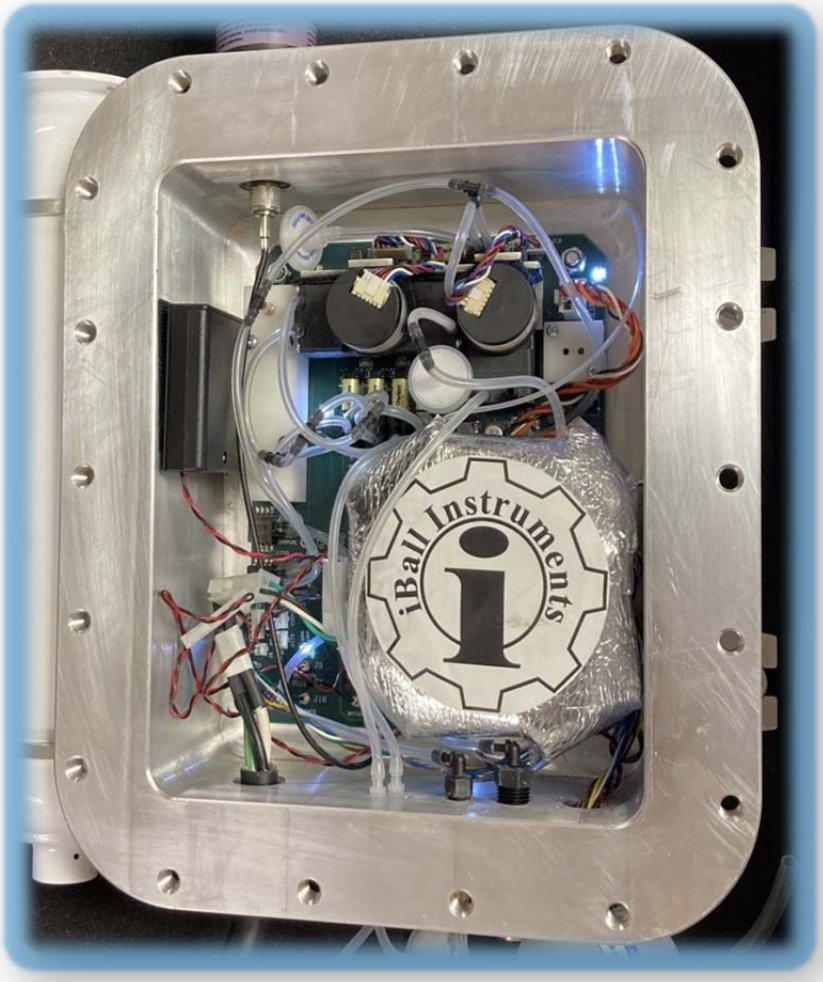
RIGWIRE™ WIRELESS SHAKER MOUNTED GAS DETECTOR AND CHROMATOGRAPH SYSTEM MANUAL



RIGWIRE SYSTEM FEATURES:

- ✓ **REDUNDANT** THERMAL COEFFICIENT DETECTORS
- ✓ **REDUNDANT** PILISTOR (HOT WIRE) DETECTORS
- ✓ INFRARED HYDROCARBON AND CARBON DIOXIDE DETECTORS
- ✓ LEAD BASED INDUSTRIAL OXYGEN REACTION SENSOR
- ✓ MEDICAL GRADE 20,000 HOUR PUMPS
- ✓ 4 MINUTE CHROMATOGRAPH
- ✓ EASILY SERVICEABLE PARTS
- ✓ AUTOMATED OR MANUAL STANDARD CALIBRATION INJECTION PORT USING STANDARD CALIBRATION GASSES
- ✓ 100% PASON COMPATIBLE FOR REPLACEMENT OF PASON FIELD EQUIPMENT
- ✓ EXPLOSION PROOF RATINGS ARE PENDING
- ✓ RSA 2048 BIT GOVERNMENT LEVEL ENCRYPTED COMMUNICATIONS

Call or visit our website Today for more information on the new Rigwire Gas Detector and Chromatograph system.

RIGWIRE.COM

support@iballinst.com

US 1+ (405) 570 4449

Release 02
July 2025
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3210 S Arena Rd
McLoud Oklahoma 74851
405 341 2434

INTRODUCTION:

The Rigwire Gas Detector and Chromatograph system is a new clean sheet design of an industry requirement and need for an easily utilized, solid, robust, small, compact, environmentally hardened, accurate and reliable compact system to monitor natural resource drilling, operation, production and safety in the field, plant, or distribution of all your natural resources.

The creation and implementation of this new type of instrument is the culmination of the last 25 years and brought together in one small usable platform and is intended to replace older and less reliable field equipment.

The Rigwire is designed for, but not limited to, two primary roles.

(1) The first is to directly and actively plug-and-play replace the current problematic Pason® Gas Detector systems found on hundreds of active wells all over the world.

(2) The second is to replace older, inaccurate, and antiquated gas detection equipment in the field for monitoring, mud logging, management, and safety.

TRIPLE REDUNDANT SENSOR TECHNOLOGY

One of the most attractive features of the Rigwire System is the Infrared AND primary and secondary traditional sensor sets for VOC detection.

The Rigwire System comes standard with not only the proven Infrared sensor technology perfected by iBall Instruments, but also a dual set of traditional Thermal Coefficient Detectors and Pilistors (Hot Wire) detectors.

