



# MCQ101A, B Remote Setpoint

BLN-95-8989-3

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## DESCRIPTION

The MCQ101 Remote Setpoint provides a grade or slope command to Danfoss rotary position and level controllers in off-highway construction applications, displaying the command via a battery-powered liquid crystal display (LCD). The MCQ101 is designed for use with the W894A Proportional Level Controller, the R7232A Proportional Indicating Controller, or the MCW101 Proportional Level Controller. The MCQ101 can also be used in grade control systems if the control unit is calibrated properly. Contact Danfoss for details.

Many options to the standard MCQ101 are available. The MCQ101A is a hand held unit in a rectangular plastic housing. It connects to the controller via a two or four foot coiled cord and a standard MS connector. The "A" model, when used in slope applications, also has an offset potentiometer at the bottom of the case which permits the user to vary the relationship between the actual setpoint and the LCD. The MCQ101B is a panel mounted device and connects to the controller via a terminal strip. It has no offset potentiometer or coil cord.



A large or small roll off circuit (for counteracting machine oscillations) is also available.

## FEATURES

- Simple electronic design with few moving parts increases reliability.
- Hand held model easily clips to railings, pipes, bars, etc. to permit extensive freedom of movement for the operator about the machine.
- A clutch in the dial prevents damage of the potentiometer when the end of travel is reached.
- Electrical offset adjust may be used to electrically null slope sensor.
- Machine oscillations are effectively shunted by the roll off circuit to prevent system reaction initiated by the highly sensitive level sensor.
- Shock and vibration resistant. Mounts in any orientation without affecting operation. Resists corrosion, moisture and other damaging environmental effects.
- MS connector on hand held model plugs in and screws tight. Four connections to terminal strip on panel mount model; mounts on a flat surface 3 by 6 inches or larger.

## ORDERING INFORMATION

TABLE A.

ORDER NUMBER	MOUNT	DISPLAY RANGE	COIL CORD	ROLL-OFF CIRCUIT
MCQ101A1013	Hand-held	± 10.0	2-Ft.	No
MCQ101A1021	Hand-held	± 10.0	4-Ft.	No
MCQ101A1039	Hand-held	± 10.0	2-Ft.	250 Microfarad
MCQ101A1047	Hand-held	± 10.0	2-Ft.	100 Microfarad
MCQ101A1062	Hand-held	± 19.9	2-Ft.	100 Microfarad
MCQ101B1004	Panel	± 10.0	None	250 Microfarad
MCQ101B1012	Panel	± 10.0	None	100 Microfarad
MCQ101B1020	Panel	± 10.0	None	No

## ORDERING INFORMATION (continued)

### SPECIFY

1. Model number MCQ101A, B (see Table A.)
2. Slope range, coil cord length and slope roll off

### PARTS LIST

Only those parts listed by Danfoss Part Numbers should be ordered from Danfoss. Common parts such as screws and washers should be purchased locally.

When replacement or parts not listed are required, the entire unit should be returned to the factory for repair and adjustment.

PART NUMBER	DESCRIPTION
K04034	Two foot cable with mating MS connector for hand-held MCQ101A
K04036	Four foot cable with mating MS connector for hand-held MCQ101A
KW01001	Two foot cable with mating MS connector and spade lugs for panel mount MCQ101B

## TECHNICAL DATA

### SETPOINT RANGE

$\pm 10.0$

One revolution of the setpoint dial changes the setpoint 20% of the total range. There are 20 marked divisions per revolution.

### RESISTANCE

$2500 \pm 5$  ohms with battery removed between A and C of the connector or terminal strip. Resistance between A and B increases when the knob is rotated clockwise.

### ROLL-OFF CIRCUIT

The roll-off circuit acts as a filter to reduce control system gain at higher frequencies.

Three options are available: No roll-off, 100 microfarad (used where moderately fast response is desired) and 250 microfarad (for slower response)

### CENTERING ACCURACY

Potentiometer centering to LCD zero position will be accurate to within  $\pm .10$ .

