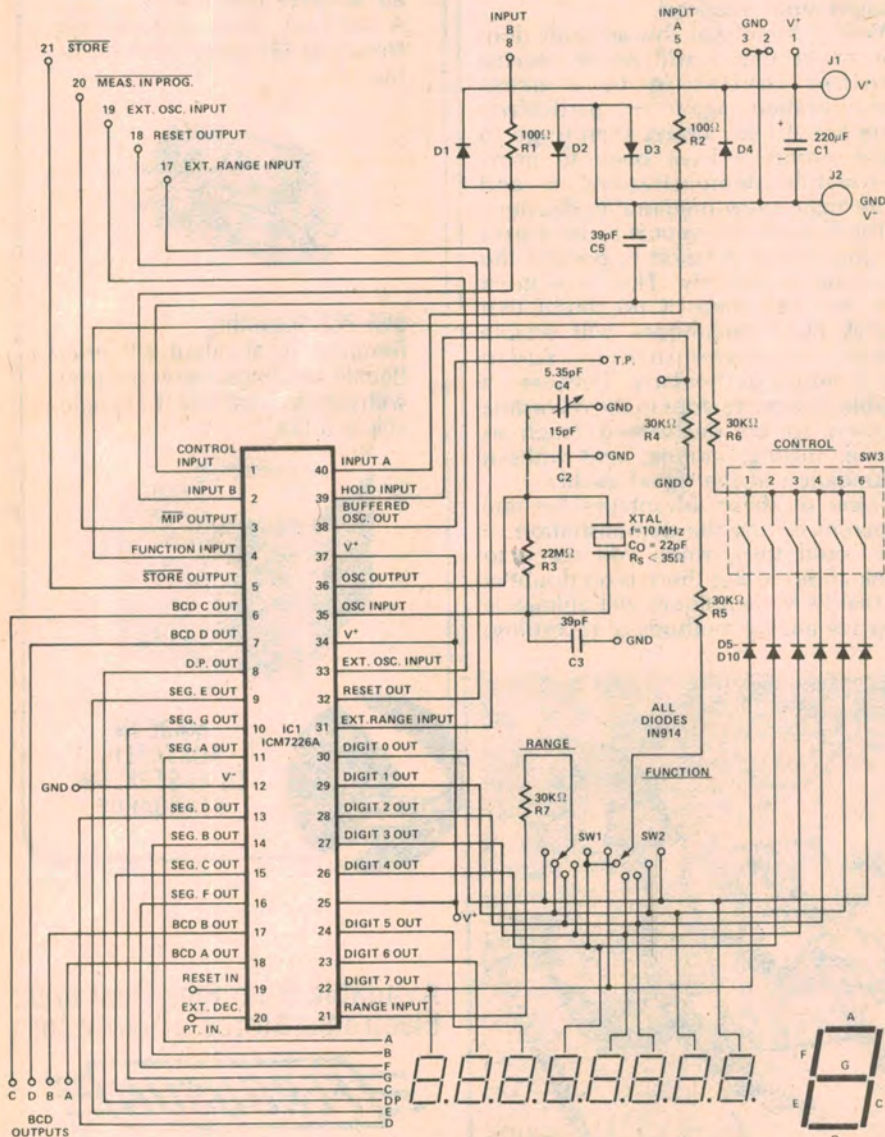


Now you can build a "no-holds barred" counter

Intersil ICM 7226 Universal Counter kit

Intersil Incorporated have released a range of universal counter integrated circuits. These ICs contain just about all the circuitry required for a full frequency counter. As promotion for the new devices, Intersil have introduced an evaluation kit which contains most of the components for a frequency counter, including eight LED readouts.

by JOHN CLARKE



This is the circuit on the Intersil ICM 7226 evaluation kit PCB.

Recognising that it could take some time for designers to become fully familiar with this range of highly complex counter IC's, Intersil decided to give them a boost by producing an evaluation kit, based on the ICM 7226A. This is an eight digit, 10MHz counter IC with leading zero blanking and its own internal timebase circuitry.

Let's discuss the 7226 chip first and find out what it contains and what it can do. Then we will go on to discuss the 7226 evaluation kit and how it can be made up to produce a high performance frequency counter.

The 40-pin 7226 can perform the functions of frequency counter, period counter, unit counter, frequency ratio or time interval counter. As well as measuring frequencies up to 10MHz or more, the 7226 will measure periods from 0.5 microseconds to 10 seconds.