If you or your company requires or prefers the Infrared sensor technology, then the Rigwire System can provide for you this robust, and hardened technology that can not burn out or be damaged over time by high VOC concentrations.

However, with the click of a button the Rigwire System can instantly change over to a traditional “Hot Wire” style of detector set. This traditional set of detectors is comprised of a Thermal Coefficent Detector and a Pilistor (Hot Wire) detector set. **More importantly, this TCD Pilistor set of sensors comes complete with a backup set of sensors already in the case and running so that the user can instantly switch over to the backup set of sensors when desired.**

This **triple redundan**t set of VOC sensors allows for the user to have unparalleled performance, reliability, and backup confidence never before had in this gas detection industry.

RIGWIRE SPECIFICATIONS

ITEM	NOMINAL	RANGE	DETAIL/NOTES
VOC DETECTION	Infrared Hydrocarbon Detector	0 - 500 Gas Units +/- 0.2% (Low Range)	Infrared Sensor detection of Hydrocarbons
VOC DETECTION	Thermal Coefficient Detector (1)	500-10,000 Gas Units +/- 2% (High Range)	Primary Thermal Coefficient Detector (1)
VOC DETECTION	Thermal Coefficient Detector (2)	500-10,000 Gas Units +/- 2% (High Range)	Backup Thermal Coefficient Detector (2)
VOC DETECTION	Pillistor (Hot Wire) (1)	0-500 Gas Units +/- 0.2% (low Range)	Primary Pilistor Detector (1)
VOC DETECTION	Pillistor (Hot Wire) (2)	0-500 Gas Units +/- 0.2% (low Range)	Backup Pilistor Detector (2)
O2 DETECTION	+/- 0.2	0 - 20.9%	Lead based chemsensor O2 Sensor
CO2 DETECTION	+/- 0.05	0 - 5%	Infrared CO2 Sensor
Serial Comms	RS-232 serial WITS RS 422	9600 bps	Wired RS232 Wireless 900 Mhz frequency hopping PASON WITS RS422 Wireless Cellular Option
Power Requirements	120V AC 0.5 Amps	90-160V AC 40-80 Hz	Designed to utilize dirty rig AC power
Backup Battery	13.5VDC	Internally regulated	Lasts up to 1 hour when disconnected from primary AC power
Temperature Range	-40 to 120 Degrees F -40 to 50 Degrees C	Internally regulated and vented	During cold weather internal heaters will operate to keep the system warm. During hot climates, the case is vented
Machined Billet Aluminum Case	Explosion Proof Rating Is Pending		The Machined Billet Aluminum case is unparalleled in the industry – Gone are the fragile cast Aluminum cases
4 Minute Chromatograph	Typical 160 F Degree Operation	Helium to Nc4	Helium Detector Optional
Brusless Pumps	20,000 Hour Minimum	Pressure regulated	Speed Regulated
Data Resend			Rigwire will resend data if it gets corrupted
Encrypted Communications	RSA	RSA 2046 bit	RSA encrypts and decrypts using public and private keys. The public key is disclosed, but the secret key is concealed. This enables keyless secure communication.
Integrated Blowback System	Clearing the Sample Line	60 Second Bursts	The Rigwire can detect a blockage at the inlet and can automatically blow back the sample line to clear it
Automated Drift Correction	Automatically adjusting The sensors for Drifting over time	Every 2 minutes	The Rigwire System will automatically adjust for drifting sensors.
Positive Case Pressure	The case is internally positive pressure maintained to keep dust and dirt out		

HARDWARE OVERVIEW AND FEATURES:

The Rigwire System is primarily designed to be a wireless shaker mounted gas detector and chromatograph system. The system also has removable integrated mounting hardware for instant hand rail mounting and deployment.

The Rigwire System can use the standard harsh environment 120V AC usually seen at drilling sites. Drilling rig operations almost always utilize diesel generators for power. These generators can and do generate dirty rig power that fluctuates wildly in both voltage and frequency. The Rigwire System can easily use this dirty power – from 90V AC to 190 V AC and from 40 to 80 Hz in operation.

Battery backed system. The low power Rigwire System utilizes internal batteries to keep the system going during momentary power fluctuations or power losses.

Integrated Pason® 10 pin military connection and communications system and protocol for plug-and-play integration with the Pason® EDR system.

Wireless communications; 900+ MHz and 500 channel frequency hopping and hardened radio transmitter system for wireless communications, monitoring, troubleshooting, updating, maintaining, calibration, and logging.

(OR)

The Rigwire System has an **OPTIONAL** internal cellular communications module that allows the Rigwire to communicate to the remote Rigwire Server System using the latest encryption. This allows the customer or user to remotely monitor and control the Rigwire System.

Medical Grade 20,000 hour industrial grade brushless Parker® variable speed pumps.

Multiple and redundant sensors using the patented (US 9903846 and US 10234437) cross talk communications protocol to keep themselves in calibration and free from drifting.

The Rigwire system uses **MULTIPLE GAS DETECTORS SIMULTANEOUSLY** to detect and read the current gasses. The Rigwire system has – at all times – **DUAL** Thermal Coefficient detectors, **DUAL** Pilistor (hot wire) detectors, a multiple element Infrared hydrocarbon detector, and a lead based Oxygen reaction sensor.

