

# 9 Channel HMI - D/A Signal Controller System Installation & User Manual

X20105  
ISSUE 2



## INTRODUCTION

The UAL 9 channel HMI (Human-Machine Interface) system is a microprocessor based system, which can provide up to 9 x 0-5 VDC control signal outputs. The system comprises 1 x HMI master unit and between 1 and 3 Digital to Analogue (D/A) slave, conversion units. Each D/A unit provides 3 x 0-5 VDC control output signals. The 0-5V signals are typically used for control signal inputs to power controllers.

Power is provided to the system via one of the D/A units. The D/A unit has 2 power inputs: 110-240VAC, 50/60Hz and 24VDC. Power should be connected to only 1 of the power inputs, on 1 of the D/A units. See the Specification section for more detail on the acceptable power ranges.

The units in the system are connected together using cable containing two twisted pairs. One twisted pair is used for the communication signalling between the master (HMI) unit and the slave D/A units, the physical interface used for the communication link is RS485. The second twisted pair is used to provide 24VDC power, from the externally powered D/A unit, to the other units in the system.

The HMI unit provides an interface to allow selection of one of the 9 signal output channels and to set the voltage level on that channel. The HMI unit allows setting of the analogue output level on each of the channels in 100 steps of 50mV per division, giving an output signal range of 0-5V. The output level is indicated as 0-99 and "F", the "F" level corresponds to the output being fully on, which is equivalent to 5VDC.

All the HMI functions are also available via the optional infra-red remote control handset.

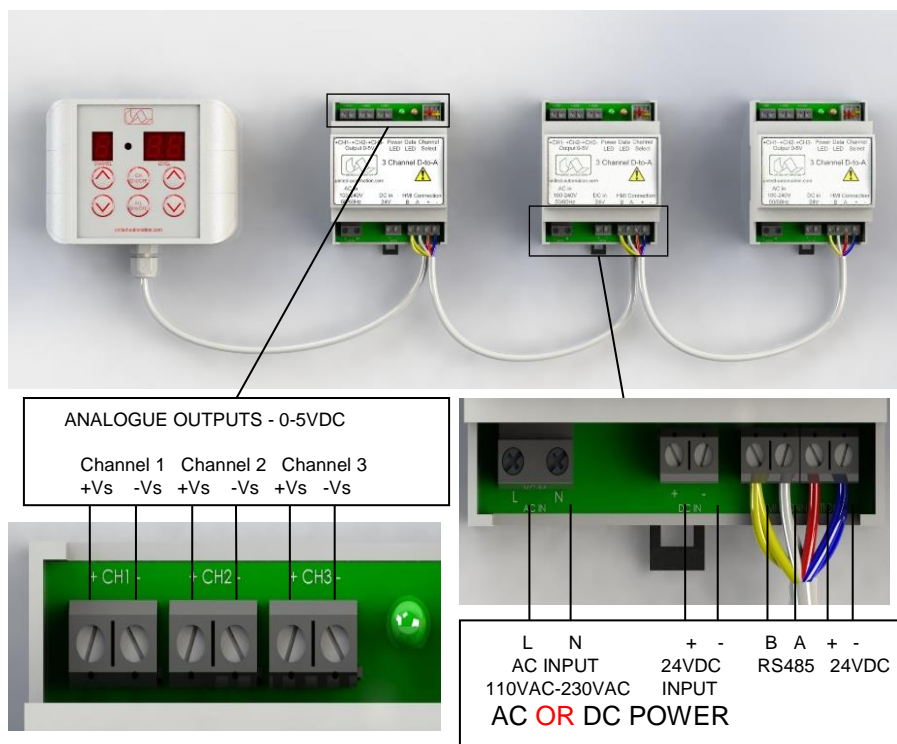
The HMI unit is provided in an IP65 rated enclosure, which is mounted using four fastenings, to suite the wall or panel, the unit is to be attached to. The D/A units are supplied in a DIN rail housing with a spring loaded retaining clip, this can be clipped onto a suitable DIN rail.

