CLIPZAC

DDC Controller

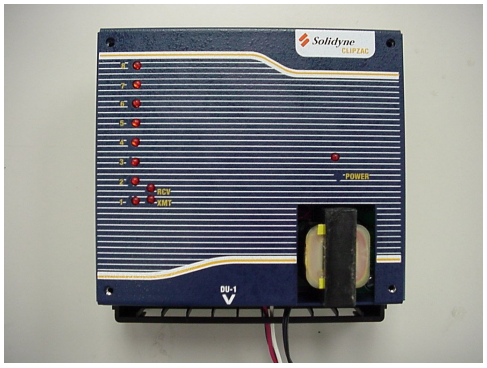
Clipper Replacement Product

The **CLIPZAC** Controller is a member of the **IZAC** Family of Intelligent Zone Automation Controllers.

They are true Peer-to-Peer networkable or stand-alone universal real-time embedded controllers. They can control any type of equipment provided that their available number of inputs and outputs are not exceeded.

CLIPZAC offers unlimited number of application capabilities, unlike other dedicated controllers. Operating algorithms can be a standard program or can be expanded to control any special or unique control applications. These controllers have many control, data-logging and alarm features and functions. Below is a brief list of these features, functions and capabilities:

- Requires no significant installation. You remove the existing Clipper from its wiring base and plug in the new **CLIPZAC** in place of the removed Clipper and you are ready to go.
- **CLIPZAC** is designed to be fully compatible with the latest version of IZAC Family of advanced universal controllers.
- Can be networked with other Solidyne controllers on a three-wire communication bus at speeds up to 9600-bps and is programmable to slower speeds like 1200 and 2400 baud.
- Will interface and work with Clipper sensors and modules, which may already be installed, or the latest Solidyne hardware.
- Inputs are universal, they can interface with thermistor sensors (3k, 10k, 100k), 0-10 vdc, 4-20 mA, or dry contacts.
- Unlike the previous Clipper controller that allowed only digital or slow PWM outputs, now each of the 8 outputs of the **CLIPZAC** can be selected for digital, slow PWM or fast PWM.
- 11 status LED's including a Power On LED. Dip switch to configure Node addresses. Many added control, alarming and logging capabilities.
- Offers 1/8th degree temperature control and 3 year on board battery backup of programs, logged data and real-time clock.
- Fully compatible with latest INFORM (ICMS) software for Windows 95/98/NT/2000/Me. Also backward compatible to PDC-832 DOS software version 5.40b.



Model:

CLIPZAC

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Some of the other highlights of the CLIPZAC Controller.

- **CLIPZAC** is specifically designed as a replacement Controller for Clipper Controllers as a pin-to-pin equivalent. Once you remove an existing Clipper Controller from its wiring base, you can plug the Clipzac in its place. Hence, the goal and objective of designing Clipzac had been to replace the older generation Clipper product with today's much more powerful and capable Universal Controller.

- The **CLIPZAC** Controllers come with a real time clock and RAM storage, for programs and logged data. Up to 3 years of accumulated battery backup in case of power failure.

- The CLIPZAC Controllers have universal inputs. They can be programmed to accept 0-10 VDC, 4-20 mA current, any resistive sensor and dry contact inputs. Each input can be programmed to convert any voltage, current or resistive input to specific data value. Additionally, they can count a train of pulses and average them over a programmed period of time to calculate rate of pulses or average values derived from the number of received pulses over a specified time duration.

- CLIPZAC Controllers also share information among each other. As an example, an OAT (Outside Air Temperature) sensor attached to one of the CLIPZAC Controller's sensor inputs can be broadcast and used by the other Controllers in the Network. Similarly any and all of the information residing in one CLIPZAC Controller can be requested by other Controllers to be broadcast for them to use this information to control their own mechanical equipment. This can be sensor's average or instantaneous values, loads status, Virtual sensors, sensor's or load's overridden state, analog output (PWM) values of any one or multiple nodes.

- Various information such as Time of Day, Baud Rate of the communication can be programmed via DU-1 or a special DU-1 hand-held programmer. A 6-position RJ-11 connector DU-1 port located on each Controller makes the connection to the DU-1. This connection requires a six-conductor phone cable with a RJ-11 phone plug. Please review DU-1 documentation for more information.

