Installation Guide

Universal Keypad

Safety Information

The Control Techniques Universal Keypad is intended only for use as an accessory for Control Techniques variable speed Drives. Any other attempted use invalidates the warranty and may be hazardous.

The variable speed Drives with which this keypad is used contain high power, high voltage parts, which can cause severe electric shock and burns and could be lethal. Refer to the Drive installation guide before working on the Drive system.

Close attention is required to the Drive system design to avoid safety hazards either in normal operation or in the case of faults. To ensure mechanical safety, additional safety devices such as electro-mechanical interlocks may be required. The keypad must not be used in a safety-critical application without additional high-integrity protection against hazards arising from a malfunction. In any application where a malfunction could cause damage, loss or injury a risk assessment must be carried out and, where necessary, measures taken to reduce the risk.

System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience, and they must pay close attention to this safety information and the contents of the installation guide.

Contents

Declaration of Conformity

Control Techniques Plc, The Gro, Newtown, Powys, UK. SY16 3BE

Product	Universal Keypad
Control Techniques Part No.	8550-0000

The Universal Keypad has been designed and manufactured in accordance with the following European harmonised, national and international standards:

EN61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use – general requirements.
EN50081-2	Generic emission standard for the industrial environment
EN50082-2	Generic immunity standard for the industrial environment
EN61800-3	Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods

This product complies with the Low Voltage Directive 73/23/EEC, the Electromagnetic Compatibility (EMC) Directive 89/336/EEC and the CE Marking Directive 93/68/EEC

W. Drury

Technical Director

Date: 2 July 1999.

Compliance with safety and EMC regulations depends upon installing and configuring the keypad correctly. The assembler is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used. Refer to the User Guide. An EMC Data Sheet is also available giving detailed EMC information.

1   Introduction

Many applications consist of a small number of Drives mounted inside a cubicle or cabinet. A front panel mounted Universal Keypad will allow plant maintenance personnel easy access to Drive parameters for maintenance and commissioning.

1.1   Overview

The Universal Keypad is a display and keyboard that communicates to the Unidrive, VTC, GP, Commander SE and Mentor II range of Drives using standard EIA-RS485 serial communications, with the CT-ANSI protocol.

The keypad can access any Drive connected to the EIA-RS485 network and scroll through the parameter set providing native language descriptions.

NOTE   ***The Unidrive must be fitted with a basic serial communications option (UD71) or applications module (UD70).***

The onboard two-line LCD display shows the menu number, parameter number and value on the top line and the 16-character parameter description on the bottom line. After 10 seconds of inactivity, two custom Human-Machine Interface lines may be displayed. These HMI lines are programmed to read a parameter on any Drive, apply a scale and offset and then display this data with descriptive text.

The keypad is intended to be used in the following modes:

- Hand-held, for programming Drives

- Panel mounted, for service access to the parameters of one or more Drives

- Panel-mounted, for operation of plant

The *Universal Keypad Advanced User Guide* will be available on request or can be downloaded from the "Products Area" of the following Websites:

- www.controltechniques.com/prods

- www.ctsupport.com/protected

Front Panel Layout

The front panel design was purposely styled to match the Unidrive family of products. Eight of the eleven membrane buttons have exactly the same function as the Unidrive's front panel keypad. These keys include the colored RUN, STOP/RESET and DIRECTION buttons, the arrow keys and the modify button.

The three buttons labeled F1, F2 and F3 directly below the 2-line LCD display are the macro keys. These keys may be programmed by the user to send one or two stored values to any parameter on any Drive that is on the EIA-RS485 network.
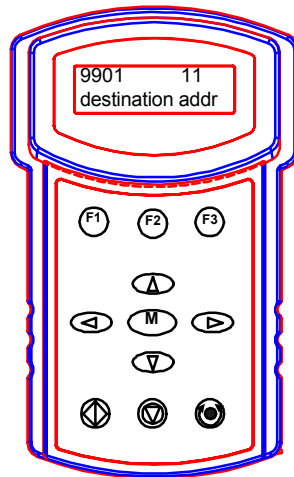
Figure 1. Universal Keypad Front Panel Layout