## APPLICATIONS

- Control signal input for power controllers requiring a 0-5V control input signal.
- Any application requiring up to 9 x 0-5V signals, the levels of which can be controlled from a HMI keypad.




## INSTALLATION CIRCUIT

A typical system with 3 x D/A units is shown below:



## CONFIGURATION OPTIONS

The HMI unit can control up to 3 D/A units, the HMI selects a particular D/A unit by means of a 2 bit address. The address of each D/A unit is selected by switches 3 and 4, on DIP switch SW1, on each D/A unit. Switch 4 on SW1 is used to set the least significant bit of the address, switch 3 on SW1 is used to set the most significant address. The HMI unit uses addresses 01, 10 and 11 to access the three D/A units. The 9 possible output channels, as indicated on the HMI display, are mapped across the 3 D/A units. The Table below shows how to set up the D/A switches for the three allowable address values and how the displayed channels are mapped to each D/A unit:

D/A 1	D/A 2	D/A 3
Switch setup xx01	Switch setup xx10	Switch setup xx11
		
Mapped Channels 1,2,3	Mapped Channels 4,5,6	Mapped Channels 7,8,9

Switches 1 and 2 on SW1 are not used and are ignored by the D/A and HMI units.

Please note that the D/A units should be set up with unique addresses, duplication of D/A addresses will result in unknown output levels being driven on the analogue outputs.

## SET UP

**CAUTION! Ensure the mains supply is disconnected before proceeding.**



Set the D/A address switches on each D/A unit to a unique address, refer to the "Configuration Options" section.

Connect the HMI unit to the D/A slave units using four core, dual twisted pair type cable, the cable should have a minimum gauge of 26AWG. One twisted pair should be used for the RS485 A and B signals, the other for the power connection. The corresponding signals on each unit should be connected, namely: A, B, +, -.

Connect the analogue output signals of the D/A units to the signal input connections of the equipment being controlled. The "-" output terminals, on each D/A in the system are connected together and are also connected to the 24VDC system supply ground. If an external DC supply is used to power the system, the DC supply -ve is also connected the system ground and hence also the analogue output "-" terminals. The complete system including the equipment being controlled should have a common ground connection.

If the system is being powered by a mains AC supply, connect the supply to the "AC IN" terminals on one of the D/A units in the system

If the system is being powered by a 24VDC supply, connect the supply to the "DC IN" terminals.

**NOTE: A SINGLE POWER SOURCE, EITHER AC OR DC, SHOULD BE CONNECTED TO ONLY ONE D/A UNIT**

The system should be fused externally, the typical power consumption is 30mA@24VDC per unit (HMI or D/A).

## HMI UNIT DESCRIPTION

The HMI unit provides buttons to allow control of the connected D/A units output channels and 7 segment LED displays to display the selected channel and its power level. The HMI unit auto detects the connected D/A units and will only allow valid channels to be selected.

The HMI unit has the following buttons:

- CHANNEL+ Increment channel selection (1 to 9)
- CHANNEL - Decrement channel Selection (1 to 9)
- CHANNEL OFF Switch off Current Channel
- ALL ON/OFF Switch ON or OFF all channels (Toggle)
- LEVEL + Increment Current Channel Power Level: 0 to 99, F (Fully on))
- LEVEL - Decrement Current Channel Power Level (0 to 99)

The HMI unit has the following 7 segment displays:

- CHANNEL Single digit, indicates the currently selected channel (1-9)
- LEVEL Two digits, displays the level of the currently selected channel. Each level step represents 50mV, e.g. a level of 50 is equivalent to an output voltage of 50 x 50mV = 2.5V

The HMI unit has the following terminal connections:

- "-" DC power supply negative connection
- "+" DC power supply positive connection: 24VDC
- "A" RS485 interface A leg
- "B" RS485 interface B leg

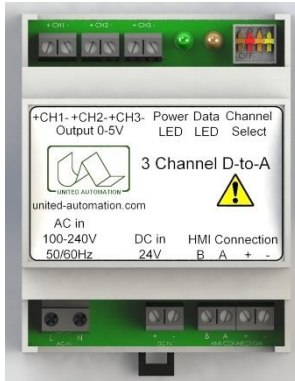


## D/A UNIT DESCRIPTION

The D/A unit receives messages from the HMI master unit and sets the analogue output levels to the level requested by HMI unit. The D/A slave unit also acknowledges the message from the HMI unit so that the HMI unit knows that the addressed D/A unit has received and decoded the message.

