



ENGINE GOVERNING SYSTEMS

PRODUCT
INFORMATION
BULLETIN

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DSC1002 Series Digital Engine Control System

INTRODUCTION

The DSC1002 engine control is designed to operate the BOSCH EDC fuel injection pump and to be an enhanced replacement for the standard mechanical governor. The DSC1002 control concept addresses industrial engine applications comprehensively.

DESCRIPTION

Mechanical Replacement

The standard features in the DSC1002 include fuel control, torque limiting vs. speed, boost pressure, and constant/variable speed governing. Each of these features operates in a manner identical to their mechanical counterparts but under electronic control. In addition to providing all the features found on the most sophisticated mechanical governors, the DSC1002 engine control allows complete customization and enhancement of the engine to the application. Features such as starter/engine cranking control, temperature sensing, load sharing /synchronizing, isochronous engine governing, and fault detection and correction, provide additional performance advantages not available with the traditional mechanical governor. The use of the on-board communication links allows other electronic controls within an application to monitor and adjust the engine's operation. This provides a complete vehicle/vessel package. Some equipment that may communicate with the DSC1002 include: transmission controls, electronic operator panels, and gen-set monitoring equipment.

Control Features

The DSC1002 engine control is a micro-processor-based control capable of real-time control of a diesel engine over a wide variety of operating speeds and loads. Unlike mechanical governors, electronic controls such as the DSC1002 are capable of running isochronously over a wide range of speed and load conditions. This is due to the system's ability to have different performance settings for different operating conditions. If necessary, a small amount of droop can be added to the system to match existing applications.

In multiple engine applications, the need for load sharing (gen-sets), or synchronizing of systems (get-set or marine), can easily be accommodated with the DSC1002 and appropriate accessory equipment. For precise adjustment of engine speed and loading, the DSC1002 provides inputs for standard accessory equipment such as trim pots, load sharing units, and auto synchronizers. This makes an engine equipped with a DSC1002 a perfect choice for gen-set and marine applications.

In order to facilitate a smooth transition between idle and rated speed, the DSC1002 system incorporates speed ramping fea-

tures which provide smooth speed changes and helps to minimize the over/undershoot that may occur during these transitions.

Many applications require engine control while switching between idle and rated speed as well as at start up. Typically these functions are performed by external electronic devices or by the operator. Incorporated in the DSC1002 system is the logic required to provide precise control over the starter and cranking cycles as well as switching between idle and rated speeds. Each of the parameters that controls these functions (crank cycles, crank time, crank termination speed, automatic Idle/Run switching, etc.) is independently programmable at the dealer/service level. This allows the system to be tailored to the customer's exact requirements and helps reduce costs associated with external electronic controls.

Different requirements for speed settings will be necessary for various engine applications. The DSC1002 is designed to accommodate a number of different speed setting methods. For gen-sets, where the engine operates at a constant speed, the operator will have the ability to adjust the speed setting over a small speed range through the use of an external trim pot. Actual running speed would be set within the control. Additionally, the operator has the ability to switch between two speed settings, such as for 50/60Hz output, by changing a switch located on the unit. For marine applications, where the engine is to operate over a wide range of speeds, the operator controls the speed through the use of a potentiometer (possibly integrated within a throttle lever). When the vessel is maneuvering in small areas, such as marinas, the DSC1002 provides the ability to lower the idle speed below normal idle, to provide slower and safer engine speed control.

Secondary control features are also implemented in the DSC1002 which provide for communication with transmission controls. This allows the engine speed to be adjusted and coordinated with the transmission speed changes. A very smooth transition between gear changes results. This offers enhanced drivability, and helps extend the life of the transmission and engine.

A PTO switch is available that allows vehicles that normally run over variable speed ranges to remain at a constant speed setting while operating their PTO.

Power Management

Torque limiting vs. speed is provided as a standard feature on the DSC1002. In addition to simple torque limiting, the DSC1002 provides multiple torque maps that may be automatically or manually selected for different operating condi-

tions. A feature not easily implemented on a mechanical governor is the ability to temporarily shift from one torque map to another. This gives the application the ability to request different engine power output for a specific condition. The DSC1002 monitors all engine sensors and prevents engine damage by reducing power to normal levels when necessary.

