation			
ESN Type Version	2500 0528 TLM3 00.03.03.16				
		Upr	date Fim	nware	┘ │ ◀ ── Update Firmware E
Alarms	Diagnostics	Status Fi	rmware		TAB ARROWS
- worning				mml	

FIRMWARE PAGE

Figure 6. iNodeConfig-PDA firmware screen.

All iNodeConfig-PDA screens have similar views and tools. The Firmware page, which you can select after connecting to a TLMe, contains most of them, which will be referred to as follows:

- <u>*OK* button</u>: The white circle at the top right of the screen containing the letters "ok". If you tap this button on this page, iNodeConfig will return to the Connection page (more on this later).
- <u>Upper window</u>: Some pages have only one window; others, like the Firmware page, have two. The upper window usually contains one or more items that can be selected.
- <u>Lower window</u>: This window usually contains information items.

- <u>Update Firmware box</u>: Most pages have one or more action boxes like this one. If you tap a box, the action described by the box text is performed.
- <u>Keyboard icon</u>: This is part of the PDA operating system. If you tap this icon, a keyboard will pop up to allow you to enter text and numbers. iNodeConfig usually will pop up the keyboard automatically if you tap an editable value.
- <u>Tab arrows</u>: There is a tab to select each page. In most cases, not all tabs can be displayed at the same time. You can tap the left (◄) and right (►) tab arrows to slide the tab set so you can locate the tab you want to choose.
- **Firmware** tab: Eight pages can be chosen after you connect to a TLMe with iNodeConfig. These pages are chosen by tapping the tab of the page you want to see.
- <u>File menu</u>: Most pages have pull-up menus, located at the bottom left of the screen. If you tap a menu, one or more choices will pop up. File choices relate to importing and exporting types of files into iNodeConfig.

PC version

iNodeConfig-PC uses about 6MB of disk space. A setup application is used to install iNodeConfig on your PC. After installation, use File Explorer to browse to the iNodeConfig folder and tap the "iNodeConfig.exe" icon to start iNodeConfig. (You may want to copy and paste the icon as a shortcut to your laptop's desktop for quick access to the program.)



iNodeConfig PC screen layout

FIRMWARE PAGE

Figure 7. iNodeConfig-PC firmware screen.

All iNodeConfig PC screens have similar views and tools. The Firmware page, which you can select after connecting to a TLMe, contains most of them, referred to as follows:

- <u>Windows buttons (Minimize, Maximize, Close)</u>: The standard Windows buttons. They behave as in other Windows programs.
- <u>Upper window</u>: Some pages have only one window; others, like the Firmware page, have two. The upper window usually contains one or more selectable items.
- Lower window: This window usually contains information items.
- <u>Update Firmware box</u>: Most pages have one or more action boxes like this one. If you tap a box, the action described by the box text is performed.
- **Firmware** tab: Eight pages can be chosen after you connect to a TLMe with iNodeConfig. These pages are chosen by tapping the tab of the page you want to see.
- <u>File menu</u>: Most pages have pull-down menus, located at the top left of the screen. If you tap a menu, one or more choices will be presented. File choices mainly relate to importing and exporting types of files into iNodeConfig.

Device Selection screen

Choose a device: Setup Action Help 3636 0508 TLM3 Clear 1380 0000 TLM3 Find Devices 2500 0528 TLM3 Find Devices 1200 0538 EFM Find Devices 1200 0510 EFM Device Group 1375 0559 CCU No Group ID< ▼ 1151 1281 CCU ESN 1200 0500 WPM 2500 0528	🎊 iNodeConfig	😂 🗱 🐟 4:10 🛛 🚳	🕴 iNodeConfig	
Connect CF Radio CF Radio CF Radio CF Radio	Choose a device: 3636 0508 TLM3 1380 0000 TLM3 2500 0528 TLM3 1200 0538 EFM 1200 0510 EFM 2500 0529 TLM3 1450 0568 WPM 1375 0559 CCU 1151 1281 CCU 1450 0599 WDS 1120 0500 WPM Setup Action Help	Clear ☐ Find Devices Device Group No Group ID ESN < > 2500 0528 Connect CF Radio	Setup Action Help Choose a device: 2500 0528 TLM3	Clear Find Devices Device Group No Group ID ▼ ESN < > 2500 0528 Connect CF Radio

The first screen iNodeConfig displays is the Device Selection page.

Device Selection screen actions

- Choose an iNode device from the ESN list.
- Find iNodes and automatically add their ESNs to the list.
- Clear ESNs from the list.
- Enter an iNode ESN manually.
- Configure the CFR.
- Create a Device Group and assign a Group ID to the Group.
- Enter the Setup and Help screens.

To choose an existing iNode device from the ESN list:

- Tap the ESN for the iNode.
 - o If you double-tap, the ESN appears in the ESN box, or
 - Tap the > box and the selected ESN appears in the ESN box.
- Tap *Connect*.

To make iNodeConfig find iNodes and add them to the ESN list:

- Tap the *Find Devices* checkbox.
- The bar beneath *Find Devices* scrolls back and forth as iNodeConfig searches for iNodes.
- As iNode ESNs are found, they are added to the ESN list. Each added ESN will have an * beside its ESN.
- Tap the checkbox again to stop finding iNodes.

To clear ESNs from the ESN list:

- Tap an ESN to highlight it.
- Tap *Clear*.

To manually enter an ESN:

- Tap the Keyboard icon at the bottom right of the PDA screen. The keyboard will pop up.
- Tap inside the ESN box.
- Use the keyboard to enter the ESN. Valid characters are numbers "0" through "9", and letters "a" through "f".
- If you want to save the ESN in the ESN list, tap the < box to the left of the ESN box. The ESN is copied to the ESN list.
- Tap *Connect*.

To configure a Device Group and assign a Group ID:

• Contact iMonitoring Customer Support if you want to learn more about this feature.

Device Selection menus

- Setup.
- Action.
- Help.

Setup menu items:

- <u>Options.</u>
- Group IDs.
- Admin Privileges.
- <u>Demo Mode.</u>

🎊 iNodeConfig	₽ 4 × 4:47	❹2	Options
Comm Ignore Contention Retries 3 V Show CFR status m	essages		Comm Ignore Contention Retries 3 T Show CFR status messages
ОК	Cancel	≝ ^	OK Cancel

The **Options** screen allows you to:

- Set behavior with contention and the number of retries.
- Show CFR status messages.

