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A Programmer for the 68HC705C8 MicroController

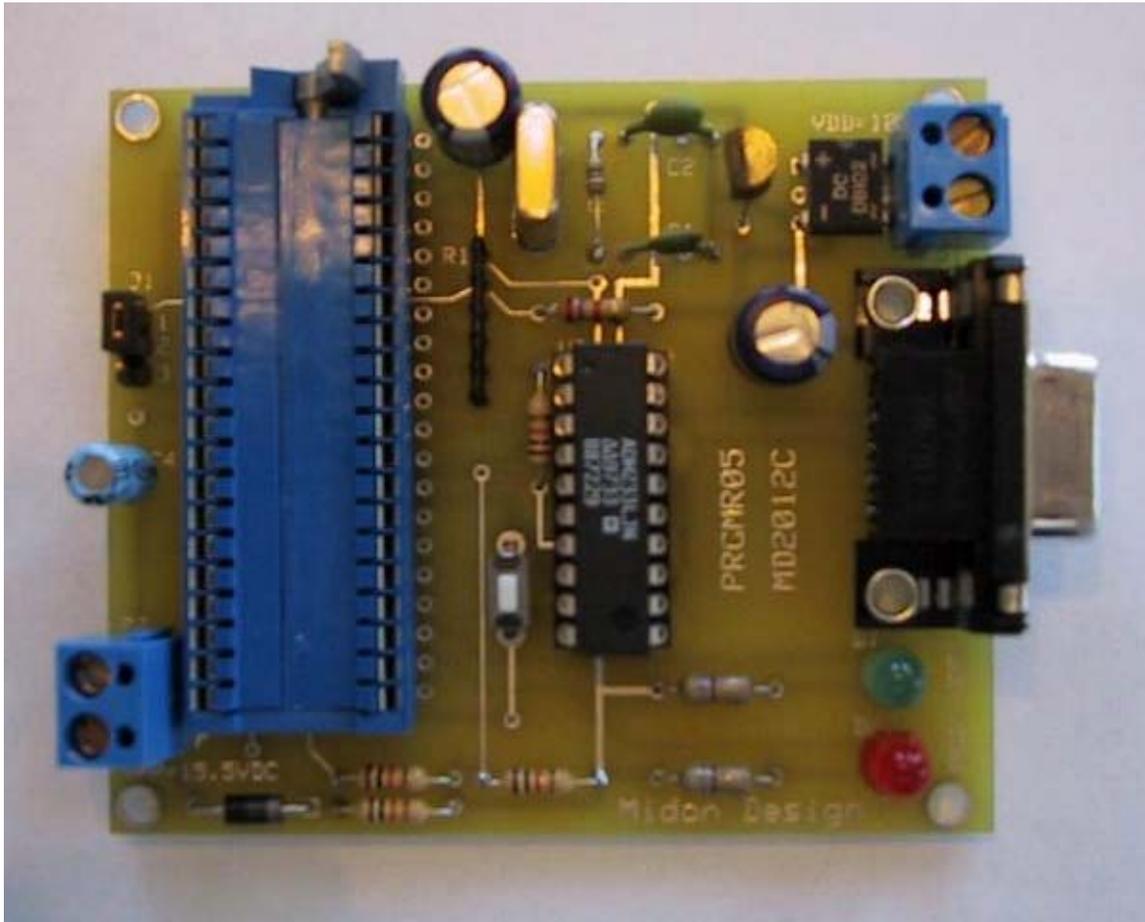


Figure 1 PROG05 As Built

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1. Introduction

This programmer is used for programming the Motorola 68HC705C8 (or C8A). The 68HC705C8 has the following attributes;

- 8K bytes of internal EPROM
- 304 bytes of internal RAM
- 24 user-definable input/output ports
- 7 Input only ports
- Serial Control Interface (SCI)
- Serial Peripheral Interface (SPI)
- 16 bit capture/compare timer system
- Watch Dog timer

This micro-controller is used in numerous projects available from Midon Design. Programming is very straightforward when this programmer is used in conjunction with the easy to use DOS-compatible software also available from Midon Design. Both One Time Programmable (OTP) and EPROM versions of the 68HC705C8 can be programmed with this circuit.

The PC software used to program the micro-controllers was written and developed by Gil Shultz.