For stationary applications, maximum engine power output is limited by the application's operating altitude. Sensing atmospheric pressure upon startup allows the DSC1002 to set maximum power output based on the existing altitude.

Emissions

There are several features within the DSC1002 that help to meet strict emission requirements. Two of the major features are boost pressure fuel limiting and starting fuel control. Both of these features help to eliminate black smoke on startup and while running under load. These features are fully adjustable at the factory so that maximum engine performance can be achieved while still meeting emission requirements.

Engine Protection Features

While controlling the engine, the DSC1002 is constantly monitoring itself and the engine looking for conditions that may lead to engine damage. If one of these conditions is detected, the control will take a number of steps to alter its control strategy to ensure acceptable power output, and at the same time, reduce the possibility of damage to the engine. If this is not possible, the system will attempt to provide only enough power to move the vehicle or vessel to a location more suitable for service. Only under unusual circumstances, when the engine can not be safely controlled or excess damage may occur, will the engine be shutdown.

Some of the predominant features that the control provides are protection for overspeed, low oil pressure, high engine temperature, and high air inlet temperature. All these features work together to allow maximum power output and at the same time reduce the possibility of engine damage.

In addition to detecting faults with the engine, the DSC1002 will detect faults in its own operation, and alter control strategies to minimize the effect these faults might have on engine performance. Special protection is provided for cable breakage and short circuits.

Diagnostics

Diagnostic capabilities are integral to the DSC1002 control. The system is able to detect and adjust for a variety of faults. In addition to adjusting engine operation, the need to determine the problem and allow service personnel to correct it is also addressed by the DSC1002. Through a dedicated diagnostic electronic link, service personnel are able to connect test equipment to interrogate the cause of most problems. Within the DSC1002 control, there is fault memory which retains important information regarding detected faults as well as additional maintenance information. This information is used by service personnel during regular maintenance procedures to help determine what engine functions need extra attention.

Even though the control provides sophisticated fault detection and correction, this does not make it too complex for the operator to correct minor problems without test equipment. Any fault that is field-correctable will be displayed on the LED display so that the operator will know what area to examine for the failure.

In addition, an optional operator interface module can be provided which includes many of the standard indicators (Overspeed, High Coolant Temperature, Low Oil Pressure, etc.) found in a typical application.

Primary configuration of the basic control is made at the factory, with application specific configuration and adjustments made by the service/dealer personnel.

Packaging

The unit is packaged in a rugged metal case to meet industry standard IPXXX requirements for temperature, shock, vibration, etc. It is to be mounted away from direct engine vibration and temperatures, but within the engine compartment. It also meets the light and heavy industrial ratings for EMC requirements of the EC.

System Integration

Integration of the DSC1002 control to an engine application requires connecting the various I/O to both the engine and to the operators panel. A custom wiring harness provided by the engine manufacturer will eliminate most customer wiring issues. Diagram 1 shows the wiring to/from the DSC1002 engine control.

SPECIFICATIONS

PERFORMANCE

Isochronous Operation / Steady State Stability.....	+/- 0.25% or better
Speed Range / Governor	50 - 3000 RPM continuous
Speed Range / Variable Speed Input	400 - 3000 RPM adjustable
Gain Range	XXX : 1
Stability Range	XXX : 1
Deadtime Range.....	XXX : 1
Droop Range	0 - 20%

ENVIRONMENTAL

Ambient Operating Temperature Range.....	- 40° to +85° C
Relative Humidity	Up to 95%
All Surface Finishes	Fungus proof & corrosion resistant

INPUT POWER

Supply	Nominal 24 VDC Battery Systems (transient & reverse voltage protected)**
Polarity	Negative ground (case isolated)
Power Consumption.....	200 mA continuous plus actuator current
Speed sensor signal.....	0.5 - 120 Volts RMS
Connector	AMP P/N 344108-1
Mating components (for wire harness)	
Receptacle	AMP P/N 344111-1
Contacts	AMP P/N 344112-1
Anti-backout	AMP P/N 172746-1
Wire seal	AMP P/N 172748-1
Wire plug.....	AMP P/N 175104-2

