DINEX G2A MULTIPLEX SYSTEM

FOR

BLUE BIRD BUS

I/O CONTROLS CORPORATION
I/O CONTROLS CORPORATION

CORPORATE HEADQUARTERS

1357 West Foothill Blvd.
Azusa, CA  91702
Tel: (626) 812-5353
Fax: (626) 812-5332

SALES OFFICE

1255 West 15th Street, Suite 200
Plano, TX  75075
Tel: (972) 424-6488
Fax: (972) 578-2230

SALES REPRESENTATIVE

WEST
Transit Marketing Group
Mark Magaldi
John Barberis
6525 Gunpark Drive, Suite 320
Boulder, CO  80301
Tel: (303) 530-1491
Fax: (303) 530-3113

EAST
Gambaccini Transit Sales (GTS)
Mark and Jane Gambaccini
Ron Dunbar
3376 Green Meadow Circle
Bethlehem, PA  18017
Tel: (610) 694-9763
Fax: (610) 691-7115
e-mail: gts@fast.net

http://www.iocontrols.com

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1-Key Nomenclature

Data Bus——The multiple pair of common wires providing the multiple DATA path and/or power supply to link each network element. Similar to a telephone line.

Module——The network functional unit which contains the intelligent co-processor unit. The vital communications data link to IO devices, inputs and outputs.

Bus Controller——The communication traffic controller that directs and regulates communication between each functional unit on the data bus. Think of the Bus Controller as a telephone switchboard.

Node——An individual functional module in the network. The telephone receiver in a network.

ID——The unique address symbol (either a number or a character) which is assigned to each functional unit in the network. A telephone number.

I/O——Inputs (sensors and switches) and Outputs (actuators or lamp loads). These are the fundamental system functions.

DNET——The unique name for DINEX G2A system to be defined as UPLINK data port. Acting as Slave Function.

CNET——The unique name for DINEX G2A system to be defined as DOWNLINK data port. Acting as Controller Function.
Clean Power______(Computer Power) The isolated power source for modules in the network. “Clean Power” avoids data corruption from a common power source such as battery or electrical interference.

LED__________A light emitting diode. A small semi-conductor lamp.

Reset__________Restart the system.

Cellnet Controller____This CNC module has the capability to act as a subset of Master Bus Controller (G2A-MBC-32) which includes 32-inputs and power management function.

HCNC__________A high speed cell network controller.

DIO__________An intelligent slave module.

Multiplex________A way of transmitting several lines of communication simultaneously on the same data link.

Inputs__________Switches and sensors, which supply information to the modules to perform an operation. A circuit is “active” when it is turned on. A circuit is “inactive” when it is turned off. The computer can make use of both “active” and “inactive” data to perform a specific function.

Data__________The information from module to module over Multiplex system.

Outputs__________All physical actions that are performed by the modules, such as turning on or off lights, solenoids and other devices.

Ring Loop________Data bus structure in which the modules are connected to form a “ring.”

Ladder Charts____Ladder charts, circuits, or diagrams are logic diagrams. They are not schematics. The primary function of a ladder diagram is to show how devices are related one to the other.
What is MULTIPLEX (MPX)?

- MPX simplifies the way electrical devices are hooked up together.
- MPX allows for two or more data transmissions to take place on the same wire.
- In the world of traditional wiring systems -- such as wiring harnesses, and relays -- as much as three miles of wires can be used. These harnesses run hundreds of signals, using hundreds of wires, just to keep a single transit vehicle operational.
- Instead of having three miles of complicated wiring harnesses and a number of failure prone connectors, multiplexing sends multiple signals at the same time through a common pair of wires to turn-on or turn-off various electrical devices.

Some of the problems encountered with the old technology are:

- Cumbersome systems,
- Relay based,
- Over-crowded -- making upgrading and maintenance difficult,
- Prone to connector and harness failure,
- Costly to troubleshoot and repair,
- Expensive vehicle downtime.

Multiplex hardware which makes-up the system is composed of:

- A separate power supply,
- Several control modules.
- And a unique cabling system made up of connectors and multi-stranded wires that run through a cable.
Some of the benefits of MPX are:

- A simple system,
- Reduced number of connectors,
- Immediate ease of troubleshooting,
- Reduced vehicle down-time,
- Ease of operation.

What will DINEX G2A Intelligent MPX do for me?

DINEX-G2A-MPX advances transit vehicle control techniques into the computer age.

- The DINEX-G2A-MPX system provides a reliable, cost-effective alternative to the old technologies.
- The DINEX-G2A-MPX system replaces relays, flashers, connectors, and outdated wiring harnesses.
- The DINEX-G2A-MPX system offers an intelligent network for the control, monitoring and data acquisition in transit bus and rail cars.
- The DINEX-G2A-MPX system’s bottom line is to make your life easier and less costly.

How does DINEX-G2A-MPX system do all this?