Change these settings as needed, then tap the *OK* box to enable the changes and return to the Device Selection screen, or tap the *Cancel* button to exit without making changes.

Contention takes place when another iNode, iNodeConfig or a SCADA radio system is transmitting as you try to communicate with a device - the signals interfere with each other. iNodeConfig will detect contention, display a Contention error and stop transmitting. If <u>Ignore</u> <u>Contention</u> is checked, iNodeConfig will continue to transmit even if there is contention and no error will be displayed. This is usually an undesirable setting, since it allows you to interfere with other device communications. The default setting is disabled (unchecked).

Retries sets the number of times iNodeConfig will try to establish communications with an iNode before quitting. In situations where there is more interference, more retries may be needed. You can choose 0 through 10 retries (default = 3).

Show CFR status messages allows you to watch the communications progress and messages between a CFR and an iNode. Expert users enable status messages when troubleshooting communications problems. Leave this feature disabled unless instructed by iMonitoring.

Group IDs

Groups are used to prevent unauthorized access to iNode data. This feature is risky, as it is possible to lock users out of devices if the group code is lost or forgotten. Contact iMonitoring for instructions on the configuration and use of this feature.

User Levels

Three user levels are defined in iNodeConfig: Pumper, Installer and Administrator. A Pumper can view data but not make configuration changes. An Installer can view data and fully configure the iNode. The Administrator can change an iNode's ESN, shut it down, etc. The default level is Installer. Administrator level requires a password.

Demo Mode

Demo mode allows you to simulate viewing data and configuring an iNode without making connection to a real device. This option is used in training.

Action menu item selections:

- <u>Clear Device List</u>
- <u>Find Devices</u>
- <u>Connect to Device...</u>
- Configure CF Radio

<u>Clear Device List</u> clears all ESNs in the Device List. A caution box is displayed, asking if you're sure you want to clear the list. If you tap *Yes*, the list is cleared.

Find Devices performs the same action as the *Find Devices* checkbox.

Connect to Device ... is the same as the Connect button.

Configure CF Radio is the same as the CF Radio button.

The Help - About screen displays the iNodeConfig files and versions.

CFR screens

Tap the *CF Radio* button to view the CFR screens. The **Config** screen displays CFR information: ESN, transmit cypher, power setting, firmware version and board revision. The **Firmware** screen is used to update the CFR firmware.

🏂 CFR - 2000	0037 🛛 井	-(× 1:01	₿	💦 🚰	R - 2000 0	037 🛛 🗱 ┥	× 1:01	@
Name	Value			Availab	le Updates	_		
CFR ESN	2000 0037			Name		Version	Code	
Cypher	0000 0000			CFRv3	3.03.02.hex	00.03.03.02	CFR3	
Transmit Power	-10							
Board Revision	CER3							
200101101000	0.10							
				Current	t Version Info	ormation		
				ESN	2000 0037			
				Туре	CompactFl	ash Radio		
				version	00.03.03.0	J2		
<u>R</u> efresh						Updat	e Firmwa	ire
Config Firmware				Config	Firmware			
Action		E	∎ ►	File Ac	tion		Ē	≊ ^

Figure 8. CFR screens on the PDA.

CAUTION: Do not update CFR firmware without direction from iMonitoring customer support.

To close the CFR screen, tap the *OK* circle button or the Windows Close (X) button. iNodeConfig returns to the Device Selection screen.

🚯 CFR - 2000 10)13	🛉 CFR - 2000 1013	
Action		File Action	
Config Firmware	1	 Config Firmware	
Name	Value	Available Updates	
CFR ESN Cypher Transmit Power Firmware Version Board Revision	2000 1013 0000 0000 0 00.03.03 02 CFR3	Name Version Code CFRv3 3.03.02.hex 00.03.03.02 CFR3 Current Version Information ESN 2000 1013 Type CompactFlash Radio Version Version 00.03.03.02	
Refresh		Update Fin	mware

Figure 9. CFR screens on the PC.

The **Config** page displays the CFR's current device settings. Tap the *Refresh* button to refresh the information on this screen.

Config menus

There is only one **Config** menu item selection: **Action** > <u>Refresh</u>, which is the same as the *Refresh* button.

The Update screen displays the CFR firmware revision and any available firmware updates.

To update CFR firmware:

- On the PDA, CFR firmware files must be stored in the iNodeConfig folder. On the PC, you can browse to other folders to find CFR firmware files. All CFR firmware files will be listed in the upper window of the Firmware page. To see available firmware, tap **File** > <u>Refresh Available Updates</u>.
- Tap the firmware (.hex) file you want to highlight it. Example: "CFRv3 3.03.02.hex" is Version 3.03.02.
- Tap *Update Firmware*. The selected file will be loaded into the CFR's flash memory.
- The new firmware version will be displayed on the **Update** screen.

Firmware menus

- File.
- Action.

File menu item selections:

- Browse directories.
- <u>Refresh available updates.</u>

- Update firmware.
- <u>Refresh version info.</u>

Browse Directories ...

PDA: Nonfunctional.

PC: You can browse to any directory, tap a folder, then tap OK. To see the update files, tap File > <u>Refresh Available Updates</u>.

	ADT430	4
	Documents and Settings	
4	Administrator	
	All Users	
	303016	
	Application Data	
	Desktop	
	Eavoriter	
	E C Start Menu	
	Templates	

<u>Refresh Available Updates</u>... If you copied a new CFR firmware file into the iNodeConfig folder on your PDA, tap <u>Refresh Available Updates</u> to display the new file in the upper window without closing and restarting iNodeConfig.

<u>Update Firmware</u> is the same as the *Update Firmware* button.

<u>Refresh Version Info.</u> If the firmware has been updated, this will display the new firmware version.

Data screen

	🗍 TLM1 - 0000 0362									
			File Actio	on						
			Data D	Data Log C	Config Thre	esholds	Alarms	Status	Firmware	
			Transduc	cer Data		-				
🎊 TLM1 - 0000 0:	362 2 46	1:06 👧	Name		Value					
			TLM1 ES	N	0000 0362	2				
Transducer Data		-	Level		n/a o' n''					
Nama	Valua		RESERV	ED	n/a					
Name			Energy le	ture vel	76.95°F 90 %					
ILM1 ESN	0000 0362		RSSI mar	rgin (dB)	28.00					
Level	n/a		Device st	tatus	Normal	-				
Range	8.0.		Version Drop in le	امى	00.04.00.0 n/a	Б				
RESERVED	n/a		Drop time	span (min)	n/a					
Temperature	76.67°F		1	-F ()						
Energy level	90 %									
RSSI margin (dB)	28.12									
Device status	Normal									
Version	00.04.00.06									
Drop in level	n/a									
Drop time span (min)	n/a									
<u>R</u> efresh										
Data Data Log Con	fig Thresholds	Ala 🔸 🕨								
File Action			Ref	fresh						

Figure 10. Data screen.