1.3 Technical Specifications

Specification	Value
EIA-RS485:	2-wire or EIA-RS485 4-wire interconnection. Screw terminals under protective cover. An optional cable assembly provides crimped wire to RJ45 plug-in capability for point-to-point connection to Commander SE. Other Drives are catered for by the addition of an RJ45 to custom D-type assembly incorporating crimped wires for power connection
Supply voltage:	24V DC ±20%
Rated current:	150mA
Maximum current:	200mA when supplied from a Control Techniques Drive. When used with a separate DC supply use a fast-acting 250mA fuse rated at 24V DC with breaking capacity to suit supply.
Dimensions (W x H x D):	115mm x 188mm x 50mm (4.53" x 7.40" x 1.97")
Ambient Temperature:	0ºC to +50ºC
Altitude:	The Universal Keypad is capable of operation at altitudes of 4000m above sea level.
Humidity:	Maximum relative humidity 80% for temperatures up to 31ºC decreasing linearly to 50% relative humidity at 40ºC
EMC:	Complies with EN50081-2 (emission), EN50082-2 (immunity) and IEC61800-3 (power drive systems)
Panel Mounting:	Standard DIN 96 X 96 mm panel meter punch -- 92mm x 92mm cutout
Environment	Enclosure ingress protection when correctly assembled to a panel is IP65 for the outside (front) surface and IP40 for the inside (rear) surface.

1.4   Compatibility

The following table shows a list of Drive versions that the Universal Keypad is compatible with:

Drive	Drive option	4 wire	2 wire	Drive firmware version
Unidrive	UD71 or UD70	Yes	Yes	All
Commander SE	None	No	Yes	All
Mentor II	None	Yes	No	All
Mentor II	MD29 or MD29AN	Yes	Yes	All
Unidrive VTC	UD71	Yes	Yes	$\geq$ 3.0.0
Unidrive VTC	UD70	Yes *	Yes *	$\geq$ 3.0.0
Commander GP	UD71	Yes	Yes	$\geq$ 3.0.0

*   Unidrive VTC with UD70 option - the Universal keypad will identify the Drive as being a standard Open-Loop Unidrive. Menu 0 will be incorrect; future UD70 firmware will correct this.

2   Installation

The Universal Keypad is intended to be used in two ways:

- As a panel-mounted control unit for a Drive or Drive system. When used in this mode it may be used by plant operators and other staff with no specific skills or training.

- As a hand-held Drive programming device. Since this requires access to the Drive connections, it is intended for use in this mode only by trained and experienced technical personnel, who must carefully observe the safety precautions given in this guide and the Drive installation guide.

For mounting and dimensions refer to Appendix B.

2.1   Power Supply

Supply voltage 24V DC nominal ±20%.

The supply must either be current limited at 150mA nominal or else provided with a fast-acting 250mA fuse rated at 24V DC with a braking capacity to suit supply. When used with the specified Control Techniques Drive this protection is provided automatically

The power supply required by the Universal Keypad is 24 volts (±20%) at 150 mA maximum. As Figure 2 suggests, we recommend a good quality 4-conductor shielded, twisted pair cable for the communications channel. The rear panel housing has cable strain-relief built into the plastic molding.

The Unidrive has 24 volts, 200 mA available on the signal connector, sufficient to power the Universal Keypad. Pin 22 is +24 volts while pin 23 is the digital ground. A popular method is to use 6-conductor shielded cable and bring the power and ground leads out of the 9-pin connector's boot for attachment to the Unidrive's signal connector.

The Drive control terminals are separated from live circuits in the Drive by basic insulation only. Accessible wiring between the keypad and Drive must be insulated with at least one layer of insulation rated for the supply voltage in use.

This also applies to all other circuits fed from any DC supply used for this purpose. The same supply must not be used for operator accessible circuits or SELV circuits.