- The DINEX-G2A-MPX is a microprocessor-based system. It uses multiplex data-bus architecture.
- The DINEX-G2A-MPX uses a small, compact, powerful module to perform full computer functions. This central module controls a family of small, lightweight microprocessor-based control and monitor functions.
DINEX G2A Working in Bus

FIGURE: 2.1 – DINEX G2A SYSTEM
**Typical Module Locations**

Modules are located in zones as near to the needed inputs and outputs as possible. The locations of the modules reduce the amount of “hard” wire necessary to reach the module. Some examples of zone locations are:

- **Zone A**: Door Area/ Main Panel
- **Zone B**: Above Driver
- **Zone C**: Front Door / Rear Door
- **Zone D**: Engine Area

(Some locations may vary due to customer options)

**FIGURE: 2.2 – TYPICAL MODULE LOCATIONS**
How the DINEX G2A System Works?

The inputs to the Main Bus Controller (MBC) Module are supplied by the driver operated controls and the various switches and sensors linked together in the system.

G2A-MBC-32 module can receive up to 32 inputs. It does not have outputs and feedback channels.

When the driver turns on a switch, the inputs are activated and a signal goes to the MBC.

The MBC is the COMMAND CENTER or the switchboard.
The MBC receives inputs as an on or off signal and relays the signal to the module that executes the commands. After the module executes the command it keeps track of how the system is working. Each module in the system has a unique address.

The MBC uses the DATA CABLE to link up with the various modules required to do the job.

The DATA CABLE is made up of eight, small gauge wires. The twist pair wire keeps out all unwanted noise that might distort the data. Data travels through the cable at 115,200 BPS or 1/1,000,000th of a second.

The DATA CABLE talks to all components through a unique “loop” link-up. The MBC checks in with each module and issues instruction. As a check, it rechecks its inputs to verify that the job has been done.

LEDs tell the driver/operator if the modules are working as he has instructed. Single-controller systems are used in the Data Bus Cable. MBC is the only controller in a system and is the only programmable module among the system components.

The Main Bus Controller (MBC) is the general-in-command. It has the special built-in features, such as a computer, which tells all listeners what to do. After the MBC issues a command it tracks the work in progress.

The MBC communicates all instructions via a data cable to all modules in the network. Each module is identified by an address, like an employee, social security, or phone number. The MBC contacts modules by using this special ID number.

G2A-MBC-32 module can receive up to 32 inputs. The G2A-MBC-32 module does not have outputs and feedback channels.

Multiplex modules are each assigned a unique address. This address allows the MBC to communicate directly with each specific module. Each module has a sub-address that relates to a specific circuit.

Most DIO modules can control up to eight output circuits and receive eight more inputs, and, optionally, 8 feedback channels.
FIGURE: 3.2 -- G2A-DIO-888

For example, in the figure of G2A-DIO-888 above,

A = module location on the bus
4 = module number
i4 = input point on the module

Thus,
MBC-1 = input from master switch/run position
A2-i4 = input from interlock stop light pressure switch
A2-o1 = output to stop light lamps

The loop and how it works:

The MBC uses the main data bus cable to communicate with all the modules in turn, one after the other.

The MBC only addresses each module -- using its unique address -- one at a time, telling it what to do and then the MBC rechecks its inputs to verify the job has been done as ordered.
The Main Bus Controller – G2A-MBC-32 -- is the top-level device. It is the command post for what’s happening throughout the operating system.

- The Main Bus Controller controls and monitors up to 16 modules in a single level of data bus.
- It interfaces with 32 inputs and contains its own power management unit for entire system.
- It interfaces with switches, such as limit switches, temperature and pressure switches, and can directly control other modules.
- LED status indicators are provided on all input points.
- It stores instructions for control and monitor.
- It supports Automatic Test Equipment.
- All I/O points are optically isolated.
- It replaces relays with solid state, electrical switching.
- The MBC is simple to replace in the field.
- It has Built-In Self Test functions in software.
Intelligent Digital Input/Output Control Module G2A-DIO-888

FIGURE: 3.4 -- G2A-DIO-888 MODULE DIAGRAM

- DIO normally can only handle 8 inputs, 8 feedbacks and 8 outputs.
- Special DIO units allow additional input controls (up to 32 inputs total).
- Replace like devices with like devices. READ THE LABELS first before replacing one unit with another.
- DIOs are on/off units only and are not programmable.
- Feed-back circuits are used for BIST (Built-In Self Test)
Intelligent Digital 24 Outputs Gateway Module
T2-DIO-24OG-R7

FIGURE: 3.5 -- T2-DIO-24OG-R7 MODULE DIAGRAM

- For driving LED modules.
- Total 24 outputs
- LEDs on the instrument panel are the outputs.
- Acts as gateway on DINEX network and other host systems.
32LED Indicator Panel
T2-32LED-OB-01

