UniStream®

Built-in

User Guide

US7-B5-R37, US10-B5-R37

This guide provides basic installation information for specific UniStream® models with built-in I/O. Technical specifications may be downloaded from the Unitronics website.

General Features

Unitronics' UniStream® Built-in series are PLC+HMI All-in-One programmable controllers that comprise a built-in CPU, an HMI panel, and built-in I/Os.

The series is available in two versions: UniStream Built-in, and UniStream Built-in Pro. Note that a model number that includes:

- **B5** refers to UniStream Built-in
- **B10** refers to UniStream Built-in Pro (these products)
  B10 models offer additional features, detailed below.

HMI	▪ Resistive Color Touch-screens ▪ Rich graphic library for HMI design
Power Features	▪ Built-in Trends and Gauges, auto-tuned PID, data tables, data sampling, and Recipes ▪ UniApps™: Access & edit data, monitor, troubleshoot & debug and more – via HMI or remotely via VNC ▪ Security: Multi-level password protection ▪ Alarms: Built-in system, ANSI/ISA standards
I/O Options	▪ Built-in I/O configuration, varies according to model ▪ Local I/O via UAG-CX series I/O expansion adapters and standard UniStream Uni-I/O™ modules ▪ Remote I/O via EX-RC1
COM Options	▪ Built-in ports: 1 Ethernet, 1 USB host, 1 Mini-B USB device port ▪ Serial and CANbus ports may be added via UAC-CX modules
COM Protocols	▪ Fieldbus: CANopen, CAN Layer2, MODBUS, EtherNetIP and more. Implement any serial RS232/485, TCP/IP, or CANbus third-party protocols via Message Composer ▪ Advanced: SNMP Agent/Trap, e-mail, SMS, modems, GPRS/GSM, VNC Client, FTP Server/Client
Programming Software	All-in-One software for hardware configuration, communications, and HMI /PLC applications, available as a free download from Unitronics.

Differences between B5 and B10

Feature	B5	B10 (Pro)
System Memory	3GB	6GB
Audio Jack	No	Yes
Video/RSTP Support	No	Yes
Web Server	No	Yes
SQL Client	No	Yes

Before You Begin

Before installing the device, the user must:

- Read and understand this document.
- Verify the Kit Contents.

Alert Symbols and General Restrictions

When any of the following symbols appear, read the associated information carefully.

Symbol	Meaning	Description
⚠	Danger	The identified danger causes physical and property damage.
⚠	Warning	The identified danger could cause physical and property damage.
Caution	Caution	Use caution.

- All examples and diagrams are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product according to local and national standards and regulations.
- This product should be installed only by qualified personnel.

⚠
- Failure to comply with appropriate safety guidelines can cause severe injury or property damage.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Do not connect/disconnect the device when power is on.

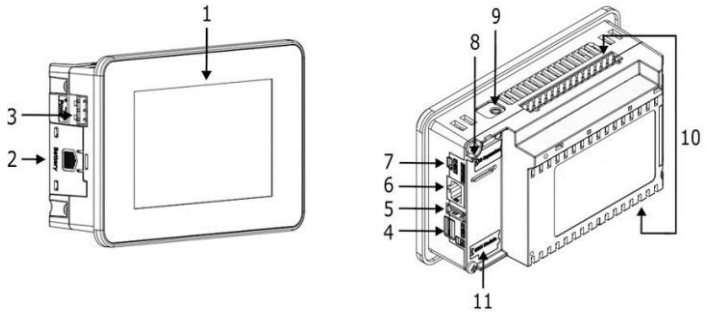
Environmental Considerations

⚠
- Ventilation: 10mm space is required between the device top/bottom edges and the enclosure's walls
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration, in accordance with the standards and limitations given in the product's technical specification sheet.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.
- Install at maximum distance from high-voltage cables and power equipment.

Kit Contents

- 1 PLC+HMI controller
- 4/8 mounting brackets (US7/US10)
- 1 panel mounting seal
- 2 panel supports
- 1 power terminal block
- 3 I/O terminal blocks
- 1 Battery

Product Diagram



Front and Rear View

1	Screen Protection	A plastic sheet attached to the screen for protection. Remove it during installation of the HMI Panel.
2	Battery Cover	The battery is supplied with the unit, but must be installed by the user.
3	Power Supply Input	Connection point for the controller power source. Connect the Terminal Block supplied with the kit to the end of the power cable.
4	microSD Slot	Supports standard microSD cards.
5	USB Host port	Provides the interface for external USB devices.
6	Ethernet port	Supports high-speed Ethernet communications.
7	USB Device	Use for application download and direct PC-UniStream communication.
8	I/O Expansion Jack	Connection point for an I/O Expansion Port. Ports are supplied as part of I/O Expansion Model Kits. Kits are available by separate order. Note that UniStream® Built-in is compatible only with adapters from the series UAG-CX.
9	Audio Jack	Pro models only. This 3.5mm Audio jack enables you to connect external audio equipment.
10	Built-in I/O	Model-dependent. Present in models with built-in I/O configurations.
11	Uni-COM™ CX Module Jack	Connection point for up to 3 stack-on modules. These are available by separate order.

