Specifications (continued)

DIP Switches

Switch 1 : As defined by the application program in the CPU

Switch 2

SW2-1 to SW2-7 : Conet node ID (1 to 127)

SW2-8 : Conet baud rate selection
62 500 baud (Mode N)
7812 baud (Mode S)

Power Consumption (from base)

5 V dc : 170 mA maximum

Environmental

Operating temperature : -25 °C to +60 °C (-13 °F to +140 °F)
Storage temperature : -40 °C to +70 °C (-40 °F to +158 °F)
Humidity : 5 % to 95 % at 40 °C (104 °F) (non-condensing)
Vibration : 10 Hz - 150 Hz, 1 G (9,8 m/s^2)

Mass

Including packaging : 480 g (16,93 oz.)
Excluding packaging : 390 g (13,75 oz.)

Ordering Information

Order Code : M1212

 Data subject to change without notice 98-8952-890-003 Ver. 01

General Instructions

Maxiflex 1000 Series

CPU 8 C

Model No. M1212

General Description

The M1212 is an 8 bit programmable CPU which controls the Maxiflex system. It has a Conet LAN port to provide network communication using the Conet protocol. A DIP switch (Switch 2) is used to set up the Conet parameters.

An application program can be developed on a PC using EziForth (Omniflex's programming language based on Forth) and then downloaded to the CPU using the programming port on the M1212. (RAM is battery backed so that application program variables are not lost on power down).

A serial port, link selectable between RS232 and RS485, is application program dependent and could be used as a printer port or for communication with a third party device.

Data from all the Maxiflex modules can be stored by the application program into a special area of CPU memory called the Data Interchange Table (DIT), which will then be available to any device on the Conet network.

A second DIP switch (Switch 1) is configured by the application program.

Installation Procedure

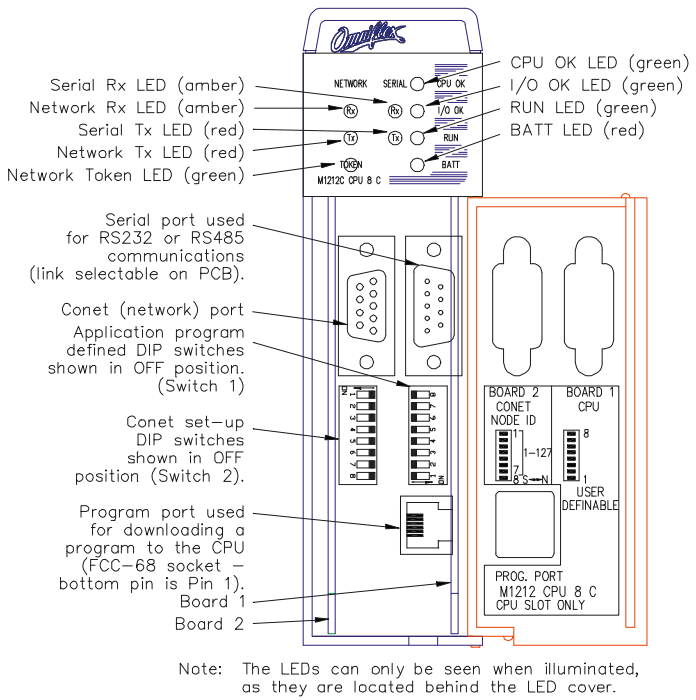
1. Connect up internal battery (see Figure 3).
2. Determine whether RS232 or RS485 communication using the CPU's serial port is required and change links if required (see Figure 3 and section on Links). The PCB must be removed for this.
3. If the CPU is going to be programmed, make up a cable to connect the CPU's programming port to a PC's serial port (see Table 3). Programming port connector supplied. Programming port cable is available as an accessory (Model No. M1831).
4. Set up Conet baud rate and Mode using Switch 2 (see Figures 1 and 2 and section on Switch 2 Set-up).
5. Plug the CPU into the required slot (see section on Module Positioning).
6. Connect up the Conet network to the CPU (see Table 2). Use the Conet termination board (see sections on Conet).

