

**Analog to MIDI Interface  
User Manual**

# SYCOLOGIC

## Analog to MIDI Interface User Manual

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## 1) Introduction

The SYCOLOGIC AMI is a microprocessor-based interface which will convert standard analog Control Voltage (1 volt/octave) and Gate signals into digital MIDI signals. Using the AMI you can transmit not only NOTE EVENTS with DYNAMICS but also PATCH CHANGES, MODULATION PARAMETERS and even SYNC CODE. Thus giving analog keyboards and sequencers new creative abilities, with the power to control any MIDI-equipped musical instruments.

### 1.1 PITCH INPUTS

There are 8 sockets on the front panel labelled "Pitch Inputs". Control Voltage (CV) signals from an analog source, ranging between 0 and 5 volts, may be connected to any input (circuitry is included to protect the AMI should any input exceed this range). The unit is calibrated at 1 volt/octave thus allowing control over a 5 octave range. The lowest note is C1 with 0V input and the highest C6 with 5V input.

### 1.2 GATE INPUTS

A group of 8 sockets, below the Pitch Inputs, are labelled "Gate Inputs". Gate or Trigger signals from the analog source should be connected to the inputs corresponding to those used for Pitch. Gate signals should be active high, ranging between 5 and 15 volts. When a Gate goes high, or ON, the CV at the Pitch Input above it will be read.

### 1.3 DYNAMIC & CONTROL INPUTS

To the right of the Pitch and Gate Inputs are another 8 sockets which are labelled "Dynamic & Control Inputs". These inputs are similar to the Pitch Inputs as they allow CV's from 0 to 5 volts to be connected. However these can be used to control the Dynamics of each note event, patch changes and modulation parameters.

### 1.4 MIDI NOTE ON / NOTE OFF EVENTS

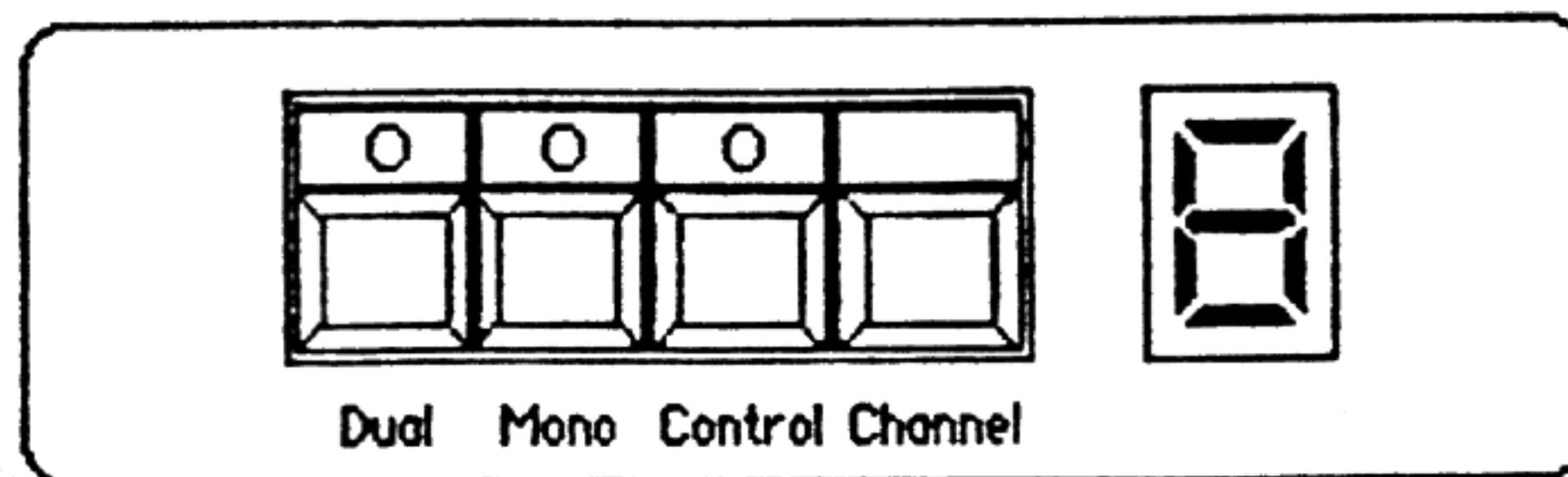
When any of the 8 Gates go high, their Pitch and Dynamic inputs are converted into digital form and sent as a MIDI 'NOTE ON' event, simulating a key down on the receiving instrument (Note: If there is no Dynamic input a default value of half full range is transmitted).

While the Gate is high the Pitch input will be constantly read. If its level changes, the old note will be switched off by transmitting a MIDI 'NOTE OFF' event and then retriggered by sending a 'NOTE ON' with the new Pitch and Dynamic levels.

When the Gate goes low a 'NOTE OFF' event is sent, simulating the respective key up on the receiving instrument.

## 1.5 OPERATING PANEL

Above the Dynamic & Control Inputs is the "Operating Panel". Four switches allow the various operating modes to be selected and displayed, together with a seven-segment LED display showing which MIDI channel the AMI is transmitting on.



When the CONTROL mode is off Dynamic information is added to note events in accordance with the following modes :

- POLY Control of 8 voices polyphonically on 1 MIDI channel.
- DUAL Control of 4 voices polyphonically on each of 2 MIDI channels.
- MONO Control of 1 voice monophonically on each of 8 MIDI channels.

When the CONTROL mode is active and POLY or MONO mode selected , the following controls or parameters will be transmitted for CVs connected to the Dynamic & Control inputs :

- 1) Common Dynamics for inputs 1-8.
- 2) Patch Change from 1 to 64 ( patch per semitone).
- 3) Pitch Bend upwards.
- 4) Modulation.
- 5) After touch.
- 6) DX Volume.
- 7) DX Portamento.
- 8) DX Breath control.

When the CONTROL mode is active and DUAL mode selected the following controls may be transmitted :

- MIDI Channel N
  - 1) Common Dynamics for inputs 1-4.
  - 2) Patch Change.
  - 3) Pitch Bend upwards.
  - 4) Modulation.
- MIDI Channel N+1
  - 5) Common Dynamics for inputs 5-8.
  - 6) Patch Change.
  - 7) Pitch Bend upwards.
  - 8) Modulation.

Where N is the channel number selected from 1 to 8.

## 1.6 SYNC INPUTS

On the rear panel are two inputs labelled "START/STOP" and "CLOCK" which can be used to convert sync signals from sequencers or drum machines into MIDI SYNC signals.

Clock outputs of 24, 48 and 96 beats per qtr. note may be connected to the CLOCK input, internal division being provided to produce a MIDI clock.