- The CLIPZAC Controller was designed as a retrofit for Clipper controllers. The Clipzac mounts into an existing Clipper base-plate (not included with new Clipzac purchases) and can use existing Clipper sensors and modules or newer IZAC sensor types. It comes as an 8 universal input /8 output controller. Each CLIPZAC also has one built-in analog output capable of generating a 0-10 VDC output. This analog output can be used for modulating a DC voltage output, which can be used for applications such as PID controls.

- The CLIPZAC Controller can be networked among other IZAC Family of Controllers in a peer-to-peer network or it can be used as a stand-alone unit. If it is networked, it has a programmable Node identification number from1 through 256, up to 256 CLIPZAC Nodes can be networked. Due to nature of the design, communication protocol and internal hardware, these Controllers do not need any types of supervisory master Controller to manage them. Each Controller is self-contained and will function regardless of the state of all other Nodes, in the event of network failure.

- The CLIPZAC Controllers communicate over 3-wire RS-485 network wiring. The speed of communication is typically 9600 Baud, but can be programmed for 1200, 2400 and 4800 Baud. Due to nature of RS-485 wiring, many Controllers (up to 50 or more) can reside on the same 3-wire network for up to 5,000 feet of cabling. For applications higher than 50 Nodes, after the 50th Node, an M203 (LAN Link) module can be used to link another additional 50 Nodes to the network. The M203 isolates and amplifies the network data.

- The RS-485 Communication Circuitry internal to CLIPZAC Controllers have both Optical and Power supply isolation for maximum noise immunity. Hence, the processor, sensors, and outputs are not damaged due to electrical transients and noise. Relay outputs are also optically isolated from the internal processor. As a result, electrical noises and transients generated when output relays turn on and off cannot easily penetrate and effect the internal operation of the processor.

