IC-920 / IC-922
Ignition Controllers with ServLink

Applications

The IC-920 and IC-922 are state-of-the-art capacitive-discharge ignition system controllers especially designed for spark-ignited engines used in gas compression, electric power generation, and other industrial applications.

The IC-920 controller provides standard-strike energy for up to 20 ignition coils, with an option for up to 24 coils available.

The IC-922 controller provides "big-strike" energy for up to 20 (or optionally 24) coils. The big-strike capability is well suited for high-BMEP or other engines that are prone to misfire.

Description

The IC-920 and IC-922 are ultra-high-energy ignition system controllers featuring user-controlled energy levels, advanced diagnostics, and an RS-232 ServLink interface for easy programming with a Windows®-based service tool.

The controller system consists of a 16-bit CPU, sensor signal conditioning circuitry, a high-voltage power supply. and 20 (or optionally 24) outputs. The system can be configured from two cylinders to 20 (or 24) cylinders.

The unit software can be configured for any type of industrial engine. There is never a requirement for factory reprogramming of software. All user programming/configuring is accomplished via a Windows-based computer program.

The IC-920/IC-922 uses information provided by three timing sensors (position of crankshaft and camshaft and speed of the engine) to precisely determine when and which cylinder should fire.

The ignition timing of the engine is controlled by operator inputs, such as two manual timing potentiometers, a 4–20 mA signal, a 0–5 Vdc signal, or a five-point speed curve.

Engine operators can adjust spark energy levels for precise spark control and to optimize spark plug life. And to assure good combustion in lean-burn and other misfire-prone applications, the IC-920 and IC-922 controllers are capable of providing very high levels of energy output. The single-strike IC-920 controller is adjustable up to 170 mJ of stored energy, the big-strike IC-922 model is adjustable up to 340 mJ of stored energy.

While the IC-920/IC-922 is operating, the unit continuously monitors the status of the ignition system by verifying proper information from all timing sensors and proper operation of the primary ignition circuit. Depending on the severity of the fault, the unit will either shut down or warn the operator. In both cases, a message is transmitted via a serial link to a PC. Some faults are also annunciated via an auxiliary output.

In addition to protecting the engine from ignition faults, the IC-920/IC-922 also has a user-programmable overspeed set-point shutdown.

The 20-cylinder versions are suitable for four-stroke engines having rated speeds up to 1800 rpm, and two-stroke engines rated up to 900 rpm. The 24-cylinder versions are suitable for 1500 rpm (four-stroke) or 750 rpm (two-stroke) operation.

- User-adjustable energy levels for precise spark control and optimum plug life

- Ultra-high energy available—170 mJ (IC-920) or 340 mJ (IC-922)—assures outstanding combustion

- User-programmable for any industrial gas engine

- Individual cylinder timing control

- RS-232 ServLink interface for easy programming with Windows®-based service tool

Features

The IC-920/-922 is a versatile ignition control that is user configurable for a variety of engine installations. A single IC-920/-922 ignition control can be configured to fit numerous engine makes, models, and sizes.

The IC-920 family of ignition controls derive their power from a 24 Vdc battery power distribution system with a steady state range of 18–32 Vdc.

The IC-920 family accepts three magnetic pick-up signals. Typically two of the sensors are variable reluctance type (passive), and the third sensor is an active proximity or Hall effect sensor. These pick-up sensors indicate the position of the camshaft, the position of the crankshaft, and the speed of the engine. Using pre-programmed timing sequences, the CPU in the IC-920 family controls the ignition timing of up to 24 ignition outputs. The ignition outputs are connected to the primary windings of industry-standard CD ignition coils.

The IC-920 family ignition drivers are designed to work with industrial engines that require between 2 and 24 separate CD ignition coil outputs. A CD ignition coil output is intended to connect to the primary side of a CD ignition coil. The firing sequences are user programmable.

Energy Control:

Spark energy levels of the IC-920/IC-922 are adjustable, allowing the user to obtain optimum spark duration while maximizing spark plug life. Energy settings are easily increased as needed to compensate for normal spark plug wear.

With the IC-920 platform, the capacitively stored primary energy can be adjusted from 20 to 170 mJ in 10 mJ steps.

To provide "big strike" capability, the IC-922 platform incorporates two power output boards—a main power board and a secondary board that drives a second spark at an optimized time delay from the main board spark. The main and delay power boards each have a stored energy range of 20 to 170 mJ. The IC-922 software configures both the main and delay boards to the same energy level. With the combined boards, the capacitively stored primary energy can be adjusted from 40 to 340 mJ in 20 mJ steps.

Ultra-High Available Energy Levels:

The IC-920 is capable of delivering up to 170 mJ of energy, and the IC-922 is capable of delivering up to 340 mJ of energy.

This ultra-high available energy provides a number of benefits to engine operation, including a reduced ignition delay that provides for improved and more consistent combustion, particularly at lean conditions.

