

MICRO PROCESS CONTROLLER (MPC)

The MPC is a low cost, easy to use, computer switchgear unit that can be connected to a computer's Centronics Parallel interface. It may be connected in-line with a printer or second MPC. Control of the six independent switched circuits is performed by Electro Mechanical make/break Relays. The use of this type of relay has the advantage of being able to switch a wide range of DC and AC voltages up to a maximum loading of 3 Amps @ 240v AC. They also provide complete isolation from the controller circuitry.

Most applications will require only simple programming techniques. If precision split-second timing is required it may be necessary to produce control programs in low level languages (machine code for instance) Proprietary programs for some machines are available from Di-Ren to suit most applications.

SETTING UP THE MPC

Ensure the computer is switched off. Ensure that the power switch on the MPC is off (right hand switch in the UP position)

The MPC is fitted with 36 way Centronic connectors on ribbon cables.

Data input lead - Short ribbon cable
Data output lead - Long ribbon cable

MPC COMPUTER LINK

Single Unit	Single unit In-line with printer	Two units
Obtain suitable Centronics printer lead. Plug one end into the computer printer socket. Plug the other end into the MPC input socket.	Remove the lead from the printer, plug the printer lead into the mpc input connector, plug the mpc output connector into the printer.	Follow instruction for connecting single MPC. The output lead from the first MPC should be connected to the input connector of the second MPC.

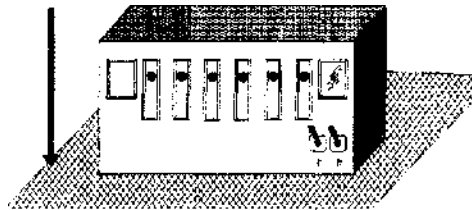
UNIT POWER SUPPLY

Ensure the MPC power switch is Off and all links are disconnected. Connect either a battery or battery eliminator to the unit. If using a battery eliminator ensure the supply is set to between 9-12v DC. Switching on the units power switch will illuminate the green power-on LED. The power input connector is on the right hand side of the unit.

If the green LED does not come on check that the battery is charged, or in the case of a battery eliminator, it is connected to the mains and switched on. Check also the polarity settings.

WARNING

The unit should always be operated in the upright position. When in operation, relays generate heat. The ventilation holes in the rear of the case must on no account be obstructed.



Before removing the back cover of the MPC for any purpose it is essential that the unit is disconnected from ALL power supply lines, including it's own power supply, and most importantly, from the computer.

OPERATION PRINCIPLES

Control of the unit is achieved by sending it a byte (character) of information. The setting of the bits within the byte indicate to the MPC the switch settings required. Bits 0 to 5 correspond to the controllers switches (relays), 0 to 5. If bit 2 for instance is set *ON* then relay number 2 will be activated, switching ON the circuit.

An understanding of binary code is helpful when developing software in order to operate the unit. For those of you who are not familiar with bits and bytes the following explanation may be helpful.

Computers are a mass of electronic switches that each have only two positions; 'ON' (Set) or 'OFF' (Unset). These switches are referred to as bits. If a BIT is SET, the switch is ON and is represented by the value '1'. If OFF (Unset), the BIT is represented by the value '0'

Bits are clustered together in groups of 8. A group of 8 bits is called a byte, or sometimes a character. A maximum of 256 combinations can be achieved by setting the 8 bits to 1 or 0.

For example;	Bit patterns	Decimal Value
	00000001=	1
	00000010=	2
	00000011=	3
	01000000=	64
	10000000=	128
	10000001 =	129

Bits are numbered from Right to Left starting at 0 and finishing at 7. Setting Bit 0 will return a decimal value of '1' (See above). If for example bit 7 and bit 1 are set the decimal value of the byte will be 129 (128+1).

The controller reacts exactly to how these bits are set. Bit 7 (value 128), on the first unit, has to be set to allow any operation to take place. Setting Bits 7 and 2 will switch on the controllers switch number '2'.