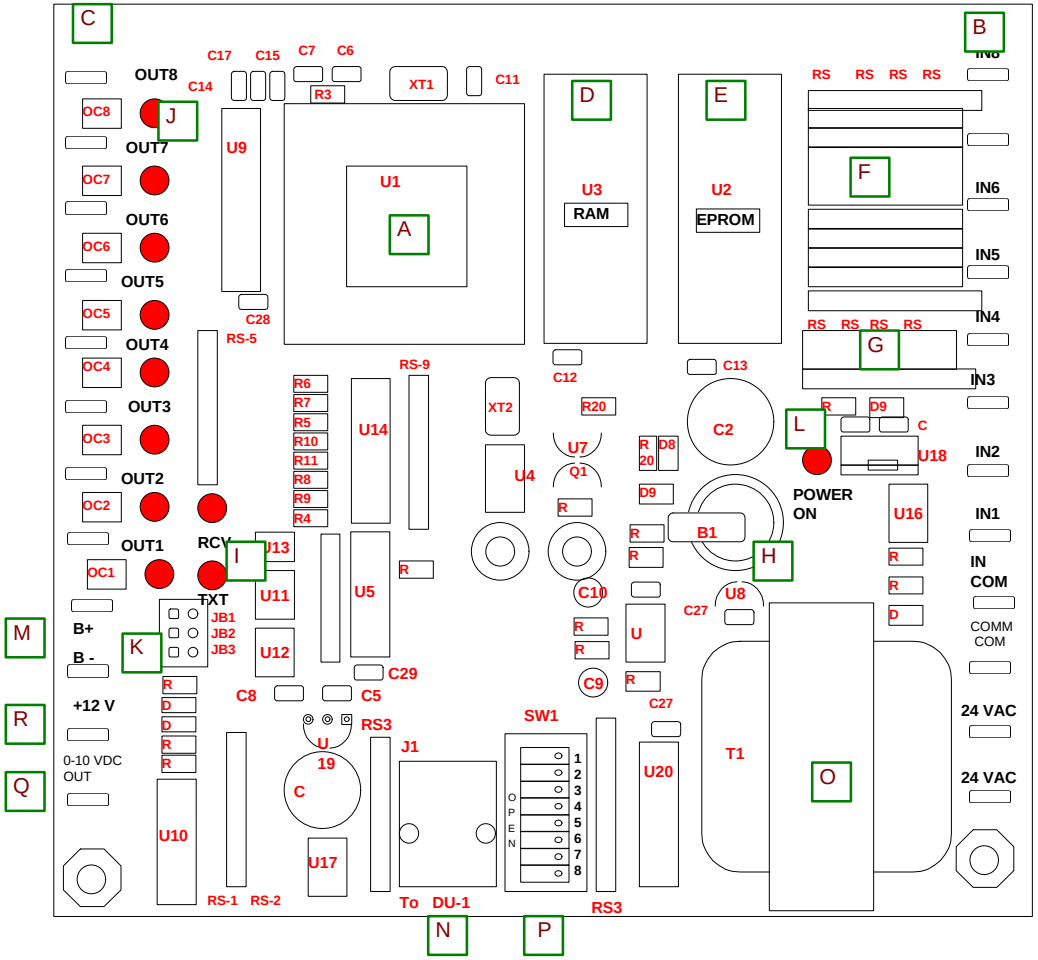


FIG. 1 Highlights of **CLIPZAC** Controller Board .

- **A** THE PROCESSOR
- **B** THE INPUT TERMINALS
- **C** THE OUTPUT TERMINALS
- **D** THE EPROM OPERATING SOFTWARE
- **E** RAM FOR DATA AND PROGRAM STORAGE
- **F** UNIVERSAL INPUT JUMPERS FOR THERMISTOR, 0-10 VDC AND 4-20 MA CURRENT INPUTS
- **G** INPUT JUMPERS FOR ORIGINAL CLIPPER TEMPERATURE SENSOR USE
- **H** LITHIUM BATTERY
- **I** RECEIVE AND TRANSMIT LEDS
- **J** OUTPUT STATUS LEDS
- **K** COMMUNICATION BUS TERMINATION JUMPERS
- **L** POWER LED
- **M** COMMUNICATION BUS CONNECTIONS B + , B-
- **N** DU-1 DISPLAY UNIT RJ-11 CONNECTION`
- **O** TRANSFORMER
- **P** NODE ID DIP SWITCH
- **Q** 0-10VDC OUTPUT
- **R** UNREGULATED 12VDC OUTPUT

The **CLIPZAC** Controllers have many programmable features that are listed on the next page. Based on the application and type of loads being controlled, these parameters should be carefully reviewed and implemented for safety and protection of the equipment being controlled for effective and precise results.

The **CLIPZAC** Controllers have many programming features to control loads in real time. The technical personnel who would be programming the **CLIPZAC** and other IZAC Family Controllers are expected to attend Solidyne's formal training seminar to learn, understand, and apply control algorithms in detail. Such personnel are also expected to have a vast knowledge of various HVAC equipment operation and control requirements.

Those technical personnel who are certified and approved customers of Solidyne can contact Solidyne's Technical Services Department and talk to one of the Engineers for any application help, suggestions, programming tips and ideas for your unique application.

1. Minimum on and off times: Each output can be set from 0 to 15 minutes. If fan or electric heat outputs need to be on for a minimum period of time, program accordingly.

2. Sequential Delays: This is a time delay of turning loads on and off sequentially. It is programmable from 0 to 255 seconds. This is important if multistage electric loads are controlled to minimize demand kW.

3. Load Polarity : Each output can be programmed independently to be energized for ON or OFF state.

4. Fail Safe Operation : Desired output status can be preset in case of a major failure where all control programs are lost. Each output can be set to stay energized or de-energized. Program loads for the most desirable default state in case of such failure.

5. Input Averaging period: Inputs can be configured so that they will control outputs based on the averaged reading of the corresponding sensors over the past programmable sliding window time period in minutes.

6. Input Sensor Offset and Multiplier: Each input of the controller can be programmed with an offset and multiplier. Any input data reading can be zeroed or modified by calculating the correct offset and multiplier from:

   $y = ax + b$

   y = Desired Reading
   x = Unmodified data reading .
   a = Multiplier .
   b = Offset value .

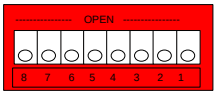
Note : a and b can be negative numbers. If two desired data readings are known along with unmodified data reading at these corresponding values, then two equations can be solved for a and b values.

7. Holidays: Program holidays in advance for up to 16 different dates in a year and each holiday can last for a duration of 1 to 255 days. Make sure to check "Holiday" Day for those programs that do take place during holidays.

8. Daylight Savings Dates : These dates are programmable and should be programmed in advance if applicable.

9. Override enabling and duration: Each Zone can have an Override capability and can be programmed for duration from 1 to 255 minutes. They can further be set for cancelable feature. This function will allow occupants to change Zone's state from unoccupied to occupied for a predetermined period of time and can be re-started upon momentarily pressing an override button (may be built into a Zone Sensor) before it times out.
   For Space Temperature Sensor applications with built in after hours occupancy features (override momentary switches), Solidyne's ZTS, ZTS-B, ZTS-A or DU-1 sensors are recommended.