The ultra-high energy capability also contributes to outstanding brake specific energy consumption characteristics at lean operating conditions.
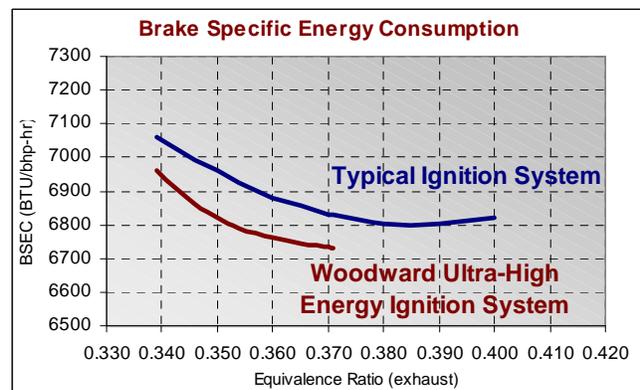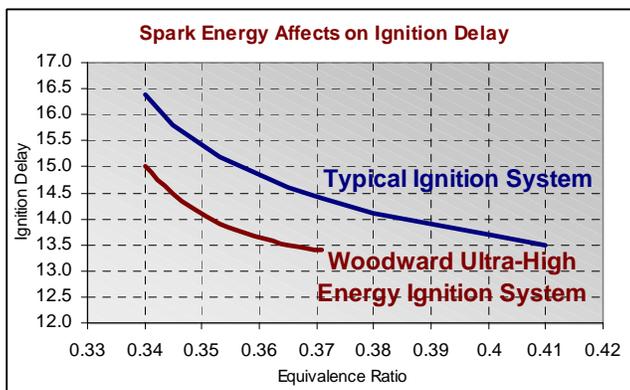
Timing Control:

Ignition timing of the IC-920 family can be biased (advanced or retarded) in real time based on a potentiometer setting, a 4–20 mA or 0–5 Vdc signal, or a 5-point speed map. The speed map allows the ignition timing to be varied relative to the CPU-calculated engine speed.

The global timing can be set for a maximum span of 60° crankshaft. The most advanced timing is limited to 10° less than the distance from the reset location to cylinder one.

Universal timing limit values are programmed for the earliest (most advanced) and latest (most retarded) timing points. The universal timing limits override any combination of the timing variation inputs that exceed these limits.

Individual Cylinder Timing Offsets:

Because of the unique circumstances for each engine configuration, the IC-920/-922 allows run-time energy adjustment for each (odd and even) primary output. It is possible to adjust the individual cylinders within a range of +/- 3° crankshaft.

Annunciation:

The 92X family ignition controllers contain three discrete outputs that can be used within an engine system to communicate fault or abnormal conditions. Faults sensed by the 92X design can be communicated via the discrete outputs. A PC-based service tool is used to retrieve the precise reason for the discrete output annunciation.

Engine Control and Safety:
The IC-920 family also has built-in ancillary functions that include a programmable overspeed shutdown, hour meter, and a speed switch output. The IC-920/-922 has built-in features that protect the engine if any malfunction related to the ignition system is detected:

- Overspeed protection
- Auxiliary shutdown input
- Timing sensor fault detection
- Permissive start output
- Misfire rate protection
- Alarm output

ServLink Communications:
The RS-232 ServLink communications interface allows the setting of numerous parameters.

- Number of cylinders
- Firing sequence
- Number of teeth of the flywheel ring gear
- Position of the trigger source for the first cylinder
- Overspeed setpoint
- Primary misfire limit
- Speed for the security speed function
- Limit values for the earliest and latest timing points. Schedules A and B both have a maximum advance and retarded setting
- Setting range for the potentiometers
- Enabling of the speed curve timing
- Speed and timing for each of the five speed points
- Enabling of the 4–20 mA or 0–5 Vdc timing adjustment
- The 4–20 mA signal has three timing settings: 20 mA timing, 4 mA timing, and a default timing for <1 mA signal.
- The 0–5 Vdc signal has two timing setting: 0 Volt timing and 5 Volt timing
- Speed trip levels and hysteresis
- Global energy and Energy level alarms

ServLink Display:
It is possible to display the following information on the ServLink communications interface:

- Status line display—indicates communication mode, firing, warnings
- Timing
- Individual cylinder misfire
- Misfire rate
- Run/Stop discrete input signal status
- 4–20 mA input level
- 0–5 Vdc input level
- Energy levels for each cylinder
- Operating hours and software version
- Individual Cylinder timing adjustments

Service Tool:
The IC-900 series ignition service tool is a Windows-based software tool that is used to configure, monitor, and troubleshoot an IC-920/-922 ignition system. It runs on a personal computer and communicates with the IC-920/-922 ignition control through a serial connection.