After connecting to the TLMe, iNodeConfig displays the Data screen, containing data related to tank liquid depth and important operating information. You can choose from three data formats:

- Transducer data (the most current data),
- RTU data (the data sent to an RTU),
- SatCom data (the last data sent to the iCCU).

Data values and definitions

Item	Definition
TLMe ESN	Electronic Serial Number (ESN) of the TLMe
Level	The fluid depth.
Range	The distance from the TLMe to the fluid surface.
RESERVED	Not used.
Temperature	The temperature at the TLMe head.
Energy level	The charge in the battery in percent.
RSSI margin (dB)	The Received Signal Strength Indicator value, a measure of the
	signal strength received by the TLMe.
Device status	Indicates alarm conditions. If an alarm is present, a code and a brief
	fault description are displayed, otherwise it displays "Normal".

Version	The TLMe firmware version.
Drop in top level,	If the level drop alarm is enabled, these will display the level drop
Drop time span	in feet and inches, and the drop time. See the Alarms section.

Data screen actions

- View and refresh the current TLMe data.
- Export (save) the data to a file.
- Run a data loop test.

Data screen menus

- File.
- Action.

File menu item.

• Export...

To export the data displayed on the TLMe Data screen to a Comma Separated Variable (CSV) file, tap File > Export... iNodeConfig will display the Save As screens, shown in Figure 11.

🎊 TLM1 - 0000 0362 🛛 🗱 ◀€ 3:01				
Save As				
Name:	Save As			<u>? ×</u>
Folder: None -	Save in:	🛃 Desktop		•
Type:	History	My Documents My Computer My Network Places	CfrTester Firmware NC 4.0.3	AcpDbUpload.
Location: Main memory		Adobe Reader 8 Auto-Cycle Plus V5.1	iNC 4.00.09	CCU-RTU test
OK Cancel		FT Calibrator	RFT calibrator	iNC 3.3.16 iNC 3.3.31
123 1 2 3 4 5 6 7 8 9 0 - = 4 Tab q w e r t y u i o p []	My Documents	ILM3 Probe Tester V1.2 TLM3 Probe Tester	TLM3 probe tester 100393-MTP WDS test proc.doc II 14001151 RF test results.txt	♪ iNC 4.0.9 ♪ iNodeTest 070 ♪ iNodeTest old
CAP a s d f g h j k ; ' Shift z x C V b n m , / . ←	My Computer			Þ
Ctl áü ` \ ↓ ↑ ← → ▲	My Network P	File name: Save as type:	<u> </u>	Save Cancel

Figure 11. File Export, Save As screens.

- On the PDA,
 - Enter a filename.
 - Choose a folder. Tap the $\mathbf{\nabla}$ arrow beside the <u>Folder</u> box to list all folders.
 - Choose a location. Tap the ▼ arrow beside the <u>Location</u> box for a list of memory locations: Main Memory, Built-In Storage, or SD Card. (The SD card is the most reliable, as it does not need a battery to retain its memory.)
 - Tap **OK**.

- On the PC,
 - Type a name for the file.
 - Browse to a folder.
 - o Tap *Save*.

Action menu items.

- <u>Refresh</u>. Refreshes the data displayed on the screen.
- <u>Data loop...</u> When <u>Data Loop</u> is enabled, iNodeConfig will periodically collect data from the TLMe. After selecting <u>Data Loop</u>, the <u>Frequency</u> dialog box, which allows you to set the data collection rate, is displayed:

🎊 TLM3 - 3636 0508 🛛 🗱 🐟 2:04	9		
Frequency As fast as possible Every minute Every hour Custom interval (H:M:S) 00:00:00 V OK		Data Loop Op Frequency As fast as Every mir Every hou C Every hou C Custom ir D0:00:0	tions possible nute ur nterval (H:M:S)
E	⊴ ^	OK	Cancel

After choosing a Frequency, tap **OK**. The collected data is displayed, most recent data at the top of the page.

Level	Range	DECEDUED	100
nla	100 A 17	REDERVED	Te
nya	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74=
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	8'0"	n/a	74
n/a	7' 11	n/a	74
n/a	7' 11	n/a	74
n/a	7' 11	n/a	74
n/a	7' 11	n/a	74
nla	7' 11	nía ,	74
			+
	n/a n/a n/a n/a n/a n/a n/a n/a n/a n/a	n/a 8' 0" n/a 7' 11 n/a 7' 11 n/a 7' 11 n/a 7' 11	n/a 8'0" n/a n/a 7'11 n/a n/a 7'11 n/a n/a 7'11 n/a n/a 7'11 n/a

📲 Data 🛛	Loop									<u> </u>
File Set	up									
Time	Level	Range	RESERVED	Temperature	Energy level	RSSI margin (dB)	Device status	Version	Drop in level	Drop time span (min)
16:05:09	n/a	8' 0''	n/a	74.57°F	90 %	28.71	Normal	00.04.00.06	n/a	n/a
16:05:06	n/a	8' 0''	n/a	74.57°F	90 %	28.12	Normal	00.04.00.06	n/a	n/a
16:05:03	n/a	8' 0''	n/a	74.57°F	90 %	28.95	Normal	00.04.00.06	n/a	n/a
16:05:00	n/a	8' 0''	n/a	74.57°F	90 %	28.24	Normal	00.04.00.06	n/a	n/a
16:04:57	n/a	8' 0''	n/a	74.58°F	90 %	27.53	Normal	00.04.00.06	n/a	n/a
16:04:54	n/a	8' 0''	n/a	74.60°F	90 %	28.83	Normal	00.04.00.06	n/a	n/a
16:04:51	n/a	8' 0''	n/a	74.57°F	90 %	28.00	Normal	00.04.00.06	n/a	n/a
16:04:48	n/a	8' 0''	n/a	74.57°F	90 %	27.88	Normal	00.04.00.06	n/a	n/a
16:04:45	n/a	8' 0''	n/a	74.57°F	90 %	27.41	Normal	00.04.00.06	n/a	n/a
16:04:42	n/a	8' 0''	n/a	74.58°F	90 %	29.07	Normal	00.04.00.06	n/a	n/a
16:04:39	n/a	8' 0''	n/a	74.55°F	90 %	27.76	Normal	00.04.00.06	n/a	n/a
16:04:36	n/a	8' 0''	n/a	74.57°F	90 %	28.00	Normal	00.04.00.06	n/a	n/a
16:04:33	n/a	8' 0''	n/a	74.56°F	90 %	28.12	Normal	00.04.00.06	n/a	n/a
16:04:30	n/a	8' 0''	n/a	74.56°F	90 %	27.88	Normal	00.04.00.06	n/a	n/a
16:04:27	n/a	8' 0''	n/a	74.57°F	90 %	27.65	Normal	00.04.00.06	n/a	n/a
16:04:24	n/a	8' 0''	n/a	74.59°F	90 %	28.60	Normal	00.04.00.06	n/a	n/a
16:04:21	n/a	8' 0''	n/a	74.60°F	90 %	28.60	Normal	00.04.00.06	n/a	n/a
16:04:18	n/a	8' 0''	n/a	74.57°F	90 %	28.24	Normal	00.04.00.06	n/a	n/a
I										

