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Technical Information

Sensors

ACE100B DC Millivolt Input Amplifier



Revision history

Table of revisions

Date	Changed	Rev
November 2015	Converted to Danfoss layout	0003
August 2010	Typos	AC
July 2010	Typos	AB
July 2010	Initial release (was BLN-95-9050)	AA

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Overview

Description

The ACE100B Panel Mount Amplifier is designed for use in grade, steering and slope control applications. A grade position sensor such as the MCX103A can be connected to ACE100B, providing a proportional millivolt dc input signal to the amplifier. In slope control applications, the MCX104A Level Sensor is used.

In mobile use, the sensor detects the position of the machine with respect to a reference such as gravity or stringline. The amplifier converts the deviation information into a proportional output to power a two-wire servovalve such as the KVF. The servovalve repositions a final drive element in the proper direction to eliminate the error signal. In steering control applications, a feedback unit such as the ACX104C may also be needed to protect against over-correction.

The ACE100B has fully adjustable gain, MANUAL/AUTO switching, JOG switch and a continuous display deviation meter to aid the machine operator.

Features

- Deviation meter—zero center meter shows direction and amount of servovalve drive
- Resists vibration
- Reverse polarity protection
- Short circuit protection
- EMI/RFI protection
- Manual override—a JOG switch provides manual commands to the servovalve
- RUN/STANDBY switch
- Moisture protection—Circuit board components are coated to guard against corrosion

Overview

Theory of operation

The ACE100B amplifier, shown in the *Block diagram* on page 5, is powered by a 12 Volt system. The internal circuitry of the ACE100B consists of three basic stages:

Input stage

The input stage accepts a millivolt signal from the external sensor. The sensor voltage is compared to a reference voltage, and the difference is amplified.

Controller stage

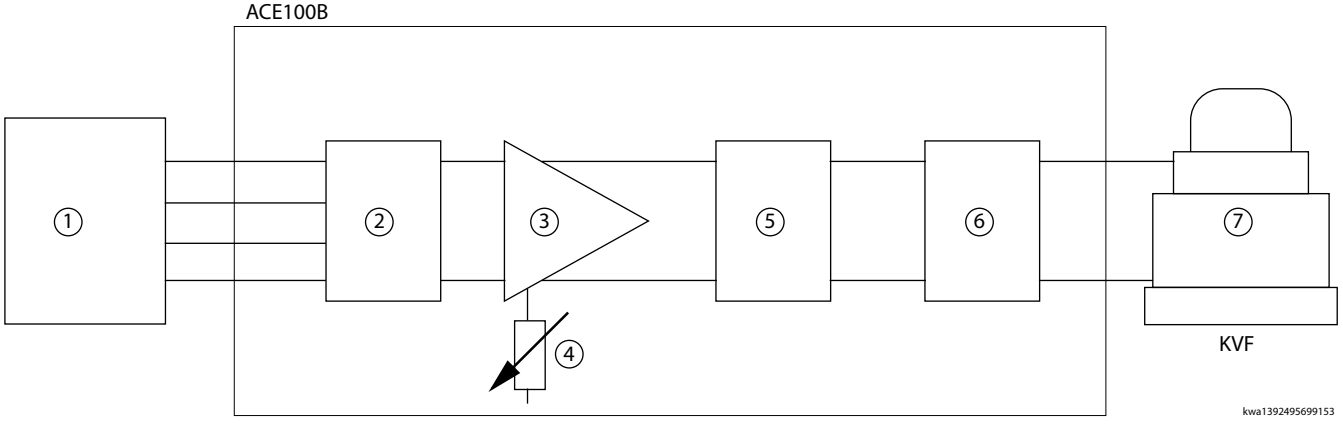
The dc error signal is summed with a variable amplitude 400 Hz signal, creating a dynamic balance between the two halves of the time-proportional output to the valve. An increased gain setting reduces the amount of error signal required to supply full drive (maximum voltage) to the valve.

