Solidyne

MODEM
PC
NETWORK
INTERFACE

The M202 Master Interface Module is an important part of ICMS®, IZAC and Clipper Net® Network. It Provides an Intelligent Serial Interface to Networked Controllers using a direct, PC, or remote, modem, connection. It supervises network activity, modem activation and operation providing reliability for unattended modem operation. It acts as a supervisor, regulating various network functions.
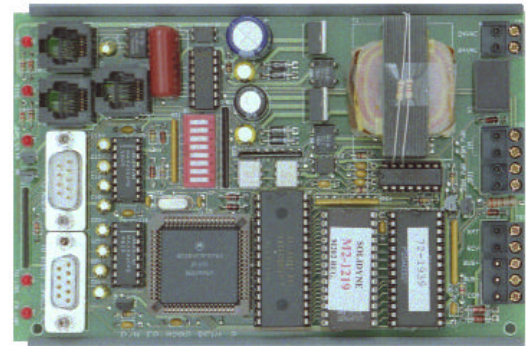
- Optically isolates both Modem and direct PC interfacing to the Network.

- Supervises modem for unattended operations.

- Automatically configures most modems for communication.

- Can communicate at 1200, 2400, 4800 or 9600 baud.

- Buffers all information from the Network to the PC and Modem.

- The Network actively communicates with, and responds to the Network.

- The supplemental operating firmware allows for future expansion and many other supervisory functions.

- It is powered by a 24 VAC source.

Model:
M202

Solidyne

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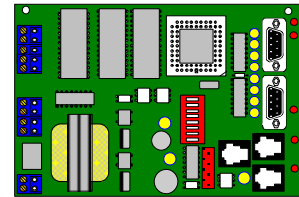
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Model :
M202

FIG. 1 M202 Module, Showing Input Output Connections

A	RS-485 PORT, 3 WIRE NETWORK	K	POWER ON LED
B	2 WIRE NETWORK, CLIPPER LAN	L	PHONE RING LED
C	UART, SERIAL COMMUNICATION	M	MODEM IS ON LED
D	OPERATING FIRMWARE EPROM	N	9 PIN "D" CONNECTOR TO MODEM SERIAL PORT
E	PHONE LINE CONNECTION TO MODEM	O	9 PIN "D" CONNECTOR TO DIRECT PC COM PORT
F	DEDICATED PHONE LINE CONNECTION	P	TRANSMIT DATA TO THE NETWORK BY M202
G	POWER IN FROM MODEM TRANSFORMER	Q	RECEIVED DATA FROM THE NETWORK
H	POWER OUT TO MODEM	R	FUTURE HAND HELD PROGRAMMER CONNECTION (DU-1)
I	24 VAC INPUT POWER CONNECTION TO M202	S	24 VAC ISOLATION TRANSFORMER
J	8 POSITION PROGRAM DIP SWITCH	T	MICRO CONTROLLER IC

OPERATION :

The M202 Master Interface Module provides a communications interface to the IZAC and/or Clipper Net Building Automation System. Fig. 1 shows the details of M202 module. The M202 is designed to connect the Network directly to a PC and/or Modem. This module will convert the RS - 232 signals from the Modem or PC into 2 - wire bi-directional or 3 - wire RS - 485 signal (Fig. 1 A, B). These serial connections are optically isolated for reliability of the Network and overall System operation.

Although it is not used commonly, an M202 can support older 2 - wore Clipper networks communicating at 1200 or 2400 baud with an M832 communications module. If the Clipper Controllers are equipped with M896 Modules, they can communicate up to 9600 baud and can reside on the same network as IZAC and IZAC-VAV Controllers.

If Clipper Controllers are to reside with IZAC Controllers on the same 3 - wired Network, they must have an RS-485 Communication module (M896) plugged into them and the controller programmed at the same Baud rates as the Network speed.

INSTALLATION OF M202 MODULES :

The M202 should be located near the PC, if it is to be connected directly (Fig. 1 S). For a modem connection only, it can be mounted in a control cabinet with other controllers so long as a dedicated phone line con be connected to the M202 (Fig. 1 R, E, F).

In general, the PC or the modem should not be more than 25 feet away from the M202 Module, for reliable connection and operation.