2.2　Rear panel layout and interconnections

The rear panel plastic molding is designed to push through a 92mm x 92mm aperture cut-out in the cabinet or cubicle. There are four tapped screw holes provided to secure the fitting. Removing the two screws securing the cable hatch cover can expose the rear terminal connector.

Figure 2a shows the required power and signal interconnections for EIA-RS485 4-wire operation.

Please note that the Commander SE Drive does not support EIA-RS485 4-wire communications.
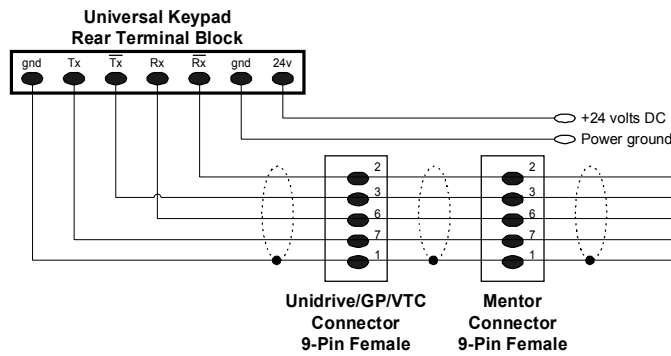

Figure 2a. Universal Keypad EIA-RS485 4-wire Interconnection Diagram

Figure 2b below shows the interconnection for 2-wire operation.

Please note that a Commander SE Drive only supports 2-wire communications whilst the Mentor Drive does not unless an MD29 card is fitted.
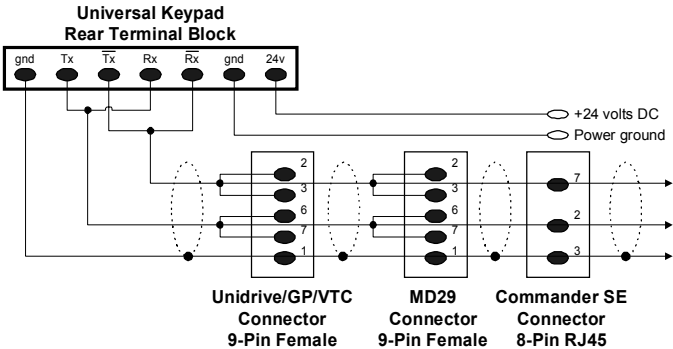

Figure 2b. Universal Keypad EIA-RS485 2-wire Interconnection Diagram

The Universal Keypad works in both 4-wire and 2-wire mode with no user intervention or set-up required
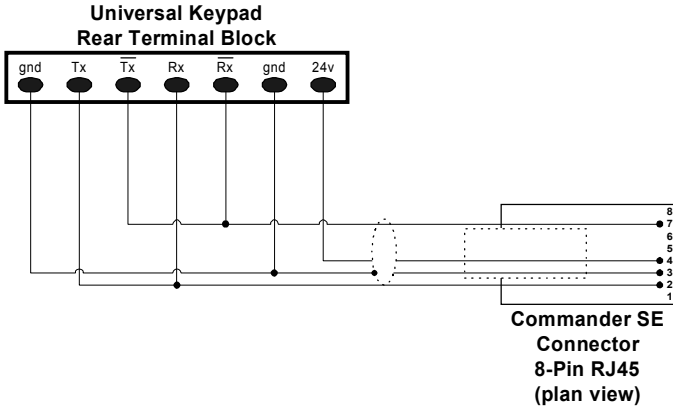
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Figure 2c. Universal Keypad EIA-RS485 interconnection with power connection.

2.3 Serial Communications

2.3.1 Routing the serial communications cable

A data communications cable should not run parallel to any power cables, especially ones that connect Drives to motors. If parallel runs are unavoidable, ensure a minimum spacing of 300mm (1 foot) between the communications cable and the power cable.

Cables crossing one another at right-angles are unlikely to give trouble.

The maximum cable length for a EIA-RS485 link is 1200 meters (4000 feet).