Power drive stage

The amplifier output goes to the power drive stage, creating a pulse width output. The output signal provides both dither and power to the load at a rate of 440 Hz. With zero error signal, the drive in each direction will be equal, resulting in no net power delivered to the valve. With the introduction of an error signal, the drive in one direction will be longer than the other, resulting in net power delivered to the valve.

Block diagram

ACE100B block diagram



1	Rotary position, level or steering sensor	**5**	Power drive
2	Input	**6**	Run/standby and jog switches
3	Controller	**7**	Flow control servovalve
4	Gain		

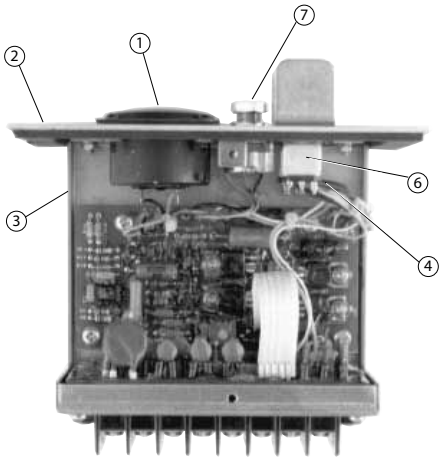
Overview

Ordering information

Specifications

Model number	ACE100B1002
Sensor(s)	ACX104C, MCX103A or MCX104A
Valve(s)	KVF
Slope set unit	MCQ101
Cables and connectors	

Components location



Components

Callout	Part number	Description
1	110160114	Deviation meter (includes face plate, gasket, screws, washer and nuts)
2	K02632	Front plate
3	K15530	Case
4	K04387	JOG switch
5	K04382	Cover (not shown)
5A	— —	Cover retaining screws (not shown) (4 required, #6-32, 1/4 inch long)
6	K04201	RUN/STANDBY switch
7	K32689	Gain potentiometer (P2, 10K)

Technical data

Electrical

Supply voltage	1 to 15 Vdc
Power consumption	0.5 ampere maximum
Voltage output	0 to 5.8 ± 0.4 Vdc with 12 Vdc supply voltage Frequency of pulse width modulation is 440 ± 40 Hz

Control

Run/standby switch

In the RUN position, the output is proportional to the sensor error signal. In the STANDBY position, the output of the ACE100B is switched off.

Jog switch

Spring return to open center position. The JOG switch overrides the sensor signal and provides manual valve control regardless of the RUN/STANDBY switch position.

Sensor supply voltage

The amplifier provides +6 Vdc to the sensors. Inputs to the amplifier run at a common mode of +3 Vdc. If the sensors are at center with 6 Volts applied, the resultant 3 Volt input will balance the controller.

Meter

Displays output of the amplifier. The output may or may not be connected to the load, depending upon the RUN/ STANDBY switch position. With the switch in the STANDBY position, the meter will continue to indicate errors generated by the sensor. Zero drive is at mid scale. Needle in the red indicates output greater than 3 Vdc.

Gain adjustment

A ±35 millivolt dc error signal will result in full output to the servovalve when the gain potentiometer is turned fully clockwise (maximum gain). With the gain potentiometer turned fully counterclockwise (minimum gain), a ±1.0 Vdc error signal will result in full output to the servovalve. Shaft rotation of the gain adjustment is 270°.

Caution

Potentiometer will break. To prevent the potentiometer from breaking, do not force the gain adjustment potentiometer beyond the travel stops.

Environmental

Vibration

Withstands a vibration test designed for mobile equipment devices that includes two parts:

1. Cycling from 5 to 2000 Hz over a range of ±1.0 g's to ±3.0 g's for a period of one hour (if there are four resonant points), for two hours (if there are two or three resonant points) and for three hours (if there is one or no resonant point). The cycling test is performed on each of the three major axes.
2. Resonance dwell for one million cycles over a range of ±1.0 g's to ±3.0 g's for each of the four most severe resonant points on each of the three major axes.

