

ADVANCED TECHNICAL MANUAL

Part #: 265888-500
Universal Control Card
Version 2 (UCC2)

Advanced Technical Manual

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PRODUCT OVERVIEW

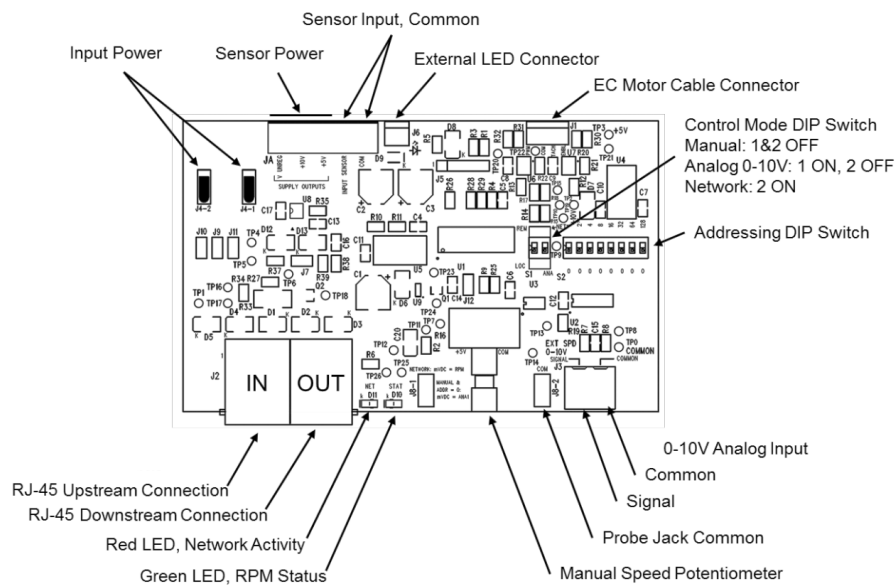
The ENVIRCO Universal Control Card, version 2 (UCC2) provides control capability for ENVIRCO electronically commutated motor (ECM) based fan filter units (FFUs). UCC2 was developed to be a running change as a complete going-forward replacement for the legacy UCC. While the UCC2 has new capabilities over the legacy UCC, it maintains the mechanical, electrical, and software compatibility with the legacy UCC.

There are two additional capabilities optionally available with the UCC2. The first is auto-addressing, which is a new mode that is initiated and managed from a properly equipped ENVIRCO control console. Auto-addressing eliminates the need to uniquely set address IDs of each FFU independently. Instead, the control console sequences through and automatically assigns an address into FLASH memory for each properly daisy-chained network connected FFU.

The second UCC2 new capability is a new sensor interface allowing the UCC2 to directly connect to a plenum-based air pressure sensor without the need for an additional voltage transformer. Instead, the UCC2 has both AC and DC voltage output for activating an external sensor.

FEATURES

- Networkable via an RJ45 serial bus with MODBUS RTU protocol
- Supports auto-addressing when connected to an ENVIRCO auto-addressing capable control console
- Has AC and DC output power available connecting to and for activating external pressure sensors
- 0-10 VDC analog control
- Manual control via onboard potentiometer
- Simple connections
 - Two RJ45 connections for daisy-chain network connections
 - Screw terminals for analog control
 - Text probe jacks for DC mV signal output of RPM and motor control set points
- LED diagnostics
 - Support for external LED (10mA) remote status notification via 2-pin MTA connector
 - Onboard green LED for board status notification
 - Onboard red LED for network traffic
- Powered from network or local supply



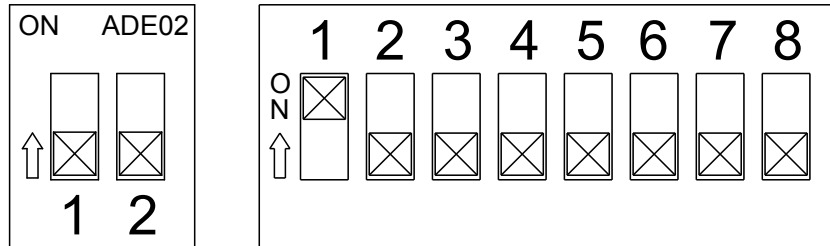
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CONTROL MODES