2.3.2 Network limitations

The host controller can operate up to thirty two EIA-RS485 devices with the use of line repeaters. Each transmitter or receiver of Control Techniques devices loads the line by two unit-loads. Therefore in 2-wire mode, each Control Techniques device loads the line by four unit loads. This means that no more than a total of seven such devices can be connected in a single group, allowing up to four unit-loads for the line repeater. Up to 15 devices can be connected if 4-wire mode is used.

2.3.3 Terminating the cable

When a multi-drop EIA-RS485 system is used, connect a 120Ω resistor between the two receive lines of the last unit* in the chain (i.e. the farthest away from the host). Care must be taken to ensure that other units in the system do not have the resistor already fitted. Excessive signal loss will occur if termination resistors are connected to units other than the last one.

*If the last unit is a Commander SE connect pin 1 to pin 8 (/TX/RX) to activate the termination.

2.4   # Connecting to a Drive

For the Universal Keypad to operate, a connection must be established between the keypad and a Drive. The Universal Keypad will communicate with all supported CT Drives (see 1.4), without the need for any non-default parameters on the Drive or keypad. The exception being Mentor II, which requires **11.11** to be set to the correct address (default of "1" not allowed by the keypad).

After wiring the keypad connect to the EIA-RS485 port on the Drive and apply power.

- Select the Drive address parameter (**99.01**) and change to the appropriate value.

- Select the baud rate parameter (**99.04**) and change to the correct baud rate for the Drive.

- When the Universal Keypad has established communications with the Drive a "**RS485 Init OK**" message is displayed briefly on the bottom LCD display line.

NOTE

Firmware versions up to and including 01.01.05 can exhibit an anomoly with the baud rate display (99.04).

On first powering up or following restoration of defaults (99.00 = 1244), the keypad shows 9600 but the actual value is 4800. This is most easily determined if connected to a Drive set for 4800.

If operation at 4800 is required, set 99.04 = 4800. The display will now be correct.

If operation at 9600 is required, set 99.04 = 4800 followed by 99.04 = 9600. The display will now be correct.

The table below shows the Drive communications parameters:

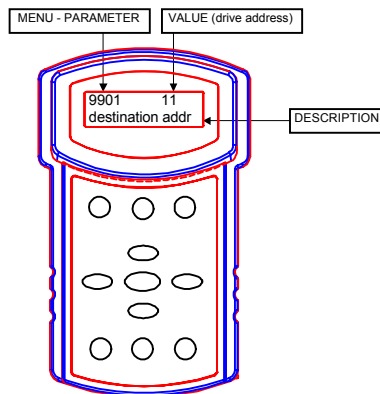| Node	Baud Rate Parameter	RS485 Address Parameter	RS485 Mode Parameter	RS485 Mode Value
Universal Keypad	99.04	99.01	N/A	N/A
Unidrive, VTC, GP	0.36 (11.23)	0.37 (11.25)	0.32 (11.24)	=1 (4 wire) =0 (2 wire)
Commander SE	0.42 (11.23)	0.43 (11.25)	0.41 (11.24)	=0 (2 wire)
Mentor	11.12	11.11	11.13	=1 (4 wire)
UD70	17.07	17.05	17.06	=1 (4 wire) =5 (2 wire)
MD29	14.03	14.01	14.02	=1 (4 wire) =5 (2 wire)

Figure 3. Selecting a Drive Address

You can scroll at any time to local parameter **99.01** to change the destination Drive address. There is a useful shortcut wherein pressing the LEFT and RIGHT ARROW buttons simultaneously will jump directly to local parameter **99.01**.

There are some limitations on Drive addresses: no Drive addresses less than 11 are permitted and you should avoid Drive addresses in which the least significant digit is zero (e.g. 20, 30, 40, etc.).

If the entered Drive address does not exist, a "**Comm Failure**" message will be displayed briefly and you will be locked into local menu 99 until a valid Drive is selected.

3 Keypad Operations

3.1 Basic Operation

The Universal Keypad operates in two modes The M button (modify) is used to switch the Keypad between these modes :

3.1.1 Browse mode

In this mode, the left and right arrow keys are used to rapidly scroll through the Drive's menus and the up and down arrows are used to scroll through the current menu's parameter numbers.