M202 DIP SWITCH CONNECTION :

There are 8 DIP switches located on the M202 Module (Fig.1 K). These switches identify the Network speed, the modem baud rate and Network wire termination resistors. This DIP switch is numbered 1 - 8 and marked for OPEN (off). The following switch settings determine the M202's Network communication rate:

M202 - to - Network baud rate

Baud Rate	Switch -1	Switch - 2 :
9600	off (open)	off
2400	on (close)	off
1200	off	on
300	on	on

Dip Switch numbers 3 and 4 configure the Baud rate at which the M202 will communicate with the modem at 1200, 2400, 9600 or 19200 baud.

The following list shows the baud rate and the DIP switch setting for M202 Module :

M202 - to - PC baud rate

Baud Rate	Switch -3	Switch - 4
19200	off	off
9600	on	off
2400	off	on
1200	on	on
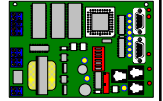
The M202 acts as a buffer between the Network and the modem and PC. The M202 will allow the modem to communicate at a different speed then the Network speed. If the modem speed is higher than the Network speed, the M202 will buffer all the data from the modem or the Network as it passes to prevent data from being lost.

In certain instances, the speed of the modem's communication may be less than the Network speed . In those instances , the Modem will exercise the Data Flow Control with the M202 only as fast as the modem can talk over the phone lines. The M202 will buffer the data from the Network and pass the data to the modem at a regulated rate.

LAN TYPE :

Dip switch - 5 determines the Network bus type. If the DIP Switch # 5 is "Open" (off), then it is a 2 wire Network.

If it is "closed" (on), then it is a 3 wire RS - 485 type of Network.

TERMINATION RESISTORS :

The DIP switches 6, 7 and 8 are used to install internal termination resistors across the 2 - wire are 3 - wire communications bus.

NOTE : Sometimes, the termination resistors are needed to eliminate the capacitive effect of the Network wiring, especially if the wires are capacitive and long in length. The effect of capacitance can be serious for the network communication where nodes far away from each other may not hear the broadcasted data. The capacitance on the network wiring lowers the rise and fall time of the digital data and disturbs asynchronous communication.

Termination resistance increase noise immunity and reduces the effect of wire capacitance. However it also reduces the signal amplitude due to resistive loading. It is best to check the operation of the network and set the DIP switch termination resistors only when necessary. These resistors are as follows:

DIP SW # 6	4.7 KOhms across 2 wire Network (RCV/XMT to Bus common)
DIP SW # 7	1 KOhms between B – and Common of the 3 wire RS - 485
DIP SW # 8	1 KOhms between B + and +5 VDC (internal to M202)
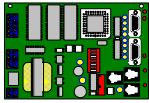
SPECIFICATIONS :

ELECTRICAL :

Input Power :   24 VAC, 50/60 Hz, ± 10%, 5 VA

COMM Port A : RCV, XMT, COM
                        Data line, Clipper LAN bus interface, 12 to 20
                        VDC peak voltage, up to 25 mA source
                        current when data is high.

COMM Port B and C : True RS-232 Port to communicate to a
                        Modem and a PC.
                        RS -232 voltage levels:
                        Logic "1" = +12 VDC
                        Logic "0" = - 12 VDC

COMM Port D : BUS +, BUS -, BUS COM
                        RS - 485 voltage levels :
                        Logic "1" ≥ 3.5 VDC peak
                        Logic "0" ≤ 1.0 VDC

IMPORTANT NOTE :

RS - 485 DC Voltage levels when DIP Switches 7 and 8 are
open (off) and no data is being transmitted , should be as
follows :

BUS + to BUS COM : + 3. 00 ± 0.5 V

BUS - to BUS COM : + 2. 00 ± 0.5 V

If DIP Switch # 8 is closed :
BUS + to BUS COM : + 2. 00 ± 0.5 V

If DIP Switch # 7 is closed :
BUS + to BUS COM : + 1.00 ± 0.5 V

If one of the Nodes has a defective RS - 485 port and it is
pulling the RS - 485 BUS + line high or BUS - low, these
voltages will be significantly higher and lower, respectively.
See trouble shooting Network System wiring - next page.