Switch 2 Set-up

Conet node ID - SW2-1 to SW2-7

Each device on the same Conet network is given a unique identity number known as the node ID. The node ID starts from 1 for the first device (node) and increments by one for each node on the Conet network up to a maximum of 127 *ie* node IDs from 1 to 127 are allowed. The node ID is set in binary with SW2-7 the MSB (Most Significant Bit). Refer to Figure 2 for an example.

Figure 1: Layout of the M1212

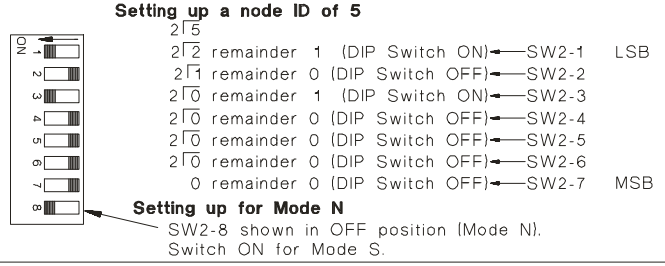


Note: The LEDs can only be seen when illuminated, as they are located behind the LED cover.

Conet Baud Rate - SW2-8

This Switch sets the Conet baud rate. Two options are available: Normal mode (Mode N - 62 500 baud) and Slow mode (Mode S - 7812 baud).

Figure 2: Setting up Switch 2



Specifications (continued)

Diagnostic Indicators (LEDs) (continued)

Serial Rx (amber)	: ON = data is waiting in receive queue OFF = receive queue is empty FLASHING = receive queue is full *2
Network Tx (red)	: Flashes every time a data message is transmitted by the node
Network Rx (amber)	: Flashes every time a data message is received by the node for the node
Network Token (green)	: Flashes at a rate proportional to the speed that the token is being passed along the network
Network fault indication	: All three Network LEDs flash simultaneously if the node ID is set to 0 (ID of 0 is illegal)

Real Time Clock

Resolution	: 10 ms
Battery life	: More than 5 years
Type	: 3,6 V lithium wafer cell - size BEL - model TL-5186

Presentation Layer Services

DIT service

Number of registers	: 3250
DIT access format	: Read DIT, Write DIT, Read DIT Bit, Write DIT Bit, Read Ownership, Set Ownership, Release Ownership

Queue service

Number of Tx queues	: 4
Number of Rx queues	: 4
Number of heads per queue	: 4
Queue size (default)	: One Tx queue - 1500 bytes one Rx queue - 500 bytes
Maximum size (all queues)	: 2000 bytes total

Programming port service

Function	: Allow remote programming/monitoring of the node over the Conet network

Subscriber service

Number of Transmit subscription tables	: 8
Number of Receive subscription tables	: 8

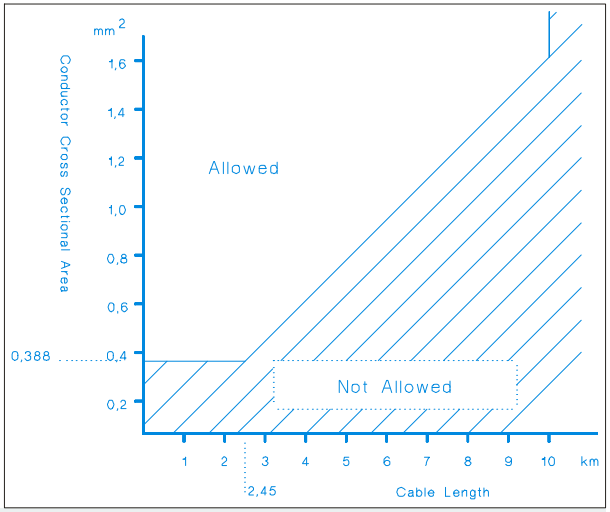
Datagram service

Maximum length of datagram: 248 bytes

2 This signifies an error condition

Specifications (continued)

Graph 1: Required cable cross-sectional-area



Memory

Type : 24 k EPROM
16 k EEPROM
32 k Battery-backed RAM
8 k I/O

Usage

User program	: 16 k EEPROM
User variables	: 10 k Battery-backed RAM
Presentation (DITs & Queues)	: 16 k Battery-backed RAM

Diagnostic Indicators (LEDs)

CPU OK (green) : ON = CPU healthy
FLASHING or OFF = CPU faulty

I/O OK (green) : ON = I/O all healthy
OFF = one or more I/O modules faulty or an incorrect I/O module plugged in or no I/O modules defined in the set-up

RUN (green) : ON = application program running
FLASHING = during program down-load
OFF = no application program or application program not running.