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2. Description

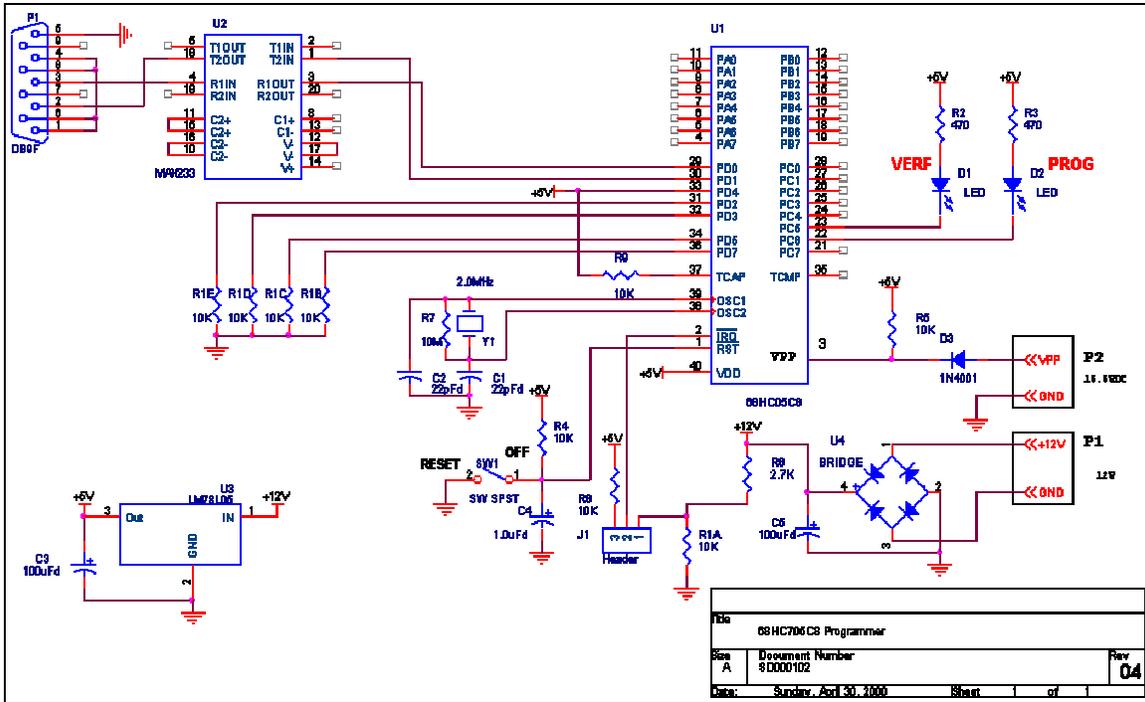


Figure 2 Programmer Schematic Diagram

As you can see from the schematic diagram in Figure 2, this is a very simple circuit built around Motorola's 68HC705C8 8-bit micro-controller. The SCI is connected to a MAX233 serial interface driver from Maxim. This five-volt only device converts the TTL level serial communications to standard RS232 levels through the use of built-in voltage converters. No external capacitors or additional power supplies are required to obtain the ± 12 volts required for standard RS232 levels.

A simple power supply, consisting of U3 and C5, converts 12 volt DC to the 5 volts required for the circuit. A LM78L05 version of voltage regulator was used due to the low power consumption (less than 32mA, worst-case) of the circuit. The programming voltage, 15.5VDC \pm 0.5V, is connected when requested to connector P2.

Two LED's are available to provide a visual state of programming.

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3. Construction

Standard construction techniques may be used for this circuit and a printed circuit board is available if desired. The prototype was point-to-point wired on a Radio Shack prototype PCB (part # 276-168B).

If building the Programmer from the PCB, refer to Figure 3 for component placement. Begin by inserting IC sockets (highly recommended). Follow this with the insertion of all passive components. I like to proceed by inserting all resistors, then all capacitors. Watch the polarity of the electrolytic capacitors. The positive lead of the electrolytic capacitors is the square pad for that component.

There are only 4 types of discrete resistors; 470, 10K, 2.7K and 10M. The color-codes for these are shown in Table 1. Insert the resistors where shown in Figure 3. The SIP resistor R1 should be mounted as shown, with care to ensure pin 1 is oriented to the square pad on the PCB.