### ACCURACY

Half scale accuracy:

$\pm 0.1$  for 10.0 range units  $\pm 0.2$  for 19.9 range units

Full scale accuracy:

$\pm 0.2$  for 10.0 range units  $\pm 0.4$  for 19.9 range units

Half scale accuracy is defined as the accuracy of the read out value compared to the absolute setting within the range of 0.0 to half scale in either direction. Full scale accuracy is defined as the accuracy within the range of half scale to full scale in either direction.

### TURN-ON VOLTAGE

The unit will turn on (i.e., LCD activates) with a voltage across connector Pins A to C of 1.2 Volts minimum.

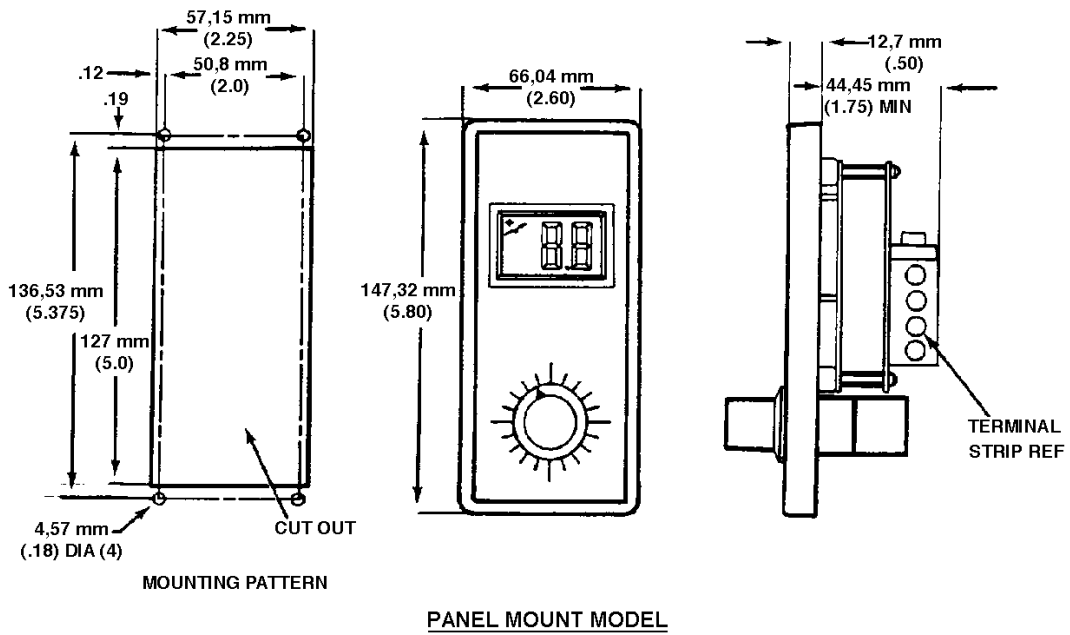
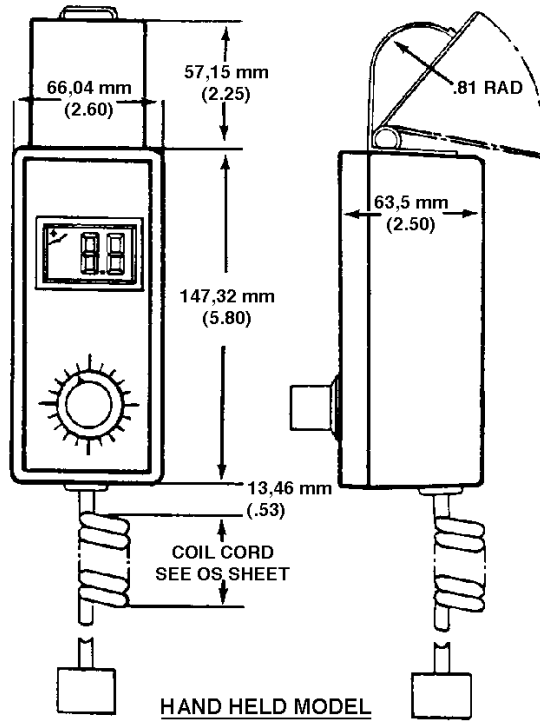
### LIQUID CRYSTAL DISPLAY