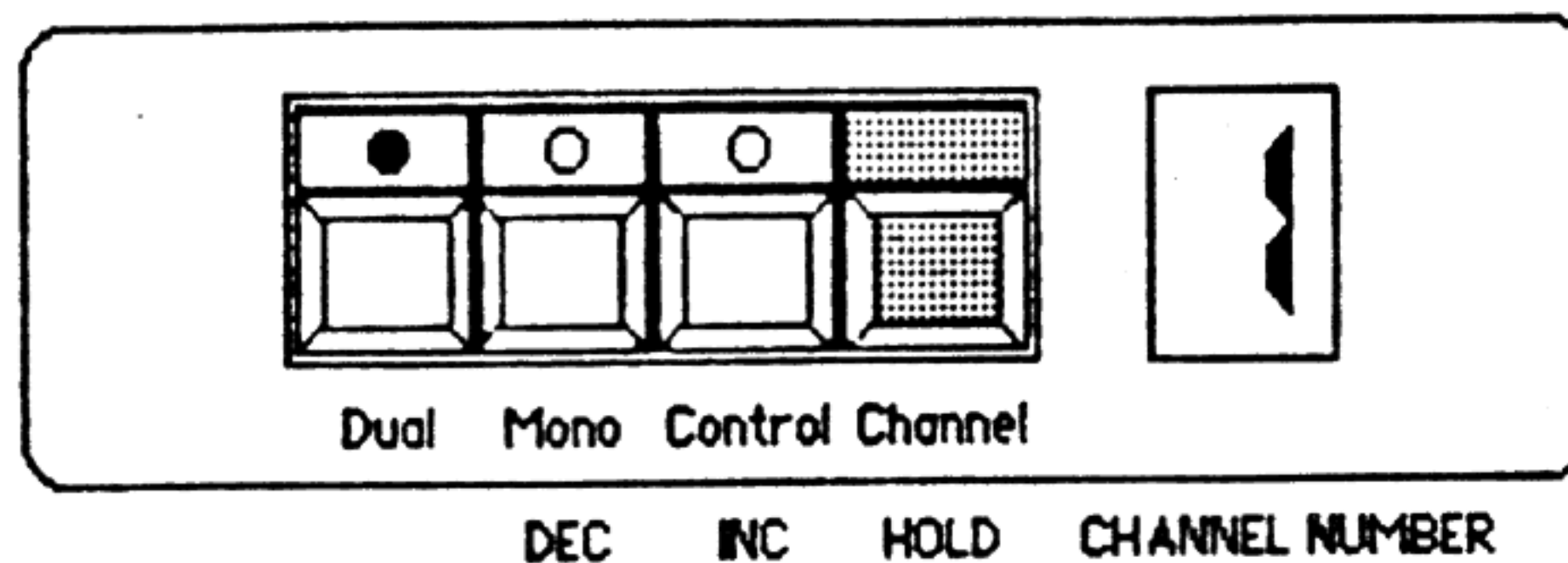
The START/STOP input is provided for use with ROLAND equipment.

When the first clock pulse is seen the AMI produces a MIDI START signal and then a MIDI CLOCK on every beat. If there is a gap of more than 0.5 seconds between clocks the interface will 'time out' and generate a MIDI STOP signal, thus assuming that the sending instrument has stopped.

## 1.7 CHANGING THE MIDI CHANNEL

When the interface is first switched on, all of the LED's will be lit. After about a second all the switch LED's will go out and the number '1' will be shown in the display. This is the default setting, showing that the AMI will be transmitting any data on MIDI channel 1. To receive this data your MIDI instrument should be set to the same channel.

The interface can 'sit' on any one of 8 MIDI channels. To change the channel number, hold "CHANNEL" and press "CONTROL" to increment, or "MONO" to decrement.



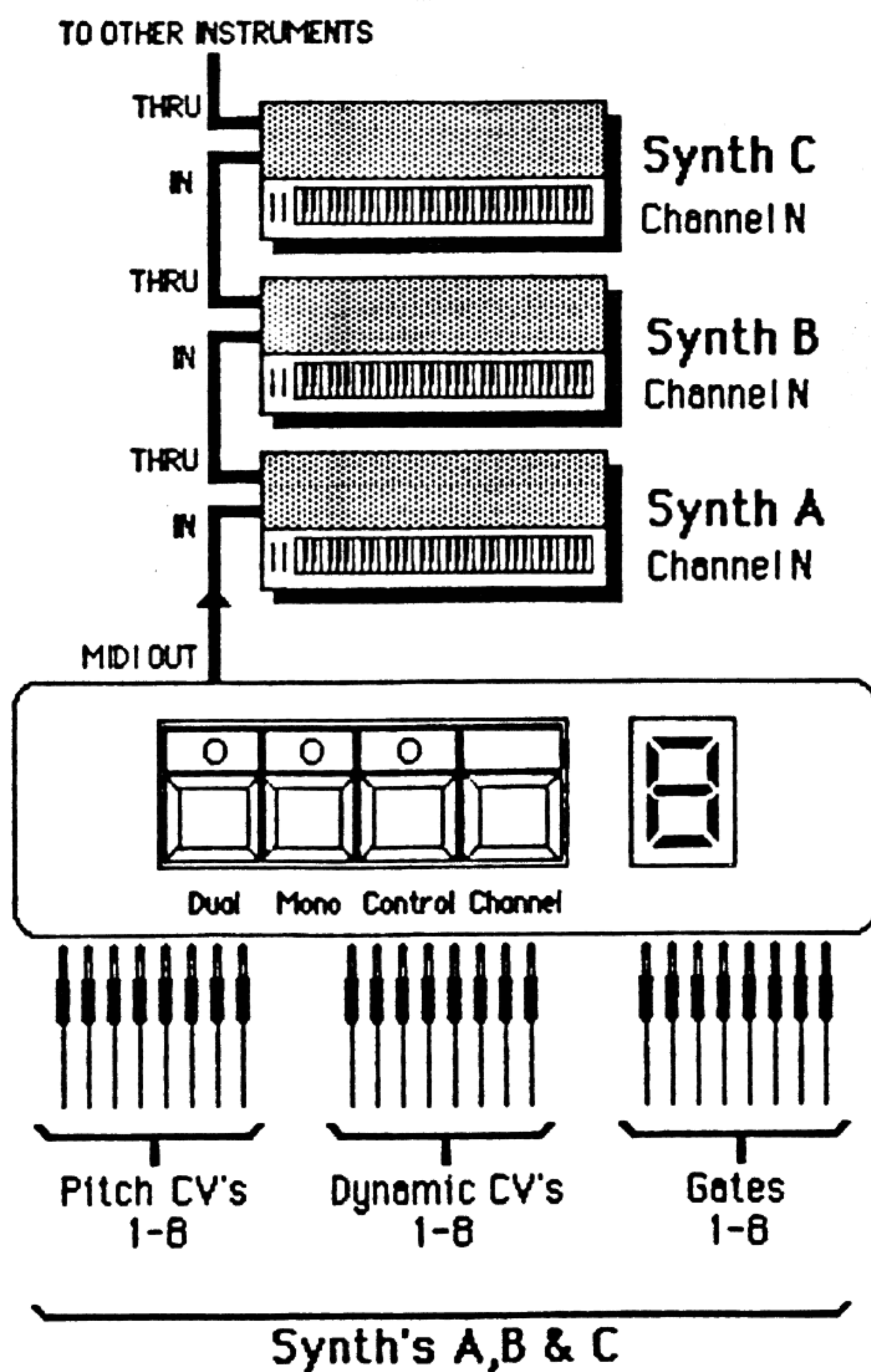
## 2) Operating Modes

### 2.1 POLY MODE with Dynamics

With no switch LED's on, the interface is in POLY mode with individual control of dynamics for each input (Default on power-up).

