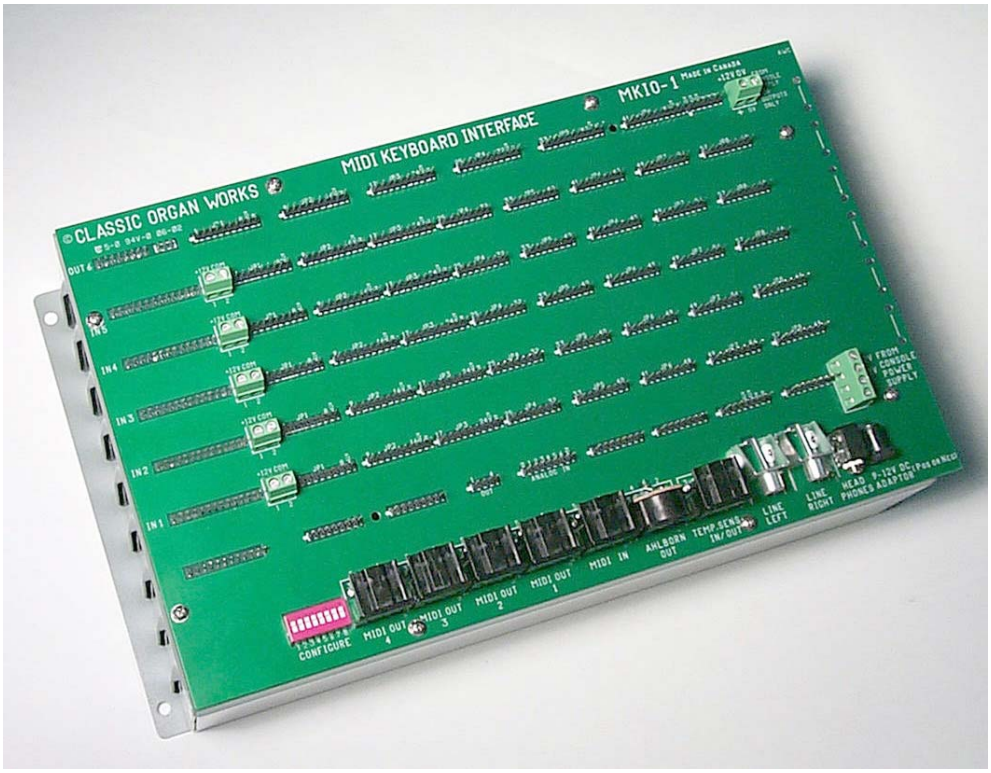
MIDI CONTROL UNIT
MCU-1



General

The MCU-1 allows MIDI sound modules to be added to a pipe or electronic organ. It converts key-switch information from up to three manuals and pedals to MIDI control data. Stops, pistons and other switches are also implemented.

Designed as a modular unit, it provides a 'smart' add-on interface so that organs can be provided with MIDI voices that can be controlled as though they were part of the organ.

In particular, the MCU-1 can simultaneously drive up to four Ahlborn Archive Series™ modules[1] that generate pipe-organ voices to expand a small instrument. It also includes an optional internal plug-in General MIDI sound generator, Classic type GM 9773.

The unit is supplied with several basic configurations included to suit typical applications and these may be selected via a DIP-Switch. Eventually, the configuration will be customer-adjustable via a computer.

Brief Description

The MCU-1 unit consists of a fully-enclosed metal box with a removable printed-circuit front panel. This through-pin panel serves both as mountings for internal boards and for connections to the various external inputs and outputs. The panel also reduces electro-magnetic interference.

Switch inputs may be made with pluggable headers using crimped pins (Molex) or mass-termination insulation-displacement connectors (MAS-CON). Standard DIN connectors are used for MIDI inputs and outputs while Phono and stereo jacks are included for audio outputs (for the optional GM MIDI).

Power may be taken either from a standard wall adaptor or from the organ supply and no special ventilation is necessary.

[1] Archive Module Series is a registered Trademark of Ahlborn-Galanti Organs, a division of Generalmusic Corporation, Italy.

Principal Features

- Allows an existing organ console to operate MIDI equipment.
- Inputs for up to three 61-note keyboards plus a 32-note pedalboard.
- Up to 105 control inputs for stops or other switch inputs.
- All the control inputs must be active-high (+12V On).
- Five analog inputs for expression shoes or other functions.
- Can simultaneously operate up to four different Ahlborn Archive modules.
- General piston inputs on organ can control Ahlborn modules.
- 48 optional outputs to drive lamps or magnets *
- Optional internal GM MIDI module.
- Optional tuning input from temperature sensor.
- Customisable configurations can suit almost any type of organ.
- MIDI input (merge function) allows other MIDI sources to operate sound modules.

* If optional outputs are required, customer must specify which, and if outputs are to be high-drive or low-drive.

MIDI Features

The following MIDI parameters are supported for Ahlborn modules:

Division, Channel, Stops, Couplers, Combination, Pistons, Tremulants, Crescendo, Expression, Sforzando (Tutti), Cancel, SET, Tuning.