Installation Space Considerations

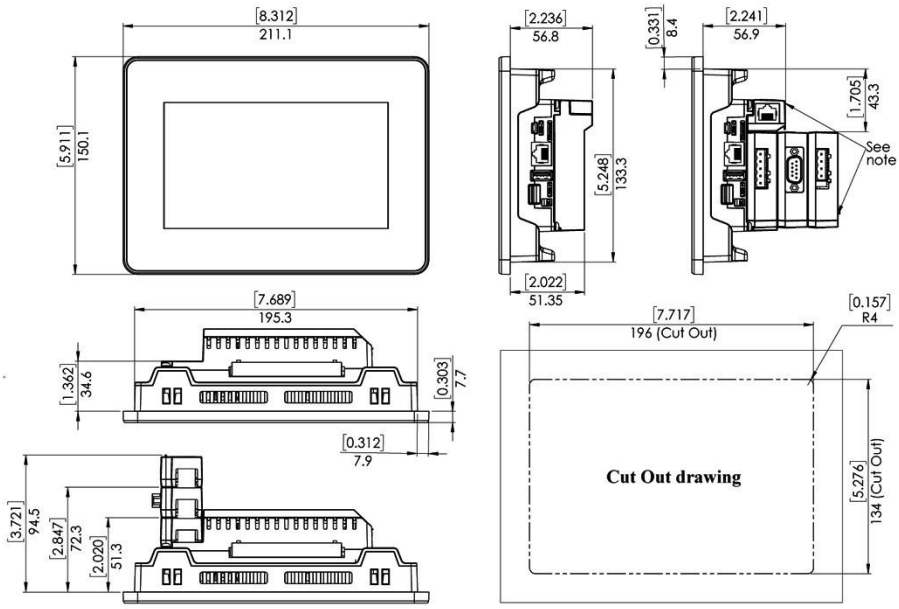
Allocate space for:

- the controller
- any modules that will be installed
- access to ports, jacks, and the microSD card slot

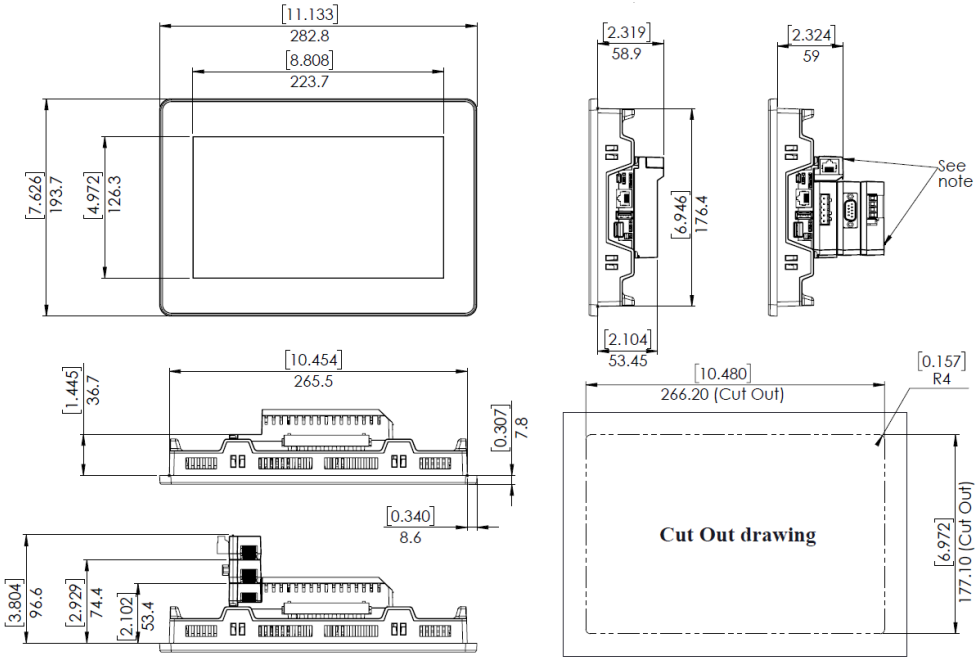
For exact dimensions, please refer to the Mechanical Dimensions shown below.