RELIABILITY

Vibration	
Testing.....	100% Functionally tested

PHYSICAL

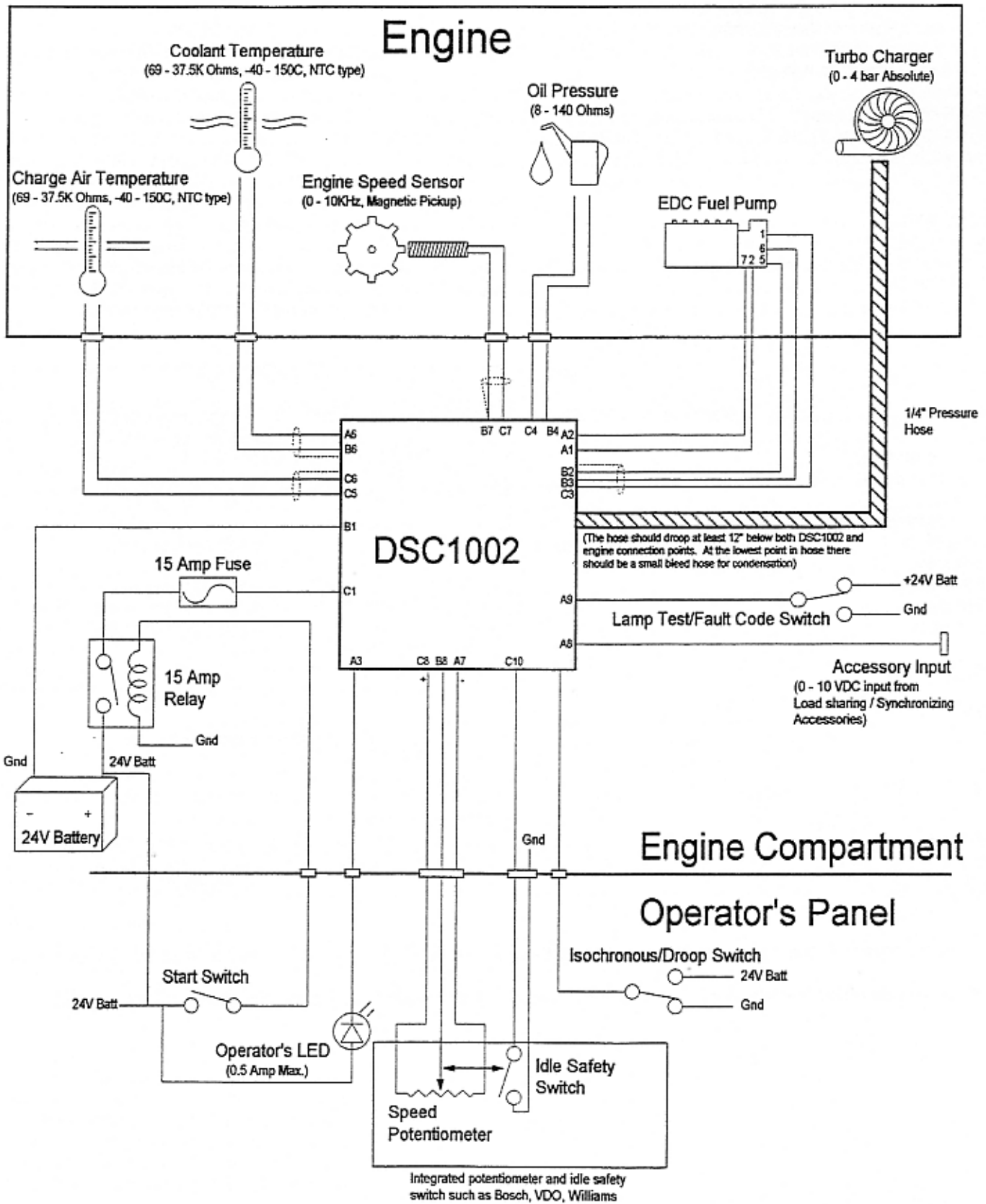
Dimensions.....	See outline (Diagram 2)
Weight.....	3.8 Lbs. (1725 grams)
Mounting.....	See outline (Diagram 2)

** Protected against reverse voltage by a series diode. A 15 amp fuse must be installed in the positive battery lead for maximum protection.