Figure 12. Data loop screens.

Data Loop records:

- Time of collection
- Level
- Range
- Temperature
- Energy level
- RSSI margin
- Device status
- Version
- Drop in level
- Drop time span

To save the data, you must enable data logging. **NOTE**: <u>Any data displayed before data logging</u> is started cannot be saved later. See **File** > <u>Log Data</u> below.

Data Loop menu selections

- File.
- Setup.

File menu item.

• Log Data...

Log Data allows you to save Data Loop data to a CSV file. If you select this feature, the **Save As** dialog is displayed. (This is <u>not</u> the same as the **Data Log** screen, explained in the next section.)

🎊 PocketCo 🖬 । 🕂 🕂 🕯 4:48		
Save As	Save As	? ×
Name:	Save in: 📉 My Documents 💽 🔶 🖆 🏢 -	
Folder: None 👻	My Pictures	
Type: Comma separated values (🗸	History LCD 3.02.00.hex	
Location: Main memory 🗸		
OK Cancel		
	My Documents	
Tab q w e r t y u i o p []		
CAP a s d f g h j k l ; '	My Computer	
Shift z x c y b n m , , / ↔	File name:	Save
	My Network P Save as type:	Cancel

To log data,

- Enter a file name.
- Choose a folder.
- Tap OK or Save.

PDAs cannot display CSV files directly. You must first move it to a laptop or desktop PC with ActiveSync, then open it with a spreadsheet program. Logging will continue until you exit the Data Loop page (tap *OK*). The PC can display the file contents if it has a spreadsheet program.

Setup menu item:

• <u>Options</u> redisplays the Frequency dialog.

Data log screen.

The TLMe keeps a data log for later review. This log can be downloaded and saved from the Data log screen.

AT TIME						362			
	- 0000 03	02 🗰	₹ 7:20 V		Action				
Date	Time	Range	Temp		ata Data Log	Config Thres	holds Alarm	s Status Firmwa	
1/12/2000 1/12/2000 1/12/2000 1/12/2000 1/13/2000 1/13/2000 1/13/2000 1/13/2000 1/13/2000 1/13/2000 1/13/2000 1/13/2000 1/13/2000 ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	19:45:00 20:45:00 21:45:00 22:45:00 0:45:00 1:45:00 2:45:00 3:45:00 4:45:00 5:45:00 6:45:00 6:45:00 7:45:00	-111' 11" 2' 1.25" 2' 1" 8' 0" 7' 11.75" 8' 0" 8' 0"	76.21°F 76.94°F 76.77°F 76.09°F 75.12°F 74.74°F 74.56°F 74.42°F 74.31°F 74.14°F 73.92°F 73.70°F 73.48°F ▼		ate Time 12/2000 19.45 12/2000 21.45 12/2000 21.45 12/2000 23.45 12/2000 0.45(13/2000 0.45(13/2000 0.45(13/2000 4.45(13/2000 6.45(13/2000 6.45(13/2000 6.45(13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 11.45 13/2000 13.45 13/2000 14.54	Range 00 -111' 11'' 00 2' 1.25'' 00 2' 1''' 00 8' 0'' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 7' 11.75''' 00 7' 11.75''' 00 8' 0''' 00 8' 0''' 00 8' 0''' 00 8' 0'' 00 8' 0'' 00 8' 0''	Temp E 76.21*F 8 76.97*F 8 76.09*F 8 76.77*F 8 74.74*F 8 73.92*F 8 73.02*F 8 73.02*F 8 72.26*F 8 72.26*F 8 72.92*F 8 73.67*F 8	Device status 18 % Normal 18 % Normal	5
File Action	ı			-	Refresh				

Figure 13. Data log.

Data log screen actions

- Set the log range.
- Download the data log.
- Save the data log.

When the Data log screen tab is tapped, the Log Range dialog box opens, shown in Figure 14. By default, the Start Date/Time and End Date/Times are set to the beginning and ending times in the log. Frequency sets the interval between downloaded log entries: Every 5 minutes, Every 15 minutes, Every 6 Hours, Every 12 Hours, and Every Day.

🎢 TLM1 - 0000 0362 🛛 🗮 📢 7:15	Log Range
Start Date/Time 01.12.00 - 19:45	Start Date/Time 01.12.00 - 19:45
01.13.00 - 16:40	End Date/Time
OK Cancel	Frequency
en 1997	OK Cancel

Figure 14. Data log range screens.

To download the data log,

- Choose a Start Date/Time. (A new date/time must be <u>later</u> than the default and <u>earlier</u> than the End Date/Time.)
- Choose an End Date/Time. (A new date/time must be <u>earlier</u> than the default and <u>later</u> than the Start Date/Time.)
- Choose an entry Frequency.
- Tap *OK*.

A downloaded log is displayed similar to those shown in Figure 13.

The data log contains the following data:

- Entry date and time.
- Range or Level, depending on the operating mode.
- Temperature.
- Energy level.
- Device status.

Data log menus

- File
- Action.
- Admin. (Requires Administrator login.)

File menu items:

• Export...

The data log can be saved to a CSV file for later review. See the **Data** screen, **File** \geq <u>Export</u>. The save process and screens are the same.

Action menu items:

- <u>Redraw.</u>
- <u>Refresh/Acquire.</u>

<u>Redraw</u> redraws the existing data on the Data log screen.