BATT (red) : OFF = Lithium battery healthy
FLASHING = Lithium battery voltage low (<2,6 V [nominal]) or disconnected

Serial Tx (red) : ON = data is waiting in transmit queue
OFF = transmit queue is empty
FLASHING = transmit queue is full *1

1 This signifies an error condition

Figure 3: Link set-up

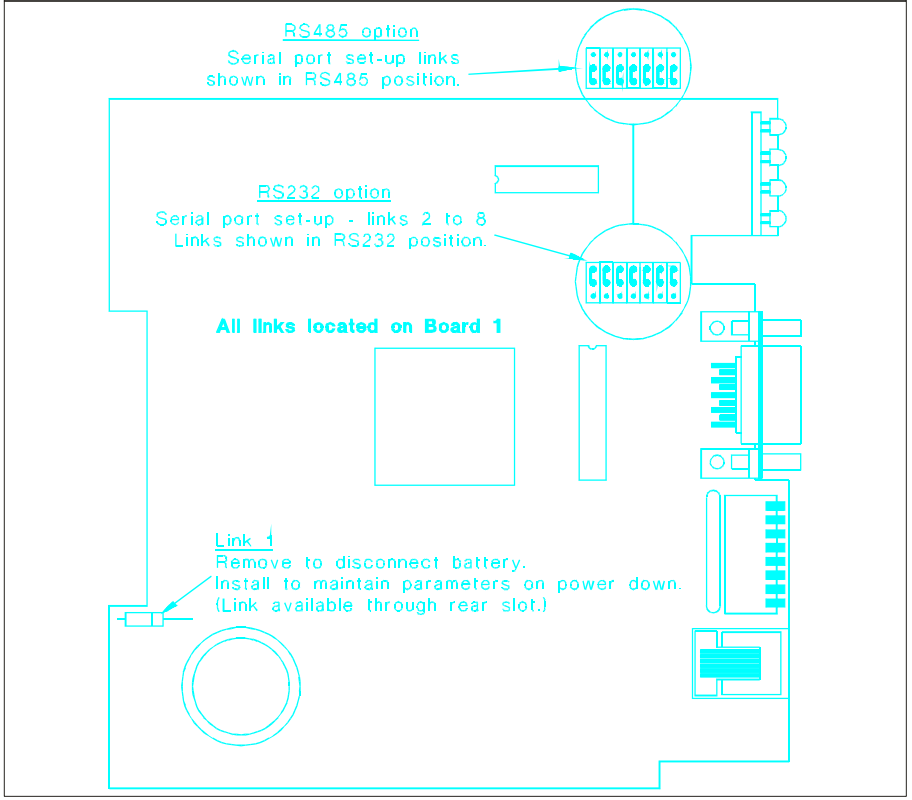
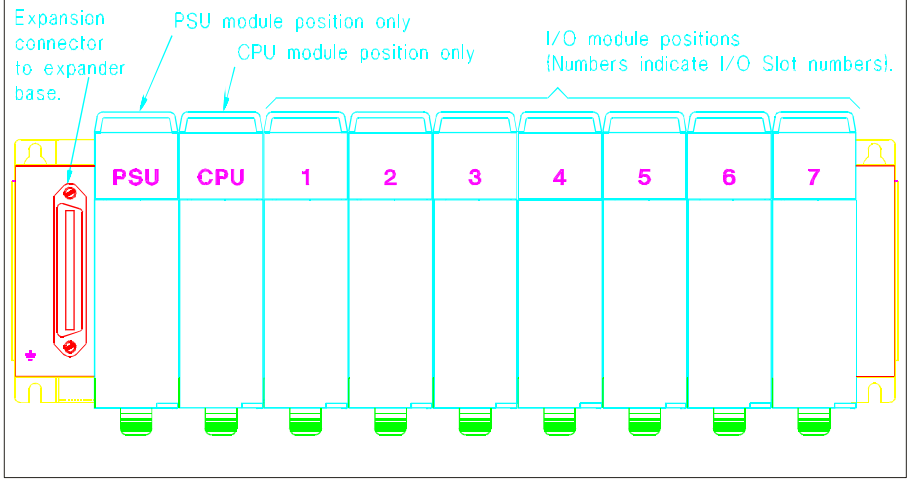


Figure 4: Layout of the 7I/O Master base



Links

To change any of the links (with the exception of Link 1), it will be necessary to remove the printed circuit boards (PCBs). Link 1 is accessible through the rear slot. It is recommended that Link 1 be installed when the M1212 is put into service to maintain parameters when power is removed.