Table 1 Resistor Color Codes

Value	1st Stripe	2nd Stripe	3rd Stripe	4th Stripe (Tolerance)
2.7K	Red	Violet	Red	Gold
10K	Brown	Black	Orange	Gold
10M	Brown	Black	Green	Gold
470	Yellow	Violet	Brown	Gold

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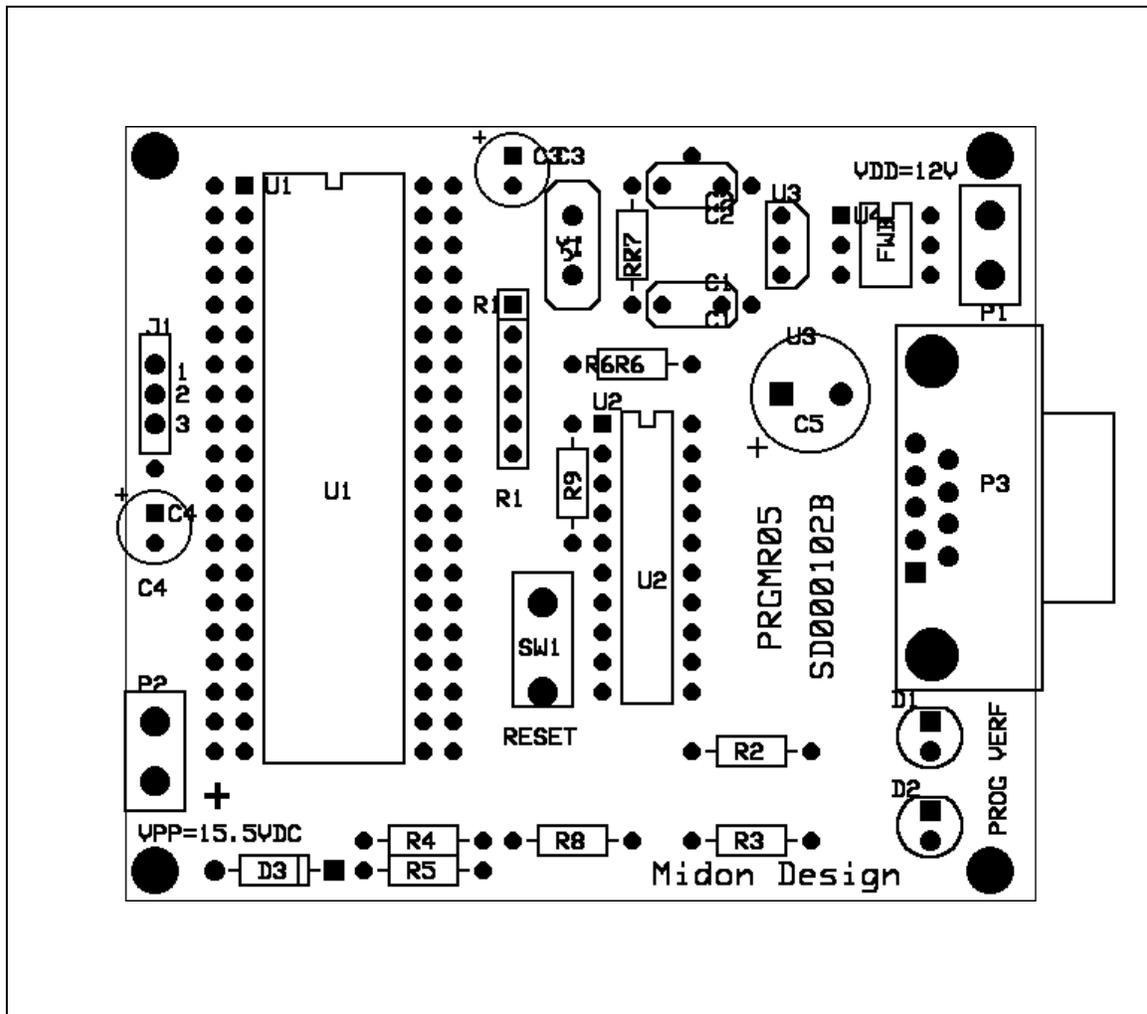


Figure 3 Parts Placement

Next, insert voltage regulator U3. At this time, you should also insert connectors P1 and P2. Once that is done, put down the soldering iron and get out a suitable power supply. Connect the power supply to the terminals of P1, being careful to connect the proper polarity to the correct terminal. Power up and then measure voltages between pins 40 and 20 of IC U1. Pin 40 should be +5 volts while pin 20 is ground. If you are wiring this circuit on your own board, then check polarity on the other IC socket as well. Table 2 shows the voltages required on each IC.