Bit number		Controller
76543210	Byte Value	
10000001	=(128 + 1)	Switch 0-ON
10000010	=(128+ 2)	Switch 1-ON
10000100	=(128+ 4)	Switch 2-ON
10001000	=(128+ 8)	Switch 3-ON
10010000	=(128+ 16)	Switch 4-ON
10100000	=(128+ 32)	Switch5-ON

If therefore you add 128+1+2 this will give a decimal byte value of 131 and a Bit pattern of 10000011. Sending CHR\$(131); to the controller will enable switches 0 and 1.

The following *BASIC* routine illustrates the concept. "a\$" is an 8 character string of 1's and 0's representing the 8 bits within the byte. The routine steps through the string and calculates the appropriate byte to be output to the Micro-Process Controller.

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CL8
INPUT a$
REMark  the following procedure calculates the value in a$
REMark  and outputs the result to the screen and output channel
IF LEN(a$)<>8 THEN PRINT "Error": STOP
byte = 0
FOR switch = 0 TO 7 step -1
IF (MID$(a$,switch+1,1)) = "1" THEN byte = byte + 2 ^ (7 - switch)
NEXT switch
PRINT byte
PRINT#Channel,CHR$(byte);

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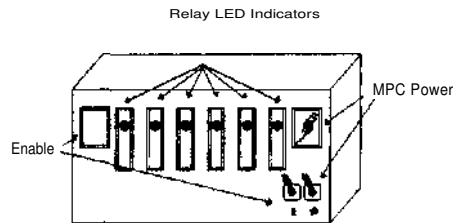
Thus;

a\$= 76543210	Bits set	Decimal value	Relays activated
"10000010"	7,1	130	1
"10000100"	7,2	132	2
"10010001"	7,4,0	144	4,0

It should be noted that on most high level languages, such as BASIC, it is necessary to suppress the line feed/carriage return, which is output after a print statement. This is achieved in the above example by the semi-colon after the "PRINT CHR\$(byte);" command.

GENERAL

As previously discussed, bits 0-5 of the byte controls the units relays. If bit 6 is set, this will invoke a hardware pull off of all relays regardless of the settings of bits 0-5.



The _Enable switch on the unit has three positions.

Down position	Centre position	Up position
In this position the unit intercepts and acts upon bytes whose bit 7 is set. When intercepted these bytes are not available to the next device. This is the normal setting for a single MPC.	All data is ignored by the MPC and is available to the next device.	The unit ignores bit 7 and acts upon all other data sent.

Single unit operation.

The Enable switch should be in the down position. If a printer is fitted in line, all data bytes below the value of 128 will be received by the printer. This feature allows most printers to print draft text. Printer graphics codes are normally above 128. To send codes above 128 the enable switch should be in the centre position. When the switch is in the centre position no data is intercepted by the MPC.

**** IMPORTANT**** If a printer is fitted in line, it must be switched *ON*. Failure to observe this rule will lead to unpredictable switching operations. Printers that are switched off leave their data lines in unpredictable states, to which the MPC cannot compensate.

Double unit operation.

Where two units are connected in-line; the first unit's enable switch should be at the down position, and the second, in the up position.

To enable relays on the first unit (enable switch down), bit 7 should be set in the data byte sent. The second unit will operate on all remaining data (ie; bit 7 not set).