The D/A unit has the following terminal connections:

- AC Supply Input (L and N) Single Phase Supply, Live (L) and Neutral (N) connections. 100-240V AC +/-10%, 50/60Hz.
- DC Supply Input (+ and -) DC IN, 24VDC Supply, positive and negative connections.
- HMI CONNECTION "+" Positive power supply, 24VDC, power connection to all other units in the System.
- HMI CONNECTION "-" Negative power supply, ground connection to all other units in the system.
- HMI CONNECTION "A" RS485 A leg to all other units in the system.
- HMI CONNECTION "B" RS485 B leg to all other units in the system
- Analogue Outputs 3 x Analogue Channels: CH1 "+", CH1 "-", CH2 "+", CH2 "-", CH3 "+", CH3 "-". The "-" terminals are common and also connected to the system DC ground.



The D/A unit has the following switch for slave unit address configuration:

- SW1 4 Way DIL Switch for D/A channel configuration, only switch positions 3 and 4 are used.

The D/A unit has the following LED indicators:

- POWER Green LED indicating that the unit is powered
- DATA Orange LED, which flashes when the D/A unit is communicating with the HMI unit.

## REMOTE HANDSET DESCRIPTION

The optional infrared remote control handset communicates with the HMI unit and allows the analogue D/A channels to be controlled in a similar way to the HMI unit buttons.



The infrared remote control handset has the following buttons:

- 1-9 Selects the channel to be controlled
- CHANNEL "-" Decrements the channel selected (1-9)
- CHANNEL "+" Increments the channel selected (1-9)
- CHANNEL OFF Toggles the ON/OFF state of the currently selected channel
- ALL ON/OFF Turns all channels ON or all channels OFF, toggle function
- POWER "+" Increments the voltage level of the currently selected channel.
- POWER "-" Decrements the voltage level of the currently selected channel.

The infrared remote control is powered by 2 x AAA batteries.

## SYSTEM SPECIFICATIONS

Mains Supply Voltage	110VAC - 240VAC +/- 10% 50/60Hz
DC Supply Voltage	24VDC +/- 10%
Number of Channels per D-A module	9 total, 3 per D/A unit
Power Consumption	50mA max per unit (HMI and D/A)
D-A, IP Rating	IP00
HMI, IP Rating	IP65
Gland Diameter (HMI)	Max Cable Entry 2.5mm <sup>2</sup>
Operating Temperature Range	-20°C to 40°C
HMI Unit Dimensions	W=118mm D=110mm H=50mm
D to A Unit Dimensions	W=72mm D=96mm H=65mm
Remote Handset Dimensions	W=45mm D=22mm H=160mm
HMI Cable	4 core data cable, 2 x twisted pair, 26AWG minimum gauge.
Remote Handset Batteries	2 X AAA (1.5V)

## SAFETY



It is recommended that installation and maintenance of this equipment should be done with reference to the current edition of the I.E.E. wiring regulations (BS7671) by suitably qualified/trained personnel.



These regulations contain important requirements regarding safety of electrical equipment (for International Standards refer to I.E.C/ directive IEC950).

Please read these instructions before installing and operating this product.



**ORDERING INFORMATION: HMI: A402190, D/A: A402191, REMOTE HANDSET: A86357**



United Automation Limited  
Southport Business Park  
Wight Moss Way  
PR8 4HQ

Tel: 0044 (0)1704 516500  
Fax: 0044 (0)1704 516501  
www.united-automation.com  
email: sales@united-automation.com