10. LAN ID No. : Each Node should be programmed for Node Identification Number in sequence from 1 to 255. Factory default Node number is 1.



11. Virtual Sensor Inputs: Each Controller can have up to 8 programmable Virtual Sensors. These Virtual Sensors can be a mathematical formula using various other sensors and loads from its own controller or other controllers on the network. Virtual Sensor functions provide a powerful tool for controlling mechanical equipment, zone comfort, temperature levels and other control and monitoring capabilities.

12. Miscellaneous Parameters: Based on the application and type of equipment used, other parameters may be necessary to be programmed for proper control function operation. You can also refer to IZAC-8 or -4 programming and PDC-832 version 5.35 (or higher) for more extensive programming features, that may suit your application.

ELECTRICAL:

INPUT POWER: **22** to **26.5** VAC 50/60 Hz ,

POWER CONSUMPTION: **6 VA** or less.

OUTPUTS :

1. OUT-1 to OUT-8 Transistor driver output can drive up to 100mA-dc current from an external or built in 12 VDC unregulated power supply, internal to the controller. See various application drawings as to how it is wired to drive 12 VDC external relays.
2. 0-10 VDC OUTPUT : One 0-10 VDC Analog Output is built into the CLIPZAC. It can drive any external actuator or driver that has a 0 to 10 VDC signal for PID control. This output can drive 0 to 10 VDC into a 10KΩ load resistance. The input of the receiving equipment should not be any lower than 5 K Ω. Otherwise there will be an error for the actual DC voltage vs. % PWM values due to loading effect by the equipment. When the built-in 0-10 VDC output is used, program LOAD - 4 to be Fast PWM type output from the Sensor Details in the software. Once LOAD- 4 is programmed for PWM , the 0-10 VDC output voltage will change based on the program modulating this output (Set Load polarity for Energized = ON). The duration for this output to go from 0.0 VDC to 10.0 VDC is approximately 30 Seconds.

   It is important to ground the Common of 0-10 VDC output. This common is electrically the same as the Sensor Common. The reason for grounding this Common, hence the Input Common of the equipment receiving the 0-10 VDC signal, is to eliminate any floating external voltages that may be generated by this equipment and its power supply. Floating power supplies and other control circuits tied to the common of the Clipzac may be a source of disturbance for the Clipzac's internal Processor. Make sure that Sensor input Common or 0-10 VDC Output Common is connected to a good ground.

Load – 4 on the displayed in the software for the Clipzac has been dedicated to the PWM programming of the built-in 0-10 VDC output. Set Load for Energized = ON.

INPUTS:

IN-1 to IN-8: The Clipzac has 8 Universal Inputs. These universal inputs can accept 0-10 VDC, 4-20 mA , any resistive sensor, or older Clipper sensors. To select 0-10 VDC, 4-20 mA , or older Clipper sensor inputs, jumpers must be inserted into their proper position as shown on Fig. 2.

SENSOR TYPES :

Type of Input	OPEN	SHORT
1. 3 K Ω Thermistor ° F	-40.0 ° F	+212.0 ° F
2. 3 K Ω Thermistor ° C	-40.0 ° C	+100.0 ° C
3. 10 K Ω Thermistor ° F	-40.0 ° F	+302.0 ° F
4. 10 K Ω Thermistor ° C	-40.0 ° C	+302.0 ° C
5. 100 K Ω Thermistor ° F	-40.0 ° F	+302.0 ° F
6. 100 K Ω Thermistor ° C	-40.0 ° C	+302.0 ° C
7. FLOW	-40.0	+302.0
8. ZTS-A	-40.0	+302.0
9. 0-10 VDC	0.0	+1000.0
10. 4-20mA	0.0	+1000.0
11. PULSE	-40.0	+302.0
12. ANALOG	-40.0	+302.0

Please note that Thermistor, Flow and ZTS-A inputs are non-linear and internally the processor uses a look-up table to convert non-linear resistance values to correct temperature readings.

On the left side of the baseplate, there are 12 termination screws/points.

Point 1 is the 0-10vdc output that is used in combination with the input/output common on the right hand side of the baseplate. The 0-10vdc output is configurable through output 4 only.

Point 2 is the 12vdc unregulated output.