In this mode all 8 Pitch, Dynamic and Gate Inputs are converted to MIDI data and transmitted on the channel shown on the LED display. This means that an analog source can have control of 8 voices polyphonically on 1 MIDI channel. All MIDI instruments connected and receiving on this channel will play the same notes polyphonically (according to their internal keyboard algorithms).

Instruments connected which do not have the ability to express dynamics will ignore the dynamic information sent by the AMI.



N is the MIDI channel selected from 1 to 8

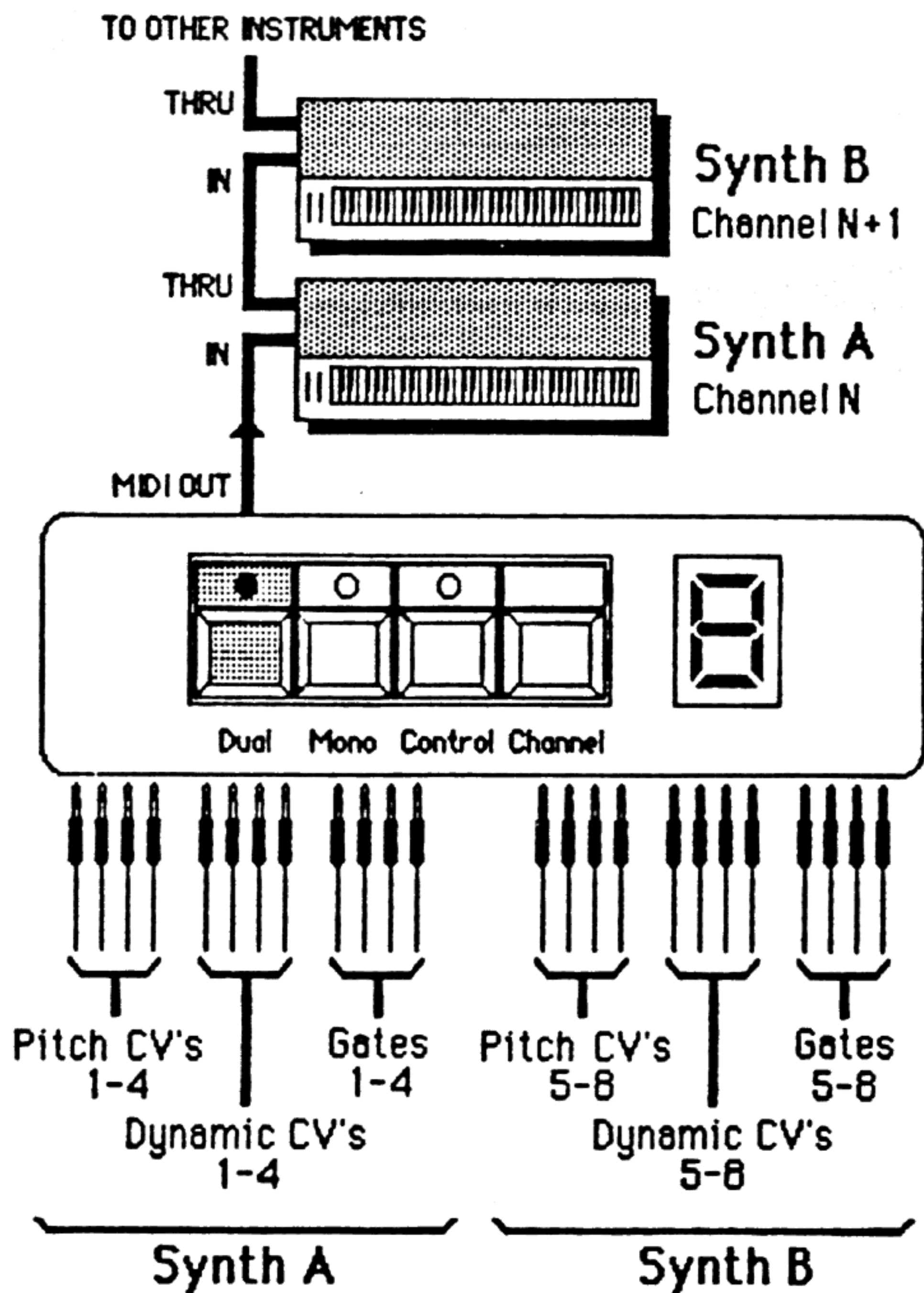
**POLY MODE Control of 8 voices polyphonically on 1 MIDI channel**

## 2.2 DUAL MODE with Dynamics

Pressing "DUAL" on the operating panel puts the interface into DUAL mode with individual control of dynamics for each input.

In this mode 2 sets of 4, Pitch, Dynamic and Gate Inputs are converted and transmitted. Inputs 1-4 are sent on the MIDI channel selected (1-8) while Inputs 5-8 are sent on the next MIDI channel up (2-9). For example, when the AMI has just been switched on and DUAL mode entered, Inputs 1-4 are on MIDI channel 1, while Inputs 5-8 are on channel 2.

This means that an analog source can control 4 voices polyphonically on each of 2 MIDI channels. MIDI instruments connected may be set to receive on either channel, depending on the effect desired.



N is channel number selected from 1 to 8.

### DUAL MODE

Control of 4 voices polyphonically on each of 2 MIDI channels.