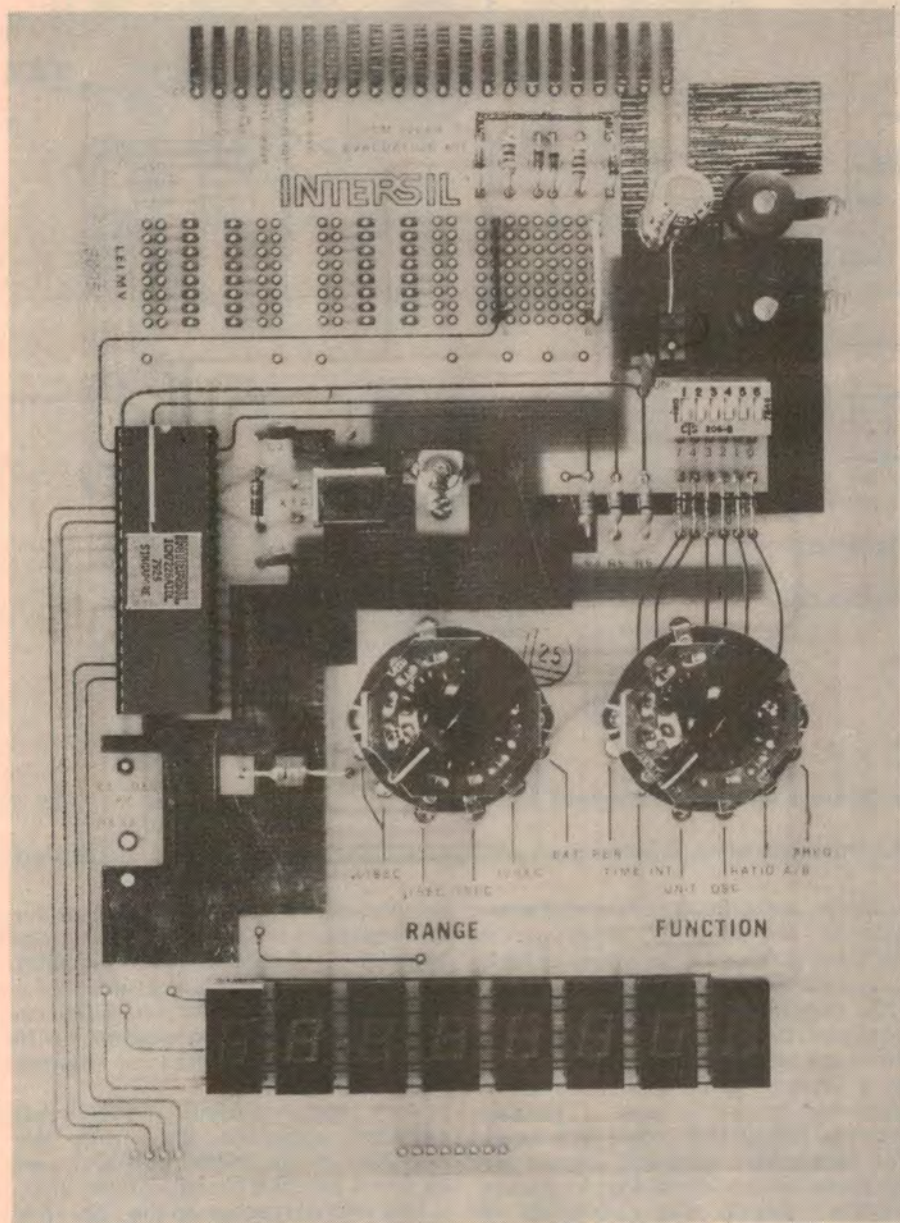
With an eight-digit display, high resolution measurements are possible. In the period and time interval modes, the resolution is a minimum of 0.1 microsecond (ie, the highest resolution) while in frequency mode, the resolution is 0.1Hz, for a gating time of 10 seconds. Gating times can be switched to 0.01, 0.1, 1.0 and 10 seconds.

The 7226 drives the segments and anodes of the LED displays directly, without the need for buffer transistors. The displays are multiplexed, which reduces the number of display output lines required from 72 to 16 (includes decimal point). The multiplex frequency is 500Hz and each display has a duty cycle of close to 12½%. There is also an interdigit blanking period of six microseconds to prevent display ghosting.