Point 3 is the Bus – terminal.

Point 4 is the Bus + terminal.

Points 5 – 12 are for output termination. The solid state digital output is an unregulated 12vdc and can handle a max of 25mA.

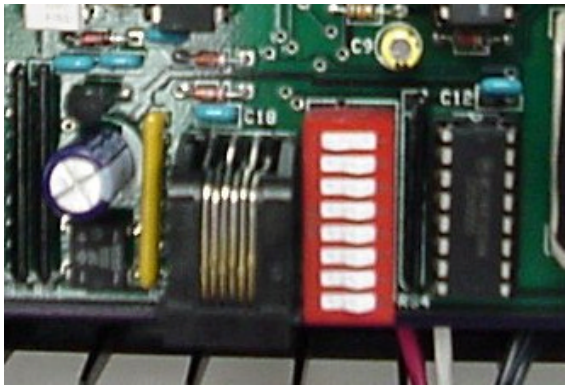
On the right hand side of the baseplate, there are 12 termination screws/points. Termination points 1 + 2 in the graphic on the left are for the 24vac to power up the unit.

Point 3 is the communication common. **DO NOT** use this point for input or output common.

Point 4 is for input and output common.

Points 5 – 12 are input termination.

Figure 2



This picture shows the DU-1 connector and the Node ID dip switch. These two components work the same as they do on the IZACVAV. The DU-1 connector is a 6 position RJ-11 connector. For more information about the DU-1 Connector please refer to the DU-1 datasheet. For more information on the Node ID dip switch, please refer to the IZACVAV datasheet.

Figure 3

The jumper setting above is set for input 5 as a 0-10vdc input.

The jumper setting above is set for input 5 as a 4-20mA input.

The jumper setting above is set for input 5 as a Clipper type sensor (LM335 or "Analog")

Figure 4

SPECIFICATIONS MECHANICAL:

The mechanical dimensions are 5.1” L / 5.5” W / 2.2” T

COMMUNICATION :

Communication Port:
3 - wire RS-485 bus port .
Optically isolated from the main circuitry and it has its own isolated power supply. It requires a shielded cable for networking the Controllers.

Baud Rate :
Can be programmable from 1200 BPS to 9600 BPS using a direct attachment to the PC or via Hand Held DU-1 programmer.
Note : Units are programmed for 9600 BPS from the factory and set as Node 1 on the DIP switch.

DU-1 RJ-11 Port:
This port is used for the DU-1 Wall Stat (or Hand Held DU -1). See Fig. 4 and 5.
This port connector has 6 male terminals to accept a RJ-11 phone plug. The DU-1 similarly has a RJ-11 socket and removable 6-position terminal block. These connections and terminals are as follows:

1. +12 VDC unregulated power supply.
2. Synchronous Clock (output from Clipzac).
3. 10 K ° F Zone Temperature Sensor built into the DU-1 and is automatically wired to Input-1 of the controller when the DU-1 is connected.
4. Synchronous Data In (input to Clipzac).
5. Synchronous Data Out (output from Clipzac).
6. Common for logic and Sensors.

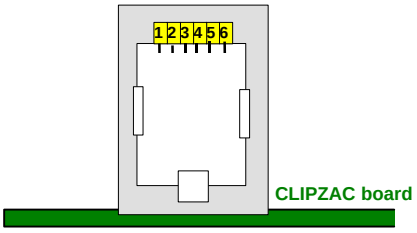


Figure 5

ENVIRONMENTAL SPECIFICATIONS:

Operating Temp. : +40 to +140 ° F **(INDOORS ONLY)**
Storage Temp. : -10 to +150 °F
Operating Humidity: 10 to 90 % RH non-condensing
Storage Humidity: 0 to 95 % RH non-condensing.

INSTALLATION :

1. **Please read the Instructions carefully.**

2. It is strongly recommended that specified Input, Output Modules along with recommended wiring be followed for Installation. Otherwise, there can be problems associated with the reliable operation and communication of the network.

3. A trained and experienced technician should do the installation. All standard precautions for handling electronic PCBs should be taken.

4. Make sure that the wiring, termination of wires, proper connections are made to the intended terminals, programming, jumpers, batteries, Node ID settings are properly done and fully inspected prior to applying 24 VAC to the Controller. Always check 24 VAC input power for the correct voltage prior to connecting it to the Controller.