Technical data

Shock

Withstands a shock test designed for mobile equipment devices that consists of three shocks of 50 g and 11 ms duration in both directions of the three major axes for a total of 18 shocks.

Temperature

Operating temperature	-18° to +66° C (0° to +150° F)
Storage temperature	-40° to +77° C (-40° to +170° F)

EMI/RFI

EMI/RFI	10 VM from 10 to 350 MHz

Electrical transients

- Operate device at maximum rated temperature, maximum rated voltage supply at:
  - Maximum load 168 hours ometer sensor
- Jump start:
  - Apply ± 26.5 Vdc to device for 5 minutes with device in operation
- Inductive load switching
- Alternative field decay:
  - -90 Vdc, 0.038 sec time constant

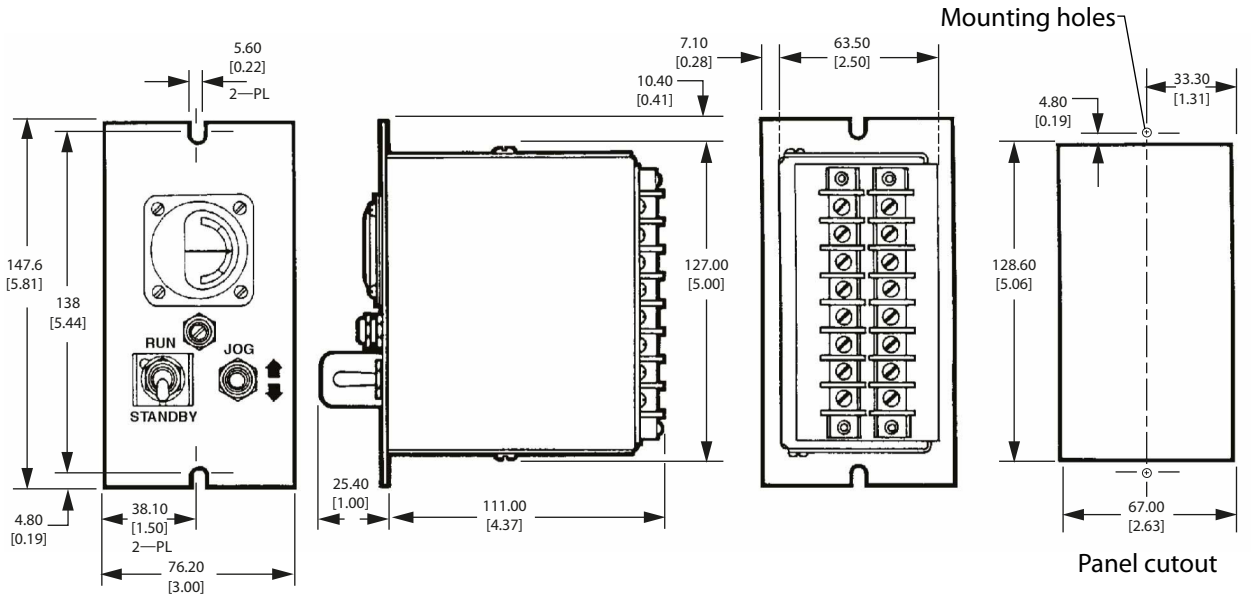
Weight

Weight	0.97 kilograms (2 pounds, 2 ounces)

Installation

Dimensions

ACE100B mounting and panel cutout dimensions in millimeters [inches]



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Mounting

The ACE100B amplifier is designed to be mounted in a panel. Select a mounting location convenient for the operator. Cut a rectangle hole in the panel as shown in the dimension drawing above. Drill two holes in the panel in the location shown. If the amplifier is to be secured with sheet metal screws, use #10 screws and drill holes with a #30 drill. If the panel is to be drilled and tapped, use a #21 drill and tap for 10/32 screws. Otherwise drill 7/32 inch clearance holes, and use 10/32 screws and nuts to fasten the ACE100B.