Removing/replacing PCBs

1. Remove top screw and lift off vent cover.
2. Gently ease LED cover and door away from the module.
3. Slide out PCBs.

Replace in reverse order.

Module Positioning

The M1212 module must only be plugged into the CPU position on a Master base.

Refer to Maxiflex Bases General Instruction (P/N 98-8952-930-00X) for more detail on base layout, module insertion and module removal.

Electrical Installation

Table 1: Pin allocation of serial port connector on CPU

Pin number	Mode selected	
	RS232	RS485
1	No connection	RTS+
2	Rx Data	RTS-
3	Tx Data	Ground
4	DTR	Tx Data+
5	Ground	Tx Data-
6	No connection	CTS+
7	No connection	CTS-
8	CTS	Rx Data+
9	No connection	Rx Data-

Table 2: Pin allocation of Conet port connector on CPU

Pin number	Description
1, 3, 4, 6, 7 and 9	No connection
2	Signal +
5	Cable screen (S)
8	Signal -

Specifications

Serial communication port

Parameters	RS232	RS485
Type of transmission	Asynchronous	Asynchronous
Transmission rate	300 to 38400 baud	300 to 38400 baud
Maximum distance	20 m (65 ft.)	1200 m (3940 ft.)
Connection	9 pin sub-miniature D-type male connector	9 pin sub-miniature D-type male connector
Selection	via PCB links	via PCB links

Programming Port

Type of transmission : Asynchronous serial
Transmission rate : 9600 baud fixed
Connection : FCC-68 telephone plug with a two metre long cable to a DB-9 socket for connection to an RS232 port on a PC available as an accessory (Model No. M1831)
Function : Programming only

Programming Language

Type : EziForth
Program editor : EziEdit

Conet Port

Type of transmission : Omniflex Industrial LAN
Connection : 9-way sub-miniature D-type female connector
Isolation : 1500 V_{rms}
Transmission rates : 62 500 baud (Mode N) or 7812 baud (Mode S)
Maximum distance : 10 km (6,2 miles)
Maximum tee-off distance : 20 m (65 ft.)
Line termination : Typically 100 Ω match to Cable Characteristic Impedance
Node ID selection : 1 to 127

Conet Cable Termination

Location : Both ends of the Transmission Line
Value : A 0,5 W non-inductive resistor equal to the cables characteristic impedance

Conet Cable Characteristics

Type : Twisted pair with outer shield
Impedance : Cable characteristic approx. 100 Ω up to 100 kHz
Resistance : Series Loop < 240 Ω
Mutual capacitance : Between pairs <60 pF/m (<20 pF/ft.)
Stray capacitance : Between one conductor and ground <120 pF/m (<40 pF/ft.)
Conductor size : >0,388 mm^2 and <98 Ω/km (30 Ω/1000 ft.)
Refer to Graph 1

DIT Register (continued)