Operating Temperature : + 40 ° to + 120 ° **F**
Storage Temperature : -20 ° to + 140 ° **F**
Communication Baud Rates : 1200, 2400, 4800, 9600
                        (determined by the 8 DIP
                        Switches on the unit).

MECHANICAL :

Dimensions : 6.250 " L x 4.000 " W x 1.500 " H

Wiring requirements :

4 Conductor RJ - 11 phone cable with plugs at both ends.
(Included with the Modem)

9 wire ribbon cable with 9 pin Male and 9 pin Female D
connectors at both ends. (for direct connections).

9 conductor ribbon cable, 9 pin female and 25 pin
Male D connectors at both ends. (for modem
connections).
24 VAC power input wiring to the M202 power input
removable 2 position terminal block.
Cut and connect the modem's plug-in adapter
transformer.
RS - 485 wiring to the Network via 3 conductor
shielded cable.

COMMENTS ABOUT NETWORK WIRING :

It is important to understand some of the basic
fundamentals of Network wiring.
Long lines of Network wiring require a few important
considerations. They are the length of the wiring, the
baud rate of the Network communication and type of
wiring used.
One of the most important issue in Network wiring is
related to the susceptibility of network signals to
interfering signals in specific installations.
Electromagnetic Interference (EMI) is a common
problem on large networks since long wires make a good
antenna. The best way of reducing EMI is to use a
shielded cable and ground the shield at the most
desirable point in the long distance wiring.
Shielding is critical with respect to where it is
attached to a ground. If the shield is grounded at
multiple locations, it can cause other problems and may
counteract the benefits of grounding the shield.
The most common method, is to connect all shielded
cables to a good ground at one location of the bus. This
is typically done at the controller.   Although if there is a
poor ground at this controller, this may not be the best
location to ground the shield.
For the distributed Network systems, such as an
IZAC system, the grounding for the entire Network
should be done only at one location. This means not to
ground the shield of the Network at each Controller
location since this may potentially cause multiple
grounding at each node location. The shielding must be
continuous throughout the network, not sectioned
between nodes.
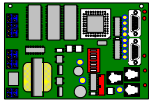
WIRING :

2 WIRE NETWORKS :

2 wire networking is only used for Clipper Networks and at LAN speeds 1200 and 2400 Baud. In order to use an M202 with this type of network, follow the steps listed below :

1. The 5 position terminal Block marked XMT, RCV, BUS +, BUS -, COM is used for wiring the M202 to IZAC or Clipper networks. Connect the COM terminal to the common wire of the 2 wire Network.
2. Connect the RCV and XMT terminals together on the M202.
3. Connect the shorted RCV and XMT terminals to the 2 wire network's signal wire. The other ends of these two wires should be connected to the nearest controller by connecting RCV/XMT to the Clipper's RCV/XMT terminals, also shorted. Also connecting the M202 COM to the Clipper's MDM COM terminal.

3 WIRE NETWORKS :

1. Each IZAC controller has a 3 terminal RS - 485 Network communication port. When connecting an IZAC controller, the M202's COM should be connected to the IZAC's RS - 485 communications com. If a Clipper Controller with M896 COM Module is in the Network, connect its MDM COM to RS - 485 COM.
2. Connect the M202's BUS – to the IZAC controllers RS - 485 BUS – terminals. For Clipper Controller's, this terminal is MDM XMT on the Clipper base.
3. Connect the M202's BUS + to the IZAC controller's RS - 485 BUS + terminal. In the Clipper's case, use the MDM RCV terminal on the wiring terminal block base.

CONNECTION TO A PC :

1. Each M202 is shipped with a 9-pin Male to 9-pin Female " D " connector. This cable is used to directly connect a local PC to an M202.
2. Connect the 9-pin Male D connector of this cable to the 9-pin D Female connector on the M202 board. This D connector is labeled " TO DIRECT CONNECT PC " on M202 board.
3. Connect the 9-pin Female side of the cable to the serial communications port of the direct connected PC.

NOTE: If the PC has 25-pin instead of 9-pin serial port, then use a standard 25-pin to 9-pin adapter to convert 25-pin D to 9-pin D connector.