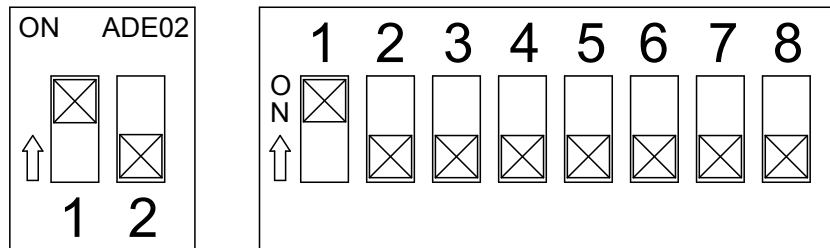
The UCC2 operates in one of three selectable modes. The Mode is selected using DIP Switch S1.

- MANUAL control, on-board potentiometer
- ANALOG control, Remote 0-10 VDC
- NETWORK control, MODBUS RTU

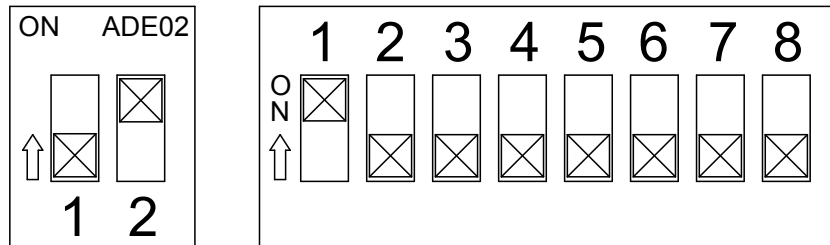
Manual Mode = 1 OFF 2 OFF



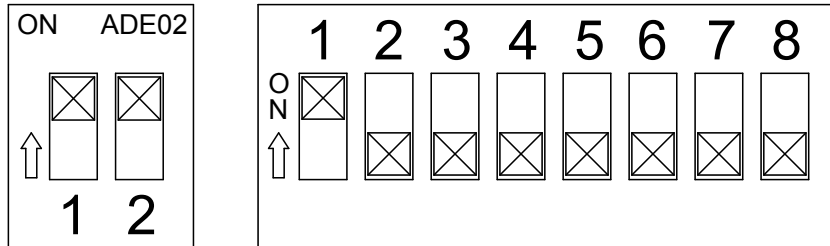
Analog Mode = 1 ON 2 OFF



Network Mode = 1 OFF 2 ON



Network Mode = 1 ON 2 ON



Note: Network mode can be configured using either DIP switch setting shown above. DIP switch pictorials are for reference and may be labeled differently by the manufacturer.

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Manual Control Mode:

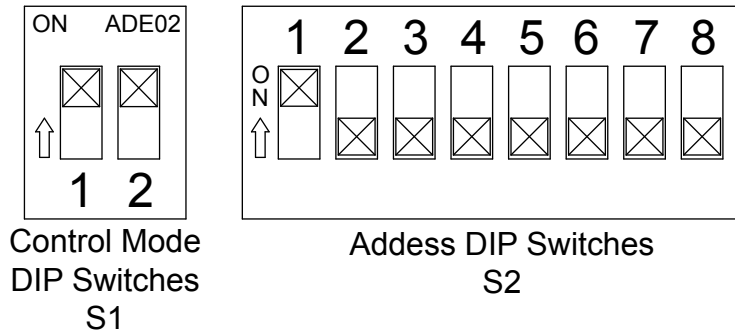
In Manual control mode, the motor speed is set using the onboard potentiometer. Onboard potentiometer rotation is CW to increase the motor output.

Analog Control Mode:

In ANALOG control mode, the motor output is set using an external 0-10 VDC demand signal.