The LCD will display 3 digits and a decimal point. To the left of the numeric display is the low battery indication (see Battery) and the slope indicators (slanted lines indicating slope orientation with a “/” or “\” indicator) or grade indicators (“+” or “-” indicator).

### BATTERY

The replacement battery for the MCQ101 hand held device is a standard 9 Volt. A weak battery will cause the LCD display to read “LO BAT” before the display terminates. The battery will power the display only when the machine electrical system is powered. Note: The control capabilities of the MCQ101 are powered by the vehicle electrical system. All control functions will remain despite a dead or weak 9 Volt battery. Only the LCD will be affected by the battery’s condition. The battery’s life is approximately 1000 hours, or one paving season. To prevent damage to the MCQ101, do not store the device with the battery in place for extended periods, and always remove dead batteries promptly.

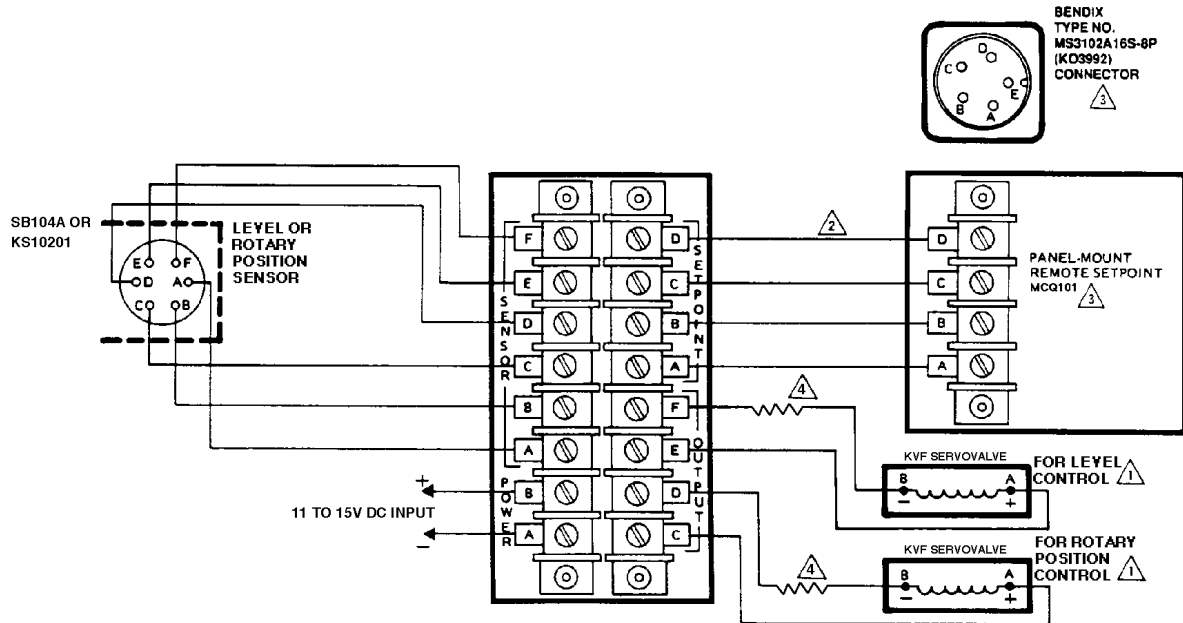
# DIMENSIONS



DIMENSIONS ARE FOR REFERENCE ONLY

Dimensions of the MCQ101A, B in Millimeters (Inches).