Explosion proof rating is pending laboratory certifications for the following ratings: (Expected December 2026)

- ✓ Class 1, Division 1 and 2 Groups B, C and D
- ✓ NEMA Type 4,7, and 9
- ✓ Class 1, Zone 1, AEx d IIB+H2
- ✓ IP66 – DUST TIGHT, POWERFUL WATER JETS
- ✓ UL 1203/CSA C22.2 No. 25 and 30
- ✓ IEC 60079-1/IEC 60079-31
- ✓ ATEX Dirictive 94/9/EC
- ✓ IEC 60529

The **Rigwire System EXPLOSION PROOF case** is machined from a very thick forged 6061 billet aluminum that is treated for corrosion resistance.

Integrated calibration port and calibration gas bottle holder.
The Rigwire System allows for the Rigwire instrument to be calibrated or to allow for the calibration to be checked in the field using the integrated calibration gas port, integrated gas bottle holder, and on demand regulator system.

On the bottom of the Rigwire System a port is available that is used for all calibration functions and nothing else.

Calibration gas is drawn into the dedicated calibration gas port for all calibrations.

This gas can be from a calibration bag holding the calibration gasses. However, the Rigwire System was designed to utilize the **Mesa Gas Demand Regulator**.

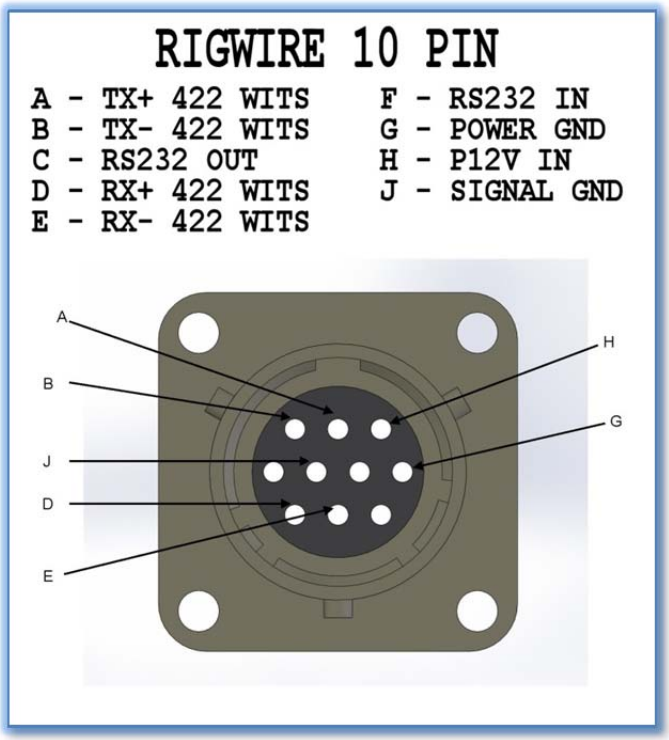
By using the Mesa Gas Demand Regulator on the calibration bottle attached to the Rigwire System in the field, the user has a much easier time generating calibration reports instantly, remotely, and on the go.

Also By using the Mesa Gas Demand Regulator the user just mounts the calibration bottle with the regulator to the Rigwire System in the field and calibrations performed on demand or automatically based on the sites supervisor or safety officer.

CASE INPUT/OUTPUT CONNECTIONS:

The Rigwire System has only 6 user connections on the bottom of the case.

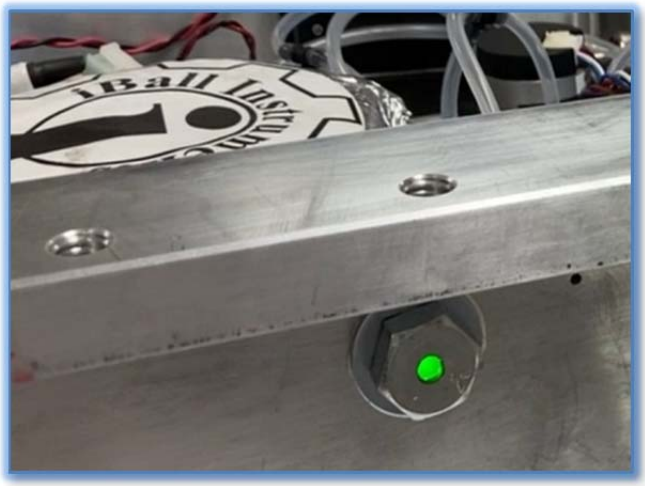
(1) Standard 120V AC power connector using the standard **Appleton ECP2023 plug**
(2) 10 pin Military style twist lock Pason® interface cable connection
(3) 1/2” exhaust port outlet
(4) 1/4” sample gas port inlet
(5) 1/8” chromatograph air inlet port – with small 0.5um disk filter element attached
(6) 1/8” calibration gas port inlet



RED / GREEN CASE INDICATOR:

The Rigwire System has on the right hand side of the case a RED/GREEN LED indicator. This indicator allows the user to see which mode the Rigwire System is currently operating in.

SOLID RED – Not operating and possibly in need of service
When the LED is solid red, the Rigwire System is not operating or is currently booting up from a previous shutdown. If the Rigwire System stays in this mode for more than two minutes, technical support should be contacted at 405 570 4449.



BLINKING RED – Operating and in service Mode
When the LED is blinking red, the Rigwire System is operating in a service mode of operation. This mode allows for the uploading of new program code as well as low level testing and function checks. In this mode the Rigwire System will not output data other than service data. If the Rigwire System stays in this mode for more than two minutes, technical support should be contacted at 405 570 4449.