Mechanical Dimensions

UniStream 7”



UniStream 10.1"



NOTE Allow space for modules to be snapped onto the back of the controller, if required by your application. Modules are available by separate order.

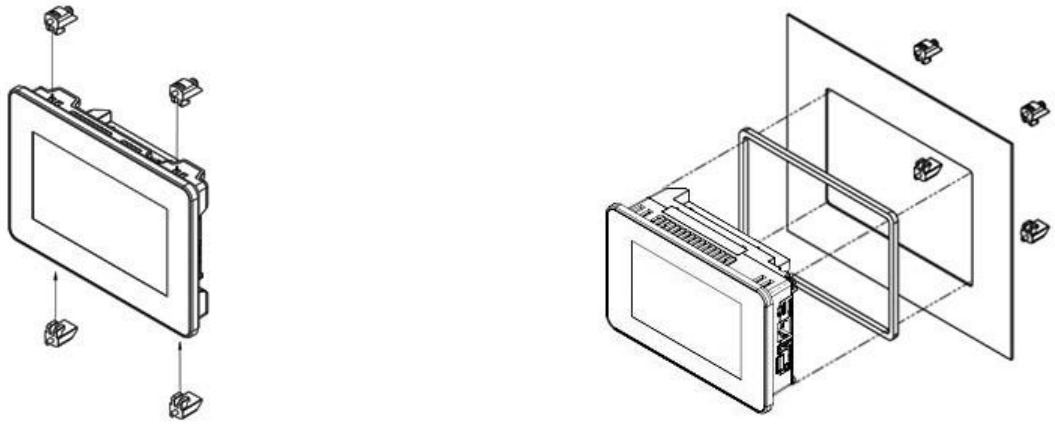
Panel Mounting

NOTE
- Mounting panel thickness must be less or equal to 5mm (0.2”).
- Ensure that the space considerations are met.

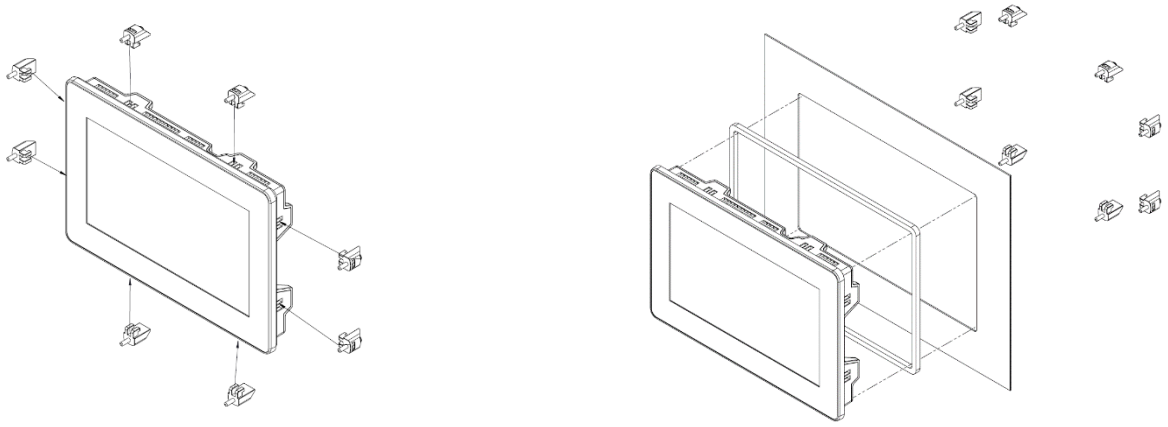
1. Prepare a panel cut-out according to the dimensions as shown in the previous section.
2. Slide the controller into the cut-out, ensuring that the Panel Mounting Seal is in place as shown below.
3. Push the mounting brackets into their slots on the sides of the panel as shown below.
4. Tighten the bracket screws against the panel. Hold the brackets securely against the unit while tightening the screws.

When properly mounted, the panel is squarely situated in the panel cut-out as shown below.

UniStream 7”



UniStream 10.1”



Caution
- The necessary torque is 0.35 N·m (3.5 kgf·cm).

Battery: Back-up, First Use, Installation, and Replacement

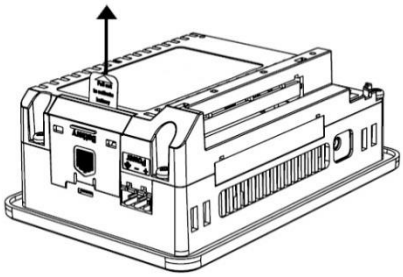
Back-up

In order to preserve back-up values for RTC and system data in the event of power off, the battery must be connected.