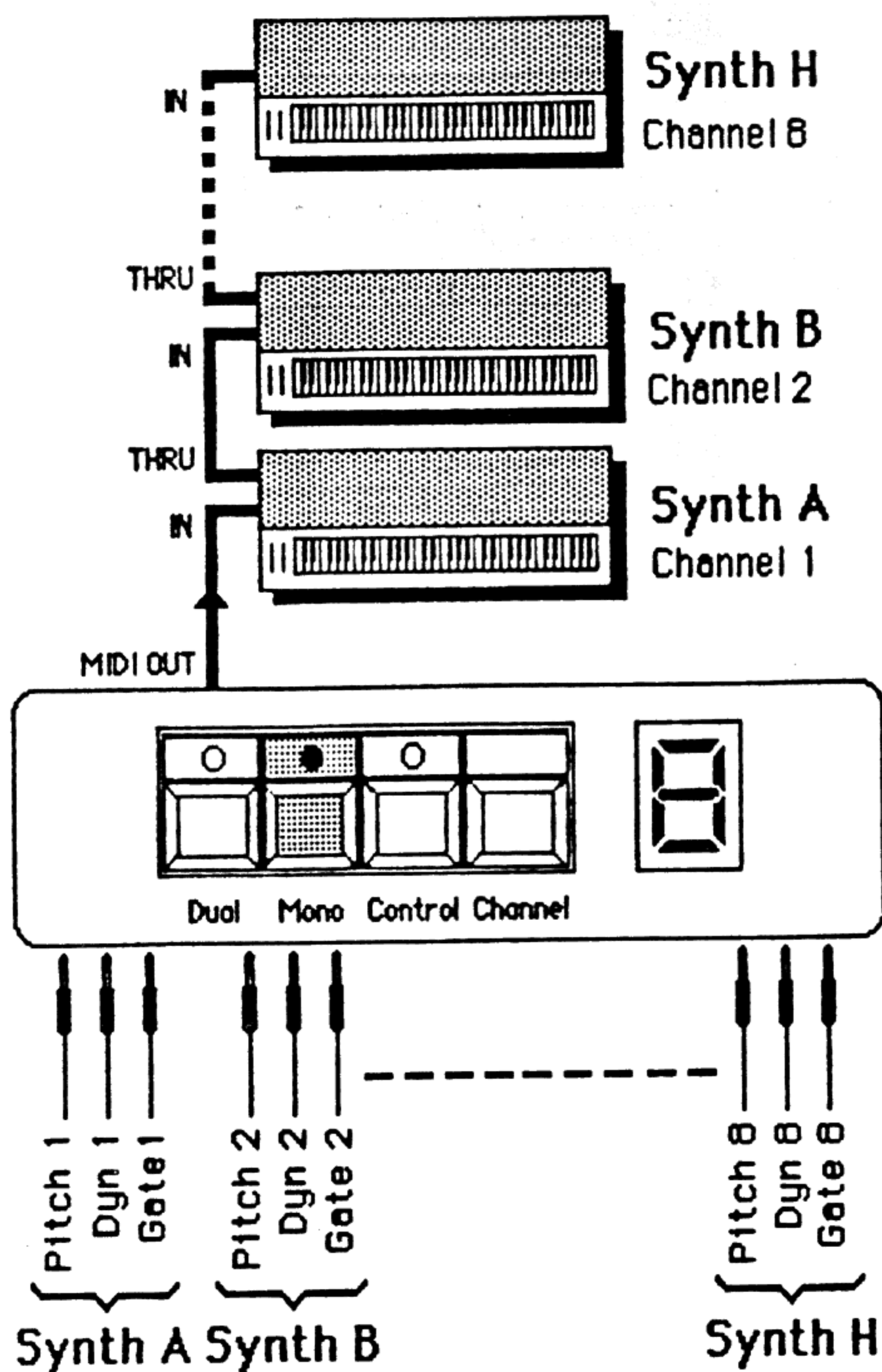
## 2.3 MONO MODE with Dynamics

Pressing "MONO" on the operating panel puts the interface into MONO mode with individual control of dynamics for each input.

This allows 8 separate Pitch, Dynamic and Gate Inputs to be converted and transmitted on MIDI channels 1 to 8. (Note : Changing the MIDI channel in this mode has no effect.)

An analog source can now control 1 voice monophonically on each of 8 MIDI channels. Up to 8 instruments could be controlled individually, each placed on a different MIDI channel.

If a receiving MIDI instrument is "Multi-timbral" (can play several voices, each with a different sound), such as SCI's SIXTRAK, then putting it into MONO mode will allow the AMI to control each voice.



### MONO MODE

Control of 1 voice monophonically on each of 8 MIDI channels.

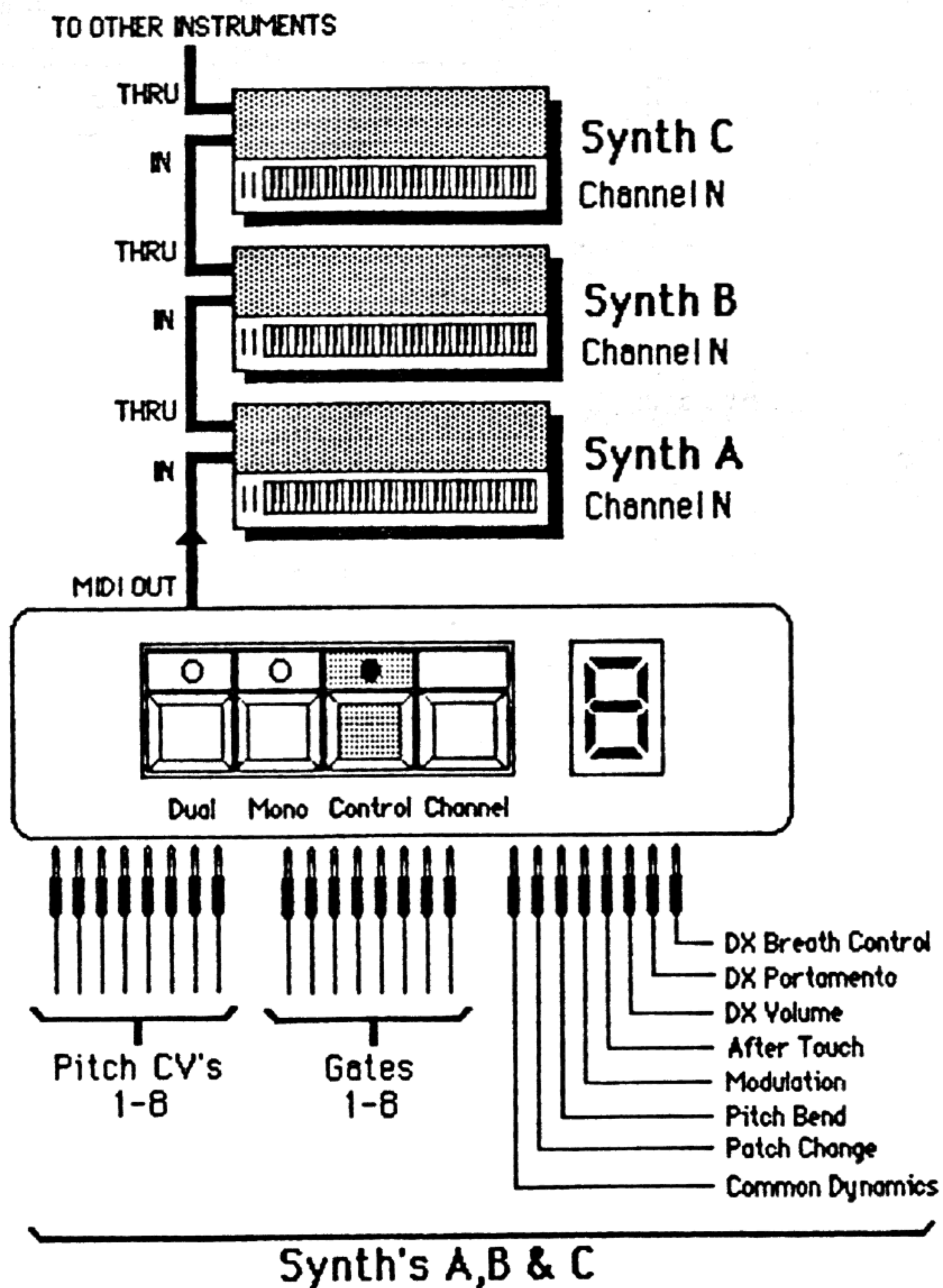


## 2.4 POLY MODE with Controls

Pressing "CONTROL" on the operating panel, with both "DUAL" and "MONO" off, puts the interface into POLY mode with 8 CONTROL Inputs.