BLINKING GREEN – Normal operating mode but NOT wirelessly connected
When the LED is blinking green, the Rigwire System is currently working correctly and is generating gas detection output data. A Blinking green LED may be normal if the Rigwire System is only connected to the Pason® WITS 10 pin connector and not connected wirelessly.

SOLID GREEN – Normal operating mode and wirelessly connected
When the LED is solid green, the Rigwire System is currently working correctly and is generating gas detection output data. The output data is currently being sent over the wireless connection and the wireless connection is good. This mode allows the user to be at the shaker or remote equipment and see if the Rigwire System is currently connected wirelessly to a laptop or other data collection device.

SAMPLE LINE AND EXHAUST GAS TUBING SETUP:

The Rigwire 1/4” sample line inlet port **MUST AT ALL TIMES** have two items connected **IN LINE** to protect the Rigwire System from sucking in contaminants, water, or liquid condensate.

FLOATING BALL CHECK VALVE

As seen below the first item is a water float check valve. This check valve has a floating ball within. If water or condensate liquids are being drawn into the sample line the check valve ball will start to float and eventually block off the exit of the check valve itself.

When the check valve is full of water and closed off, the Rigwire System will detect a blockage at the inlet and automatically initiate a blowback cycle. During the blowback cycle air is forced into the sample line inlet tube which forces the water or condensate back out of the sample line.

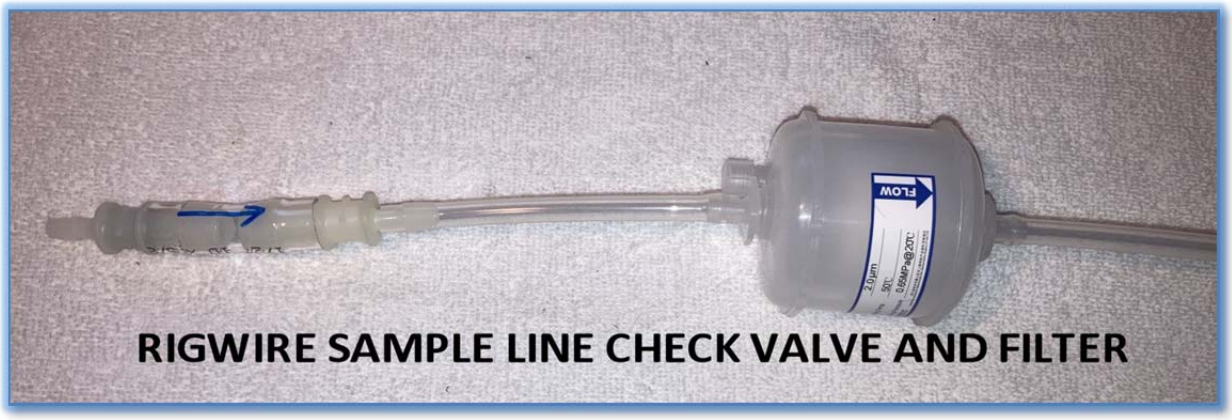
After 60 seconds in the blowback mode of operation, where water or other condensate liquid has accumulated in the sample line and float check valve, the Rigwire System will resume normal operations.

TWO MICRON WATER HYDROPHOBIC GAS FILTER

After the check valve and before the Rigwire System, there is a 2 micron hydrophobic gas filter. This filter will block any material larger than 2 microns from getting into the Rigwire System and stops all natural non-liquid contaminants from damaging the Rigwire System.

BOTH THE CHECK VALVE AND 2 MICRON FILTER ARE CONSIDERED TO BE CONSUMABLE ITEMS AND SHOULD BE CHANGED AT LEASE ONCE FOR EVERY TWO WEEKS OF OPERATION.

FAILURE TO USE THESE TWO CONSUMABLE ITEMS WHILE OPERATING THE RIGWIRE SYSTEM WILL CAUSE DAMAGE TO INTERNAL COMPONENTS OF THE RIGWIRE SYSTEM. ALL DAMAGE WILL BE ADDED TO THE RENTAL CHARGES.



RIGWIRE SAMPLE LINE CHECK VALVE AND FILTER

It is highly recommended that a 6 foot piece of 1/2" ID tubing is connected to the Rigwire System exhaust port and routed away from the equipment. This makes sure that exhaust gasses to not interfere with the operation of the Rigwire System. This tubing should not have any loops or upward curves that can trap liquids.

INSTANTLY PERFORMING OR CERTIFYING CALIBRATIONS:

The Rigwire System can be calibrated or have the calibration certified on the fly and in the field using the integrated calibration system. This is done by connecting the calibration gas bottle of the users choice to the side of the Rigwire System using the calibration gas holding brackets.

After the calibration bottle is attached to the Rigwire System bottle brackets and secured, the calibration gas on demand regulator is then attached to the bottle.

After the bottle is mounted and the demand regulator attached, a short piece of nylon 1/8" ID tubing is then attached to the demand regulator and the calibration gas inlet port on the Rigwire System.

To create a leak free connection when attaching the demand regulator, it is suggested that a small amount of petroleum jelly is added to the threads and O-ring of the regulator.

The operator or user has the option to connect one of 3 different calibration gasses to the Rigwire System for on the fly calibration or certification.

(1) 5 part calibration gas, balance Nitrogen, for the 4 minute chromatograph system, or
(2) 1% Methane, balance air calibration gas, or
(3) 100% Methane calibration gas.