First Use

The battery is protected by a removable cover on the side of the controller.

The battery is supplied installed inside the unit, with a plastic tab preventing contact which must be removed by the user.

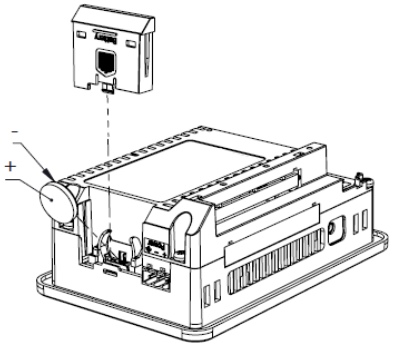


Battery Installation and Replacement

⚠ ▪ Use proper precautions to prevent Electro-Static Discharge (ESD) while servicing the battery.

Caution
- To preserve back-up values for RTC and system data during battery replacement, the controller must be powered.
- Note that disconnecting the battery halts the preservation of back-up values and causes them to be deleted.

1. Remove the battery cover from the controller as shown in the accompanying figure:
   - Press the tab on the module to disengage it.
   - Slide it up to remove it.
2. If you are replacing the battery, remove the battery from its slot on the side of the controller.
3. Insert the battery, ensuring that the polarity is aligned with the polarity marking as shown in the accompanying figure.
4. Replace the battery cover.
5. Dispose of the used battery according to local and national standards and regulations.



Wiring

⚠
- This equipment is designed to operate only at SELV/PELV/Class 2/Limited Power environments.
- All power supplies in the system must include double insulation. Power supply outputs must be rated as SELV/PELV/Class 2/Limited Power.
- Do not connect either the 'Neutral' or 'Line' signal of the 110/220VAC to device's 0V point.
- Do not touch live wires.
- All wiring activities should be performed while power is OFF.
- Use over-current protection, such as a fuse or circuit breaker, to avoid excessive currents into the power supply connection point.
- Unused points should not be connected (unless otherwise specified). Ignoring this directive may damage the device.
- Double-check all wiring before turning on the power supply.

Caution
- To avoid damaging the wire, use a maximum torque of 0.5 N·m (5 kgf·cm).
- Do not use tin, solder, or any substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

Wiring Procedure

Use crimp terminals for wiring.

use 26-12 AWG wire (0.13 mm^2 –3.31 mm^2)

1. Strip the wire to a length of 7±0.5mm (0.250–0.300 inches).
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure a proper connection.
4. Tighten enough to keep the wire from pulling free.

Wiring Guidelines

In order to ensure that the device will operate properly and to avoid electromagnetic interference:

- Use a metal cabinet. Make sure the cabinet and its doors are properly earthed.
- Use wires that are properly sized for the load.
- Use shielded twisted pair cables for wiring High Speed and Analog I/O signals.
  In either case, do not use the cable shield as a signal common / return path.
- Route each I/O signal with its own dedicated common wire. Connect common wires at their respective common (CM) points at the controller.
- Individually connect each 0V point and each common (CM) point in the system to the power supply 0V terminal, unless otherwise specified.
- Individually connect each functional ground point (⏚) to the earth of the system (preferably to the metal cabinet chassis).
  Use the shortest and thickest wires possible: less than 1m (3.3') in length, minimum thickness 14 AWG (2 mm^2).
- Connect the power supply 0V to the earth of the system.

- Earthing the cables' shield:
  - Connect the cable shield to the earth of the system (preferably to the metal cabinet chassis). Note that the shield must be connected only at one end of the cable; it is recommended to earth the shield at the PLC-side.
  - Keep shield connections as short as possible.
  - Ensure shield continuity when extending shielded cables.

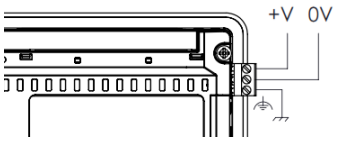
NOTE For detailed information, refer to the document System Wiring Guidelines, located in the Technical Library in the Unitronics' website.

Wiring the Power Supply

The controller requires an external power supply.

⚠ ▪ In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

Connect the +V and 0V terminals as shown in the accompanying figure.