Eight Pitch and Gate inputs can be converted, with the dynamics for all notes determined by the level of Control Input 1. This allows the other 7 Control Inputs to be used to control parameters of the MIDI instruments connected.

Both note and parameter information will be transmitted on the MIDI channel selected.



N is the MIDI channel selected from 1 to 8.

### POLY MODE & CONTROLS

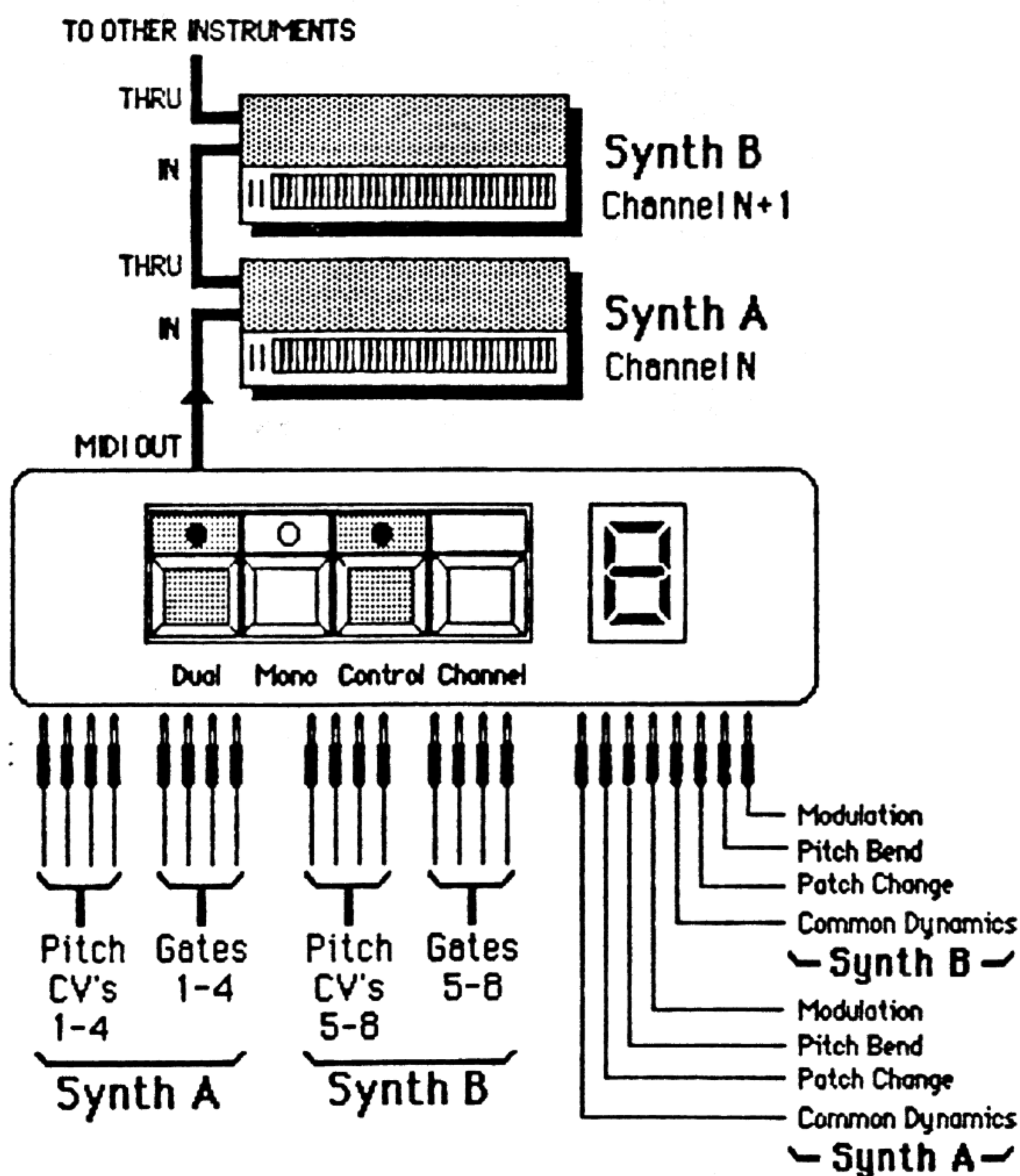
Control of 8 voices polyphonically on 1 MIDI channel.

## 2.5 DUAL MODE with Controls

Pressing "CONTROL" on the operating panel, with "DUAL" on, puts the interface into DUAL mode with 8 CONTROL Inputs.

Two groups of 4 Pitch and Gate Inputs can be converted, with common dynamics for each group. This allows the other 6 Control Inputs to be used to control PATCH CHANGE, PITCH BEND and MODULATION on each of the 2 MIDI channels selected.

Note that in this mode the first MIDI channel is the one selected (1-8) and therefore shown in the display, the second channel is the next one up (2-9). MIDI Instruments connected may be set to receive on either channel.