The timebase oscillator uses a 10MHz crystal. It is also possible to use an external timebase oscillator which must be 100kHz or higher.

There are two inputs to the ICM7226. The A input is for measurement of frequency, period, unit counting, frequency ratios and time interval modes. The B input is for frequency ratio and time interval. Both inputs require a signal swing of at least 50% of the supply voltage, peak-to-peak, and centred about 2.0 Volts for a 5 Volt supply. Any input 0.3 Volts above the supply will damage the circuit.

Intersil ICM 7226



When assembled the PCB looks like this, with a breadboarding area at the top of the PCB.

As well as driving the LED displays, the multiplexed output lines also play a part in the control functions of the chip. Specifically, five input pins are controlled by being connected to a respective digit driver output. For example, by connecting the Function input, pin 4, to one of six designated digit driver outputs, the functions of Frequency, Period, Frequency Ratio, Time Interval, Unit Counter and Oscillator frequency are selected.

The last-mentioned function, "Oscillator frequency" is a checking mode which reads the crystal oscillator — the readout is 10MHz, regardless of the actual crystal frequency.

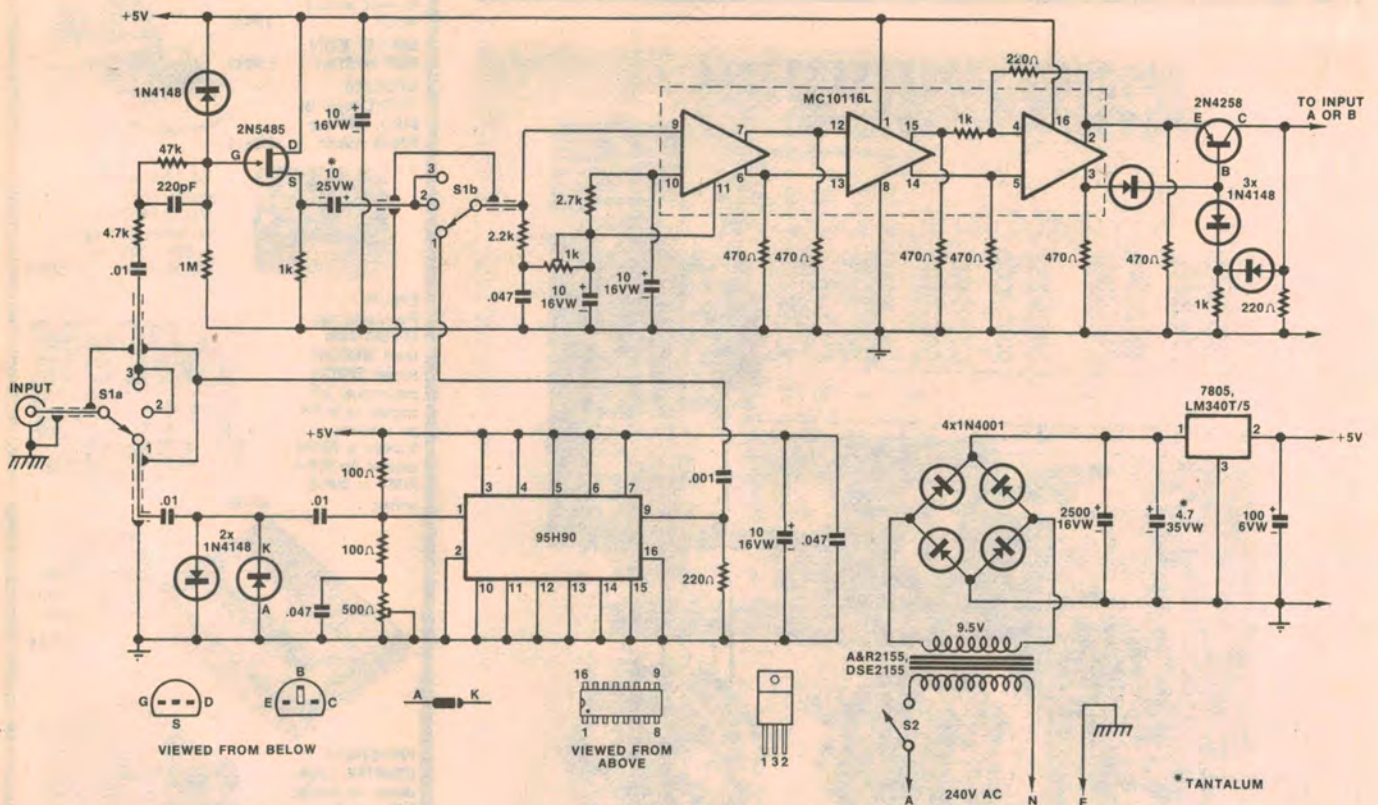
Another of these five multiplexed

inputs is pin 1, designated the control input. This allows the display to be blanked, tested (displays all eights), 1MHz select (instead of a 10MHz oscillator frequency), and three other specialised modes.

Other inputs controlled in this fashion are the Range input, pin 21, External Range input, pin 31 and the External Decimal Point input, pin 20.

Some of the other outputs provided by the 7226 are BCD outputs (four), a buffered oscillator output, a "measurement in progress" output and a reset output.

Well, that should serve as a brief introduction to the functions of the ICM 7226 universal counter IC.



EA PREAMPLIFIER FOR INTERSIL ICM7226A FREQUENCY METER

7/F/-

Suggested input circuitry and power supply for the Intersil kit. If both inputs are required, the preamps must be duplicated.

Comprehensive information is provided in the 7226 evaluation kit which also provides a PCB, the 7226 chip itself in a ceramic dual in-line package, a 10MHz crystal, eight seven-segment LED displays plus switches, diodes, resistors, capacitors and a few other bits and pieces.

The kit is quite simple to construct and takes only about one hour to put together. The range and function switches are mounted directly on the double-sided PCB which also carries the switch labelling. A miniature DIP switch provides the control functions, which were briefly mentioned above.

Power supply requirements for the 7226 evaluation kit PCB are 5 volts at 300 milliamps or more. Before connecting the power, the 7226 should be checked for correct orientation in its socket. If a mistake is made in this regard, it is the one sure way to destroy the chip. In other respects the chip is well protected.

