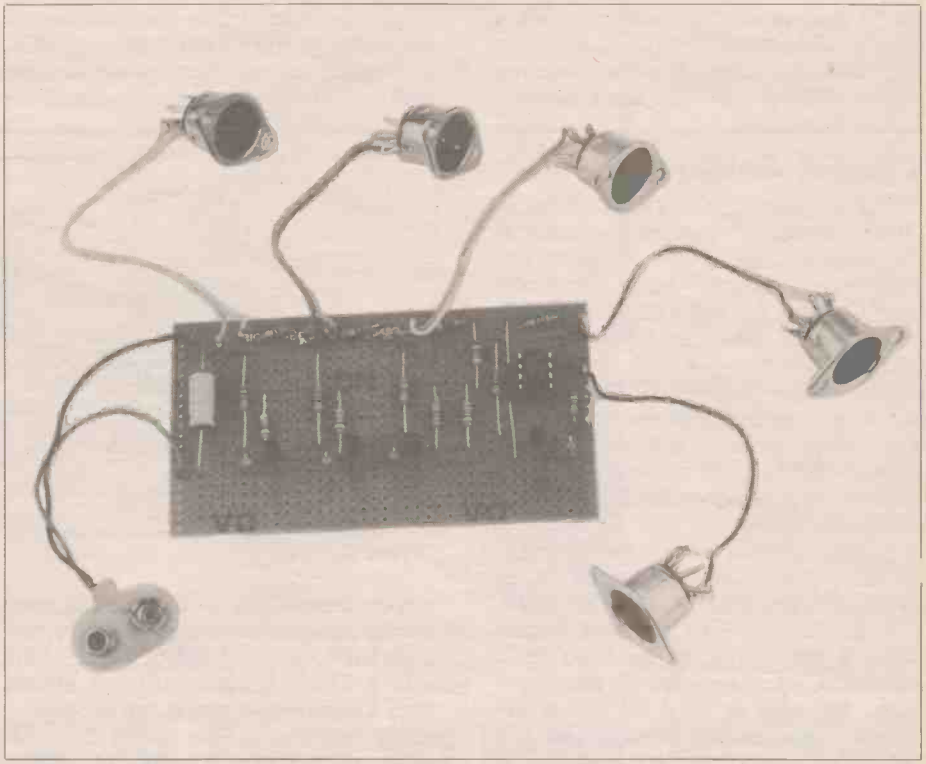
MIDI Thru Box

The standard method of driving pieces of MIDI equipment from a control device is the so-called 'chain' system of connection. This has the 'OUT' socket of the controller connected to the 'IN' socket on one of the other pieces of equipment, and then the 'THRU' socket of this device connects to the 'IN' socket of the next piece of equipment, and so on. In theory, any number of instruments, etc. can be connected together by wiring the 'THRU' socket of one instrument to the 'IN' socket of the next one in the 'chain'. In practice this is not always possible though. There can be problems with what are often called 'delays', but which are more probably problems with smearing of the signal that compromise reliability. At a more basic level, many items of MIDI equipment (especially keyboard instruments) simply do not have a MIDI 'THRU' port, and cannot be used with this method of connection. Actually, if only one instrument lacks a 'THRU' socket it is possible to use the 'chain' system, provided this instrument is placed at the end of the 'chain'. If more than one instrument lacks a 'THRU' port, then the 'star' system must be used.



MIDI 'thro' stripboard layout.

