

68HC705P9 PROGRAMMER

This Kit is a Programmer board for the Motorola 68HC705P9 series of micro-controllers (uC). The basic circuit is from the Motorola Databook plus a power supply of our own design using the TL497 IC.

Every P9 uC contains a self-programming algorithm inside it so there is no intelligence or programmed EPROM which comes with the programmer. For full information about how it works see the P9 Databook. Some technical information is given below.

We have supplied top quality components in this Kit. The double-sided plated-through hole PCB is routed and has a printed overlay to aid in placing components. Four C&K switches. Two dual-in-line IC sockets are supplied. For volume use of the programmer you should invest in zero insertion force (ZIF) sockets. (Space has been left on the board for ZIF sockets.) The switches are placed so that you just move your finger up or down the three switches on the right of the board to begin or to turn off programming respectively. Space is provided in the corners for four rubber feet (included) or for user-supplied standoffs. All the components necessary to start programming after assembly of the board are supplied.

Assembly.

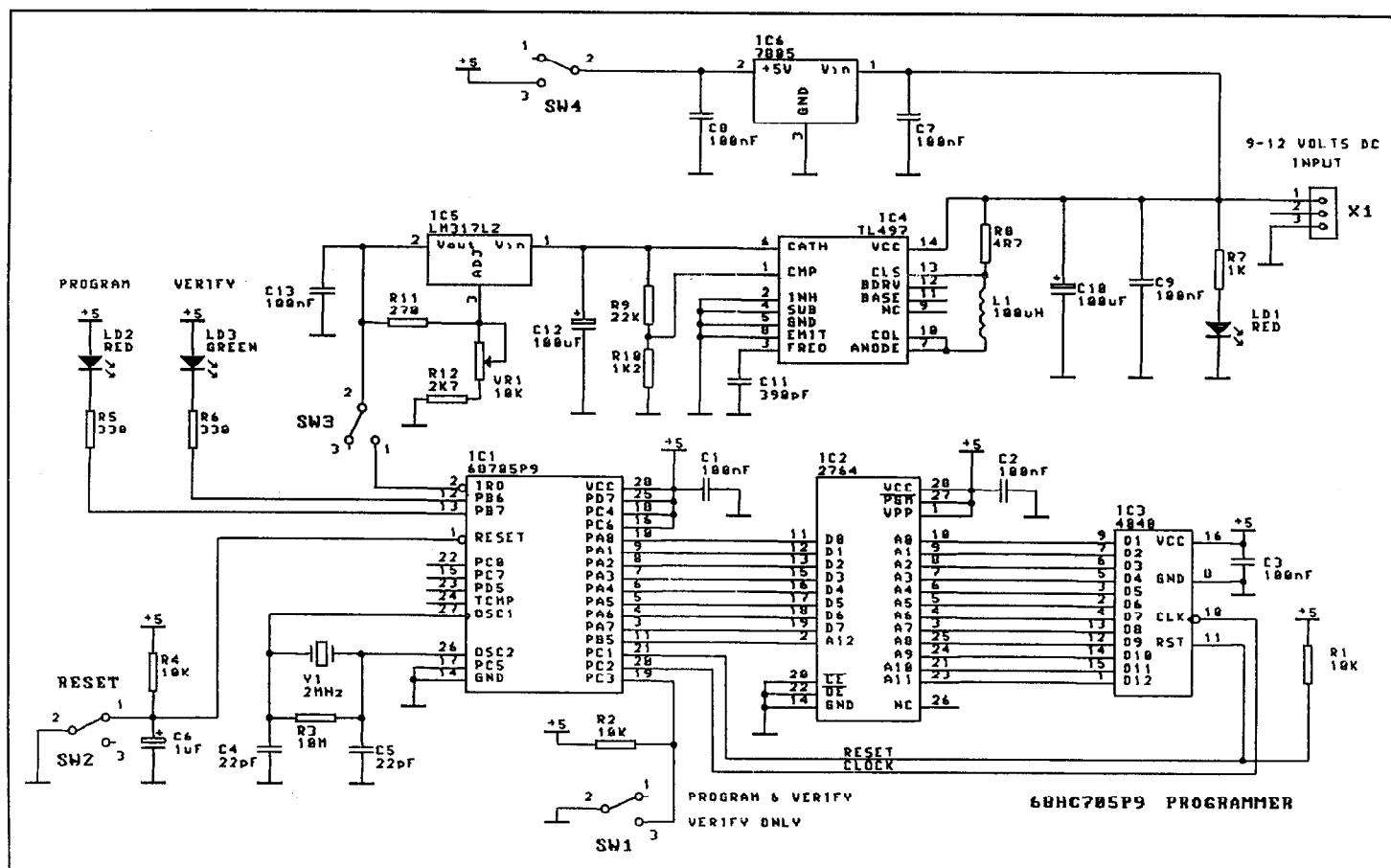
Before commencing any assembly work, please check the PCB thoroughly for any track faults such as shorts and opens. Pay particular attention to the component side of the PCB, especially underneath the 40 pin IC sockets.

Once components have been soldered it becomes very difficult to find PCB faults.

Identify the inductor. It looks just like a 1 watt resistor. It is much bigger than all the other standard 5%, quarter watt resistors in this Kit. The markings are the same as on resistors - brown, black, brown for 100uH. It is generally good practice to insert & solder all the lowest height components first. Note the orientation for the electrolytic capacitors, the ICs, the trimpot and the LED's. Bend the legs of the 7805 using needle-nosed pliers. Do not just solder it into place then push it over; you may break the case where the legs enter it. Screw it down using the nut & bolt provided. Solder in the ZIF sockets last.