3.1.2 Modify mode

In this mode, the left and right arrow keys are used to move the cursor along the numeric position within the value display. The up and down arrow keys are used to increment and decrements the value stored in this position. Pressing the up and down arrow keys together will clear the value of the parameter to zero (for a multi-choice parameter the value will be to the first choice available).

The Universal Keypad has an "auto-repeat" feature that speeds up finding or modifying parameters. If any key is held down for longer than one second, the keystroke will be repeated ten times a second until the key is released. This feature applies to all buttons.

3.1.3 Shortcut combinations

- Pressing the up and down arrow keys simultaneously will return to parameter zero of the current menu in **Browse** mode, and clear the value to zero in **Modify** mode.

- Pressing the left and right arrow keys simultaneously, in **Browse** mode, will jump to parameter **99.01**. This is a quick way to log on to another Drive.

- Pressing the left arrow and M keys simultaneously in either **Browse** or **Modify** mode will jump to parameter **99.44** (Password) and enter **Modify** mode.

When modifying a value, the Drive will return a status reflecting the success of the operation. The value field will display XXXXXX if the parameter does not exist or is out of range and so forth. The 16-character lower LCD display line will also display a reminder about what is wrong. If the Universal Keypad loses communications with the Drive, the value field will display _ _ _ _ _ _ (underscores) to indicate this condition.

3.2 Keypad Security features

To prevent unauthorized tampering with the Universal Keypad, the user may establish a security password. Definition of a new password will set the keypad into **"locked"** mode which limits keypad users to viewing the HMI displays and read-only browsing of menu zero. To return the keypad to **"unlocked"** mode, giving full access to all parameters, the user must re-enter the previously defined password.

3.2.1 Enabling/Disabling security

- Access parameter **99.44** (pressing left arrow and M keys together will take you straight to the parameter)

- Enter your numeric password

- Press the M (modify) button.

- If the keypad was unlocked it will jump to parameter **00.00** and briefly display a "**Keypad Locked**" message. You will be able to browse menu 00 but not alter any values. Security is now enabled.

- If the keypad was locked and the password was correct it will jump to parameter **99.01** and briefly display a "**Keypad Unlocked**" message. You may now view any parameter and modify it's value if it is a read-write parameter. Security is now disabled. If the password was incorrect the keypad jumps to parameter **00.00**

The Universal Keypad is shipped with the password set to 0 and the operational mode is **"unlocked"**, thus giving full access to all parameters.

If you forget the saved password, contact your Supplier.

NOTE   *If the keypad appears locked on first power up (e.g. no access to menus other than 99), but no security code has been set, then this is the procedure:*

Enable security with the default value (0), then disable again with 0. All parameters will now be accessible.

3.3 Run, Stop/Reset and Direction operations

The RUN, STOP/RESET and DIRECTION buttons are designed to emulate the Unidrive onboard keypad. To implement this function correctly, the following settings need to be made:

Drive	Enable link	Parameter	Parameter value
Unidrive Unidrive VTC Commander GP	Terminals 30 to 31	6.04 1.14 Menu 8 destinations	=3 (PLC) =Any reference except keypad (4) =Any parameter other than 6.30 and 6.32
Commander SE	Terminals 7 to 9	0.05	=Any reference except keypad
Mentor	Terminals 21 & 31 to 40	8.21	=1 (disable normal logic functions)

The STOP button has a dual purpose:

- If the Drive is running, the STOP button will stop the Drive.

- If the Drive is not running, the STOP button will RESET the Drive.

For those Drives that support the virtual Drive Key Control parameter, simulating the STOP button works fine for stopping and resetting the Drive. In all other cases, the "user trip" parameters are used to reset the Drive (parameters **10.30** on the Unidrives and Commander SE and **10.35** on the Mentor).

3.4 Programmable function keys

The Universal Keypad has three Function Keys, labeled **F1**, **F2** and **F3**. Each of these keys can be programmed by the user to send predetermined values to any parameter on any attached Drive. To do this, just five parameters in local menu 99 must be set up for each key.