The input pins are protected against static discharge and inputs A and B are each protected by an on-board resistor-diode network.

With power applied to our evaluation PCB we were able to run through the test modes to confirm that the circuit was operating correctly. All the displays were functional as well as the function operations. The displays,

however, are difficult to read and some type of red filter is necessary. A circularly polarised filter would be best.

As it stands, the counter inputs of the 7226 require signals that are TTL-compatible. This is the one shortcoming of all these counter chips — a separate preamplifier circuit is required. Intersil suggest a preamp based on the 10116 ECL chip. We can go one better than that and suggest the front-end of our seven-digit frequency counter, which was published in August 1978 (File No 7/F/24, 25).

The front end comprises a FET source-follower and the ECL 10116L. The 10116L is a triple differential amplifier with complementary outputs. As connected, the device amplifies and squares the signal. The ECL to TTL interface is done with the PNP transistor, 2N4258.

As an option, you could use the 95H90 divide-by-ten prescaler, which is also shown on the front-end circuit. Since the 7226 will count up to 14MHz (typically) by itself, the addition of the 95H90 would produce a counter capable of operation up to 140MHz (again, typically).

Finally, shown on the same circuit is a suggestion for a suitable power supply using a commonly available multi-tap transformer driving a bridge rectifier from a 9.5V tap. The output of the

rectifier is filtered by a 2500µF capacitor and fed to a three-terminal regulator to produce 5 volts DC. The regulator should have a suitable heatsink.

A breadboarding area is provided on the PCB. There are two locations for 16 pin IC's and a pad area for discrete components.

With some difficulty, the input circuitry suggested here with the exception of the 95H90 prescaler, can be wired into this breadboarding area.

Our overall reaction to the 7226 kit is a little mixed. As a vehicle for introducing the capabilities of the 7226 chip it is fine. But the PCB itself seems to have been almost deliberately designed to be as inflexible as possible. This means that the kit is less attractive as a basis for a practical instrument than it otherwise would have been.

Nevertheless, as an approach to obtaining a highly flexible frequency counter which provides variable gating times, period, interval and the other functions, it must be regarded as very good value.

Our sample of the Intersil ICM 7226 evaluation kit came from Radio Despatch Service, 869 George Street, Sydney, NSW 2000. The kit is priced to sell at \$84.00. Radio Despatch Service can also supply all the parts for the suggested input circuitry and power supply.