Network Control Mode:

In NETWORK control mode, the motor output is set using MODBUS Register 2. Motor output is specified as a value from 0 to 100 representing a percentage of motor torque output. Each UCC2 in a MODBUS network must be set to a unique address. The address value is set in binary using the eight DIP switches of switch bank (S2). A maximum of 200 UCC2 devices is recommended per local area network(LAN). If an ENVIRCO ACC Control Console is the MODBUS master, then addresses should be assigned within the address range supported by the Control Console. Address zero should not be used as it is reserved for global commands. Address switch settings are only checked by the UCC2 at power-up. Power must be cycled (OFF/ON) before any changes take effect.

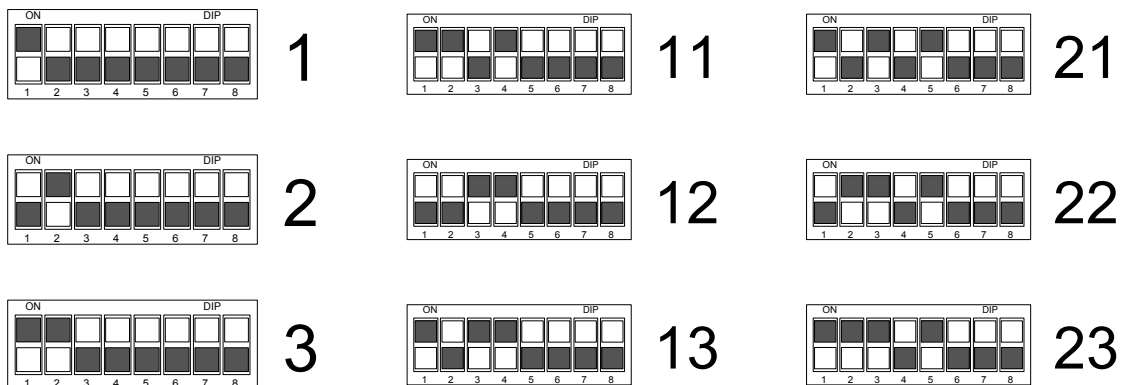


Note: Network mode can be configured using either DIP switch setting shown above. DIP switch pictorials are for reference and may be labeled differently by the manufacturer.

Registers relevant to this mode:

- Register 1 “Start/Stop” (R/W)
 - To enable motor, write a value of 1; To disable motor, write a value of 0
- Register 2 “Motor Set Speed” (R/W)
 - Motor Target speed value. Values may be written from 0 to 100
- Register 6 “RPM” (R)
 - Motor RPM. Read from the motor
- Register 12 “Actual Motor Speed Instruction” (R)
 - Speed control signal applied to the motor by the UCC2.

(R/W) = Read/Write, (R) = Read Only



Example of binary S2 switch settings

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Automatic Addressing Mode:

On legacy UCCs, the board addressing was set using the 8-position dip switch. The UCC2 has a new capability called auto-addressing. Auto-addressing is conducted and managed from a properly configured ENVIRCO console controller. The controller sequences through all of the UCC2-equipped FFUs and electronically programs them with a unique sequential 8-bit address. There are three specific requirements for auto-addressing:

1. Each FFU to be controlled must be loaded with a UCC2
2. The system must contain a specialized ENVIRCO FFU control console
3. Each FFU to be addressed must be properly daisy-chain networked

Daisy-chain networking connection overview:

1. The overall control console's RJ45 downstream control cable is connected to the "IN" marked RJ45 connector of the first FFU in the group, to be noted as FFU #1.
2. Then, a CAT5 network cable is connected from FFU #1's RJ45 "OUT" connector to FFU #2's "IN" connector.
3. All of the subsequent UCC2-equipped FFUs will be daisy-chain connected as noted in steps #1 and #2 above.
4. The final FFU in the system to be controlled will have no cable connected to its "OUT" connector.