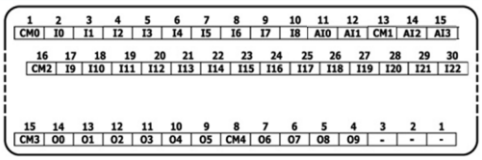


Connecting Ports

- Ethernet — **CAT-5e shielded cable with RJ45 connector**
- USB Device — **Use the proprietary programming cable supplied with the device**
- USB Host — **Standard USB cable with Type-A plug**

I/O Connection Points

The IOs for these models are arranged in three groups of fifteen points each, as shown in the figures to the right.



Top groups
Input connection points

Bottom group
Output connection points

The function of certain I/Os may be adapted via wiring and software settings.

Wiring the Digital Inputs

The digital inputs are arranged in two isolated groups:

- I0-I8 share common CM0
- I9-I22 share common CM1

Each group may be wired together as sink or source.

Inputs I9-I16 can be configured as either normal digital inputs or as high speed inputs that can receive high speed pulse signals from sensors or shaft encoders.

High Speed Input Modes

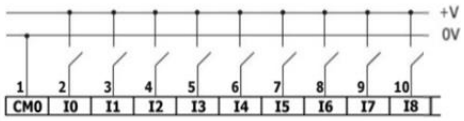
Following are the different pin assignments for the high speed channels:

	Channel 1			Channel 2	
	I9	I10		I11	I12
Quadrature	Phase A	Phase B		Phase A	Phase B
Pulse+Direction	Pulse	Direction		Pulse	Direction
Pulse	Pulse	Normal digital		Pulse	Normal digital

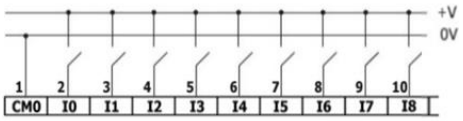
	Channel 3			Channel 4	
	I13	I14		I15	I16
Quadrature	Phase A	Phase B		Phase A	Phase B
Pulse+Direction	Pulse	Direction		Pulse	Direction
Pulse	Pulse	Normal digital		Pulse	Normal digital

NOTE
- Input modes are set both by wiring and software.

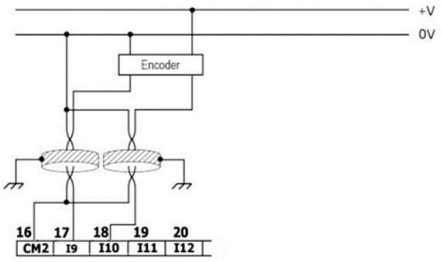
Input wiring, sink



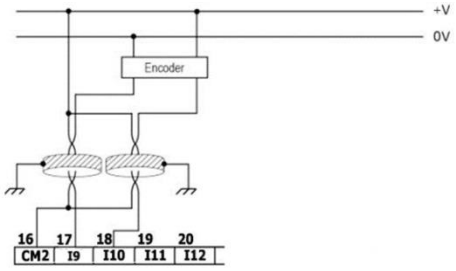
Input wiring, source



High Speed Input wiring, sink



High Speed Input wiring, source



NOTE Use sink input wiring to connect a sourcing (pnp) device.
Use source input wiring to connect a sinking (npn) device.

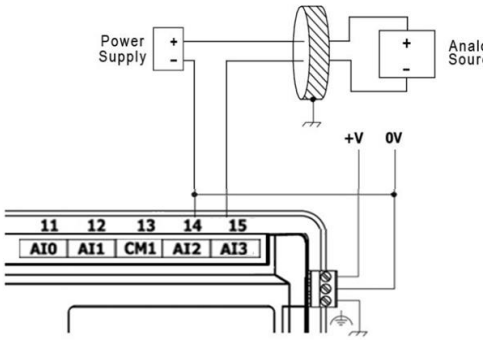
Wiring the Analog Inputs

Both inputs share the common point CM1.

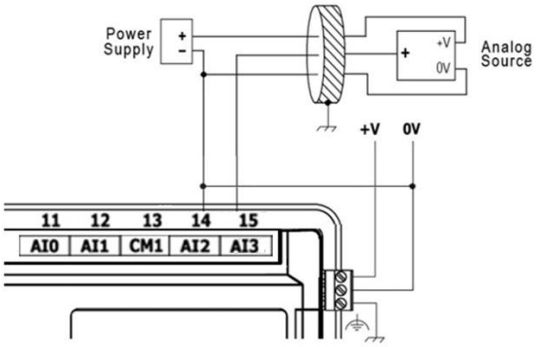
NOTE
- The inputs are not isolated.
- Each input offers two modes: voltage or current. You can set each input independently.
- The mode is determined by the hardware configuration within the software application.
- Note that if, for example, you wire the input to current, you must also set it to current in the software application.