MODEM CONNECTION :

1. Each M202 is also shipped with another ribbon cable, to be used for connecting a Modem to the M202 Module. This ribbon cable has a 9-pin Female and 25-pin Male D connectors at each end.
2. Connect the 9-pin Female D connector to the 9-pin Male D connector on M202 board which is labeled " TO MODEM ".
3. Plug the 25-pin Male end of the cable to the Modem's 25-pin Female D connector.
4. Plug a dedicated phone line into the RJ-11 connector on M202 the board, labeled " TO WALL LINE ".
5. Plug the short standard phone cord, included with the M202 into the RJ - 11 connector on the M202 board labeled as " TO MODEM LINE ".
6. Connect the other end of this short phone cable into the designated RJ - 11 connector on the Modem labeled " TO LINE ".
   NOTE : Most modems come with 2, RJ-11 connectors one for the Line and the other for the Phone extension. Plug the short phone cable coming from M202 into the RJ-11 connector marked " TO LINE " on the Modem.

POWERING THE MODEM :

The M202 totally controls the power to the modem. The M202 powers the modem when a ring is detected on the phone line or if one of the Controllers tries to dial out.

NOTE :

Most external modems are designed to operate on a desktop, attended by the operator. As a result, if something goes wrong with the Modem, the user can shut its power off, check its phone lines etc.

However, a modem on the network end of a system does not have a user to supervise its operation. For this reason, the M202 is used to provide a total supervision over the Modem, including application of power and connection of the phone lines.
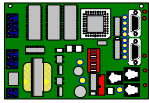
Connecting The Modem Transformer to the M202 :

1. The Modem is supplied with 120 V plug-in wall transformer. Coming out of this transformer is a low voltage 2 wire cable with a male connector at the other end. It plugs into the modem's DC power the female socket.
2. Cut the two wire cable somewhere in the middle.
3. Connect the two wires attached to the transformer to the terminals labeled " MDM PWR IN "on the M202 board.
4. Connect the other two wires (which has the modem power plug) to the terminals labeled "MDM PWR OUT".

Now the modem will be powered and under the control of by the M202 Module.

MODEMS:

MODEM CONFIGURATIONS :

The M202 module is a Microprocessor based controller and it is programmed to initialize modems every time the M202 powers the modem.

Modems are changing very rapidly and new and higher speed modems come to the market place while previous ones become obsolete faster than ever. New modems often come with new and different command parameters that are incompatible with older modems. Ideally, we would like the M202 to automatically configure any modem, now or old. However, because of these incompatibility issues the M202 is limited to only a select number of modem initialization commands. For this reason the network modem should have several of its default settings programmed before connecting it to the M202 module. This unfortunately, is a common problem across the industry.

In order to insure the most reliable and correctly configured Modem operation , the Modem should have several of its default settings should be programmed, changed and set before connecting on to the M202 module .

The basic modem parameters are listed below. These are called basic "AT " commands and they are stored in the modem's EEPROM, internally to the modem. They can be stored in the modem's " **Profile 0** " and " **Profile 1** " parameters.

MODEM CONFIGURATIONS :

| COMMAND	DESCRIPTION AND SET
E0	Echo Off
V0	Digit Result Codes
X0	Limited Set Of Result Codes
&C1	DCD Set By Modem When Carrier Is Detected
&D2	Disconnects Modem When DTR From The M202 Is Dropped
S0=1	Answer After The First Ring
S46=136*	Disable Data Compression
(*) : S46=136	Disables Data Compression For Most Modems. Consult To Your Modem Manual For Proper Setting.
&W0	Store Changes To Profile 0

MODEM CONNECT :

The M202 will keep the modem powered off until a ring is detected by M202's internal circuitry or if any of the nodes in the Network attempts to dial out to report an alarm.

When phone ring is detected, the M202 powers and initializes the modem. Based on the baud rate of the Network, the following command is given to the Modem :

BAUD	COMMAND
1200	ATE0Q0V0S0=1
2400	ATE0Q0V0S0=1
9600	ATE0Q0V0W0X0&C1&D2S0=1
19200	ATE0Q0V0W0X0&C1&D2S0=1

After the first ring detection, the M202 powers the modem and it answers and off hooks the phone line. The M202 will not interfere with the Network communication during phone ring detection, modem initializations etc. However, once a link is established between the modems, the M202 starts passing data between the modem and the Network transparently.