For example, to set up the **F1** key to send a one followed by a zero to Drive 15's sequencing bit (**06.30**), set parameters **99.23** through **99.27** as shown in the following table (parameters shown in italics are for descriptive purposes and do not require setting up for this example to work):

F1 Button Set-up Parameters		
Set-up parameter	**Value**	**Description**
99.23	2 values	F1 key assign disabled 1 value 2 values
99.24	15	F1 destination address
99.25	630	F1 destination parameter
99.26	1	F1 destination value 1
99.27	0	F1 destination value 2
99.28	*2 values*	*F2 key assign disabled* *1 value* *2 values*
99.29	15	F2 destination address
99.30	631	F2 destination parameter
99.31	1	F2 destination value 1
99.32	0	F2 destination value 2
99.33	*2 values*	*F2 key assign disabled* *1 value* *2 values*
99.34	15	F3 destination address
99.35	632	F3 destination parameter
99.36	1	F3 destination value 1
99.37	0	F3 destination value 2

Hint: The previous example allows only 2 values to be written to the specified parameter. However, if you wish to write more values to a parameter (maximum of 6), you could set up the F2 and F3 function keys in the same way as F1.

Once the F1 parameters have been configured, the first time you push the F1 button, a "one" will be sent to Drive 15, parameter **06.30**. Being the sequencing bit zero, this should start the Drive. The next time you push the F1 button, a "zero" will be sent which should stop the Drive. This toggling action will operate ad infinitum. Unfortunately, there is no way to tell which value goes next.

3.5   HMI Display

The keypad has provision for 2 user-defined HMI lines. For information on using these refer to the *Universal Keypad Advanced User Guide*.
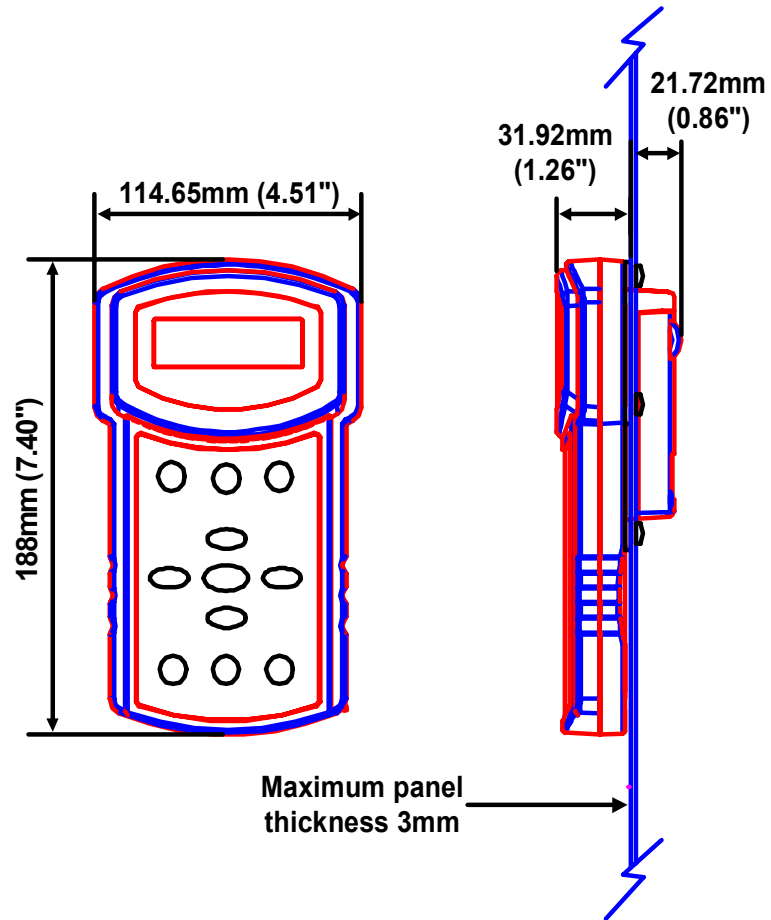
Appendix A   Local Menu 99

The Universal Keypad has an onboard non-volatile memory that is used to save/restore the local set-up menu 99. This local menu works exactly like the Drive menus except that no serial communications are involved in accessing this menu. When the keypad arrives from the factory, the local menu 99 will be set to standard factory defaults (4800 baud, Drive 11, etc.). If you make changes to menu 99, you can save these changes in non-volatile memory so that these settings are automatically restored when you power up the Universal Keypad.