*** Protected against short circuit to actuator (shuts off current to actuator), unit automatically turns back on when short is removed.

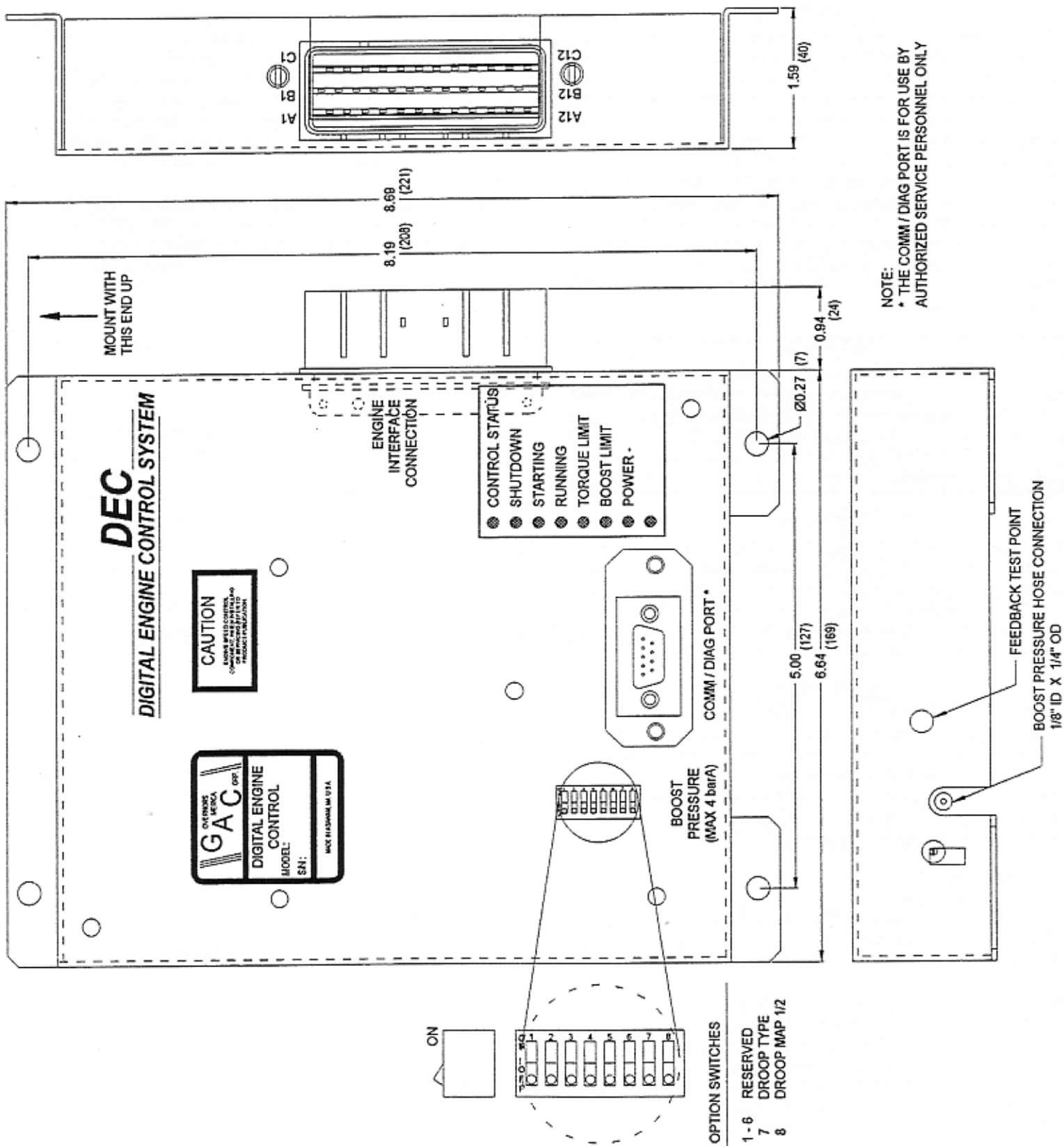
WIRING DIAGRAM

Diagram 1



UNIT OUTLINE

Diagram 2



NOTE:
* THE COMM / DIAG PORT IS FOR USE BY
AUTHORIZED SERVICE PERSONNEL ONLY