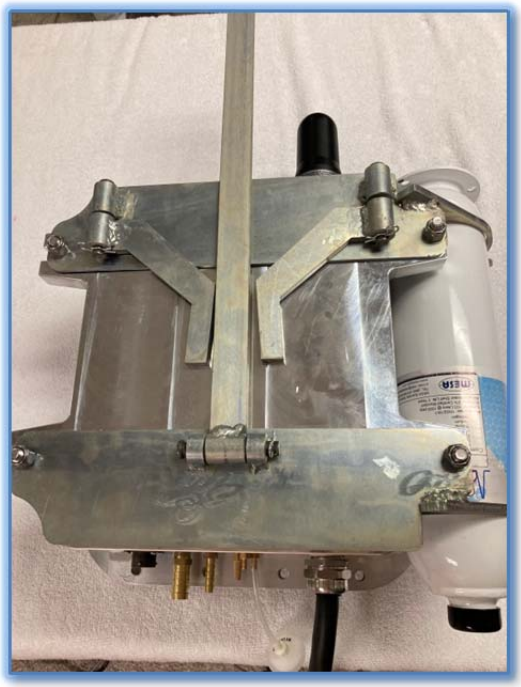
Calibration or certification using one of the three different gasses is initiated and performed using simple commands through the communications interface.

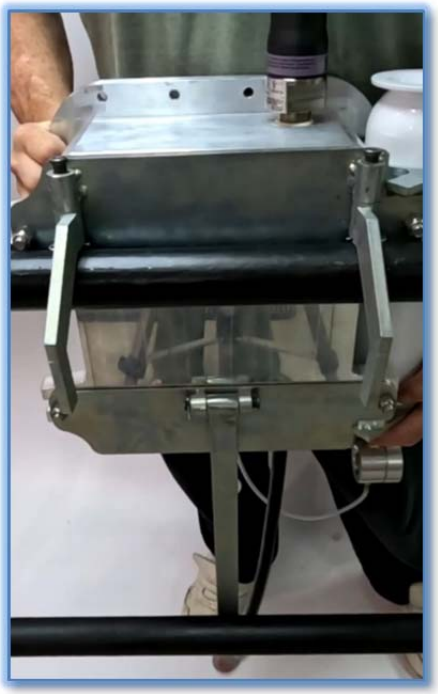
GAS BOTTLE PARTS DESCRIPTION	PART NUMBER
5 Part Calibration Gas for Chromatograph Calibration – 103L bottle	IB–5–N
1% Methane in Air for low span calibration – 103L bottle	IB–1–A
100% Methane for high span calibration – 103L bottle	IB–100–X
On demand regulator for the 103L bottle	810–C10–BR

The Rigwire System utilizes NIST (National Institute of Standards and Technology) traceable calibration gasses shipped and utilized with the 103L bottle size with C10 gas valve and matching demand regulator from Mesa Gas.

Mesa Gas Inc. 2427 S. Anne Street Santa Ana, CA 92704 Tel: 714-434-7102; Fax: 714-434-8006

INTEGRATED FOLDING HAND RAIL MOUNTING BRACKETS:





The Rigwire System has an integrated hand rail mounting system attached to the back of the case. This mounting hardware folds up easily for transport of the equipment and folds out quickly and allows the user to mount the Rigwire System on a common hand rail in seconds.

If not in use, the hand rail mounting brackets quickly and easily fold up flat to the back of the Rigwire System case.

The Rigwire System hand rail mounting brackets have been tested for all common and standardized types of double bar style of hand rails found in the industry including 1.5” to 3” tubing as well as round and square tubing styles.

WIRELESS DIGITAL COMMUNICATIONS WITH THE RIGWIRE SYSTEM:

The common and primary mode of communications to and from the Rigwire System is done serially through the integrated 900 MHz wireless transceiver connected to the explosion proof case antenna.

The second way of communications with the Rigwire System is through the wired 10 pin Pason® connector using the RS232transmit, RS232 receive, and digital ground lines called out above.

COMMUNICATIONS THROUGH THE 900 MHZ WIRELESS TRANSCEIVER

The primary mode of communications with the Rigwire System is through the 900 MHz wireless transceiver. Upon power up, the Rigwire System performs an integrated self-check routine to make sure the general operations of the machine are in good order. **This self-check will take two minutes to complete.**

After this two minute power up delay the radio transceiver in the Rigwire System is turned on and 900 MHz wireless communications can begin.

The 900 MHz wireless transceiver in the Rigwire System connects remotely to a 900 MHz wireless **base transceiver** somewhere close by.

This 900 MHz **base transceiver** is shipped with the Rigwire System and is expected and intended to be used with the **Rigwire System interface software.** However, this wireless base transceiver can be connected to other command and control computer systems to remotely monitor and control the Rigwire System.

This **base transceiver** is built and manufactured by Digi International https://www.digi.com/ part number XM-M92-UP-UA

In the **base transceiver** kit supplied with the Rigwire System, you will find:

(1) The Base Transceiver (2) Power Cord
(3) Two 10' Remote Antennas (4) One 6" Antenna
(5) 6' USB-A To USB-B Cable (6) Quick Setup Guide

After connecting the base transceiver to the local computer or laptop and powering it up using the supplied power supply, you should be ready to send and receive commands and data from the Rigwire System.