5. Make sure that Controller is powered Power LED is on.

SELECTING MOUNTING LOCATION :

The controllers should be installed indoors if all possible. If they have to be installed outdoors, make sure that they are installed inside a well-protected Electrical Enclosure or cabinet and protected from rain and other environmental factors.

Choose a location that is not exposed to any leaks, condensation, extreme heat, excessive dust, vibration or high voltage wiring. Do not install the Controller next to or on the enclosures that house electric heat coils where excessive heat may effect proper operation of the Controller.

TREAT ELECTRONIC CONTROLLERS AS DELICATE INSTRUMENTS AND HANDLE THEM WITH CAUTION AND CARE.

If possible, use mounting locations with the easiest access to the controllers.
Your local fire and other ordinance may require for it to be enclosed in special rated electrical boxes. You should be knowledgeable of local codes, installation requirements and regulations and perform installations accordingly.

Note: It is highly recommended to connect Sensor Common to a Good chassis Ground for better Electrical noise immunity.

WIRING : (See Fig 2, 3, 4)

Since the Clipzac is designed as a retrofit for the old Solidyne Clipper, there should already be a black Clipper base-plate available. Remove the old Clipper by opening its cover and unscrewing the plastic screw located under the display on the keypad. Gently pull the Clipper from its base-plate. The Clipzac input, output, power and communication connections should be the same as they were on the Clipper. The 0-10VDC output is the connection on the lower left corner (viewing from the top of the controller) and the unregulated 12VDC is the connection above that one (See Fig. 2). Inputs and outputs are wired between the desired input or output pin and common (the 4th connection from the bottom right, looking from the top of the controller). 12V external relays can also be mounted on the outputs between these points. The 12V unregulated supply voltage is wired between the 12V pin and the Common pin (See Fig. 2). The communication bus is wired to the network, M202, or M201 by connecting the B+ terminal to the BUS+ of the communication module or network, connecting the B- terminal to the BUS- of the communication module or network, and connecting the communication common (the COM above the 24VAC) to the BUS Common of the communication module or network (See Fig. 2).

Make sure that Input Configuration Jumpers are properly installed for the type of sensors used. (See Fig. 4)

Never power the unit before the wiring is complete and all lose wires properly terminated. Make sure that battery insulation plastic is removed from between the battery and its connector arm prior to powering. (Fig. 1)

If the DU-1 Display Wall Stat is used, make sure that the wiring at the DU-1 end and Clipzac DU-1 port match. Wrong installation and wiring can easily damage both the IZAC and the DU-1. Double check your wiring.

Always use 300V or higher voltage rated insulation preferably stranded wires. Do not use existing, old unknown wires, they will always be a potential source of trouble. **Always use high quality hardware for wiring.**

FOLLOW THE ENTIRE LOCAL REQUIREMENTS AND CODES FOR WIRING, TERMINATION AND INSTALLATION. DO NOT MIX CLASS-I AND CLASS-II WIRING.

INSTALLATION (cont'd):

Figure 6 is a drawing taken out of the 3282sxb datasheet. It shows the installation of an "Analog" of LM335 type sensor. This was one of the more popular sensors used with Clipper systems. It is a voltage type sensor and will need to have a jumper placed on jumper slot number one. See figure 4 for jumper settings on LM335 of "Analog" type sensors. If there are existing sensors on the Clipper that you are replacing, you **MUST** install the jumpers outlined in figure 4.