N is channel number selected from 1 to 8

### DUAL MODE & CONTROLS

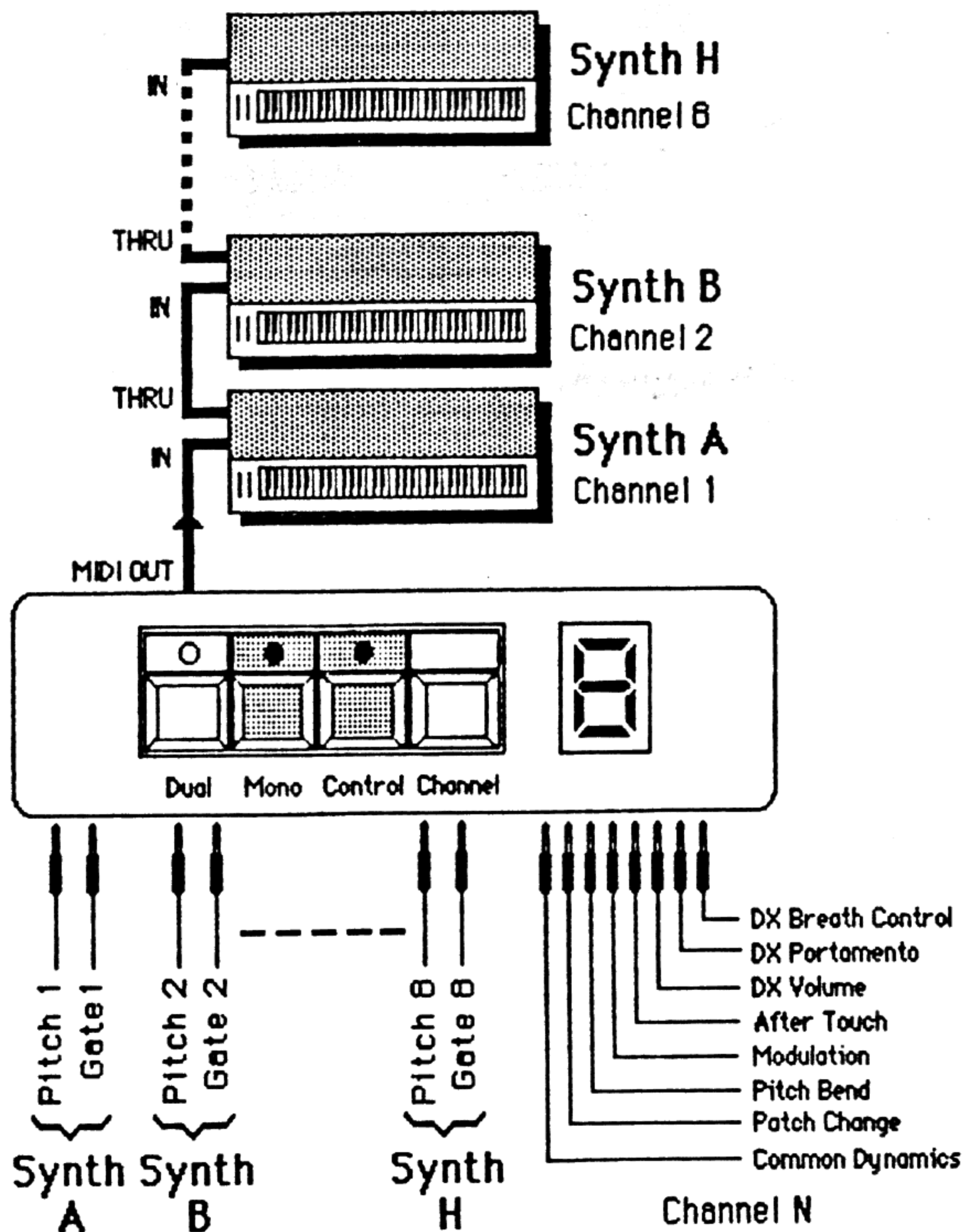
Control of 4 voices polyphonically on each of 2 MIDI channels

## 2.6 MONO MODE with Controls

Pressing "CONTROL" on the operating panel with "MONO" on , puts the interface into MONO mode with 8 CONTROL Inputs.

Eight separate Pitch and Gate Inputs can be converted and transmitted on MIDI channels 1 to 8 , with the dynamics for all notes determined by the level of Control Input 1. The other 7 Control Inputs can be used to control parameters of the MIDI Instruments connected.

Note that all of the Control Inputs are transmitted on one MIDI channel , the one selected and therefore shown on the LED display.



N is the MIDI channel selected from 1 to 8

### MONO MODE & CONTROLS

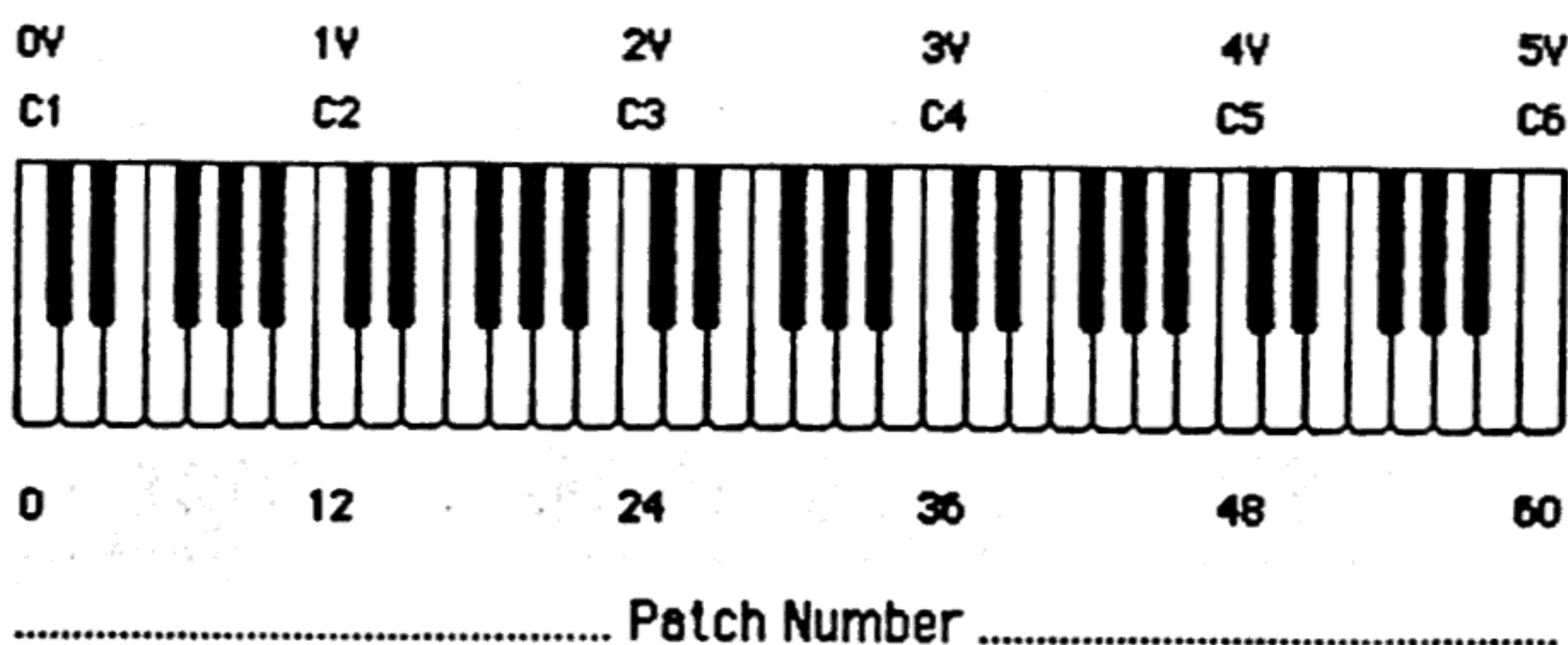
Control of 1 voice monophonically on each of 8 MIDI channels.

### 3) Control Inputs

#### 3.1 PATCH CHANGE

Any change in the level of an analog signal applied to this input will cause a MIDI "PATCH CHANGE" event. This will occur in semitone (12th of a volt) steps, thus allowing 61 Patches to be selected. Therefore Patch 0 is transmitted with 0V input and Patch 60 with 5V input.

It is suggested that you do not change PATCH at the same time as sending a NOTE ON EVENT. The receiving instrument will then have its audio channel open while it is recalling the new patch, resulting in unpredictable noises from the output!



#### 3.2 PITCH BEND

Any change in the level of an analog signal applied to this input will cause a MIDI "PITCH BEND" event, simulating the effect of moving the Pitch Bend Wheel (or controller) on the receiving instrument. In this case Pitch Bend is always upwards relative to the notes being played.