The IC-900 series service tool software can be downloaded free from the Woodward website at www.woodward.com/software/software.cfm, under Ignition System Tools.
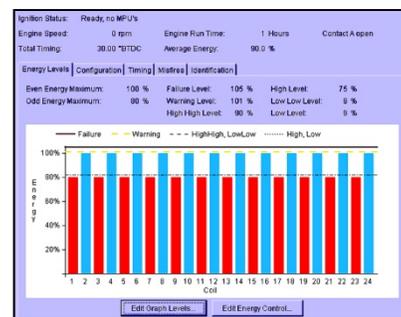
All configuration settings are shown in an intuitive graphical interface format. Configuration, for initial setup or replacement, is a straightforward process. Settings can be saved directly into the IC-920/-922 EEPROM or to a file. Settings from a file can be loaded into the IC-920/-922 ignition control for quickly configuring ignition controls for all like engines within a manufacturing facility, a plant, or a system.

Diagnostic LEDs:
Eight LEDs on the IC-92x products provide the following functionality:

Name	Function	Color	I/O Pin
Trigger	Indicates presence of signal on trigger input.	amber	Trigger Input
Reset	Indicates presence of signal on reset input. Flashes during normal operation.	amber	Reset Input
Cam	Indicates presence of signal on cam input. Flashes during normal operation.	amber	Cam Input
Power	Indicates presence of 24V power.	green	Input Power
Permissive Start	Illuminated LED indicates that ignition is firing.	green	Permissive Start Discrete Output
Speed Trip #1	Illuminated LED indicates that the Speed Trip #1 discrete output is energized.	amber	Speed Trip #1 Discrete Output
Alarm Output - Trip #2	Illuminated LED indicates that the Alarm Output - Trip #2 is energized	amber	Alarm Output - Trip #2 Discrete Output
System	General system health indicator.	amber	NA

Specifications

Technical Manual   26263

Environmental Specification
Operating Temp.	–40 to +70 °C
Storage Temp.	–40 to +85 °C

European Compliance for CE Marking:
EMC Directive	2004/108/EC
Immunity:	EN 61000-6-2, Generic Standards—Immunity for Industrial Environment
Emissions:	EN 61000-6-4, Generic Standards—Emissions for Industrial Environment
Low Voltage Directive:	2006/95/EC
ATEX Directive:	94/9/EC: ⬡ Category 3 Group II G, Ex nA IIC, T4 IP54

North American Compliance:
CSA:	CSA Certified for Class I, Division 2, Groups A, B, C, & D, T4 at 70 °C Ambient for use in Canada. Certificate 1486084

Ingress Protection
The IC-920 family has been qualified to IP-54 rating for dust and water ingress.

Input Power Requirements
Input Voltage Range	18 to 32 Vdc Steady State
Transient Voltage Range*	10 to 32 Vdc (for less than 1 minute)
Average Current Draw	IC-920: 5 A max
	IC-922: 10 A max
Peak Current Draw	30 A @ 100% energy
Current Draw Equation	IC-920: A = (rpm * outputs) / (stroke * 1800)
	IC-922: A = (rpm * outputs) / (stroke * 900)

Notes
1. Average current is dependent on the number of cylinders, input power, energy level, and engine speed.
2. Peak current is dependent only on energy level, 100% energy = 25 A peak.

Dimensions
IC-920:	13.5 in. High x 10.0 in. Wide x 5.35 in. Deep (343 x 254 x 136 mm)
IC-922:	17.5 in. High x 14.0 in. Wide x 8.35 in. Deep (445 x 356 x 212 mm)

Vibration and Shock Tests
The IC-920 family is designed for skid mount operation.

Humidity Test
The IC-920 family has been qualified to Woodward H2 humidity test procedure called out in procedure 4-04-6230 (5 cycles, 60 ºC, 95%).

Cranking Waveform
The IC-920 family is designed for operation on a 24 V battery power distribution system with a steady state variation of 18–32 Vdc. However, the units will be capable of generating spark output in the presence of the cranking waveform specified in SAE J1113/11 test pulse 4 (June 1995).

Safety Certification
All models of the IC-92x family are certified for use in Class I, Division 2, Groups A, B, C, & D and Ordinary Locations per CSA for Canada.

Accuracy
The IC-920 family timing accuracy is ±0.17° crankshaft at rated engine speed up to 1800 rpm (four-stroke) or 900 rpm (two-stroke). A deviation of ±1.0° crankshaft is not be exceeded throughout the entire speed range (50–2200 rpm). In the event that a trigger signal coincides simultaneously with the output of a firing pulse, an accuracy of ±0.17 ° crankshaft is maintained.

In the case that two outputs fire simultaneously due to the settings of individual timing, the firing point of the even cylinders (bank two) may deviate by ±0.32° crankshaft from the nominal value. The odd cylinders (bank one) will exhibit the ±0.17° crankshaft accuracy as previously stated.

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