See below for Menu 99 usage:

99.00 Save/Restore Local parameters

1000 = save Menu 99 in serial EEROM
1244 = restore Menu 99 defaults
1255 = restore Menu 99 from serial EEROM

Note: Activate the action by pressing the STOP/RESET button

99.01 Destination Node Address

nn   = EIA-RS485 serial address of the Drive you wish to query (11..99)

Note: Using the shortcut os simultaneously pressing the LEFT and RIGHT
arrow keys in BROWSE mode allows you to directly enter this parameter

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99.02 Drive Type (read-only)

nn   =   Drive model, operational mode and coprocessor

0	= no Drive	6	= Uni Cl UD70	12	= Mentor
1	= Uni Open	7	= Uni Sv UD70	13	= Mentor MD29
2	= Uni Closed	8	= Uni Rg UD70	14	= Cmdr SE Mot1
3	= Uni Servo	9	= Uni VTC	15	= Cmdr SE Mot2
4	= Uni Regen	10	= Uni Vt UD70		
5	= Uni Op UD70	11	= Uni GP		

99.03 Keypad Address

nn   =   EIA-RS485 serial address of the keypad (11..99)

99.04 Keypad Baud Rate

 0 = 4800,   1 = 9600,   2 = 19200,   3 = 38400

99.05 Disable control keys (Run, Stop/Reset and Direction)

 0 = enable control keys
 1 = disable control keys

99.40 Firmware version (read-only)

99.44 Password

nnnnn = user-entered password (digits)

Appendix B Keypad Dimensions

B.1 Front and Side view dimensions

21.72mm (0.86")

31.92mm (1.26")

114.65mm (4.51")

188mm (7.40")

Maximum panel thickness 3mm

B.2   Rear Panel and Aperture dimensions
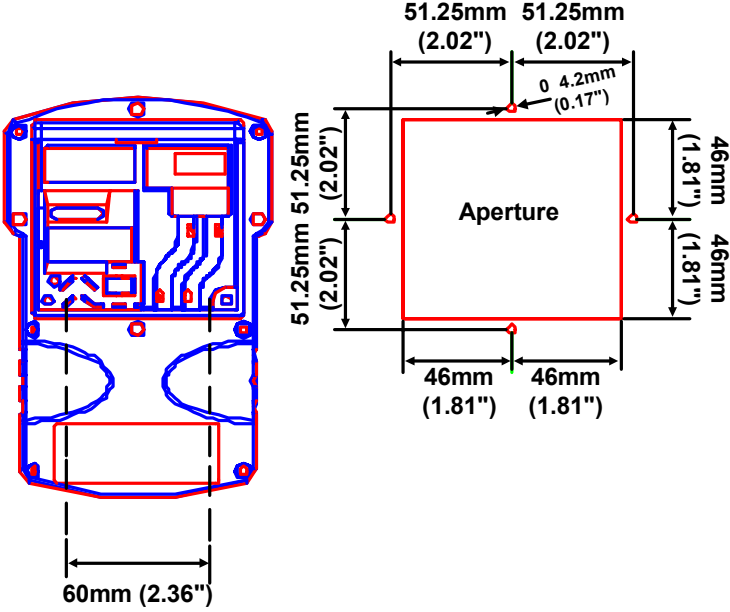
Appendix C   UL Listing Information

These devices are for use in the secondary of a Class 2 circuit, or for use only with the Drive Models as shown below when additionally fitted with a Listed Current limiting type fuse rated max 1A on the supply input to the device:

- Unidrive size 1,2,3,4 and 5 Drives

- Mentor II Drives

- Commander SE size 1 Drives

UL enclosure Type 1.