<u>Refresh/Acquire</u> is the same as the *Refresh* button, displaying the Log Range dialog box so that other dates, times and frequencies can be chosen.

Admin menu items:

- <u>Reset Data Log...</u>
- <u>Set Log Interval...</u>

Reset Data Log clears the contents of the data log.

<u>Set Log Interval</u> allows you to choose either 1 minute or 5 minute logging. 1 minute entries record more data but the log range is reduced. The default setting is 5 minutes.

Config screen.

Most TLMe configuration settings are located on the Config screen, shown in Figure 15.

			🚯 TLM1 - 0000 036	2	- 🗆 ×
			File Action Admin		
			Data Data Log C	Config Thresholds Uplink Alarms Status	Firmware
			Name	Value	
			TLM1 ESN	0000 0362	
	aca 11 4/ 3 ca		Name	Unnamed	
75 TLM1 - 0000 0	362 🖬 📲 7:50	OK	Beporting mode	Normal	
Name	Valua		Cvpher	0000 0000	
Manie	value		Clock	17:15:11 1/13/2000	
TLM1 ESN	0000 0362				
Name	Unnamed		Mode Taulukaisht	Range	
CCU ESN	0000 0000		Head offset	-0 1.0 0' 10.0''	
Reporting mode	Normal		Gas characterization	401.660004	
Cypher	0000 0000	1	Range offset	0.0	
Clock	16:42:45 1/13/2000	=	Range slope	1.0	
clock	10/12/10 1/10/2000		Temperature offset	32.0	
Mode	Range		Filter size	10	
Tank beight	-0' 1 0"		Hysteresis	0.1	
Head offcet	0' 10.0"				
Cos characterization	401 660004				
	401.000004				
Range orrset	0.0				
Range slope	1.0	-			
Temperature offset	32.0	1.5			
Refresh	Save				
Data Data Log Cor	nfig Thresholds Ala	• •	1		
File Action	æ	9 •	Refresh	S.	ave

Figure 15. Config screens.

Config screen actions

- Name the TLMe for easier identification.
- Set the operating mode (Range or Level).
- In Level mode, set the Tank height and Head offset values.
- Set the Filter size and Hysteresis.
- Synchronize the real-time clock (RTC) to the PDA or PC clock.
- Import and export device configuration.
- Perform a site calibration.
- Change the RF frequency band.
- Change the ESN (admin only).
- Change the cypher (admin only).
- Shut the TLMe down (admin only).

To name the TLMe:

• Tap the **Name** value. On the PDA, the keyboard pops up.

- Enter a name (32 characters or less).
- Tap *Save*.

To set the operating mode:

- Tap the **Mode** value.
- Choose either **Range** or **Level**.
- Tap *Save*.

Config menus

- File
- Action.

File menu items:

- Import Config...
- Export Config...

<u>Import Config</u> applies a saved configuration to the TLMe. This saves time if configuration settings are similar among several TLMe's, or if a TLMe previously in service must be replaced.

To import a saved configuration,

• Tap **File** > <u>Import Config..</u>. The File Open box will be displayed. Tap the configuration file you want to import. (On the PC, tap the *Open* button.)



An import options page will be displayed.

🎊 TLM1 - 0000 0362 🛛 🗱 ◀€ 9:48 🛛	•
Import device-specific calibration information. Update the device with imported values.	
OK Cancel	
	Import Options
	Update the device with imported values.
	OK Cancel

Figure 16. Import options selection boxes.

- <u>Check</u> both boxes.
- Tap **OK**. The configuration file is imported, and the device configuration is updated.

Export Config saves the TLMe configuration data to a CSV file. The export procedure is the same as described in the Data screen section.

Action menu items:

- <u>Refresh.</u>
- <u>Save.</u>
- Sync Clock.
- <u>Site Calibration...</u>
- <u>Change Frequency Band...</u>

<u>Refresh</u> is the same as the *Refresh* button.

Save is the same as the *Save* button.

To Sync Clock:

• Tap *Action* > <u>Sync Clock</u>.

<u>Change Frequency Band</u> allows you to configure iNode radios to minimize interference from some SCADA radios (e.g. FreeWave). Many SCADA radios, including FreeWave, can be set to use only a part of the 902 – 928MHz radio band. If the SCADA radios are configured to use the upper band and iNodes to use the lower band, the two radios will not interfere. Communications will be faster and more reliable.

To change the TLMe frequency band:

• Tap Action > <u>Change Frequency Band...</u> The Frequency Band window will open.

- The TLMe radio can be set to one of three modes: **Wide** (the entire 902 928MHz range), **A** (the lower band, 902 916MHz) or **B** (the upper band, 914 928MHz).
- Tap the desired mode to highlight it and tap **OK**.

Note that this requires a similar configuration of the SCADA radio system. Refer to the SCADA manufacturer's data for information on how to configure the SCADA system. Also the CFR must be set to use the same band as the iNodes.

🔏 TLM1 - 0000 0362 🛛 🗱 ┥€ 9:55 🔇	30
Wide (902-928MHz) A (902-916MHz) B (914-928MHz)	
OK Cancel	Frequency Band
	Wide (902-928MHz) A (902-916MHz) B (914-928MHz)
	OK Cancel

Figure 17. Frequency band settings.

Site calibration

Preparation for calibration.

Before permanently mounting the TLMe to the tank, you must make two measurements so that the TLM can be properly calibrated after it is installed: (1) the distance from the bottom of the tank to the point where the TLM is threaded into the fitting (tank depth), and (2) the distance between where the fitting mates with the TLM thread and sensor head (head offset). The automated calibration procedure performed after installation subtracts head offset from tank depth and calculates the distance between the TLM sensor head and the bottom of the tank.

- 1. Head offset.
 - a. **Closed top tank**. Measure the distance from the last visible thread that is seen when the TLM is installed and the tip of the TLM sensor head.
 - b. **Open top tank.** With an open top tank enter this distance as '0', since the distance from the TLM sensor head to the tank bottom can be measured directly.

2. Tank depth.

a. **Closed top tank.** Using a gauge line, measure the distance from top of the fitting where the TLM will be mounted, to the bottom of the tank.

b. **Open top tank.** Install the TLM and measure the distance from the sensor head to the tank bottom with a gauge line.



Calibration

After the TLMe is mounted to the tank, it must be calibrated.