Table 2 Power and Ground Table

IC	+5Volt	Ground
U1	40	20
U2	7	6,9

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Turn off the power and get back your soldering iron. To finish up, insert the crystal, the LED's, the switch and the remaining connector. The flat side of the LED's should be lined up with the square pad for it.

You are now ready to prove in the circuit.

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4. Testing the Circuit

Carefully insert the MAX233 in it's socket, observing polarity while doing so. Insert a blank 68HC705C8. Do not apply VPP programming voltage until told to do so.

Install the PROG07 DOS program on your PC. Connect a serial cable between the PC and the Programmer. Run the PROG7 program. Now power up the Programmer.

Use the C,B (Check, Blink) commands on the PROG7 program to verify that the PC is communicating with the Programmer. The result should be alternating flashing of the PROG and VERF LED's. A failure mode will be indicated on your PC.

If this does not work, verify:

1. that you have a good serial connection between the units,
2. that the PROG7 program is communicating on the correct serial port (the default is COM1).

You can also try pushing the RESET button on the Programmer. If these troubleshooting steps do not work, verify that the Programmer board has the correct components placed and that there are no solder bridges.

If all is now working, you are ready to start programming your micro-controllers! The PROG7 commands are shown in Figure 4.

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<C>heck Programming Module

ESC to exit command! Your choice (D L W P C ? Esc S)?__

Figure 4 Available Commands

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5. Parts List and Suggested Sources

Table 3 Included Parts List

Qty	Designations	Part Number	Description	DigiKey Part #	JameCo Part #
1	C3,5	100uFd	Capacitor, electrolytic, 10uFd	P6239-ND	94289
2	C1,2	22pFd	Capacitor, 22pFd	1358PH-ND	15405
1	D1	LED	Green LED	34761	
1	D2	LED	Red LED	94511	
1	D3	1N4001	1N4001 Silicon Diode	1N4001GICT-ND	35975
2	P1,2	Term	PC Mount terminal strip, 2 pin	277-1027-ND	152346
1	P3	DB-9	DB-9 Female PC Mount connector	A2100-ND	104951
2	R4,5	10K	Resistor, 10K, ¼ W	10KQBK-ND	29911
1	R6	2.7K	Resistor, 2.7K, ¼ W	2.7KQBK-ND	30390
1	R1	10KSIP	6 pin SIP, 10K, ¼ W	Q510K-ND	97826
1	R7	10M	Resistor, 10M, ¼ W	10MQBK-ND	29938
2	R2,3	470	Resistor, 470, ¼ W	470QBK-ND	31165
1	U3	LM78L05	Voltage Regulator	LM78L05ACZ-ND	51182
1	U2	MAX233	RS232 Interface	MAX233CPP-ND	106163
1	Y2	2.0MHz	Crystal	CTX068-ND	102621
1	J1	HDR	3 pin header strip	ED8250-ND	
1	U2	ZIF40	40 pin ZIF socket	A348-ND	102752
1	U7	DIP20	20 pin DIP socket		
1	SW1	SW SPST	SPST mom PCB switch		155256
1	PCB	MD2012	PROG05 PCB – no longer available		

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6. Accessories for this project

12VAC (or DC) adapter Midon Part Number MD3004

PC Programming Software (Prog7) - available from www.midondesign.com web site

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7. Frequently Asked Questions

1. Is a PCB available for this project?
 - A. No – we discontinued this project in 2002 after lack of demand for kits and no longer have stock of the PCB's.
2. Can you provide the PCB design files?
 - A. No – the original PCB was designed using an older, proprietary system and are not available. In Appendix 1 you will find a graphic depiction of the PCB layout should you choose to design your own.
3. Can this programmer program other processors?
 - A. No – the hardware and software design is specific to the 68HC705C8 and 68HC705C8A only.
4. Is the source code available for the programming software?
 - A. No – the source code is property of the original author (not Midon Design).

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8. Legal Disclaimer

YOUR USE OF THIS PRODUCT IS AT YOUR OWN RISK. YOU ASSUME FULL RESPONSIBILITY AND RISK OF LOSS RESULTING FROM THE USE OF THIS PRODUCT. MIDON DESIGN WILL NOT BE LIABLE FOR ANY DIRECT, SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES OR ANY OTHER DAMAGES WHATSOEVER, WHETHER IN AN ACTION BASED UPON A STATUTE, CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION NEGLIGENCE) OR OTHERWISE, RELATING TO THE USE OF THIS PRODUCT.

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9. Appendix 1 – PCB Layout