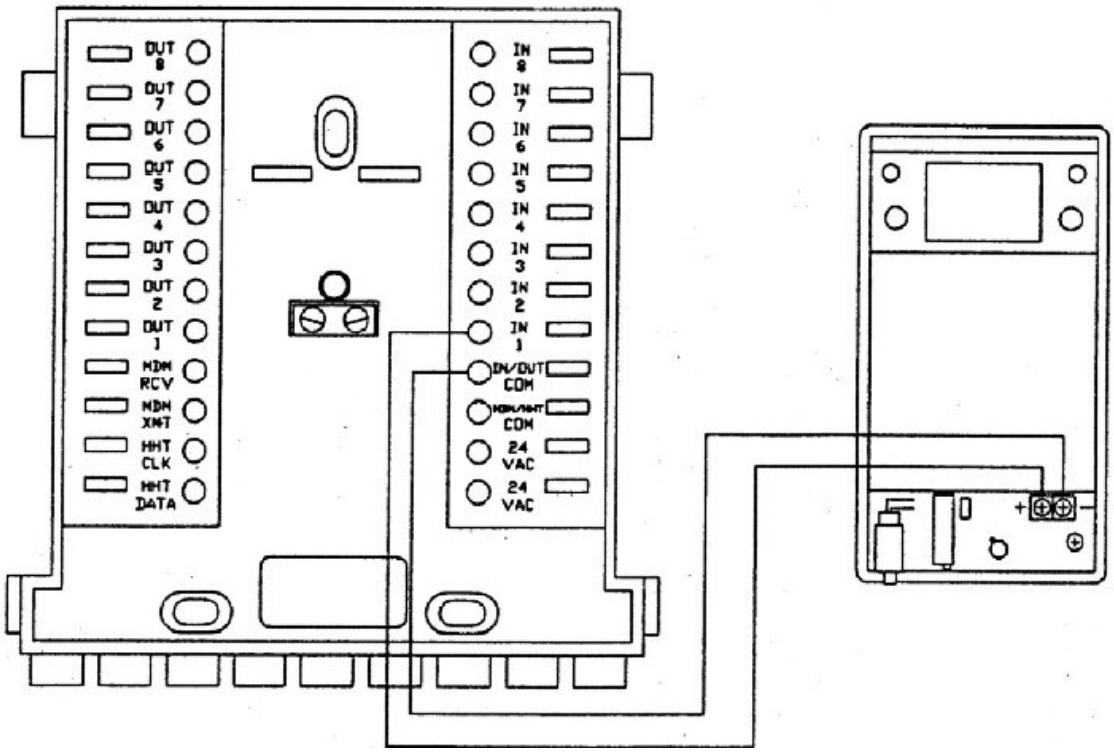


Figure 6

INSTALLATION (cont'd):

Figure 7 in a drawing taken out of the R10 datasheet. It shows the installation of a digital output relay. If these type of relays already exist on the existing system, there is no configuration needed.