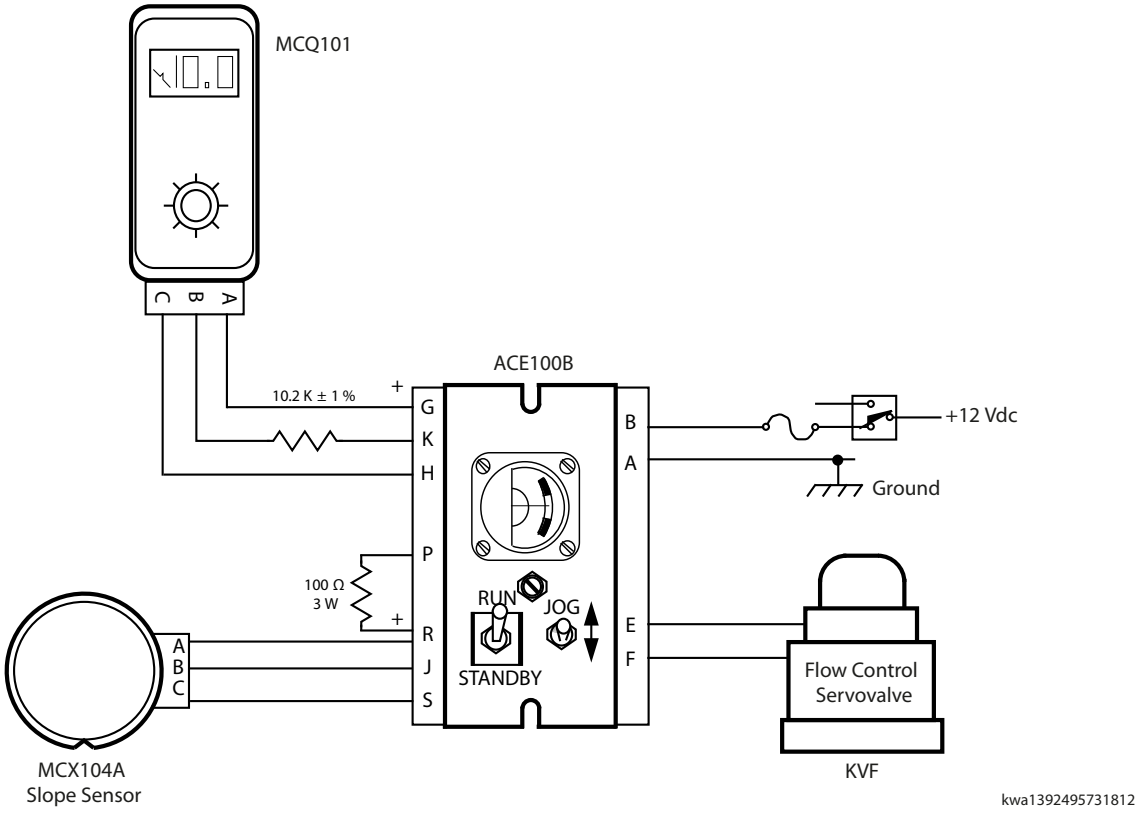
Wiring

Wiring connections are usually made to 6/32 screws on terminal strips located on the back of the case.

For wiring connections diagrams for systems see *Slope control connection* on page 10, *Grade control connection* on page 11, and *Steering control connection* on page 11 .