DIT Register (Decimal)	Description	Notes
0003	Node Type	Set to 25 for the *M1212*.
0004 - 0007	Application Name registers 1-4	The Application name is «M1212[space][space]». Each of the four 2-byte registers contain 2 characters giving a total of 8 characters for description.
0008 - 0021	Reserved Registers	Reserved for future development.
0022	System Register	
0023	Alive Counter	In order to detect that the *M1212* is in fact running correctly, an Alive Counter is used which is incremented by *M1212*. If the register is not incremented, then it can be detected that the *M1212* has in fact stopped its program execution.
0024	RTC - Current Year	Real Time Clock. Last two digits of current year. *eg* 93
0025	RTC - Current Month	Real Time Clock. Current month. *eg* 4
0026	RTC - Current Date	Real Time Clock. Current date. *eg* 20
0027	RTC - Current Day of Week	Default value 0
0028	RTC - Current Hour	Real Time Clock. Current hour based on a 24 hour clock *eg* 16.
0029	RTC - Current Minute	Real Time Clock. Current minute. *eg* 40.
0030	RTC - Current Second	Real Time Clock. Current second. *eg* 52.
0031	RTC - Current Millisecond	Real Time Clock. Current millisecond. *eg* 45.
0032 - 0099	Reserved Registers	Reserved for future development.
0100	Start of Data	This is the first data register that may be used by the application program. Any data type may be read or written.
0100-3248	Data	These data registers may be used by the application program. Any data type may be read or written.
3249	End of Data	Last data register available.

Table 3: Pin allocation of DB-9 connector on program cable and FCC-68 socket on M1212

Name	DB-9	FCC-68 Pin No.
Rx Data	2	4
Tx Data	3	1
Ground	5	2
All other pins are no connection		

A program cable with a telephone plug and DB-9 socket used for connection to the RS232 port on a PC is available as an accessory (Model No. M1831).

Conet node connection

To connect the M1212 to the Conet data highway the CONET termination board is used to tee off from the network to the CPU.

Figure 5: Conet termination board

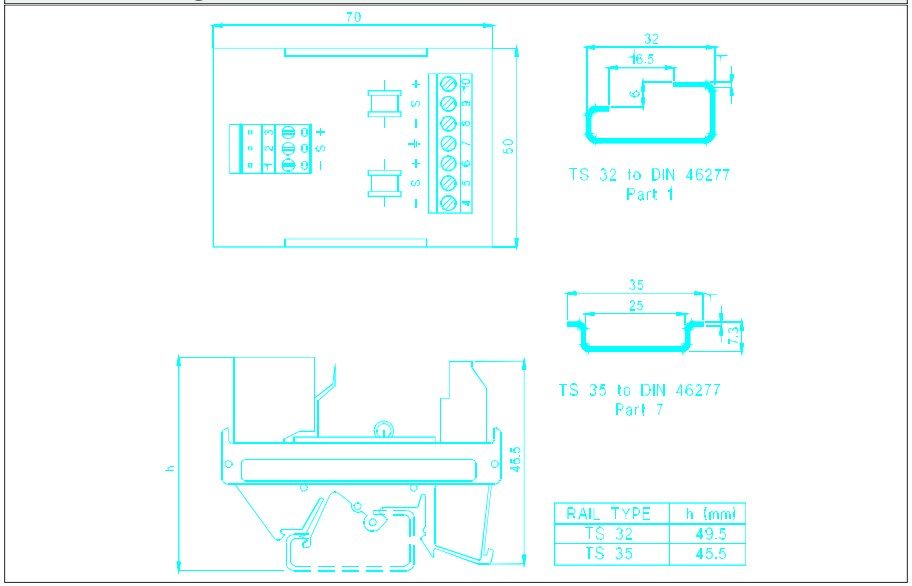


Figure 6 shows the terminal connection for the termination board. If the line is to be terminated, a resistance equivalent to the characteristic line impedance is fitted between terminals 8 and 10 or 4 and 6 depending on which terminals the transmission line is connected to. The network should only be terminated in two positions: at the first node and at the last node.

The Conet connection to the CPU is made to terminals 1 and 3 on the termination board.