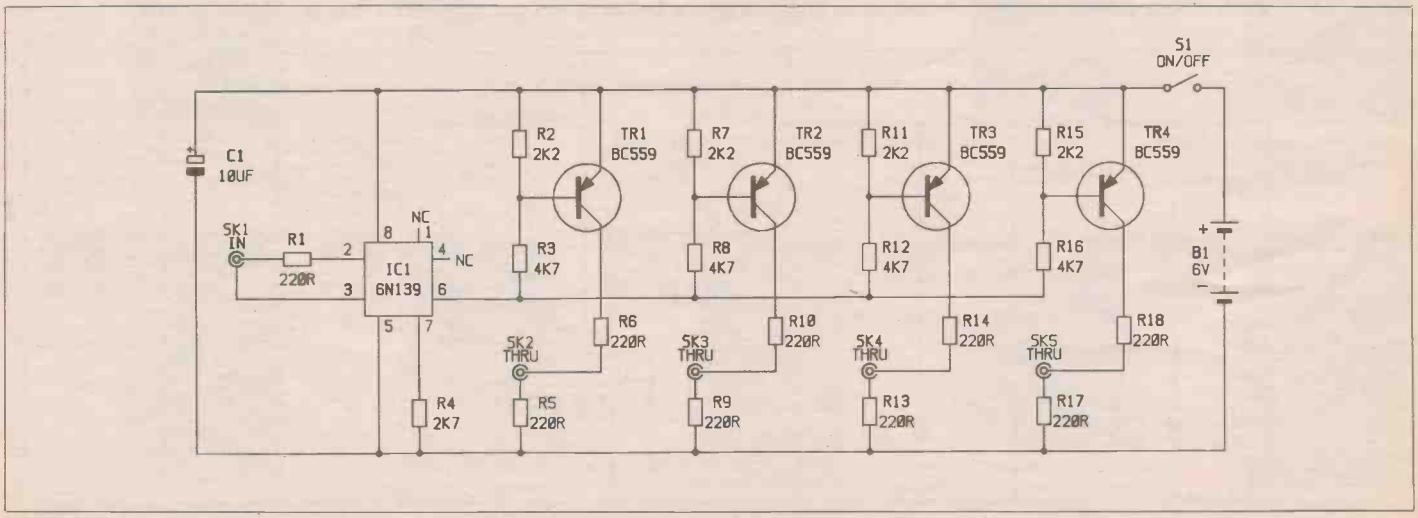


Figure 1. The MIDI 'THRU' circuit.

It is only possible to adopt the 'star' system if the MIDI controller has multiple outputs, or a 'THRU' box is included in the system. This method of connection relies on the controlling device having an 'OUT' socket for each MIDI input that must be driven. A 'THRU' box simply takes the signal from a MIDI output and splits it to give a number of 'THRU' outputs to drive the inputs of the other equipment in the system. A 'THRU' box cannot be a passive device as a MIDI output only provides a drive current of 5 milliamps, and splitting this between several inputs would give an insufficient drive current for each one.

In this circuit, shown in Figure 1, an opto-isolator is used at the input. This is not strictly necessary as there is no need for a 'THRU' box to provide isolation, but MIDI outputs are designed to drive an opto-isolator, and this method ensures reliable operation with any output that properly meets the MIDI standard. The 6N139 used in the IC1 position is not a simple LED/transistor type, but on the output side actually has a photo-diode, an emitter follower transistor, and a common emitter output stage. This gives high efficiency and fast operating speed. The circuit can comfortably accommodate MIDI's fairly high baud rate of 31250 baud, R4 ensures that the emitter follower stage operates at a reasonable current and that the device achieves a suitable fast switching speed. The 5 milliamp drive current is set partly by R1, and partly by a series resistor in the drive circuit.

On the output side of the circuit there are four common emitter switching transistors, with each one driving a separate 'THRU' socket. Two current limiting resistors are used in each output circuit, and this two resistor system gives better protection to the circuit in the event of a system being incorrectly wired up, or a fault occurring. Four output stages are shown in the circuit diagram, but IC1 is capable of driving several more output stages if necessary. Power is provided by a 6 volt battery (such as four HP7 size cells in a plastic holder). The quiescent current consumption will probably be negligible, but under worse case conditions the average current drain could be as much as 2.5 milliamps per output that is actually used.

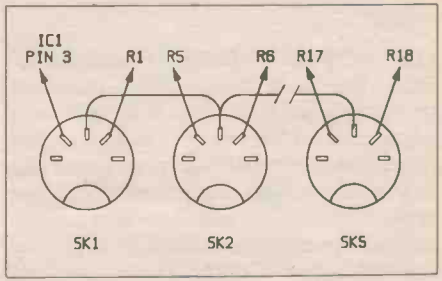


Figure 2. Socket connections.

The standard MIDI connectors are 5 way (180 degree) DIN plugs and sockets. Provided you use the appropriate type of socket connected in the manner outlined in Figure 2, the 'THRU' box can be wired into the system using standard MIDI leads. If you make up your own leads, twin screened cable is required. Pins 2, 4, and 5 on one plug are connected to the corresponding pins of the other plug, with the screen carrying the connection between the two pin 2s. Note that some audio 5-way DIN leads use cross coupling and are unsuitable for MIDI applications.

MIDI THRU BOX PARTS LIST

RESISTORS: All 0.6W 1% Metal Film			
R1,5,6,9,10,13, 14,17,18	220Ω	9	(M220R)
R2,7,11,15	2k2	4	(M2K2)
R3,8,12,16	4k7	4	(M4K7)
R4	2k7	1	(M2K7)
CAPACITOR			
C1	10μF 25V Axial Electrolytic	1	(FB22Y)
SEMICONDUCTORS			
IC1	6N139	1	(RA59P)
TR1,2,3,4	BC559	4	(QQ18U)
MISCELLANEOUS			
SK1,2,3,4,5	5-way (180°) DIN Socket	5	(HH34M)
S1	SPST Ultra-min Toggle	1	(FH97F)
B1	Battery 1.5V	4	(FK55K)
	8-pin DIL Socket	1	(BL17T)
	Battery Holder	1	(HF29G)
	Battery Connector	1	(HF28F)