- Select Level Mode.
- Enter the tank height and head offset values measured earlier.
- Tap *Save*.
- Select Action > Site Calibration... The Site Cal window will be displayed as shown in Figure 18.
- Measure and enter the fluid depth and the gas temperature.
- Tap *Calibrate*. The calibration process will run.
- If the calibration is successful, the <u>Site Cal Successful</u> window will be displayed as in Figure 19. Tap *OK* to close the window and complete the calibration.

🎊 TLM1 - 0000 0362 🛛 🗮 ◀€ 8:19 🚳 🦕	5ite Cal - Depth Mode
Fluid Depth 0' 0.0" Gas Temp 0.0°F	Fluid Depth 0' 0.0''
Note: This operation will use the entered values for Tank Height and Head Offset.	Gas Temp 0.0°F
Please make sure that they are correct. Tank Height <u>16' 6.0"</u> Head Offset <u>0' 6.0"</u>	Note: This operation will use the entered values for Tank Height and Head Offset. Please make sure that they are correct.
Calibrate Cancel	Tank Height 16' 6.0''
123 1 2 3 4 5 6 7 8 9 0 - = ◆ Tab q w e r t y u i o p []	Head Offset 0' 6.0"
$\begin{array}{c} c_{AP} = \mathbf{s} \cdot \mathbf{u} + \mathbf{y} \cdot \mathbf{n} + \mathbf{y} \cdot \mathbf{n} + \mathbf{y} \cdot \mathbf{n} \\ \text{Shift} = \mathbf{z} \cdot \mathbf{x} \cdot \mathbf{c} \cdot \mathbf{v} \cdot \mathbf{b} \cdot \mathbf{n} \cdot \mathbf{m} \cdot \mathbf{n} + \mathbf{n} \cdot \mathbf{n} \\ \text{Ctl} \hat{\mathbf{a}} \hat{\mathbf{u}} \hat{\mathbf{u}} \hat{\mathbf{u}} \hat{\mathbf{u}} \hat{\mathbf{u}} \hat{\mathbf{u}} \hat{\mathbf{u}} \\ \end{array}$	Calibrate Cancel

Figure 18. Site Cal window.

윤 iNodeConfig-PDA 🛛 🗱 📢 8:34	
Restarting filter	
🖸 iNodeConfig-PDA 🛛 🚯 🔺	
C C Site calibration is successful. The new gas characterization is:	
d 401.498901	Config-PC X
CFR: RX valid message [0x00000010] CFR: Xmit: Trying sync, poll mask = 00 [0x00 CFR: Xmit: initial sync succeeded [0x0000000 CFR: RX valid message [0x00000010] CFR: RX valid message [0x00000010]	Site calibration is successful. The new gas characterization is: 405.275024
Cancel	ОК

Figure 19. Site cal successful window.

Thresholds screen

For accurate distance measurement, the TLMe must find the <u>first</u> reflected signal. After the TLMe is installed and calibrated, its <u>threshold</u> (the signal levels the TLMe uses for distance calculations) settings can be adjusted for best performance.

The **Thresholds** screen is shown in Figure 20. If a signal pulse is <u>above</u> the red line, it will be used by the TLMe. If not, it will be ignored. The threshold levels can be changed by touching a line or point, then dragging it to a new position. (In the figure, the first blue "signal" is the transmitted pulse. The second signal is the reflection.) The default thresholds set the TLMe to ignore the transmitted pulse while using the reflected pulse. Threshold adjustment is more critical when the TLMe is measuring very short distances between the fluid and the sensor head, or it needs to ignore multiple reflections inside a tank.



Figure 20. Thresholds screens.

Thresholds screen actions

- Import and export the TLMe configuration.
- Export a trace to a CSV file.
- Get a new trace.
- Restore threshold default settings.
- Refresh the display.

• Save threshold settings.

Thresholds menus

- File.
- Action.

File menu items:

- Import Config...
- Export Config...

These selections are identical to those on the Config screen. See the Config section for their use.

• Export trace saves the trace and threshold data values to a CSV file.

Action menu items:

- <u>Get trace</u> causes the TLMe to acquire a new trace and display it on the Thresholds screen.
- <u>Restore defaults</u> resets the threshold levels and locations to their default values.
- <u>Refresh</u> refreshes the data displayed on the screen.
- <u>Save</u> saves any threshold level or location changes made on the screen.

Alarms page

The TLMe can detect alarm conditions and send alarm messages to a CCU.

A			🕴 TLM1 - 0000 0362				_0	×
75 TLM1 - 0000 036	2 🚛 📢 10:54	ok	File Action					
Level low Level high Level drop Drop window Temperature low Temperature high Device failure	Disabled Disabled Disabled Disabled Disabled Disabled Disabled		Data Data Log Config T Level low Level high Level high Level drop Drop window Temperature low Temperature high Device failure Level low Level low Level drop Level drop Level drop	hresholds Disabled Disabled Disabled Disabled Disabled Disabled Disabled Disabled Disabled 0 (0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	Alarms	Status	Firmware	-
Level low Level high Level drop Drop time span (min) Drop window start (hr) Drop window end (hr) Temperature low	-0' 3.0" 80' 0.0" 0' 0.0" 0 19 19 -328.0°F	+	Level drop time span (min) Level drop window start (hour) Level drop window end (hour) Temperature low Temperature high Alarm holdoff minutes	0 19 19 -328.0°F 572.0°F 10				
Refresh	Save sholds Alarms S	••						
File Action	E	₩.	Refresh				Save	

Alarms page actions

- Enable and disable alarms.
- Set alarms for low and high fluid levels or temperatures.
- Configure a level drop alarm.
- Set the alarm holdoff time.

To enable an alarm:

- All alarms are disabled by default.
- Tap the *Disabled* value beside an alarm.
- Tap *Enabled*.
- Tap *Save*.

To set a level alarm value:

- Tap the level setpoint value you want to change. (PDA: The keyboard will pop up.)
- Enter the setpoint value in feet and inches.
- Tap *Save*.

To set a temperature alarm value:

• Tap the temperature setpoint value you want to change. (PDA: The keyboard will pop up.)

- Enter the setpoint value in degrees F.
- Tap *Save*.

To minimize nuisance alarms, **Alarm holdoff** sets the time that an alarm condition must be present before the TLMe will send an alarm. The longer the holdoff time, the longer the alarm condition must persist before an alarm is generated.

To set the Alarm holdoff:

- Tap the Alarm holdoff value. On the PDA, the keyboard will pop up.
- Enter the desired value in minutes.
- Tap the *Save* button.

