



# UCM

## Installation and set-up guide

### DESCRIPTION

Model UCM is a low voltage DC powered Universal Conditioning Module that can accept a wide range of analogue inductive transducer types and is suitable to drive LVDTs and RVDTs. For the full product specification, refer to the UCM product brochure.

### MOUNTING

- The UCM module is designed to be mounted on a bulkhead close to the transducer, by using 4 x M5 cap head screws, 28mm long (minimum) through the mounting holes that are located under the housing lid. The recommended screw tightening torque is 4Nm.
- The user should also ensure that the rubber seal is properly located in the lid groove prior to re-fitting the lid after setup. Recommended tightening torque for the lid screws is 2Nm.

### WIRING NOTES

- The supply, transducer and output connections are routed through two IP68 rated cable glands that can accommodate cable diameters of between 3 and 8mm. The user should ensure that the cable glands are tightened sufficiently to ensure cables are clamped and sealed.
- Users should also ensure adequate sealing of the opposite end connections on supply, transducer and output cables to ensure moisture cannot migrate down the inside of the cables into the UCM.
- Connections are made to screw terminal blocks on the UCM circuit board.
- The enclosure is not connected internally to ground, so it can be mounted on a chassis carrying a voltage potential other than 0Vdc.
- If in doubt about wiring to ground, consult your systems engineer.
- **It is essential that correct connections are made before connecting the power supply. Incorrect connections or power applied to transducer connection terminals may destroy the UCM on power-up.**
- The UCM module has a supply current requirement of <20mA.

### CONNECTIONS

- The UCM, with or without option cards fitted, only requires a single supply voltage connected between **SUPPLY GND** and **SUPPLY VPOS**.
- When the **VM** (Voltage Module) option card is used, an internal negative rail generator enables zero and negative output voltages to be achieved.
- If you have a dual supply available, you can connect -10V to -30Vdc to **SUPPLY VNEG**, in which case the internal negative supply generator on the **VM** option card will be disabled and current will be drawn from the external supply. To obtain outputs of -10Vdc or -7.5Vdc, the external negative supply must be at least -13.5Vdc.
- With the lid removed, unscrew the cable glands **C1** & **C2** (Fig.1). Pass the power supply/output signal cable through gland **C1** into 'SUPPLY' zone on UCM board. Connect the power supply and output connections to the terminals on the UCM board, as indicated below and shown in Fig.1.

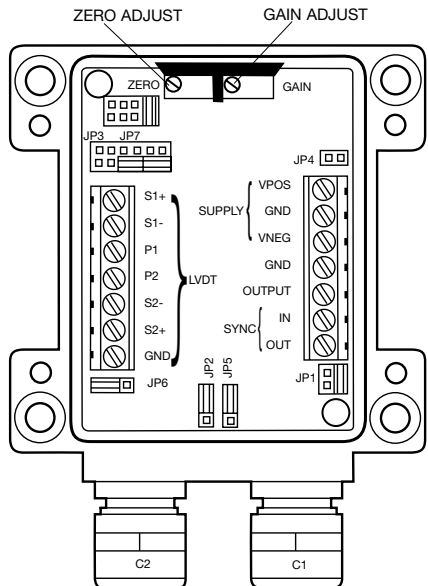


Fig. 1

<b>SUPPLY VPOS</b>	Power supply lead carrying the most POSITIVE potential (e.g. +24Vdc)
<b>SUPPLY GND</b>	Power supply lead carrying 0V
<b>SUPPLY VNEG</b>	Power supply lead carrying the most NEGATIVE potential (e.g. -15Vdc) where fitted
<b>GND</b>	Output 0V (ground)
<b>OUTPUT</b>	Output signal

- A power supply cable screen can be connected to **GND**. This is recommended but optional. Consult your systems engineer if other options required. Firmly tighten cable gland lock nut **C1**.
- Pass the transducer cable through gland **C2** into 'LVDT' zone on UCM board. Connect the transducer to the terminals on the UCM board, as indicated below (based on transducer type) and shown in Fig.1.

Transducer type	6 wire LVDT	5 wire LVDT	4 wire LVDT	3 wire LVDT (Half-Bridge)	Potentiometer
<b>LVDT S1+</b>	Secondary 1 finish	Secondary 1 finish	Secondary 1 finish	Centre tap	Wiper
<b>LVDT S1-</b>	Secondary 1 start	Secondary 1 start	Secondary 2 finish	<b>Not connected</b>	<b>Not connected</b>
<b>LVDT P1</b>	Primary finish	Primary finish	Primary finish	Winding finish	Track start
<b>LVDT P2</b>	Primary start	Primary start	Primary start	Winding start	Track finish
<b>LVDT S2-</b>	Secondary 2 start	<b>Not connected</b>	<b>LINK to S2+</b>	<b>LINK to S2+</b>	<b>LINK to S2+</b>
<b>LVDT S2+</b>	Secondary 2 finish	Secondary 2 finish	<b>LINK to S2-</b>	<b>LINK to S2-</b>	<b>LINK to S2-</b>
<b>LVDT GND</b>	LVDT screen	LVDT screen	LVDT screen	LVDT screen	Screen

- Firmly tighten cable gland lock nut **C2**.