Installation

Slope control connection



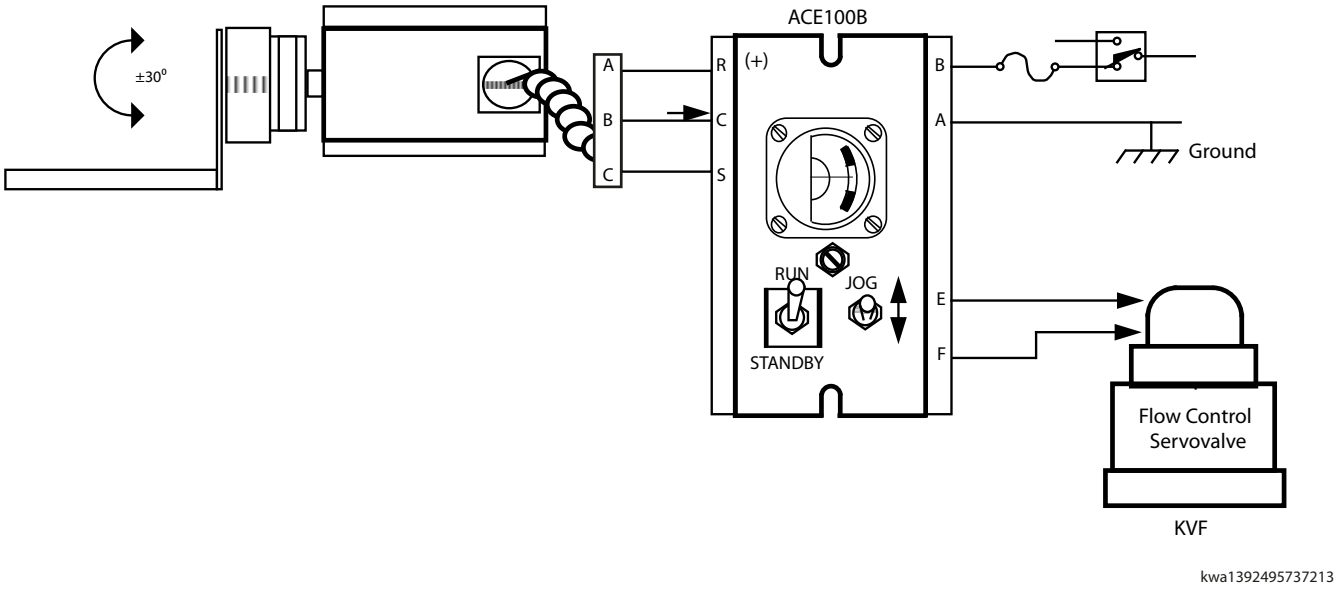
The 10.2 KW resistor is required for proper scaling, and is to be mounted on a terminal strip.

100 Ω resistor is required for proper sensor supply voltage.

Reverse sensor direction (facing rear) when used with MCQ101.