Powering up

Use a 9V to 12VDC **regulated** power supply. The centre pin of the jack is positive. Do not go over 12V. The maximum input voltage to the DC-DC converter IC (TL497) is 12V. Also do **not** use a cheap plug pack which is an unregulated power supply. All cheap plug packs if they do not say they are regulated are unregulated and supply a much higher voltage (typically 16V) under low load conditions. This will just destroy the DC-DC converter IC. The maximum current drawn by the programmer will not be over 100mA. (We could have added a 7812 to protect the TL497 and a bridge rectifier to allow a choice of AC or DC input. However, we thought that most users of this kit will almost certainly have a regulated power supply available within arms reach.)



1. Connect a 12 volt DC regulated power supply via jack X1. Led LD1 should light up.

2. Use a multimeter to check the output of the 5 volt regulator. Also check the DC-DC converter by measuring the output voltage on pin 6 of IC4. This should be approximately 22.5 volts.

Setting the programming voltage, Vpp. The programming voltage, Vpp, needs to be adjusted to the correct operating level. The Motorola databook specifies that this voltage is typically 16.5 volts. However, experience has shown that a voltage of 16.7 volts gives more reliable results. This is still within the allowed operating range of 16.25 - 16.75 volts.

A test point has been provided in the lower left hand corner of the PCB to easily measure the Vpp voltage. Connect a multimeter between this point and ground (eg, centre metal tab of the 7805, 5V regulator) and adjust the trimpot, VR1, until this voltage is correct. Preferably use a digital multimeter.

Operating Instructions

1. Select the function required: PROGram or VERify.
2. Put all three switches SW2, SW3 & SW4 in the down position. SW2 to STOP, VPP to OFF & + 5V to OFF.
3. Insert the 2764 EPROM containing the code to be copied or verified into the ZIF socket marked "2764".
4. Insert the blank uC to be programmed into the ZIF socket marked "MICRO". Or, in the case of a verify operation put in the uC to be verified.
5. Now starting from the bottom just switch up all three switches in sequence:
 - turn ON the + 5V supply at SW4
 - then turn ON the VPP supply at SW3
 - then move SW2 to the START position.

It is important that the switches are turned on in the correct sequence. The + 5V must be turned on before the VPP switch.

If the PROGram function is selected, the PROGram led turns on during programming and turns off when programming is completed.

If the VERIFY function is selected, the VERIFIED led turns on if successful.

Once PROGramming or the VERify operation is completed start at the top and switch down all three switches in turn:

- turn SW2 to STOP
- then turn SW3 to OFF
- then turn OFF the + 5V supply, SW4

It is important the switches are turned off in this order.

COMPONENTS

Resistors 1/4W, 5%:

| | | |
|------|----------|---|
| 4R7 | R8 | 1 |
| 270R | R11 | 1 |
| 330R | R5 R6 | 2 |
| 1K | R7 | 1 |
| 1K2 | R10 | 1 |
| 2K7 | R12 | 1 |
| 10K | R1 R2 R4 | 3 |
| 22K | R9 | 1 |
| 10M | R3 | 1 |

| | | |
|---------------------|---------------------|-------|
| 390pF ceramic | C11 | 1 |
| 1uF electrolytic | C6 | 1 |
| 22pF ceramic | C4 C5 | 2 |
| 100nF mono cap | C1 2 3, C7 8 9, C13 | 7 |
| 100uF electrolytic | C10 C12 | 2 |
| 100uH inductor | L1 | 1 |
| Trimpot 10K | VR1 | 1 |
| 4040 12 bit counter | IC3 | 1 |
| TL497 regulator | IC4 | 1 |
| 2.000 MHz crystal | Y1 | 1 |
| 7805 | IC6 | 1 |
| 28 pin IC sockets | IC1 IC2 | 2 |
| C&K Switch | | 4 |
| DC power jack | | 1 |
| 3mm green LED | LD3 | 1 |
| 3mm red LED | LD1 LD2 | 2 |
| LM317LZ regulator | IC5 | 1 |
| Kit 59 PCB | | 1 |
| 14 pin IC socket | | 1 |
| 16 pin IC socket | | 1 |
| Rubber Feet | | 4 |
| Nut & bolt for 7805 | | 1 set |
| Documentation | | |

Some Technical Information. The MC68HC705P9 is a member of the HC05 family of 8-bit microcontrollers from Motorola. The P9 contains 2112 bytes of one-time programmable ROM, and 128 bytes of user RAM. There are 20 bi-directional I/O port pins and one input-only port pin. There is a 4 channel, 8 bit ADC. Single 3.3V - 5.0V supply. See the MC68HC705P9 Data Book from Motorola for full information.

The bootloader ROM located at \$1F00 - \$1FEF contains routines for copying an external EPROM. The bootloader copies to the following addresses:

- \$0020 - \$004F
- \$0100 - \$0900
- \$1FF0 - \$1FFF

The addresses of the code in the external EPROM must match the P9 addresses. Other addresses are ignored.

The bootloader circuit includes an external 12-bit counter to address the external EPROM. Operation is fastest when unused external EPROM addresses contain \$00. The bootloader function begins when a rising edge occurs on the RESET pin while the IRQ/Vpp pin is at VPP, and the PD7/TCAP pin is at logic 1.

The logic states of the PC4/AN2 and PC3/AN3 pins select the bootloader function: program & verify, or just verify. See page 11-3 of the data book for full details.