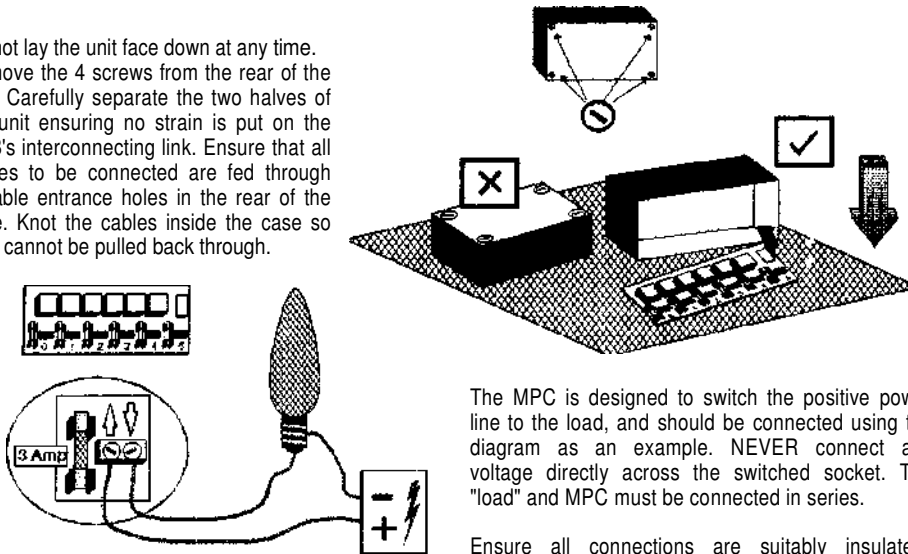
CONNECTING UP

WARNING

Outputs are rated 3 amps (at 240 Volts AC). This must not be exceeded. If connecting Mains Voltages extreme care should be taken to use correct cabling and insulation techniques. If in doubt consult a qualified electrician.

ALWAYS disconnect all power before connecting or handling the MPC or any other electrical equipment. Disconnect the MPC Centronics connectors.

Do not lay the unit face down at any time. Remove the 4 screws from the rear of the unit. Carefully separate the two halves of the unit ensuring no strain is put on the PCB's interconnecting link. Ensure that all cables to be connected are fed through suitable entrance holes in the rear of the case. Knot the cables inside the case so they cannot be pulled back through.



The MPC is designed to switch the positive power line to the load, and should be connected using the diagram as an example. NEVER connect any voltage directly across the switched socket. The "load" and MPC must be connected in series.

Ensure all connections are suitably insulated. Always check your work before connecting power. Re-assemble the case before applying power.

POWER SUPPLY

The unit may be powered by 9 Volt batteries. External power supply units should deliver 9-12 Volts DC with an output of at least 250mA. If using an unregulated PSU, 9 Volts should be selected. For all but the lightest use it is recommended that an external Mains PSU be connected (battery eliminator). Ensure correct polarity connections and supply requirements are observed. The unit is protected against accidental reverse polarity connection.

REMOTE CONTROLLING THE MPC

By far the simplest way to set up remote control is to have the program receiving the remote control instructions set up a file with some appropriate parameters. A suitable background task could periodically test to see whether or not this file exists and if it does, extract and act upon the information, deleting the file upon completion.

CARE OF USE

It should be realised that when working with electricity, mistakes can be damaging and dangerous. Every care should be taken to avoid problems.

Always disconnect the units you are working on from power sources. Double check your work before applying power.

Make sure all links are properly insulated, Remember it may not only be YOU that has access to the link wiring.

Do not operate the MPC with the back cover removed. Do not leave loose wires floating about inside the MPC.

Power Supply Unit (Battery eliminator)

The UK Type PSU supplied from Di-Ren has an unregulated output of 500 mA. This is sufficient to power two MPC's. A connecting lead and adaptor that enables both units to be powered from one PSU are provided.

Set the voltage selector on the PSU to 9 Volts. Ensure that the Polarity selector switch is pushed to the left (the position nearest the side of the case).

Connect the PSU to the MPC(s) BEFORE plugging it in to the mains supply.

NOTICE

Subject to your statutory rights, DI-REN, its employees, associates and distributors etc. cannot be held responsible for any damage, injury or loss incurred through incorrect operation or usage of this product.

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OPTIONAL EXTRAS:

1 & 2 Metre 36 way Centronics printer extension cables UK
type power supply unit (240 volts AC to 12 Volts DC)
3 Amp 20mm Fuses
Control programmes

Manufactured by Di-Ren
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