# CONNECTION DIAGRAM

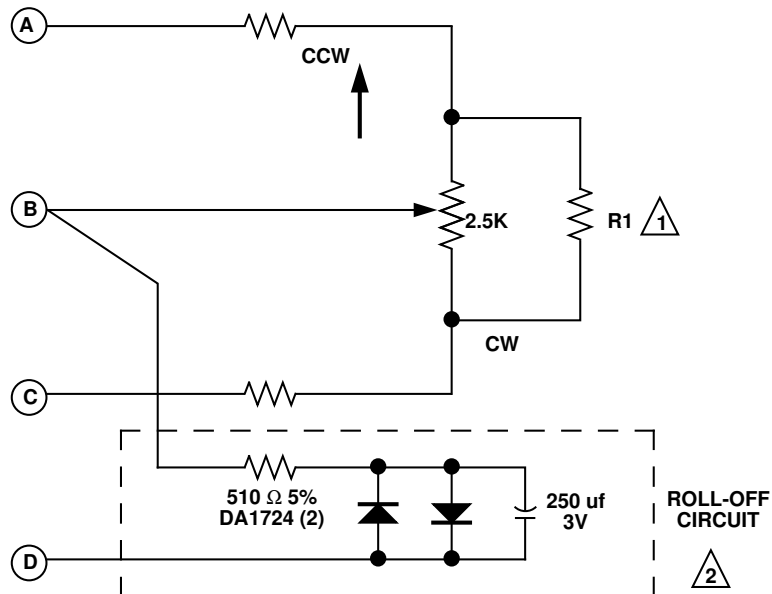


- ⚠ THE R7232 WILL OPERATE ONE KVF SERVOVALVE FOR EITHER ROTARY POSITION OR LEVEL CONTROL BUT NOT BOTH AT THE SAME TIME.
- ⚠ WIRING FROM D TO D IS NEEDED ONLY WHERE THE REMOTE SETPOINT IS EQUIPPED WITH A ROLL-OFF CIRCUIT.
- ⚠ IF A HAND-HELD REMOTE SETPOINT MCQ101 IS USED, CONNECT THE CONTROLLER TO A BENDIX TYPE NO. MS3102A-16S-8P, A, B, C, D TO A, B, C, D RESPECTIVELY AND MOUNT ON THE PANEL.
- ⚠ A 33 Ω RESISTOR MAY BE REQUIRED TO STABILIZE THE CONTROL IF USING A KVF SERVOVALVE.

1600

Typical System Wiring to an R7232A With Terminal Strips.

# BLOCK DIAGRAM



- ⚠ RESISTOR R1 IS A HIGH RESISTANCE VALUE SELECTED TO INCREASE THE ACCURACY OF THE POTENTIOMETER
- ⚠ ROLL-OFF IS OPTIONAL

201A

MCQ101 Wiring Schematic.

## ENVIRONMENTAL

### VIBRATION

Withstands a vibration test designed for mobile equipment controls consisting of two parts:

1. Cycling from 5 to 2000 Hz in each of the three axes.
2. Resonance dwell for one million cycles in each of the three axes.

Run from one to three g's. Acceleration level varies with frequency.

### SHOCK

50 g's for 11 milliseconds. Three shocks in both directions of the three mutually perpendicular axes for a total of 18 shocks.

### OPERATING TEMPERATURE

10° to 60° C (14° to 140° F)

### STORAGE TEMPERATURE

- 40° to 90° C (- 40° to 194° F)

### DIMENSIONS

See the Dimension drawing.

## INSTALLATION

### MOUNTING

Hand held models have a spring hanger designed for suspending the remote setpoint in any convenient location. No mounting is required.

Panel mount versions require a cutout of the size shown in the Dimension diagram. At least 2 inches of clearance should be provided behind the panel for the device. Drill 3/16 inch clearance holes in the location shown in the Dimension diagram. Use four #6-32 screws for mounting.