COMMUNICATIONS THROUGH THE 10 PIN PASON® CONNECTOR

The 10 pin Pason® connector on the bottom of the Rigwire System has an integrated RS232 serial port for direct communications with the Rigwire System. See the pin out elsewhere in this document.

A RS232 cable can be built or obtained from iBall Instruments LLC that can run from the Rigwire System to the local computer system RS232 serial port.

ALL SERIAL COMMUNICATIONS TO AND FROM THE RIGWIRE SYSTEM IS AT 9600 BAUD, 8 bits, No parity, and 1 stop bit.

RIGWIRE SYSTEM SERIAL COMMANDS AND RESPONSES:

The Rigwire System communicates to a host system through the standard RS232 asynchronous serial communications protocol. This is done through the wireless communications modem or directly through the Pason® 10 pin connection RS232 pins.

To send a command to the Rigwire System the protocol has to follow the following format:

```
serialnumber command variable1 variable2 variable3 {cr}
```

On some commands, the variables are optional.

EXAMPLE: `7000 SETREG 100 0{cr}`

All commands must be ended with the carriage return character 0x0D (`{cr}` or enter key from keyboard)

All responses from the Rigwire System will start with the @ character, be comma delineated, then the specific data returned followed by a simple 8 bit checksum value and ended with a return character 0x0D.

EXAMPLE: `7000 READREG 100{cr}`
RESPONSE: `@,7000,REG 100 IS 0,38,{cr}`

SETREG

This command sets a specific Rigwire System register to the given value.

EXAMPLE: `7000 SETREG 100 0{cr}`
RESPONSE: `@,7000,REG 100 IS 0,38,{cr}`

READREG

This command reads the current value of a specific register value.

EXAMPLE: `7000 READREG 100{cr}`
RESPONSE: `@,7000,REG 100 IS 0,38,{cr}`

VER

This command returns the current firmware version

EXAMPLE: `7000 ?{cr}`
RESPONSE: `@,7000,RIGWIRE,164,{cr}`

UPLOAD

This command allows for the user to upload the current version of firmware and is not currently covered in this manual.

REBOOT

This command will force a software reboot of the Rigwire System

EXAMPLE: `7000 REBOOT{cr}`
RESPONSE: `@,7000,REBOOTING,52,{cr}`

STATUS

This command will set the status level for the Rigwire System. Different status levels will display different status outputs. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

EXAMPLE: `7000 STATUS 1{cr}`

SOL

This command will turn individual internal gas solenoids on and off. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

TIME or SETTIME

This command sets the Rigwire System time. This is done by sending 12 ASCII characters representing the current date and time in the format: YYMMDDHHMMSS.

EXAMPLE: `7000 TIME 250707140010{cr}`

RESPONSE: `@,7000,250707 140010,6, {cr}`

This represents that the Rigwire System time is currently: 2025, July 7th 14:00:10

SERIALNUM

This command will return the Rigwire System serial number

EXAMPLE: `7000 SERIALNUM{cr}`

RESPONSE: `@,7000,THE SERIAL NUMBER IS 7000,216,{cr}`

LINK

This command allows for the user to directly link to another internal serial port within the Rigwire System. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

OEMSETUP

This command allows for the user to set the Rigwire System up to the Original Equipment Manufacturer specifications and settings when it left the factory. This includes most calibration settings – but not all. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

EXAMPLE: `7000 OEMSETUP{cr}`

RESPONSE: `@,7000,OEMSETUP START,171,{cr}`

RESPONSE: `@,7000,OEMSETUP COMPLETE,118,{cr}`

XBEE

This command allows the user to directly turn on and off the internal XBEE radio modem. This includes most calibration settings – but not all. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

CAL

This command allows the user to calibrate Rigwire System items. Valid calibration functions are as follows:

1. CAL ZEROVAC – Calibrates the pressure sensors and assumes all pumps are off and all lines are not pressurized
2. CAL ZEROCGPRS - Calibrates the pressure sensors and assumes all pumps are off and the chromatograph lines are not pressurized
3. CAL ZEROFLOW – Sets the flow meter variables to zero – assumes all pumps are off and there is no flow through the system tubing
4. CAL FLOW60 – This sets the flow meter variables to 60 liters per minute. This assumes that 60 liters per minute of air is flowing through the system.
5. CAL FLOWUP – This will bump the calibration point for the flow meter up
6. CAL FLOWDN – This will bump the calibration point for the flow meter down

7. CAL 100% - This starts the automatic calibration procedure for the calibration of 100% methane being available at the calibration port.
8. CAL 2.5% - This starts the automatic calibration procedure for the calibration of 2.5% methane (balance air) in air being available at the calibration port.

9. CAL 1% - This starts the automatic calibration procedure for the calibration of 1% methane (balance air) being available at the calibration port.
10. CAL CG - This starts the automatic calibration procedure for the calibration of the chromatograph system. It assumes that the 5 part calibration gas is available at the calibration port.
11. CAL AIR - This starts the automatic calibration procedure for the calibration of air or zero methane. This opens the internal air solenoid for calibration

```
EXAMPLE:  7000 CAL AIR{cr}
RESPONSE:  @,7000,AIR SOLENOID ON,161,{cr}
RESPONSE:  @,7000,INJECTING AIR INTO SYSTEM FOR 30 SECONDS,58,{cr}
RESPONSE:  @,7000,ALL SOLENOIDS OFF,47,{cr}
RESPONSE:  @,7000,0% AIR POINT IS SET,78,{cr}
```

DAC

This command allows for the user to directly control the Digital to Analog Converters within the Rigwire System. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

BATT

This command allows the user to manually turn the internal battery on and off. Generally the user turns the battery off right before unplugging the Rigwire System to move it to a new location – otherwise it may continue to run for another hour while unplugged.

```
EXAMPLE:  7000 BATT ON{cr}
RESPONSE: @,7000,BATT IS ON,47,{cr}

EXAMPLE:  7000 BATT OFF{cr}
RESPONSE: @,7000,BATT IS NOT CHARGING,230,{cr}
RESPONSE: @,7000,BATT IS OFF,109,{cr}
```

REGOFF

This command allows for the user to directly control the automated regulation routines within the Rigwire System. This command is exclusively used for debugging and troubleshooting the Rigwire System and is not currently covered in this manual.