Current

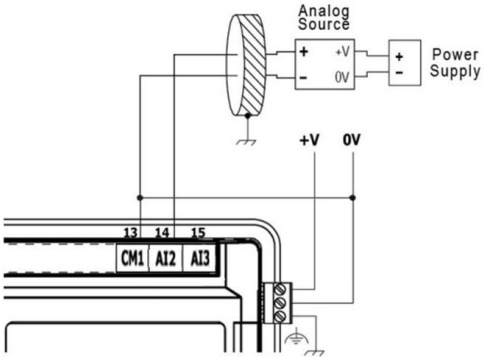
2-wire



3-wire



4-wire



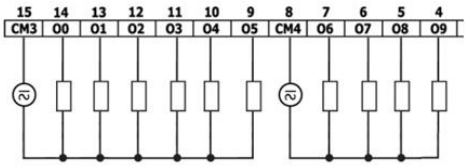
Wiring the Relay Outputs

⚠ ▪ To avoid risk of fire or property damage, always use a limited current source or connect a current limiting device in series with the relay contacts

The relay outputs are arranged in two isolated groups:

O0-O5 share the common return CM3.

O6-O9 share the common return CM4.

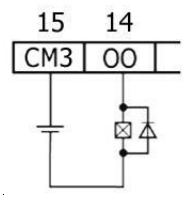


Increasing Contact Life Span

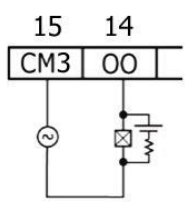
To increase the life span of the relay contacts and protect the controller from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load,
- a RC snubber circuit in parallel with each inductive AC load

DC Load



AC Load



Installing Uni-I/O™ & Uni-COM™ Modules

Refer to the Installation Guides provided with these modules.

⚠
- Turn off system power before connecting or disconnecting any modules or devices.
- Use proper precautions to prevent Electro-Static Discharge (ESD).

Uninstalling the Controller

1. Disconnect the power supply.
2. Remove all wiring and disconnect any installed devices according to the device's installation guide.
3. Unscrew and remove the mounting brackets, taking care to support the device to prevent it from falling during this procedure.

UniStream® Built-in

Technical Specifications
US7-B5-R37, US10-B5-R37

Unitronics' UniStream® Built-in series are PLC+HMI All-in-One programmable controllers that comprise built-in HMI and built-in I/Os.

Model numbers in this document

- **Beginning**: model numbers beginning with USx refer to any member of the Built-in series
- **Middle**: the series is available in two versions: UniStream Built-in and UniStream Built-in Pro. Model numbers including:
  - **B5** refer to standard UniStream Built-in
  - **B10** refer to UniStream Built-in Pro
    B10 models offer additional features, detailed below.
    If the letter "B" is followed by "x" it refers to **both** B5 and B10 models.
  - **End**: the end of the model number indicates the built-in I/O as shown in the example table below. This document provides the specifications for the I/Os.

Installation Guides are available in the Unitronics Technical Library at www.unitronicsplc.com.

- 23 x Digital inputs, 24VDC, sink/source, including 4 High speed counter input channels (1)
- 4 x Analog inputs, 0÷20mA, 12 bits
- 10 x Relay outputs

Power Supply	US7-B5-R37	US10-B5-R37
Input voltage	24VDC	24VDC
Permissible range	20.4VDC to 28.8VDC	20.4VDC to 28.8VDC
Max. current consumption	0.57A@24VDC	0.6A@24VDC
Isolation	None	

Display	UniStream® 7"	UniStream® 10.1"
LCD type	TFT	
Backlight type	White LED	
Luminous intensity (brightness)	Typically 400 nits (cd/m2), at 25°C	Typically 300 nits (cd/m2), at 25°C
Backlight longevity (2)	30k hours	
Resolution (pixels)	800 x 480 (WVGA)	1024 x 600 (WSVGA)
Size	7"	10.1"
Viewing area	Width x Height (mm) 154.08 x 85.92	Width x Height (mm) 222.72 x 125.28
Color support	65,536 (16bit)	
Surface treatment	Anti-glare	

Touch screen	Resistive Analog
Actuation force (min)	> 80 g (0.176 lb)

General	
I/O support	Up to 2,048 I/O points
Built-in I/O	According to model
Local I/O expansion	To add local I/Os, use UAG-CX I/O Expansion Adapters[3] [4]. These adapters provide the connection point for standard UniStream Uni-I/O™ modules.
Communication ports	
Built-in COM ports	Specifications are provided below in the section Communications
Add-on Ports	Add up to 3 ports to a single controller using Uni-COM™ UAC-CX Modules[4].