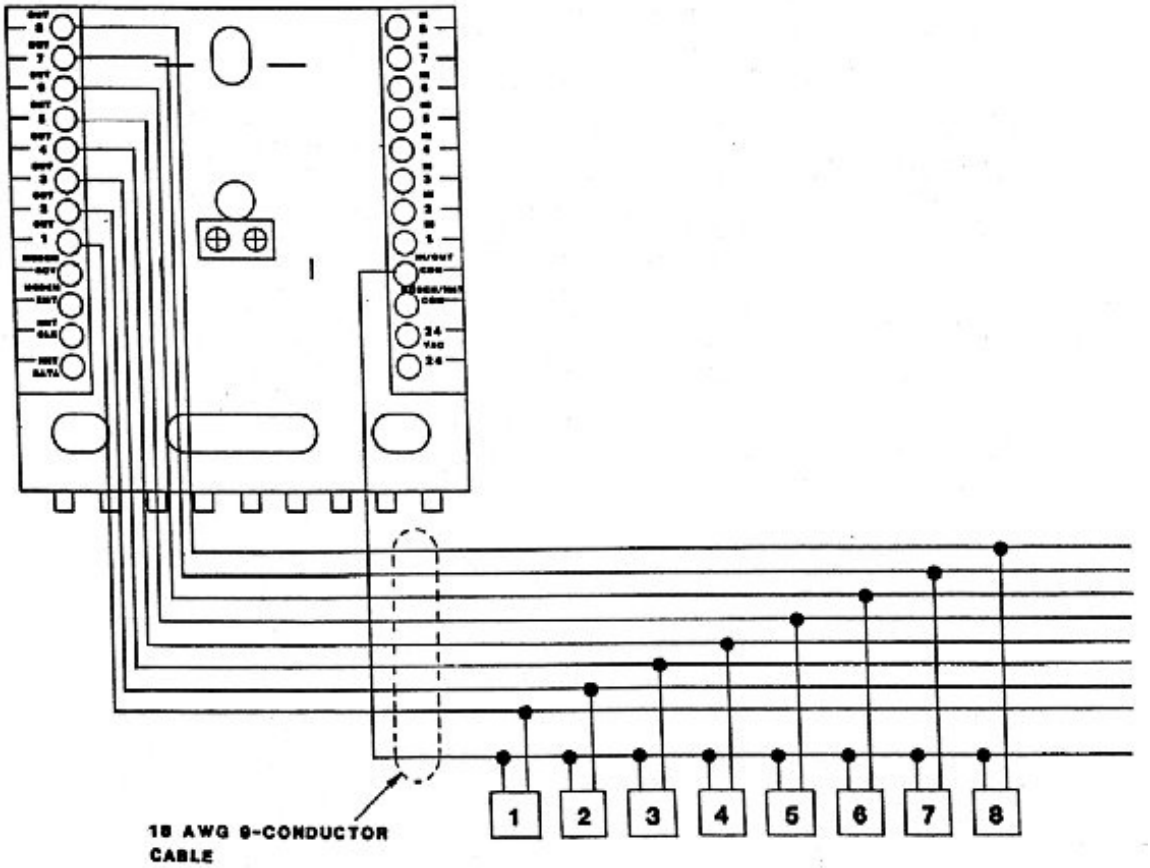


Figure 7

INSTALLATION (cont'd):

Figure 8 is a drawing taken out the M974a datasheet. It shows the wiring of the M974 multi-stage relay card to the output of the CLIPZAC. The M974a was controlled by a fast PWM signal from the Clipper. Modern day IZAC's do not have the ability to control these multi-stage relay cards. The CLIPZAC has been re-engineered to have both slow and fast PWM outputs so that they can control this type of multi-stage relay card. If you have a system that is using the M974a or similar type relay cards, please refer to the M974a datasheet for programming and more detailed information.

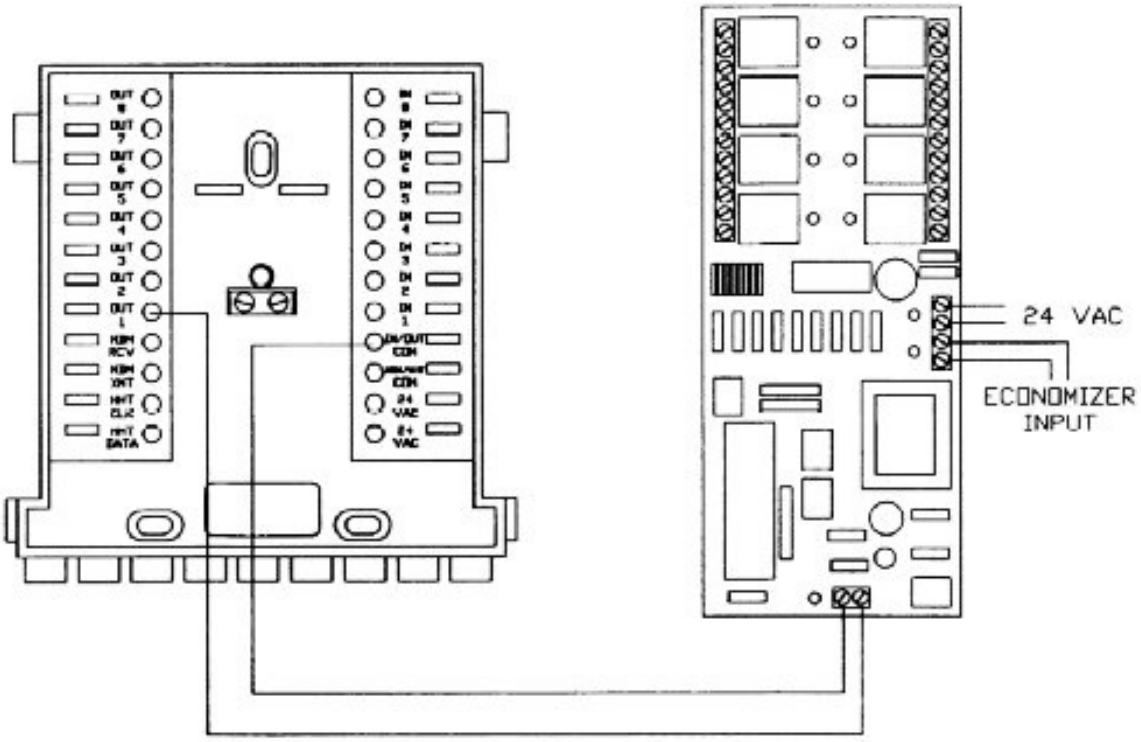


Figure 8

If you have any problems or you need technical assistance, please call 800-648-3980 and ask for the nearest Technical Support representative's phone number.

If you have a product that needs repair, please contact the company that installed your system so that they can send in the product to Solidyne's Repair Department for evaluation.