The amount of Pitch Bend Upwards will vary from 0% with 0V input to 100% with 5V input. This amount is expressed as a percentage since the overall range of Pitch Bend will be as set on the receiving MIDI Instrument.

#### 3.3 MODULATION

Any change in the level of an analog signal applied to this input will cause a MIDI "MODULATION Control Change" event, simulating the effect of moving the Modulation wheel (or controller) on the receiving instrument.

The amount of Modulation will vary from 0% with 0V input to 100% with 5V input. This amount is expressed as a percentage since the overall range of modulation will be as set on the receiving MIDI Instrument.

### 3.4 AFTER TOUCH

Any change in the level of an analog signal applied to this input will cause a MIDI "AFTER TOUCH or Channel Key Pressure" event , simulating the effect of pushing down on the receiving instrument's keyboard. Obviously instruments connected which are not capable of responding to After Touch will ignore this event.

The amount of After Touch will vary from 0% with 0V input to 100% with 5V input. This amount is expressed as a percentage since the overall range , and destination , of After Touch control will be as set on the receiving MIDI instrument.

### 3.5 DX PARAMETERS

The following control inputs are for use with the YAMAHA DX range of Instruments. Note : other manufacturer's instruments may recognise these MIDI transmissions , but interpret them in different ways.

#### 3.5.1 DX VOLUME

Any change in the level of an analog signal applied to this input will cause a MIDI " VOLUME Control Change" event , simulating the effect of adjusting the overall volume level of the DX Instrument.

The Volume will vary from Minimum with 0.04V input to Maximum with 5V input. Note that the AMI will transmit an event with Maximum Volume for 0V input. This prevents the receiving instrument from being silenced when there is no Control Voltage present.

#### 3.5.2 DX PORTAMENTO

Any change in the level of an analog signal applied to this input will cause a MIDI "PORTAMENTO Control Change" event , simulating the effect of changing the amount of Portamento on the receiving instrument.

This amount will vary from fast , or minimum , with 0V input to slow , or maximum , with 5V input.

#### 3.5.3 DX BREATH CONTROL

Any change in the level of an analog signal applied to this input will cause a MIDI "BREATH CONTROL Control Change" event , simulating the effect of blowing into the receiving instruments Breath Controller.

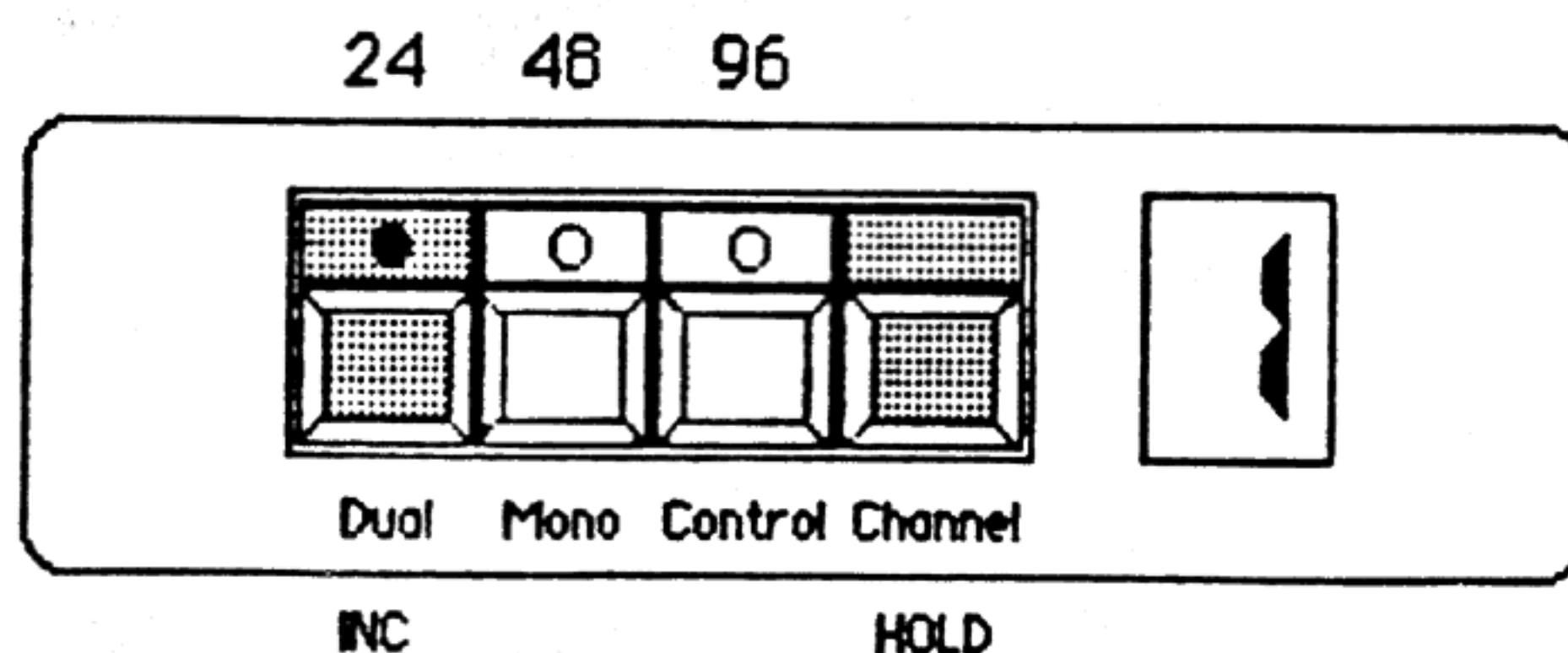
The amount will vary from 0% with 0V input to 100% with 5V input. This amount is expressed as a percentage since the overall range , and assignment of Breath Control will be as set on the receiving instrument.

## 4) Sync Inputs

Sync signals can be applied to the two inputs on the back panel , "Clock" and "Start/Stop".

### 4.1 CLOCK INPUT

The Clock signal can range from 3V to 15V in level and can be 24 , 48 or 96 pulses per quarter note (ppqn). The rate is divided internally to the 24 ppqn MIDI rate. To set the clock divisor , hold down "CHANNEL" and press "DUAL" to cycle through the 3 rates indicated by the LED in each switch. The set rate can be checked at any time by simply holding "CHANNEL". On power up the unit defaults to 24 ppqn.



### 4.2 START/STOP INPUT

The Start/Stop input is only required for equipment having a Clock output which runs all the time , such as that found on ROLAND equipment. When this input is at 0V , or low, the Clock input will be disconnected , or gated . When in the range of 5-15V , or high , the Clock is connected.

If no Start/Stop signal is present the Clock input is connected. This is the case with Drum Machines such as LINN , E-MU and OBERHEIM which have no Start/Stop output.

### 4.3 REAL TIME EVENTS

When the Clock is first detected a MIDI "START" event is transmitted , immediately followed by a MIDI "CLOCK" event. MIDI "CLOCK" events are then transmitted at 24 ppqn. If there is a gap of more than 0.5 secs between pulses the interface will presume that the Clock signal has stopped and will transmit a MIDI "STOP" event.