PACKETNUM

This command allows the user to read or set the packet number. The packet number is a specific linear number that the database uses to keep track of data position in case the time and date are corrupted.

```
EXAMPLE: 7000 PACKETNUM{cr}
RESPONSE: @,7000,THE PACKET NUMBER IS: 4498323,180,{cr}
```

CGNUM

This command allows the user to read or set the chromatograph packet number. The chromatograph packet number is a specific linear number that the database uses to keep track of data position in case the time and date are corrupted.

EXAMPLE: `7000 CGNUM{cr}`
RESPONSE: `@,7000,CHROMATOGRAPH CYCLE IS 112784,253,{cr}`

AIR

This command allows the user to allow the Rigwire Device to draw in air for xx number of seconds.

EXAMPLE `7000 AIR 60{cr}`
RESPONSE: `@,7000,DRAWING AIR FOR 60 SECONDS,79,{cr}`

RESEND

This command instructs the Rigwire System to resend the last packet of data in case the data was corrupted. Valid commands are:

RESEND DATA
RESEND WITS
RESEND CG

SHUTDOWN

This command allows the user to shutdown internal functions within the Rigwire System. This allows the Rigwire System to go into a type of sleep mode that (1) shuts off all pumps (2) shuts off the chromatograph heater and system.

EXAMPLE: `7000 SHUTDOWN ON{cr}`
RESPONSE: `@,7000,SHUTDOWN ON,196,{cr}`

EXAMPLE: `7000 SHUTDOWN OFF{cr}`
RESPONSE: `@,7000,SHUTDOWN OFF,2,{cr}`

SETDEPTH

This allows the user to set the current drill depth within the Rigwire System. This is used with the Geolograph input.

EXAMPLE: `7000 SETDEPTH 1000{cr}`
RESPONSE: `@,7000,DEPTH IS 1000.0,251,{cr}`

?

This simple command allows to user to see if the Rigwire System is currently connected and responds with the word RIGWIRE.

EXAMPLE: `7000 ? {cr}`
RESPONSE: `@,7000,RIGWIRE,164,{cr}`

RIGWIRE SYSTEM GENERATED SERIAL DATA OUTPUT FORMATS:

The data that comes from the Rigwire System is in one of 4 parts:
(1) Gas style data format
(2) Persistent style data format
(3) WITS style data format
(4) Other data and messages

GAS STYLE DATA FORMAT

The primary function of the Rigwire System is to detect, quantify and transmit data relating to the gasses detected. The output format for the gas style of data format has all the data separated by commas. The following fields of data are called out as:

*,SerialNumber, YYMMDD, HHMMSS, PacketNumber, HoleDepth, TotalGasUnits, OxygenPercent,CO2Percent, HeliumPPM, C1 GasUnits, C2 GasUnits, C3 GasUnits, IC4 GasUnits, NC4 GasUnits, FlowLPM, SampleVacMMhg, CGVout, CGPressureMMHg, CGColumnTempDegF, 8BitChecksum, {crlf}

EXAMPLE:
*,7000,250707,144450,4498550,2082.0,3.265,20.785,0.003,0,3.259,0.007,0.000,0.000,0.000,55.667,3.55,0.1511,1075.938,159.15,118,{crlf}

PERSISTENT STYLE DATA FORMAT

The persistent data is the data that does not need to be updated on a second by second basis. This data is usually sent every 60 or 120 seconds. The output format for the persistent style of data format has all the data separated by commas. The following fields of data are called as:

+,SerialNumber, YYMMDD, HHMMSS,PacketNumber, DCVolts, BatteryVolts, Charging, RSSI, P12Vamps, DualHeadPumpSpeed, CoolingPumpSpeed, PumpTachSpeed, CaseTemp, IRTemp, BSCounter, OxygenADC, IRHydGU, PILGU, TCDGU, CGVOUT, CGColumnTempSetpoint, CGTempPower, IRRefLowADC, IRRefHighADC, IRco2LowADC, IRco2HighADC, IRhydLowADC, IRhydHighADC, TCD0ADC, TCD1ADC, PILADC, Shutdown, HobbsUse, HobbsTotal, PersistantPacketNum, SensorSelect, SensorPrimary, HePeakPoint, C1PeakPoint, C2PeakPoint, C3PeakPoint, IC4PeakPoint, NC4PeakPoint, HECalFactor, C1CalFactor, C2CalFactor, C3CalFactor, IC4CalFactor, NC4CalFactor, HESlopeMax, C1SlopeMax, C2SlopeMax, C3SlopeMax, IC4SlopeMax, NC4SlopeMax,8BitChecksum,{crlf}

EXAMPLE:
+,7000,250707,144444,4498549,14.92,0.04,0,1.71,0.00,39300,655,0.00,91.56,95.38,0,48640,-1.616,-500.000,-5.927,0.151291,160.00,24006,1527,62723,19753,45371,10092,55097,57757,64413,65535,0,730,730,449817,0,0,34,44,59,93,145,182,0.000000,6.463846,4.866022,6.130958,7.729568,9.187798,-0.000540,0.000450,0.000428,0.000578,0.000917,0.000622,26,{crlf}

WITS STYLE DATA FORMAT

The Rigwire System can receive WITS information through the Pason® WITS 10 pin interface. If the Rigwire System receives WITS information through the Pason® 10 pin interface then the Rigwire System will process it and then send it wirelessly to the base system using the following comma separated format.