Internal memory	**UniStream® Built-in**	**UniStream® Built-in Pro**
	RAM: 512MB ROM: 3GB system memory 1GB user memory	RAM: 1GB ROM: 6GB system memory 2GB user memory
Ladder memory	1 MB	
External memory	microSD or microSDHC card Size: up to 32GB Data Speed: up to 200Mbps	
Bit operation	0.13 µs	
Battery	Model: 3V CR2032 Lithium battery [5] Battery lifetime: 4 years typical, at 25°C Battery Low detection and indication (via the HMI and via System Tag).	

Audio (Pro B10 models only)	
Bit Rate	192kbps
Audio compatibility	Stereo MP3 files
Interface	3.5mm Audio-out jack - use shielded audio cable of up to 3 m (9.84 ft)
Impedance	16Ω, 32Ω
Isolation	None

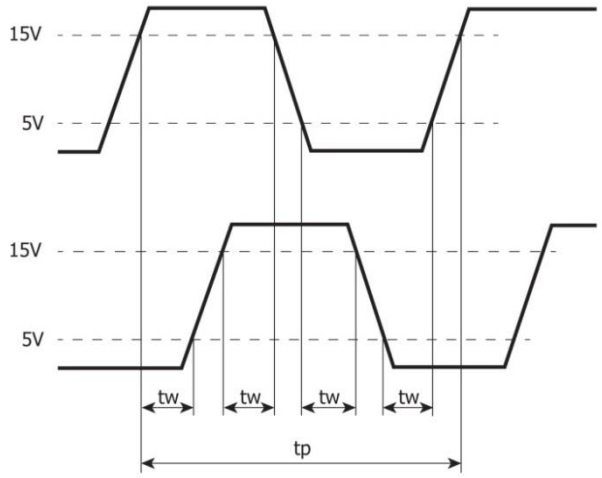
Video (Pro B10 models only)	
Supported Formats	MPEG-4 Visual , AVC/H.264

Communication (Built-in Ports)	
Ethernet port	
Number of ports	1

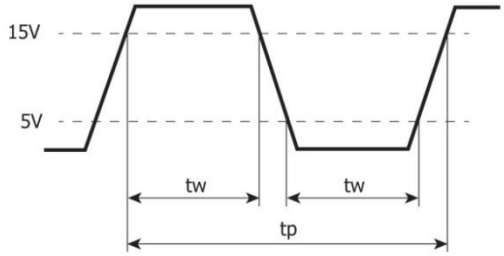
Port type	10/100 Base-T (RJ45)
Auto crossover	Yes
Auto negotiation	Yes
Isolation voltage	500VAC for 1 minute
Cable	Shielded CAT5e cable, up to 100 m (328 ft)
USB device [6]	
Number of ports	1
Port type	Mini-B
Data rate	USB 2.0 (480Mbps)
Isolation	None
Cable	USB 2.0 compliant; < 3 m (9.84 ft)
USB host	
Number of ports	1
Port type	Type A
Data rate	USB 2.0 (480Mbps)
Isolation	None
Cable	USB 2.0 compliant; < 3 m (9.84 ft)
Over current protection	Yes

Digital Inputs	
Number of inputs	23
Type	Sink or Source
Isolation voltage	
Input to bus	500VAC for 1 minute
Input to input	None
Nominal voltage	I0-I8, I17-I22: 24VDC @ 6mA I9-I16: 24VDC @ 8mA
Input voltage	
Sink/Source	On state: 15-30VDC, 4mA min. Off state: 0-5VDC, 1mA max.
Nominal impedance	I0-I8, I17-I22: 4kΩ I9-I16: 3kΩ
Filter	I0-I8, I17-I22: 6ms typical I9-I16: 5.5µs, 50µs, 0.5ms, 6ms, 12ms
High speed inputs [1]	
Frequency / Period	Pulse/Direction mode: 90kHz max. / 11.1µs min (t_p in the Pulse/Dir Mode figure below). Quadrature mode: 80kHz max. / 12.5µs min (t_p in the Quadrature Mode figure below).