Earthing transmission lines

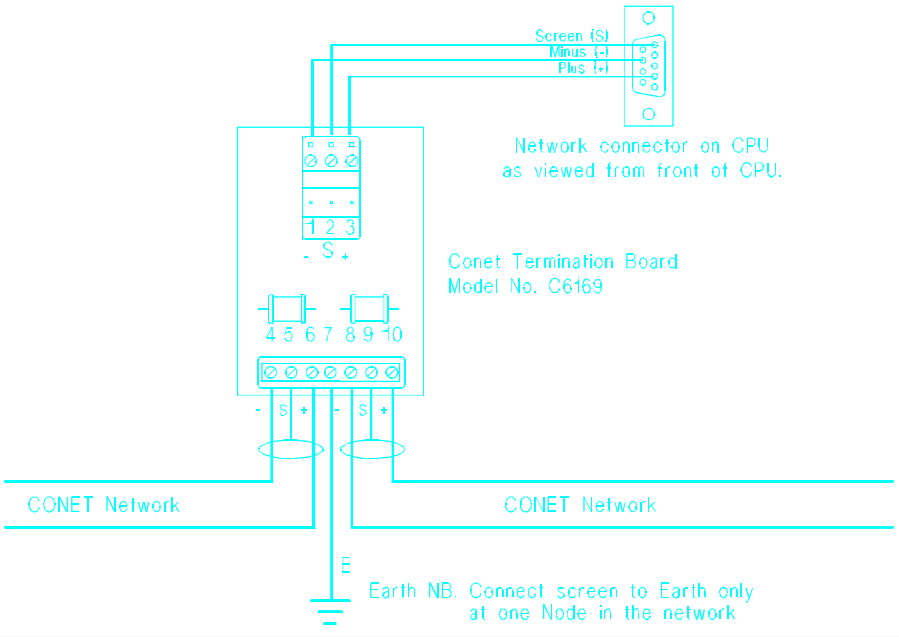
From Figure 6 it should be noted that an earth point, terminal 7, is provided on the Conet termination board for lightning protection. Terminal 7 must be earthed at every node in the Conet network. The screen of the Conet cable should also be earthed at **one** point in the Conet network.

The following guidelines should be adhered to where possible.

Conet recommended installation practices

1. Use a C6169 Conet Termination Board to connect every node to the network. This provides four benefits:
   a. High voltage transient suppression via gas discharge devices and surge arrestors.
   b. Easy loop-through connections via paralleled terminals
   c. Ability to connect and disconnect node via removable terminal block without disturbing network wiring. This can be done while the network is live.
   d. Facility to connect a line termination resistor directly into the unused terminals at each end of the line.
2. Connect a line termination resistor at each end of the network. This is usually 100 Ω 0,5 W, but may be accurately determined using the Conet Line Tester.
3. Earth the Conet screen to a High Quality Earth at only **ONE** point on the network. This prevents ground loops due to differing potentials around the plant. Each C6169 termination board must be connected to a General Local Earth nearby, to provide a discharge path for the gas discharge devices. (See Figure 6).

Figure 6: Conet connections



4. Do **NOT** suspend the cable high above ground in places where it is especially susceptible to lightning strikes.
5. Avoid running the cable next to high voltage carriers, *eg* 6 kV lines as this makes it vulnerable to induced noise.
6. Do **NOT** tee off the main Conet line more than 20 m without using the Conet Active Repeater as this may introduce line reflections and error signals.
7. Assign node IDs in ascending order on the network, beginning with ID 1. The physical location of the node does not make any difference, but Conet works most efficiently when there are no gaps in node IDs and they begin at 1.
8. Test the proposed cable for the installation with the Conet Line Tester **prior** to installing it. This device injects a signal which can be analyzed with an oscilloscope to determine the cable characteristics. Conet is designed to operate on 6 V differential voltage but will operate as low as 600 mV provided the wave-form is not too distorted.
9. Use radio links to aid in commissioning a system which is spread out over a large area. A field telephone may be used with unused pairs in a multi-core cable.

Figure 6 shows a typical connection and earthing arrangement for a Conet Network.

CPU Programming

Take note of the following points when programming the CPU (for further details refer to the CPU programming manual):

1. After the module configuration has been entered, I/O module scanning occurs.
2. The DIP switch on board 1 is application program dependent and could be used to control the baud rate of the serial port.
3. A battery-backed real time clock is used for time-stamping of data. An unconfigured M1212 has the battery disconnected from the memory so it is recommended that the battery be put into service (using Link 1) before programming starts.

DIT Register

The following DIT layout specifies what data will be made available by the M1212.

DIT Register (Decimal)	Description	Notes
0000	Software Version Number	Used as a diagnostic aid.
0001	Last DIT Register Number	Specifies the last DIT register of the entire DIT. This Register is set to 3249 decimal for the *M1212*.
0002	Supported Services Flag	Currently supported Conet Presentation Layer Services in the *M1212*. Each bit of the register signifies a different service. Set to 233 for *M1212*.