### EXCITATION VOLTAGE SELECTION

- The UCM module can be configured to provide the transducer with 1 or 3 Vrms primary excitation voltage. Use jumper on header **JP5** to select the required voltage. See Fig.2.

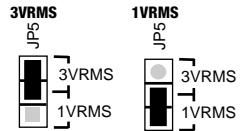
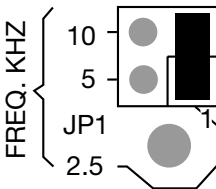


Fig. 2

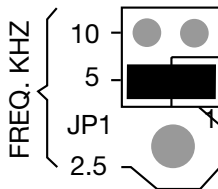
### EXCITATION FREQUENCY SELECTION

- The UCM offers three user-selectable excitation frequencies – 2.5kHz, 5kHz or 10kHz. The value chosen should be close to the specified or recommended operating frequency of the LVDT being used. Use jumper on header **JP1** to select the required frequency. See Fig.3.

#### For 2.5KHz excitation:



#### For 5KHz excitation:



#### For 10KHz excitation:

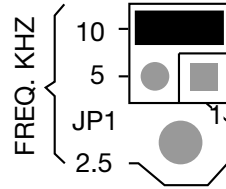
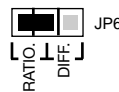


Fig. 3

### LVDT OPERATING MODE

- The UCM can be configured to operate LVDTs in the ratiometric or differential mode. Use jumper on header **JP6** to select the required mode. See Fig.4.

#### Ratiometric mode



#### Differential mode



Fig. 4

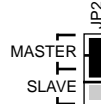
### MONITORING THE OUTPUT

- Connect a DMM as below:  
**GND** Output 0V (ground)  
**OUTPUT** Output signal
- Set DMM range to measure DC voltage.

### MULTI-CHANNEL APPLICATIONS (OPTIONAL FEATURE)

- Where several UCM modules are operated in close proximity to each other, synchronising their excitation oscillators to the same frequency can prevent heterodyning or beating between units. Up to 50 modules can be synchronised in one network.
- To synchronise up to 50 UCM modules, ensure one unit is set to master. Locate jumper on header **JP2** and set to **MASTER** position on master unit only. Set all other units to the **SLAVE** position. See Fig.5.
- Connect **SYNC OUT** of master unit to **SYNC IN** of all slave units.

#### Master position



#### Slave position

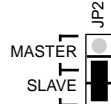


Fig. 5

## ZERO AND GAIN ADJUSTMENT

- Locate header **JP3** on UCM board. This determines the transducer gain settings.
- To establish the LVDT null point, set any jumper on header **JP3** to the **SET ZERO** position, the other jumper may be removed or placed in the **LK2** position of header **JP3**. See Fig.6.

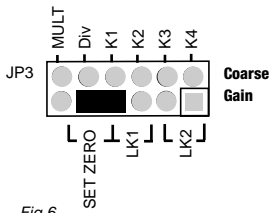


Fig 6

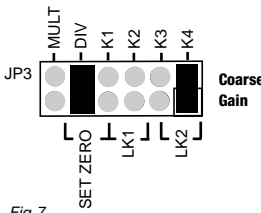


Fig 7

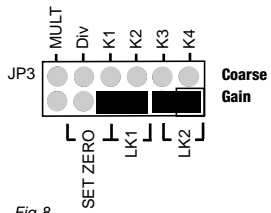


Fig 8

- **Power up the UCM module.** Rotate the **ZERO** trim pot until the output voltage reads the required mid stroke voltage (e.g. 2.500Vdc for a 0.5 to 4.5Vdc output). Remove the jumper on header **JP3** from **SET ZERO**, the jumper can be placed in the **LK1** position.
- Adjust LVDT core displacement until output signal reads 2.500Vdc (this is the LVDT null).
- Set the **GAIN** trim pot fully anticlockwise (this is a 20 turn pot).
- From null position displace the LVDT core to full-scale in the positive direction. Change the **COARSE GAIN** link settings in the following order, leaving the links in the position that gives the nearest to (but not exceeding) the required full-scale output (4.5V if no output option card is fitted on header **JP7**).
- Put one jumper in the **DIV** position and the other jumper in the **K4** position of header **JP3**: See Fig.7.  
Move the jumper from the **K4** position to the **K3** position.  
Move the jumper from the **K3** position to the **K2** position.  
Move the jumper from the **K2** position to the **K1** position.  
Move both jumpers to the **LK1** and **LK2** positions: See Fig.8.
- Move one jumper to **MULT** and the other jumper to the **K1** position See Fig.9  
Move the jumper from the **K1** position to the **K2** position.  
Move the jumper from the **K2** position to the **K3** position.  
Move the jumper from the **K3** position to the **K4** position.
- Leaving the links in the position that gives the output nearest to (but not exceeding) the required output (4.5Vdc if no output option card is fitted on header **JP7**), turn the **GAIN** trim pot until the required output is achieved (e.g. 4.500Vdc).