For the optional GM-MIDI module:

Channel, Patch, Voice Variation (Bank) [Main or MT-32 Sound Variation #127], Drumset Variation [Standard, Power, Brush, Orchestra or CM-64/32 (Partial)],Volume, Expression (On or Off only), Tuning.

A MIDI input allows other MIDI devices to merge so that the module sounds can be simultaneously controlled from other sources.

GM-MIDI Module (Optional)

The optional GM MIDI module, Classic type GM 9773, plugs onto the control board within the MCU-1 unit. It contains a typical 16-channel GM MIDI sound set with 38-voice polyphony (and two variations), including five variations of percussions on Channel-10. This single-chip, two-inch square module is specified separately.

Unit Configuration

An 8-way Configuration DIP-Switch allows up to 256 different configurations to be selected. Each configuration defines a specific way in which the unit may be used.

For instance, one configuration would set the MIDI channels for a three-manual organ with Channel-1 for the Swell manual, 2 for Great, 3 for Choir and Channel-4 for Pedal. It would also allow up to four Ahlborn Archive modules to be controlled with their stops selected by certain switches and with a particular group of switches defined to be general pistons (and a SET switch). In this case, the only extra thing to do on the console would be to link up to the existing general pistons. (The Ahlborn modules may initially need to be accessible to the organist if its stops are not wired up, in order to define what could be set onto the general pistons). A memory switch could also be added to the console to select one of the five memories in the Ahlborn modules.

Another configuration might be for only two manuals and the plug-in General MIDI sound module.

The configurations are stored in non-volatile memory so may be updated or modified. The MCU-1 is therefore a universal hardware device that can be adapted to any normal organ requirement.

Available configurations will be detailed in the operator's manual. All units may be inexpensively upgraded as new software becomes available.

Power Supply

The power supply for the MCU-1 is from a standard DC wall adaptor with a 2.1mm co-axial power jack. It may be of either polarity and between 9 and 15 Volts at a minimum current of 400 mA. Alternatively, the supply could be taken from the console power unit of the organ via the 'Console' Terminal Block, in which case it must only be positive.

If an optional output board is used, the current requirements will depend on the type of loads to be operated. If these are likely to require high currents, then the output board can be independently fed from a separate external +12V power supply (which could also power the rest of the unit via a wire link to the other terminal block thereby eliminating the adaptor).

Internal Fusing

Self-resetting Polyfuses are used inside the unit for protection. The common supply from the power input is fused at 500 mA to the processor and input boards. This power input may be from the external adaptor or via the 'Console' Terminal Block. Each input board has an individual fuse at 250 mA from this fused supply. The Output board has its own fuse at 5 Amps from the separate Terminal block.

Unit Location

Under normal circumstances, the MCU-1 would be mounted near where the key, stop and piston switch connections are accessible. The key connections should be after any couplers so that these will also affect the module sounds. There are no controls on the unit requiring operational access.

SPECIFICATIONS

General :

Dimensions

Width	12.35 inches, 31.4 cm *(including side-mounting flanges 0.50")*
Height	3.50 inches, 8.89 cm *(including connectors)*
Depth	7.50 inches, 19.5 cm

Weight

Fully loaded	7 lbs, 3.2 kg

Installation:

Mounting	By side flanges, 4 places, ¼" dia. Screws (max.)
Internal Access	Removable front cover, 8 screws, 4-40.
External Access	Allow 4" at right side for cables.

No special ventilation necessary if mounted clear of obstructions.

Controls

Configuration	8-section DIP-Switch *(Accessed only during set-up)*

Unit Connections:

Inputs:

MIDI In	DIN 5-pin Socket Standard MIDI signals
Temperature Sensor	DIN 3-pin Socket
Power	Co-axial Jack, 2.1mm ID, 9-12V DC, either polarity, 400 mA minimum.
Switches	Pins, 0.025" Square, 0.3" long, 0.1" pitch

Outputs:

MIDI 1-4	DIN 5-pin Sockets Standard MIDI signals
Ahlborn	DIN 6-pin Socket *(For Tuning)*
Line Audio Left & Right	RCA Phono Jack 100 mV high impedance *(for GM MIDI output)*
Headphones	3.5mm Stereo Jack 1.6 Watts per channel into 4 Ohms *(for GM MIDI output)*
Lamps or Magnets	Pins, 0.025" Square, 0.3" long, 0.1" pitch

Board Connections:

The following input and output connections are on header pins with 0.025" square posts on 0.1" centres (for 8-pin Molex or MAS-CON connectors):

Input Boards (SIB-4) (Up to 5)

Switch inputs On Header pins
Inputs 1-64 in 8 groups of 8. Signals 0-12V. +12V = On.
Common fused +12V on row Screw-Terminal Block

Output Boards
(OUTL-1, Low-drive for Lamps only)

Outputs 1-48 in 6 groups of 8. 0-12V. 0V = On.
200 mA Maximum per output, 5A maximum total.
Common fused +12V on row Screw-Terminal Block

Output Boards
(OUTN-1, Low-drive for Magnets or Lamps)

Outputs 1-48 in 6 groups of 8. 0-12V. 0V = On.
40 Ohms minimum per output, 5A maximum.
Common fused +12V on row Screw-Terminal Block

Output Boards
(OUTP-1, High-drive for Magnets or Lamps)

Outputs 1-48 in 6 groups of 8. 0-12V. +12V = On.
60 Ohms minimum per output, 5A max.
Common 0V From power Screw-Terminal Block
(Board is fused).