ELECTRICAL SPECIFICATIONS

Control and Interface Signals:

1. External Speed 0-10V Input
 - Input impedance 20k Ohms.
 - MIN ON-to-OFF threshold: 190mV*
 - MAX OFF-to-ON threshold: 240mV*
 - ON (~215mV) to 9.89V linearly scales 1 to 99% speed.
 - 9.89V or more deadbands to 100% speed.
2. External LED Output
 - 10mA regulated
 - LED forward voltages up to 5V
3. RPM Signal
 - Signal Value: mVDC = RPM
 - Ex: 900mV = 900RPM
 - RPM Output Range: ~ 0, 5 to 2000 RPM (0, 5mV to 2000 mV DC)
 - RPM Output Resolution: 5RPM (Zero, 400 steps from 5 to 2000 RPM inclusive)
 - RPM Accuracy: +/- 3%

Electrical and Environmental Specifications:

Specification	Min	Typical	Max	Units
Input Voltage	22	24	42	VAC
Supply Frequency	50	50/60	60	Hz
Input Power Consumption	na	na	0.5	VA
Ambient Operating Temperature	0	25	50	C

Test Probe Jacks Points:

The test probe jacks may be used to measure the motor rpm or the PWM signal that is being output to the motor.

- In Manual or Analog Control Mode with an Address setting of 1 or greater, the test probe jacks output 0-2000 mVDC representing motor RPM. By changing the address DIP switches to 0, the test probe jacks will output 0-1000 mVDC representing 0-100% demand signal to the motor. The address may be changed without interrupting power to the control card.
- In Network Control Mode, 0-2000 mVDC always represents RPM.

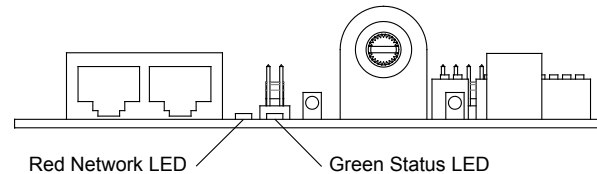
LED Indicators:

- Onboard Status LED:
The Onboard Status LED is software controlled by the unit microcontroller. The Status LED is solid ON when RPM reported by the motor is greater than zero and OFF when RPM reported by the motor is zero.
- External Status LED:
Support for an external Status LED (10mA current-controlled driver), via a 2-pin MTA connector, for remote system status notification. The external Status LED operates in the same manner as the Onboard Status LED.

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- Onboard Net LED:
 The Onboard Net LED is driven directly by the receive data signal. The NET LED shows all network traffic on a 2-wire network. The NET LED is intended to confirm low-level network connectivity, independent of microcontroller or firmware functionality. If A/B network wires are swapped, the NET LED will be normally on, providing quick diagnostics of this common condition.

Net LED Status Definition	
LED OFF	Power Lost or No Communications
LED Flickering	Network Data Traffic In Progress
LED ON	A/B network wires are swapped



RJ45 Network Cable Connections:

1	2	3	4	5	6	7	8
Bus Power Pass Through	0V (GND)	RS485				0V (GND)	Bus Power Pass Through
		+	NC	NC	-		

COMMUNICATION SPECIFICATIONS

Overview:

- MODBUS RTU protocol over RS485 (serial)
- 9600 baud rate, word length is 8, parity is none(n), stop bits=1
- 255 unique address values selectable by DIP switch settings
- (recommended network node capacity 200 nodes)
- Slew rate limited transceivers for improved network performance MODBUS Register Summary Table
- DO NOT USE Crossover Cables. THIS MAY DAMAGE THE CONTROL CARD OR RENDER IT NON-OPERATIONAL.**

MODBUS Register Specifications:

Register	Name	R/W	Values & Defaults	Units	Origin	Comments
1	RUN/STOP	RW	0,1	1	RAM	power up from REG 14
2	DEMAND	RW	0-100	%	RAM	power up from REG 10
6	SPEED	R	0,5-2000	RPM	LIVE	
9	STATUS	R	see detail	-	LIVE	
10	DEFAULT SPEED	RW	0-100	50	EEPROM	applies to network only
12	CURRENT SPEED	R	0-100	-	LIVE	
14	DEFAULT RUN/STOP	RW	0,1	1	EEPROM	applies in network mode only

To reset non-volatile registers to factory default values, write 170 (AA hex) to Register 14, and then cycle power.

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- » METD 100% Exhausted
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Laboratory & Research

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- » Unidirectional Flow
Horizontal Flow Bench (LF)
- » TT Table Top Horizontal
Flow Clean Bench
- » EnviraLab Sterility Module:
ESM

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