When remote PC disconnects, the M202 will wait 15 seconds after the carrier detect (CD) is dropped, before powering the modem down.
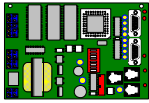
MODEMS:

A 15 second delay is required in case the modems have to retrain each other due to noisy telephone lines. If the phone lines gets noisy, the modems may drop CD for several seconds during the retraining process, then, if it is successful, the modems will raise CD again.

The M202 will guard against a modem "lockup" condition where the modem is "off hook " and CD is on (OH and CD lights are on) but the modem is not actually on line with a PC. If the M202 does not receive any message from a PC to any Node on the Network for 15 minutes, the M202 will kill the power to the modem.

DIAL OUTS BY THE MODEM :

When one of the nodes in the Network dials out, the M202 powers and initializes the modem based on the Baud rate selected. The commands to the modem, based on the baud rate, are listed below :

BAUD	COMMAND
1200	ATE0Q0V0S0=3
2400	ATE0Q0V0S0=3
9600	ATE0Q0V0W0X0&C1&D2S0=3
19200	ATE0Q0V0W0X0&C1&D2S0=3

The M202 receives the phone number that a node wishes to connect to and passes it to the modem. The M202 will allow up to 3 minutes for the modem to establish a link to a remote PC or other paging service.

While the modem is powered and on hook, the incoming phone calls will be answered at the 3 rd ring.

NOTE ON PD-832 SOFTWARE :

PDC-832 Version 5.25 or higher is required to communicate with Networks equipped with M202 via direct or a modem. Version 5.25 can communicate to M202 networks as well as Networks with older Master Interface Modules (M801X, M200 , M201).

DIAGNOSTIC LEDs :

The M202 has 5 diagnostic LED's. These are shown on Page 2, Fig. 1.

1. The PWR LED : verifies that 24 VAC is applied to M202.

2. The RING LED : It identifies an incoming call. When the ring is detected, the RING LED turns on.

3. The MDM ON LED : It indicates that the relay internal to M202 is energized and applying power to the modem.

4. To LAN LED : The M202 is transmitting data to the Network, either from a modem or a direct connected PC.

5. FR LAN LED : The M202 received data from the Networked nodes.

CONNECTING BOTH DIRECT PC AND MODEM :

In many applications, it may be important to both directly connect a PC as well as a modem for remote communication. This can be accomplished in 2 different ways, based on the location of the PC and the Modem and other factors related to wiring :

1. Use one M202, for both a PC and a modem connection. If both serial cables are attached, the M202 will allow the modem or the PC to access the Network. However, it is important to note that they can not access the Network simultaneously.

2. Use two M202 modules, they are connected parallel to the Network wiring. The first one is connected to a direct connect PC, using the 9-pin male to 9-pin female ribbon cable. The second M202 is connected to a modem using a 9-pin female to 25-pin male ribbon cable. However, again, they can not access the Network simultaneously.
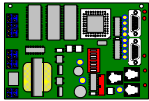
CHECK OUT AND TROUBLE SHOOTING :

Once the M202 is properly wired, DIP switches are set and configuration is done :

1. Connect 24 VAC to the power input terminals (Fig.1 (I)).
2. Observe the PWR LED is on. If not, check power input to the M202 with a DVM, in AC volts setting.
3. Check communication wiring to the Network for the polarity of the wires and proper connections.
4. Observe TO LAN and FR LAN LED's on the M202. The FR LAN LED will occasionally blink when data is received from the Network and the TO LAN will blink when the M202 transmits data to the Network.
5. If cables other than the ones supplied with the M202 module are used, make sure they are proper and compatible.
6. For direct PC connections, make sure that proper COM port of the PC is used. Make sure there are no conflicts with the other hardware in the PC such as serial mouse and the modem assigned to the same COM port. Check all your communications settings and how they are configured in the PC. Refer to PDC-832's configure menu to correctly set the various communications parameters.
7. Make sure that the modem is properly configured via DIP switches and/or software settings.
8. Establish communication with the network.
9. You can always contact Solidyne Corporation, Technical Services Group for help with your P C or modem set up.

> Solidyne C orporation
> Phone No. 847-394-3333
> Technical Service Extensions: 324,612

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