Pulse width	Pulse/Direction mode: 5.1μs min. for each state (t_w in Pulse/Dir Mode figure below). Quadrature mode: 2.5μs min. for each state (t_w in Quadrature Mode figure below).
Cable	Shielded twisted pair



Quadrature Mode



Pulse/Direction mode

Analog Inputs					
Number of inputs	4				
Input range (7)	**Input Type**	**Nominal Values**	**Over-range Values ***		
	0 ÷ 20mA	0 ≤ Iin ≤ 20mA	20 < Iin ≤ 20.3mA		
	***** **Overflow** (8) is declared when an input value exceeds the Over-range boundary.				
Absolute maximum rating	±30mA				
Isolation	None				
Conversion method	Successive approximation				
Resolution	12 bits				
Accuracy (25°C / -20°C to 55°C)	±0.3% / ±0.9% of full scale				
Input impedence	118Ω				
Noise rejection	10Hz, 50Hz, 60Hz, 400Hz				
Step response (9) (0 to 100% of final value)	**Smoothing**	**Noise Rejection Frequency**			
		400Hz	60Hz	50Hz	10Hz
	None	2.7ms	16.86ms	20.2ms	100.2ms
	Weak	10.2ms	66.86ms	80.2ms	400.2ms

	Medium	20.2ms	133.53ms	160.2ms	800.2ms
	Strong	40.2ms	266.86ms	320.2ms	1600.2ms

Update time (9)	**Noise Rejection Frequency**	**Update Time**
	400Hz	5ms
	60Hz	4.17ms
	50Hz	5ms
	10Hz	10ms
Operational signal range (signal + common mode)	AIx: -1V ÷ 5.5V ; CM1: -1V ÷ 0.5V (x=0 or 1)	
Cable	Shielded twisted pair	
Diagnostics (8)	Analog input overflow	

Relay Outputs	
Number of outputs	10 (O0 to O9)
Output type	Relay, SPST-NO (Form A)
Isolation groups	Two groups, 6+4
Isolation voltage	
Group to bus	1,500VAC for 1 minute
Group to group	1,500VAC for 1 minute
Output to output within group	None
Current	2A maximum per output (Resistive load) 8A maximum per group
Voltage	250VAC / 30VDC maximum
Minimum load	1mA, 5VDC
Switching time	10ms maximum
Short-circuit protection	None
Life expectancy (10)	100k operations at maximum load

Environmental	
Protection	Front face : IP65/66, NEMA 4X Rear side: IP20, NEMA1
Operating temperature	-20°C to 55°C (-4°F to 131°F)
Storage temperature	-30°C to 70°C (-22°F to 158°F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Operating Altitude	2,000 m (6,562 ft)
Shock	IEC 60068-2-27, 15G, 11ms duration

Vibration	IEC 60068-2-6, 5Hz to 8.4Hz, 3.5mm constant amplitude, 8.4Hz to 150Hz, 1G acceleration

Dimensions		
	Weight	Size
US7-B5-R37	0.68 Kg (1.49 lb)	Refer to the images on page 4
US10-B5-R37	1.08 Kg (2.38 lb)	Refer to the images on page 4

Notes:

1. Eight of the digital inputs (I9-I16) may be configured to function either as normal, or as high speed digital inputs, that can receive high speed pulse signals from up to two sensors or shaft encoders.
2. The HMI panel's backlight longevity is the typical operating time after which the brightness drops to 50% of its original level.
3. UAG-CX Expansion Adapter Kits comprise a Base unit, an End unit, and a connecting cable. You plug the Base Unit into the controller's I/O Expansion Jack and connect standard UniStream Uni-I/O™ modules. For more information, refer to the product's installation guide and technical specifications.
4. Uni-COM™ CX modules plug directly into the Uni-COM™ CX Module Jack on the back of the controller.
   UAC-CX modules may be installed in the following configurations:
   - If a module comprising a serial port is snapped directly into to the back of UniStream™, it may be followed only by another serial module, for a total of 2.
   - If your configuration includes a CANbus module, it must be snapped directly to the back of UniStream. The CANbus module may be followed by up to two serial modules, for a total of 3.
   For more information, refer to the product's installation guide and technical specifications.
5. When replacing the unit's battery, make sure that the new one has environmental specifications that are similar or better than the one specified in this document.
6. The USB device port is used to connect the device to a PC.
7. The analog inputs measure values that are slightly higher than the nominal input range (Input Over-range).

   Note that when the input overflow occurs, it is indicated in the corresponding I/O Status tag while the input value is registered as the maximum permissible value. For example, if the specified input range is 0 ÷ 20mA, the Over-range values can reach up to 20.3mA, and any input current higher than that will still register as 20.3mA while the Overflow system tag is turned on.
8. The diagnostics results are indicated in the system tags and can be observed through the UniApps™ or the online state of the UniLogic™.
9. Step response and update time are independent of the number of channels that are used.
10. Life expectancy of the relay contacts depends on the application that they are used in. The product's installation guide provides procedures for using the contacts with long cables or with inductive loads.

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