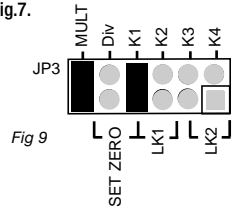


Fig 9

**Note 1** Because the **GAIN** pot provides a small amount of overlap between coarse gain settings, it is sometimes possible to calibrate an LVDT in either of two coarse gain settings. The above procedure ensures that the highest coarse gain setting is always selected.

**Note 2** If there are slight differences in the positive and negative sensitivity, or the displacements are different, then it may be appropriate to set the zero to some other voltage within the output voltage range.

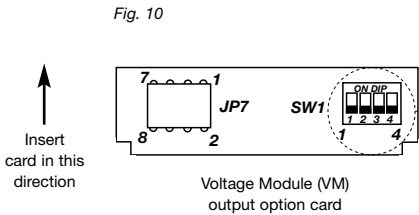
## FITTING AN OUTPUT OPTION CARD

- Before fitting an option card, ensure that the **ZERO AND GAIN ADJUSTMENT** procedure has been completed, **then power down the UCM**.
- Locate header **JP7** on UCM board. (See Fig.1.)  
Remove jumper from header **JP7 (LK3)**, and place on header **JP4** (See Fig.1.)  
A choice of three output option cards is available:  
**VM** – Voltage Module card to provide an extended range of voltage outputs.  
**CM** – Current Module card to provide 4-20mA output.  
**PWM** – Pulse Width Modulation card to provide a TTL level signal with 10-90% duty cycle.  
Insert the selected option card on to header **JP7** and follow the procedure for setting up each module card – see below.
- If the option card is no longer required, remove it and replace the jumper on header **JP4 (LK4)** to header **JP7 (LK3)**.

## SETTING THE VOLTAGE MODULE (VM) CARD

- When the Voltage Module (**VM**) output option card is selected, locate the DIP switch on **VM** card. (See Fig.10.) Select the required output voltage, using the Switch Position Matrix Guide (Fig.11.), and set the DIP switch positions accordingly. Insert connector of **VM** card onto the vacant pins of header **JP7**. Power up the UCM, monitor the voltage output and adjust the zero and gain trim pots if necessary.

Fig.11 Switch position matrix guide



	<b>ON</b>	OUTPUT
	<b>OFF</b>	-5V to 0V
	<b>ON</b>	-2.5V to +2.5V
	<b>OFF</b>	0V to +5V
	<b>ON</b>	-10V to 0V
	<b>OFF</b>	-5V to +5V
	<b>ON</b>	0V to +10V
	<b>OFF</b>	-7.5V to +7.5V
	<b>ON</b>	-10V to +10V
	<b>OFF</b>	

- When using the VM voltage option card, for selected output signals of 0-10,  $\pm 10$  and  $\pm 7.5$  Vdc the supply voltage VPOS to the UCM must be at least +13.5Vdc.

### SETTING THE CURRENT MODULE (CM) CARD

- When the UCM is fitted with the current module, the output load (resistive to 0V line) needs to be 20 ohms minimum, 400 ohms maximum for optimum linearity.
- When the Current Module (CM) output option card is selected, there are no user-configurable options on the card. Insert connector of CM card onto the vacant pins of header JP7. Change DMM (already connected between OUTPUT and GND) range settings to measure a 4 - 20mA current output. Power up the UCM, monitor the current output and adjust the zero and gain trim pots if necessary. Check that output is 4 - 20mA over the stroke of the transducer.

### SETTING THE PULSE WIDTH MODULATION (PWM) CARD

- When the Pulse Width Modulated (PWM) output option card is selected, locate the DIP switch on the PWM card. (See Fig.12.) Select the required output frequency using the matrix table printed on the PWM card and set the DIP switch positions accordingly. Insert connector of PWM card onto the vacant pins of header JP7. Monitor the PWM output with respect to GND using an oscilloscope. Power up the UCM.
- Check that output has 10-90% duty cycle over the the required displacement of the transducer, adjust zero and gain trim pots if necessary. (Equivalent to 0.5 to 4.5Vdc output).

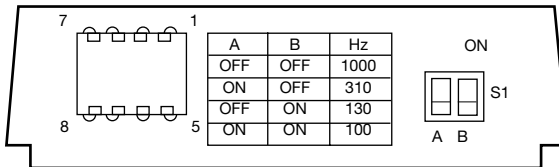


Fig 12

### FINAL SET-UP

- After configuration of the optional output cards, switch off power to the UCM. Remove DMM or oscilloscope connections.
- Replace cover using screws supplied, and follow instructions for the gasket and screw torque settings (See Mounting section).
- Optional, but recommended. Use an indelible pen to mark the configuration settings you have selected, in the appropriate label area shown on the UCM housing cover. (SENSOR type; OUTPUT type)
- The transducer and UCM module are now ready for use. Refer to UCM technical data sheet/brochure for full specification, mounting options and dimensions.

For technical assistance contact your local distributor or Penny+Giles at:  
 UK Tel:+44 (0)1202 409409 Email: sales@pennyandgiles.com  
 USA Tel:+1 562 531 6500 Email: us.sales@pennyandgiles.com

Web: www.pennyandgiles.com