The **level drop alarm** will send an alarm when the tank level drops during a selectable time span (for example, if oil is "thieved" at night when the tank is unattended). Level drop alarm configuration requires you to enter four values:

- Level drop (in feet and inches) sets the fluid level drop necessary to trigger an alarm.
- <u>Drop time span</u> (in minutes) sets the maximum time interval necessary to trigger an alarm.
- <u>Drop window start and end</u> (24 hour format, local time) sets a "window" during which a level drop alarm can be generated. This prevents sending an alarm during the normal workday.

To set the <u>Level drop</u> values:

- Tap the <u>Alarm holdoff</u> value. On the PDA, the keyboard will pop up.
- Enter the desired value in feet and inches.
- Tap *Save*.

For example, assume that you want to detect a level drop and send an alarm if the fluid level drops more than 1' in 10 minutes, between 7PM and 5AM. In this case,

- Level drop = 1' 0".
- Drop time span = 10 minutes.
- Drop window start = 19 (PM values add 12, so 7PM = 12 + 7).
- Drop window end = 5 (AM values don't add 12, so 5AM = 5).

Alarm menus

- File.
- Action.

File menu items:

- Import Config.
- Export Config.

As previously explained in the **Configuration** section, <u>Import Config</u> and <u>Export Config</u> load and save TLMe configuration files.

Action menu items:

- <u>Enable</u> (not functional).
- <u>Refresh.</u>
- <u>Save.</u>

<u>Refresh</u> and <u>Save</u> refresh the Alarms values page and save your changes. They are the same as the *Refresh* and *Save* buttons.

Status screen

The Status screen displays information about the TLMe.

		٠	TLM1 - 0000 0362	
		Fil	e Action	
		D	ata Data Log Config 1	Thresholds Alarms Status Firmware
			Vame	Value
🎊 TLM1 - 0000 0362 🟾 🗱	◀€ 12:12 💽		Firmware Version Board Revision	00.04.00.06 TLP2
Name	Value 4	. 9	Self-Test Codes:	
Firmware Version	00.04.00.06		Radio test Clock test	(0x00) OK (0x00) OK
Board Revision	TLP2	E F	LASH test	[0x00] OK
			Reset source Charge current	[0x01] Hardware reset pin 0
Self-Test Codes:		1 A	Auto-calibration status	0x00] OK
Radio test	[0×00] OK	= 4	Auto-calibration passes	5
Clock test	[0×00] OK	A A	Auto-calibration error location.	0
FLASH test	[0x00] OK	I F	Reflection peak level	0
Reset source	[0x01] Hardwa			
Charge current	0			
Auto-calibration status	[0×00] OK			
Auto-calibration passes	5			
Auto-calibration error location	0			
Background noise level	0			
4 11				
<u>R</u> efresh				
Thresholds Alarms Status F	Firmware			
File Action			Refresh	

Figure 21. Status screens.

The following status information is displayed:

- Firmware version.
- Board (hardware) revision.
- <u>Self-test codes</u>. When it is powered on or reset, the TLMe runs several self-tests. The test results display 'OK' if the test is passed, or a brief description of the failure if it fails.
 <u>Radio test</u>.
 - Clock test.
 - FLASH (memory) test.
- <u>Reset source</u>. The typical reset source is 'Hardware reset pin & power-on' (The hardware reset pin is the reset button. There are several other reset sources. If another reset source is displayed, it may indicate a problem with the TLMe. Consult Ferguson Beauregard customer support if you have a problem.)
- <u>Charge current</u>. This represents the amount of charge current generated by the solar panel. In average sunlight this value is typically > 40. If the value is 0 in sunlight, there may be a failure in the solar panel or charging circuit.
- <u>Auto-calibration status</u>. After a successful site calibration, this will display **OK**.
- Auto-calibration passes. This should display "5".

- <u>Auto-calibration error location</u>. TBD.
- <u>Background noise level</u>. The average noise level seen by the TLMe sensor.
- <u>Reflection peak level</u>. The maximum level of the reflected signal.

Status screen actions

- Refresh the displayed status information.
- Export the TLMe status.
- Run the <u>RF Link Test</u>.

To refresh status information:

• Tap the *Refresh* box. The status information is refreshed.

Status menus

- File.
- Action.

There is only one File menu item, Export. To export the TLme status information to a CSV file:

- Tap *File* > <u>Export</u>. The Save As dialog is displayed.
- Enter a filename.
- Choose a folder (or browse to a folder, on a PC) in which to save the file.
- On the PDA, choose the memory location (main memory, built-in storage, SD card).
- Tap *OK*.

Action menu items:

- <u>Refresh.</u>
- <u>RF Link Test...</u>

<u>Refresh</u> is the same as the *Refresh* button.

<u>RF Link Test...</u> When <u>RF Link Test</u> is enabled, iNodeConfig collects RF communications data from the TLMe. After selecting <u>RF Link Test</u>, the <u>Frequency</u> box, which allows you to set the data collection rate, is displayed. Choose a Frequency, tap the *OK* button, and collection will begin.



Figure 22. Data loop options boxes.

RF Link Test is similar to **Data Loop**, and the <u>Frequency</u> selection box is identical. However all collected information relates to the radio system used to communicate with all iNodes. See Figure 23 below.

🎊 сси-	RTU 1151 1285	# ◀€ 1:46	•	📲 Link Q	uality Test								×
Time	CFR RX Channel	CFR Rssi	CF 🔺	File Setu	qu								
13:46:58	30	27,290039	30	Time	CFR RX Channel	CFR Rssi	CFR TX Channel	Dev RX Channel	Dev AbsRSSI	Dev thresh	Dev margin	Timing offs	•
13:46:56	3	22.069336	3	13:54:01	35	27.883301	30	30	-48.347656	246	28.357910	865	
13:46:54	35	23.967773	35 ≡	13:53:59	44	28.476563	3	3	-48.822266	246	28.713867	865	
13:46:53	44	24.323730	44	13:53:57	41	25.510254	35	35	-48.347656	246	28.357910	865	
13:46:51	41	23.611816	41	13:53:55	47	25.866211	44	44	-48.347656	246	29.069824	865	
	1920			13:53:53	27	28.239258	41	41	-48.347656	246	29.188477	865	
				13:53:51	37	25.154297	47	47	-48.347656	246	28.832520	865	
				13:53:49	5	26.459473	27	27	-48.822266	246	28.120605	865	
				13:53:47	14	26.934082	37	37	-47.873047	246	28.357910	865	
				13:53:45	52	28.120605	5	5	-48.347656	246	29.069824	865	
				13:53:43	8	27.527344	14	14	-48.822266	246	29.069824	865	
				13:53:41	39	23.255859	52	52	-47.873047	246	28.357910	865	
				13:53:39	32	28.239258	8	8	-48.347656	246	29.188477	865 -	_
				13:53:37	18	28.120605	39	39	-48.347656	246	28.595215	865	
				13:53:35	23	21.238770	32	32	-48.822266	246	28.713867	864	
			12.5	13:53:33	34	27.645996	18	18	-48.822266	246	29.188477	864	
			-	13:53:31	29	28.120605	23	23	-48.347656	246	26.340820	864	
•				13:53:29	10	26.459473	34	34	-48.347656	246	28.951172	864	- 1
cile cette	_		mm .	12-52-27	<u>າ</u>	27 002201	20	20	40 000066	246	20 202212	004	
rile Setu	p			<u> </u>									14

Figure 23. RF link test data.