Control Board (MKSC-3)

Miscellaneous Inputs:

Analog:	5 inputs at 0-5V 10 k-Ohms *For Expression and Crescendo shoes* (0V and +5V on adjacent header pins)
Digital:	1 input at TTL levels (0-5V). *For future use.*
GM MIDI:	Connections for Classic GM 9773 module, 2x13 header (ribbon type, 0.1"x0.1").

Miscellaneous Outputs:

LED Drivers	4 at 0-5V Active-low outputs Maximum current of 20mA *(external resistors required)*

In/Out I^2CBuss: *(For memory expansion)*

SCL	Output
SCA	Input
R	Input

Interface Board Descriptions

Note: There can be up to five SIB-4 input boards but only one output board, which must be one of the three types described below (they are plug-in inter-changeable).

SIB-4

The Switch Input Board converts up to 64 active-high (+12V) inputs to an 8x8 matrix system. Eight tri-state octal invertors are used to select eight groups of eight switch-data inputs onto a common octal bus as decided by the outputs of a Binary-to-Octal decoder. This has three address inputs and one Board Select input. The address lines define which one of the eight groups of input switch-data is sent to the output buss while the Board Select determines which one of the five SIB-4 boards will be sending this data. The board has pull-down inputs and high-resistance series resistors to protect against static and excessive input voltages. The power system comprises a 5-volt Zener diode as a regulator.

OUTL-1

This output board is intended to drive up to 48 external incandescent lamps via series current-limiting resistors. The board is controlled by a serial system comprising Data, Clock and Strobe signals as well as an Enable line (normally "On"). These signals go to six cascaded octal Shift Registers that include load-driving output stages. A serial data stream is passed down this chain by the Clock signal and latched into the outputs by the Strobe signal. As this sequence repeats every few milli-seconds with the same data, the outputs are activated continuously. Output-48 is normally reserved to operate an on-board LED to show board activity.

Board power is regulated to +5V by a regulator with a reverse-polarity protection diode on its input. Input pull-down resistors and high-resistance series resistors protect the board against static and excessive input voltages. Output signals go low (to 0V) for active outputs so that the lamp common must be +12V. Typical loads would be up to a maximum of 350 mA (a minimum of 40 Ohms). This board is NOT suitable for driving inductive loads.

OUTN-1

This output board is intended to drive up to 48 low-resistance, inductive loads with active-low outputs (positive common) and contains built-in back-e.m.f. protection. Depending upon the application, this protection may take the form of either diodes or varistors. The latter are used for keyboards where speed is necessary. The board is controlled by a serial system comprising Data, Clock and Strobe signals as well as an Enable line (normally "On"). These signals go to six cascaded octal Shift Registers that include load-driving output stages. A serial data stream is passed down this chain by the Clock signal and latched into the outputs by the Strobe signal. As this sequence repeats every few milli-seconds with the same data, the outputs are activated continuously. Output-48 is normally reserved to operate an on-board LED to show board activity.

Board power is regulated to +5V by a regulator with a reverse-polarity protection diode on its input. Input pull-down resistors and high-resistance series resistors protect the board against static and excessive input voltages. Output signals go low (to 0V) for active outputs so that the output common must be +12V. Typical loads would be up to a maximum of 350 mA (a minimum of 40 Ohms). This board can also drive lamps but these should have series resistors added to reduce the in-rush currents and prolong the filament life.

OUTP-1

This output board is intended to drive up to 48 inductive loads with active-high outputs (0V common) and contains built-in back-e.m.f. protection. The board is controlled by a serial system comprising Data, Clock and Strobe signals as well as an Enable line (normally "On"). These signals go to six cascaded octal Shift Registers that include load-driving output stages. A serial data stream is passed down this chain by the Clock signal and latched into the outputs by the Strobe signal. As this sequence repeats every few milli-seconds with the same data, the outputs are activated continuously. Output-48 is normally reserved to operate an on-board LED to show board activity.

Board power is regulated to +5V by a regulator with a reverse-polarity protection diode on its input. Input pull-down resistors and high-resistance series resistors protect the board against static and excessive input voltages. Output signals go high (to +12V) for active outputs so that the output common must be 0V. Typical loads would be up to a maximum of 200 mA (a minimum of 60 Ohms). This board can also drive lamps but these should have series resistors added to reduce the in-rush currents and prolong the filament life.