These "Real-Time" events have the highest priority in the AMI and will be transmitted at any time regardless of the Mode selected and the inputs connected.

## 5) Calibration

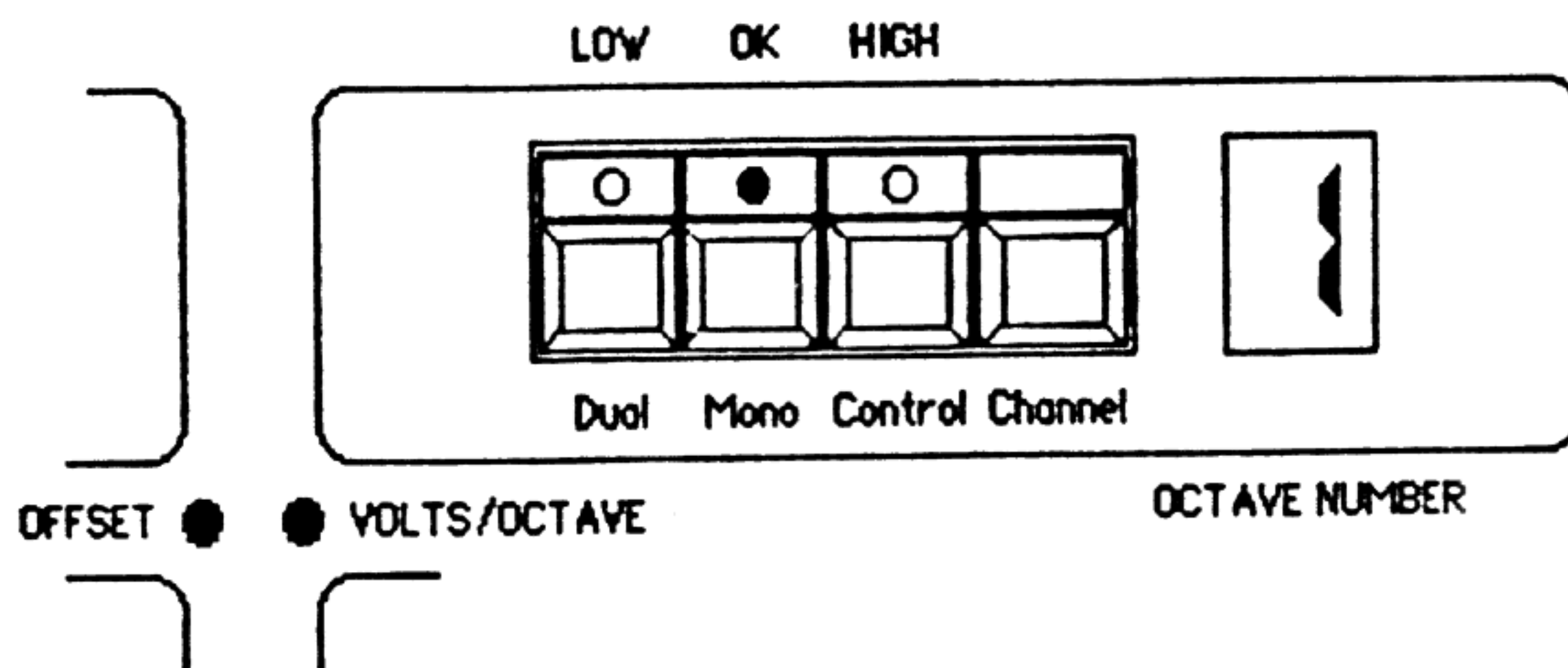
The AMI has two calibration trimmers which may be accessed through holes in the front panel. Positive Offsets in the Control Voltage source may be trimmed out using the trimmer on the left, while Volts/Octave may be adjusted using the trimmer on the right. The unit is supplied calibrated at 1 Volt/Octave with no voltage offsets, that is, C1 equals 0v.

Before any attempt is made to re-calibrate the interface, allow the unit to warm-up for at least 30 minutes then power-off. Hold down any switch on the operating panel and power-up. When the switch is released the display will be flashing, having entered the calibrate mode.

Connect the Analog source which is to be used to Pitch Input 1 and play, or enter, its lowest C. The AMI should respond with a number corresponding to the C1 played. That is, a "1" will be flashing in the display window. If no number is present insert a small Flat-bladed screwdriver into the Offset trimmer (Left hand hole) and turn until the correct number is showing.

The switch LEDs are used to "fine-tune" the input. Only the centre LED on (MONO) means that the input is correct, the left-hand LED (DUAL) means the input voltage is low, while the right-hand LED (CONTROL) means the input voltage is high. Trim until only the centre LED is on.

Now play C6. The number in the display should be 6. If this is not the case, adjust the Volts/Octave trimmer (Right hand hole) until 6 is displayed and only the centre LED is on. Playing all the C's in between should now result in the correct number being displayed for each octave.



Note: Both of the trimmers are 20 turn with no end stops

To exit from calibrate mode press any switch.

## 6) MIDI Data Format

The MIDI events transmitted by the AMI comply with Version 1.0 of the MIDI specification and therefore should be recognised by instruments manufactured after August '83. If you are unsure about the MIDI implementation used in your machine, contact your dealer or local Service Centre.

A more detailed description of the AMI's MIDI Format follows:

NOTE ON	1001nnnn 0kkkkkkk 0vvvvvvvv	n is MIDI channel = 0 to 7 key number = 24 to 84 velocity = 1 to 127
NOTE OFF	1000nnnn 0kkkkkkk 0vvvvvvvv	key number = 24 to 84 velocity = 0
PROGRAM CHANGE	1100nnnn 0pppppppp	program number = 0 to 63
PITCH BEND	1110nnnn 0vvvvvvvv 0vvvvvvvv	LSB value = 64 MSB value = 0 to 63
AFTER TOUCH	1101nnnn 0vvvvvvvv	value = 0 to 127
MODULATION	1011nnnn 00000001 0vvvvvvvv	value = 0 to 127
DX VOLUME	1011nnnn 00000111 0vvvvvvvv	value = 0 to 127
DX PORTAMENTO	1011nnnn 00000101 0vvvvvvvv	value = 0 to 127
DX BREATH CONTROLLER	1011nnnn 00000010 0vvvvvvvv	value = 0 to 127
SYNC	11111010	
START	11111000	
CLOCK	11111000	
STOP	11111100	



## 7) Specifications

INPUTS	PITCH CV's	0-5V
	DYNAMIC & CONTROL CV's	0-5V
	GATE's	0V off , 5-15V on
	SYNC	3-15V @ 24,48 or 96 ppqn
	CLOCK	0V stop , 5-15V start
	START/STOP	
OUTPUT	MIDI	3.125 KBaud serial transfer 1 start bit, 8 data, 1 stop bit
POWER SUPPLY		240V AC @ 50Hz
POWER CONSUMPTION		10W
DIMENSIONS		482 x 88 x 198 mm (WxHxD)
ACCESSORIES SUPPLIED		Mains lead with IEC plug 5 pin DIN to 5 pin DIN lead User Manual

Sycologic reserve the right to change this specification without notice.