RF Link Test displays:

- <u>Time</u> of collection (24-hour format, local)
- <u>CFR RX Channel</u> (inbound channel number)
- <u>CFR Rssi</u> (inbound signal strength)
- <u>CFR TX Channel</u> (outbound channel number)
- <u>Dev RX Channel</u> (outbound
- <u>Dev Abs RSSI</u> (inbound signal strength, seen on the TLMe)
- <u>Dev thres</u> (noise threshold of the received channel on the TLMe)
- Dev margin (noise margin of the received channel on the TLMe)
- <u>Timing offset</u> (timing alignment value synchronizing the TLMe and CFR radios)

After the link test is running, two menu items can be selected:

- *File* > <u>Log data</u>. The link test data can be logged to a CSV file. **NOTE**: Data logging must be selected <u>after</u> the link test is started. Data displayed on the screen <u>before</u> logging is enabled will <u>not</u> be saved to the log.
- *Setup* > <u>Options</u>. Displays the <u>Frequency</u> dialog box.

<u>RF Link Test</u> is usually only used by iMonitoring for system troubleshooting.

Firmware screen

	🕴 TLM1 - 0000 0362	A REAL PROPERTY OF A READ REAL PROPERTY OF A REAL P	<u>_ ×</u>
	File Action		
	Data Data Log Config	Thresholds Alarms Status	Firmware
	Available Updates		
	Name	Version Code	
🎊 TLM1 - 0000 0362 📰 📢 12:22 🚳	NO UPDATES AVAILABLE		
Available Updates			
Name Version Code			
tlm1 par 4.00.06.hex 00.04.00.06 TLP2			
Current Version Information			
ESN 0000 0362			
Type TLM			
Version 00.04.00.06			
	Current Version Information		
	ESN 0000 0362		
Update Firmware	Type TLM Version 00.04.00.06		
Thresholds Alarms Status Firmware			
File Action 🔤 🔺			Update Firmware

TLMe firmware can be updated on the Firmware screen. New firmware versions must be copied into the iNodeConfig folder on your PDA. All TLMe firmware versions in the iNodeConfig folder will be displayed in the top box on the screen. Firmware can be located in different folders on the PC, since you can browse folders to find the files.

Firmware screen actions

- View the current firmware version, ESN and device type.
- Update the firmware on the TLMe.

To update firmware,

- Tap the version to be loaded to highlight it.
- Tap the *Update Firmware* box. If the version is older than the one presently loaded, a notification box will be displayed. Tap *OK* to proceed.
- A confirmation box will be displayed. Tap Yes if you want to proceed, or No to cancel.
- If you tapped *Yes*, the firmware will be updated.

CAUTION: This process takes several minutes. Don't use the PDA until the upload process is complete.

Firmware menus

- File.
- Action.

File menu items:

- Browse Available Directories.
- <u>Refresh Available Updates</u>.

On the PDA, <u>Browse available directories</u> is nonfunctional. On the PC, you can browse to any directory on the PC to find firmware files.

If firmware files have been copied into the iNodeConfig folder on the PDA, or you have added firmware files on the PC, <u>Refresh available updates</u> will display the new files in the upper window.

Action menu items:

- <u>Update Firmware</u>.
- <u>Refresh Version Info</u>.

<u>Update Firmware</u> is the same as the *Update Firmware* button. <u>Refresh Version Info</u> displays the current TLMe firmware version.

TLMe Specifications

Measurement		
	Fluid level range Accuracy	18 to 240 inches (1.5 to 20 feet) +/- 2"
Electrical		
	Radio range: Sensor to CCU Radio range: Sensor to CFR-enabled device	1,500 feet typ. line of sight. > 5000 feet with optional high gain antenna. 500 feet.
	Radio technology Communications protocol	902-928 MHz spread spectrum frequency hopping. Proprietary iMECH protocol specifically designed for iNode wireless sensors
	Security	Access to sensor data can be restricted by cypher
	Data logging	Internally stored data logs, 30 day length
	Power	1/4w solar panel, rechargeable Li-Ion battery and integrated charger/regulator
	Data log	Level measurement data logs stored internally
Mechanical		
	Mounting	3" NPT fitting
Environmental		
	Operating temperature Humidity	-40° C to $+ 60^{\circ}$ C (-40° F to 140° F) 0 to 95% non-condensing
Certifications		
	Safety listings	UL and c-UL Class l, Div. l, Groups C and D (Intrinsically safe)
	FCC approval	CFR 47 Part 15
Reliability		
	Product life	\geq 5 years by design

The Ferguson Beauregard iNodes suite of products includes:

- Tank Level Monitor (TLM1, TLMe, TLM-3)
- Wireless Data Switch (WDS)
- Electronic Flow Monitor (EFM)
- Compact Flash Radio (CFR)
- Wireless Pressure Monitor (WPM)
- Concentration & Communications Unit (CCU)
- CCU with RTU analog and digital input interface (CCU-RTU)
- Wireless Two Pen Pressure Recorder (WPM-2P)

Other Services compatible with our iNodes suite:

FieldDIRECT® is an end-to-end service for collecting and storing production data and delivering it directly to your desktop via a Web-based interface. It operates seamlessly with our iNodes intelligent sensors and our handheld data entry system. That gives you data capture options that are economical even for mature fields with wells producing as little as five BOE per day.

For more details on iNodes and FieldDIRECT, call 1-903-561-4851, fax (903) 561-6567, visit our Web site at <u>www.FergusonBeauregard.com/products</u>, or send an e-mail to: automation@fergusonbeauregard.com.