Installation

Grade control connection

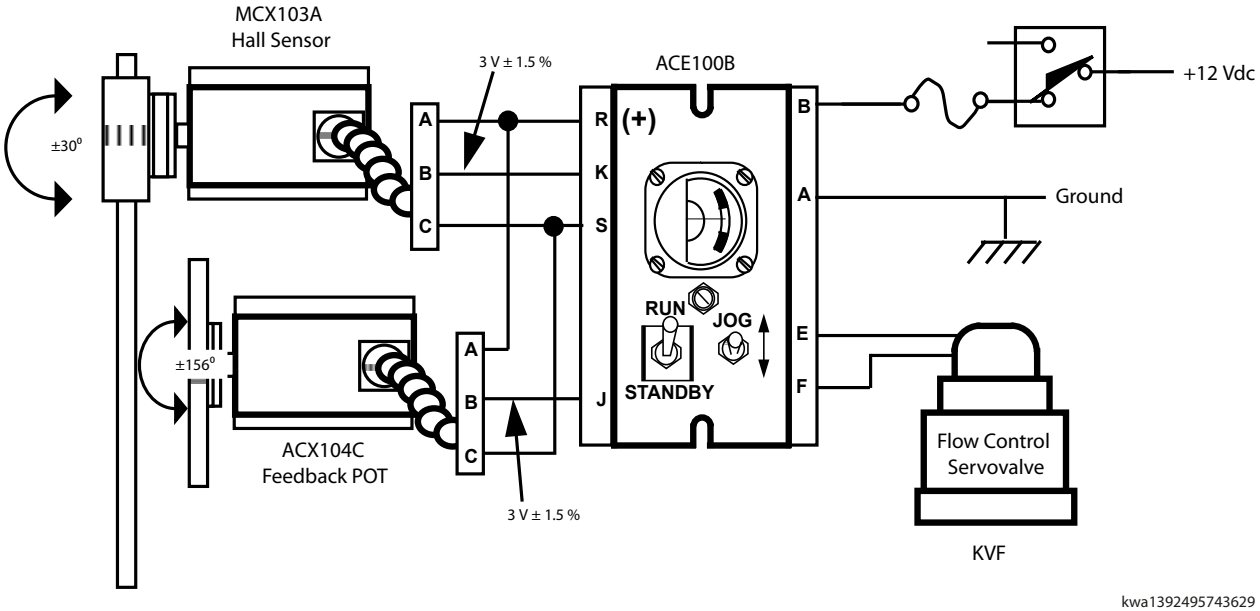


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Caution

Reverse power may damage the sensor.

Steering control connection



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Caution

Reverse power may damage the sensor.

Installation

Startup procedure

Example: Steering system

1. With the amplifier on STANDBY, start the machine.
   a) Straighten the steering post using the JOG switch
   b) Turn off the machine.
2. Disconnect all remote sensors, unplugging them at the sensor.
   a) Set the gain at halfway.
3. Turn on the electric power, but do not start the machine.
   The ACE100B should show a centered deviation meter.
4. Re-connect the stringline sensor.
   a) Position the stringline so that it centers the deviation meter.
   b) Fasten the sensor in this position.
5. Re-connect the steering feedback sensor (if used).
   a) Rotate its shaft until the deviation meter nulls.
   b) Make a tight engagement between the feedback sensor and the steering post.
6. Disconnect the stringline sensor and start the machine.
   a) Intermittently jog the amplifier, until the steering post returns to straight ahead.
   If the steering post deviates quickly to one side, reverse the valve connections at E and F and repeat this step.
7. Re-connect the stringline sensor.
   The proportional feedback system should be in working order. If the steering post moves in the opposite direction from that required, reverse the stringline sensor connections at G and J (or R and S).
8. Adjust the amplifier gain to operator machine requirements.
   If an obvious instability occurs, reduce the gain.

Installation

Troubleshooting

The ACE100B is designed to give years of trouble-free service. When a system malfunction develops, the first step must be to isolate the problem in the system. To make the troubleshooting task easier, it is important to know the following:

- Provided power to the panel mount amplifier is on, the deviation meter will indicate 1. deviations in grade, slope or steering at all times.
- The JOG switch will function regardless of the setting of the RUN/STANDBY switch.
- In the RUN mode, the amplifier output is connected to the valve. In the STANDBY mode, the amplifier output is not connected to the valve until the JOG switch is activated.

Preliminary checks should include examination of the cables or screw terminals. Look for damaged or broken wires. Examine areas where shorting may occur. Check the power supply voltage, making sure it is greater than 11 Vdc.

Check valve

1. Place RUN/STANDBY switch in STANDBY position.
2. Operate the JOG switch in both directions while noting operation of valve.

   If valve operation is satisfactory, proceed with checkout.

Check amplifier

1. Remove the remote setpoint connections and sensor connections at the back of the ACE100B.
2. Turn the gain potentiometer fully clockwise (maximum gain).
3. Touch terminal C to terminal G.

   The deviation meter should drive fully clockwise. If not, the amplifier is probably defective.*

   In the RUN mode, the amplifier output is connected to the valve. In the STANDBY mode, the amplifier output is not connected to the valve.

   * A faulty meter may be the problem. A faulty meter would not indicate any amplifier output when there actually may be some. If a faulty amplifier is indicated, change the RUN/STANDBY switch to RUN and perform the check again while observing the hydraulic valve and system.

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