### WIRING

The MCQ101A is a hand held device. All hand held models have an integral coiled cord (either 2 foot or 4 foot, contracted) with an MS connector that plugs directly into the controller. If an R7232A controller with terminal strips is to be used in conjunction with the hand held MCQ101, mount a Bendix type MS3102A16S-8P receptacle on a panel and wire the receptacle to the corresponding letters on the device terminal strip. See the Connection Diagram.

Wiring for the panel mount MCQ101B is shown in the Connection Diagram. The panel mounted MCQ101B has terminal strips for wiring connections. If an R7232A controller with MS connectors or W894A Level Controller is to be used in conjunction with the panel mount MCQ101B, order Part Number KW01001 cable assembly. The cable assembly includes spade lugs at one end and an MS connector at the other end to provide all wiring for the MCQ101B panel mount model.

### INITIAL MACHINE SETUP

In order to null the machine and setpoint, use the following procedure:

1. For the MCQ101A with offset potentiometer, turn the setpoint potentiometer fully clockwise until the clutch starts to slip. Adjust the offset potentiometer until the display reads 10.0 for 10% units 19.9 for 19.9% units. Turn the setpoint potentiometer back counterclockwise until the display reads zero (tripping the "+" and "-" indicators as above). For the MCQ101B panel mounted device, proceed directly to step 2.
2. With the machine at null, and the MCQ101 Display at zero, put all controller switches in the Standby or Manual mode. Rotate the slope sensor (or move the grade sensor up and down) until the controller valve drive is zero in both up and down directions.

## TROUBLESHOOTING

The MCQ101A or B Remote Setpoint will provide extended, trouble free operation and should not need servicing under normal operating conditions. Be sure the MCQ101A is malfunctioning before replacing it.

1. Check wiring. Connector or spade lugs may have been disconnected. Check all wires looking for cuts or evidence of pinching.
2. Check continuity. See the Block Diagram. If a VOM is available, check resistance between Pins/Terminals A and C for 2500 ohms with battery removed. Check continuity between Pins/Terminals A and B, and B and C while rotating the dial.
3. Slope roll off. If the MCQ101A has a slope roll off circuit and the equipment or machine control appears to be unstable or oscillates, the roll off circuit may be at fault. But first, try reducing sensitivity or gain of the controller to eliminate oscillation.

If a VOM is available, a check of the slope roll-off circuit can be made. See the Block Diagram.

- 3A. Place the output leads of the VOM across Pins/Terminals B and D of the MS connector or terminal strip. A reading of 1500 ohms should be found on the R X 100 scale. If the capacitor is shorted the VOM will read 500 ohms.
- 3B. Switch the VOM to the R X 10,000 scale. Reverse polarity on the VOM. Charging of the capacitor should be seen on the meter as a slowly changing reading.
4. If the MCQ101 LCD shows "LO BAT" or no display, replace the 9 Volt battery. A low or dead battery will not affect the control capability of the MCQ101.
5. If another MCQ101 is available, connect it in place of the existing one. Change the slope setpoint and observe operation. If the replacement MCQ101 corrects the malfunction, replace the original unit.
6. Check operation of the servovalve, controller and sensor.

## CUSTOMER SERVICE

### NORTH AMERICA

#### ORDER FROM

Danfoss (US) Company  
Customer Service Department  
3500 Annapolis Lane North  
Minneapolis, Minnesota 55447  
Phone: (763) 509-2084  
Fax: (763) 559-0108

#### DEVICE REPAIR

For devices in need of repair or evaluation, include a description of the problem and what work you believe needs to be done, along with your name, address and telephone number.

#### RETURN TO

Danfoss (US) Company  
Return Goods Department  
3500 Annapolis Lane North  
Minneapolis, Minnesota 55447

### EUROPE

#### ORDER FROM

Danfoss (Neumünster) GmbH & Co.  
Order Entry Department  
Krokamp 35  
Postfach 2460  
D-24531 Neumünster  
Germany  
Phone: 49-4321-8710  
Fax: 49-4321-871-184