^,SerialNumber, YYMMDD, HHMMSS,PacketNumber,WitsData, WitsData, WitsData,etc…,8BitChecksum,{crlf}
Where WitsData is the 4 character channel number followed by the float value such as bit depth channel 0108 and then the depth as a float value. i.e. 01081000.5 – or channel 0108 1000.5 ft depth.

EXAMPLE:
^,7000,250707,145323,4498659,01082090.5,01102090.5,0112294.1,01130.0,0115303.9,01177.9,011911.7,012069.3,01213301.7,01220.2,012363.8,012437.7,012565.4,0126669.0,01273.0,012840.0,0130396.7,013715412.0,014011.0,0142584285.1,01436112.0,01446073.0,01453227.0,0150584285.1,08212060.5,0824244.4,154, {crlf}

OTHER DATA AND MESSAGES

The Rigwire will send other system status messages that start with the @ character. The format is the @ character, followed by the serial number, then the message, an 8 bit checksum, then the carriage return and line feed characters.

EXAMPLE:
@,7000,ADJUSTING IR UP,180,{crlf}
@,7000,ADJUSTING TCD 0 UP,68,{crlf}
@,7000,ADJUSTING CO2 UP,221,{crlf}

RIGWIRE SYSTEM SETUP AND CONTROL REGISTERS:

The Rigwire System is setup and controlled through register settings. These register settings dictate how the Rigwire System operates in total. These registers also hold nonvolatile information such as calibration information, counters, and timers.

Register 10: Flow meter override

If this register is not zero, the Rigwire will take this number and forces the pump to stay at the supplied power level. If this register set to zero the Rigwire uses the internal flow meter readings to set the speed pump to 60 LPH and 1000 mmHg on the chromatograph.

Normal range is from 0 to 100.
Normally set to zero

Register 12: Chromatograph sensor type

If set to 0 (default value) the CG sensor uses both the CC and TC
If set to 1 the CG uses only the TCD
If set to 2 the CG uses only the CC
If set to 3 the CG only returns a 0.0 or no value but the sensor is still active

Register 16 Cooling pump control

If set to 0 - Cooling Pump control set for automatic control
If set to 1 to 100 Cooling pump percent on (1 is basically off, 100 is 100 percent)

Register 17 Chromatograph column set point

0 - 180 -- CG column temp setpoint in degrees f. This is the set point for the CG column.

Register 18 - Chromatograph max injection in seconds

Normally set to 5 or 5 seconds

Register 19 Number of seconds between sending the persistent packet

Normally 60

Register 22 Blowback active

When register 22 is set to 0 - automatic blowback is defeated
When register 22 is set to 1 - automatic blowback is active

Register 23: Sensor Select and CC power

Normally set to zero == CC off all the time or defeated
Set to > 0 to allow for the CC to be turned on during any function
If set to 0 - the Rigwire will use the IR for low range and TCD for high range Also the sensor will be powered down
If set to 1 - the Rigwire will use the CC for the low range and the TCD for high range
if set to 2 - the Rigwire will only use the TCD sensor selected for GU output and no other
Normally set to 0 or using IR for low range.

Register 24 - VQ548 selection register.

The Rigwire has two VQ548 sensors - this gives the user a backup in case one of them fails.
If this register is set to 0 then VQ548 #0 is selected for operation (Default)
If this register is set to 1 then VQ548 #1 is selected for operation
Both can not be used at the same time
This is a primary and backup TCD/CC sensor selection

Register 29 - Power down timer in minutes

This is the number of minutes before power down when the AC power is lost.
normally 10
Set to > 61 to defeat the timed powerdown

Register 30 - Digital attenuation

This is a percentage of the calibrated output
It has the same effect as air dilution
EXAMPLE: 100 = 100% output or 50 = 50% output
Normally set to 100 or 100% output

Register 35 PID controller gain setting for Proportional value

100 = 100%, 1 = 0.01 %

Register 36 PID controller gain setting for Integral value

100 = 100%, 1 = 0.01 %

Register 37 PID controler gain setting for Derivative value

100 = 100%, 1 = 0.01 %

Register 55 Register 55: Modem installed or type

0 = No modem installed
1 = 900 MHZ Serial modem installed
2 = Cellular modem installed
85 = Setup modem on boot - then change to 1 or 2 based on type of modem installed

Register 60 HE Peak in seconds
Register 61 C1 Peak in seconds
Register 62 C2 Peak in seconds
Register 63 C3 Peak in seconds
Register 64 IC4 Peak in seconds
Register 65 NC4 Peak in seconds

Register 96 external code 8 bit checksum - Should be zero if the checksum is good