FIGURE: 3.6 -- T2-32LED-OB-01 PANEL DIAGRAM

- Instrument Panel LEDs are multiplexing modules.
- Total 32 LED indicators.
- LEDs on the instrument panel are the outputs.
- Each indicator contains multiple LED elements.
- The LED cluster can be removed/replaced as a unit or LEDs can be removed/replaced individually.
- Replacement LEDs are not labeled (each label is a separate piece).
- First indication that an LED is failing maybe a dimming of the LED.
Dinex G2A System “Tree” Structure

The Dinex G2A System “Tree” hierarchy and data bus layout is shown below:

**FIGURE: 4.1 – DINEX G2A SYSTEM “TREE” STRUCTURE DIAGRAM**

- G2A-MBC-32 = MAIN BUS CONTROLLER MODULE WITH PMS
- G2A-DIO-888 = DIGITAL INPUT/OUTPUT MODULE
- T2-DIO-240G-R7 = 24 OUTPUTS GATEWAY MODULE
- T2-32LED-OB-01 = DASHBOARD LAMP CLUSTER OR TELL-TALE PANEL

4-How Is It All Hooked Together?
Dinex G2A System Ring-Loop Hookup Structure

The Dinex G2A System – Ring-Loop Hookup Structure shown below:

NOTE: For Blue Bird Bus
45’ Coach: B1 Module -- T2-32LED-OB-01
Sword 2: B1 Module -- T2-DIO-240G-R7
US Sword: B1 Module -- T2-DIO-240G-R7

FIGURE: 4.2 – DINEX G2A SYSTEM RING-LOOP HOOKUP DIAGRAM
NOTE: When removing wires from panel power studs, be sure to tag and reinstall removed wires to the same location.

**Dual Voltage Capability**

**FIGURE: 4.3 – INPUTS, OUTPUTS, & POWER CONNECTION DIAGRAM**

- DIO modules have split circuits to allow two different output circuit voltages (12 or 24 volts) from a single module.
- Power can be 12/12, 12/24, 24/12, 24/24 volts depending on the voltage requirements of circuits being controlled.
- Pin #35 supplies power to the eight inputs.
- "Inputs" to the multiplex system are grounded at a switch.
- Ground wire is in the AMP type connector PIN # 33.
The DINEX G2A system is composed of a network of rugged modules connected to a single data bus. This data bus interfaces with DINEX G2A modules. The DINEX G2A modules interface with sensors, switches, actuators and vehicle control devices.

The simplified wiring of the DINEX G2A network control system makes troubleshooting relatively simple in most cases.

Three Basic Steps to Diagnosis and Troubleshooting:

- Visual Inspection
- I/O Test Kit Verification
- Software Testing and Programming
- BIST (Built-In Self Test)

1. **Visual Inspection**

Eighty-five percent of failed circuits can be diagnosed by using modules’ LEDs -- failures usually related to defective parts, i.e., bulbs, switches, etc. This chapter discusses in depth how to diagnose and troubleshoot through visual inspection
2 I/O Test Kit Verification

The I/O Control Test Kit provides for the testing of modules and the communication network. The I/O Control Test Kit will assist you in diagnosing those faults not found during visual inspection. The next chapter will introduce these test kits in more details.

3. Software Testing and Programming

Software Testing provides a way of verifying module programming or programming of replacement modules. Please refer to bus manufacturer’s control logic diagrams/ladder charts for software testing and programming.

4. BIST (Built-In Self Test)

The BIST may be invoked any time. It is a passive test which uses the feedback circuits to check the output circuits. It also checks the DINEX module communications.

Visual Inspection:

- Visual inspection of the LEDs on the DINEX G2A modules will normally lead to the identification of 85% of all faults.
- Use Ladder Logic Diagrams -- to identify the relationship and the hook-up of devices -- and,
- Electrical Schematics -- to trace the circuits linked to a malfunctioning module indicated by the LED -- is all that is required at the Visual Inspection Level.
- Input Circuit LEDs.
- Ground connection – Verify that pin 16 of the large round AMP connector has a good chassis ground connection.

All modules, except PMS and junction boxes, have green LEDs to monitor input circuits. Each input has its own address. The lighted green LED indicates active input

- Output Circuit LEDs

DIO-888s use two LEDs, amber and red, to monitor output. If the circuit is off, the amber LED is lighted. The circuit is complete and ready, but is not active.

A lighted red LED indicates that the circuit is active. The amber LED is off.
Using LED on the modules to diagnose failed components.
- The “tools” necessary to diagnose faults are LEDs on the modules, “Ladder Charts” (or logic diagrams) and Electrical Schematics.
- When an LED does not indicate proper circuit operation, the electrical schematic can be used to trace the circuit from the module(s) to the input or output.
- Multiplex Test Equipment, Step 2, should not be necessary until, and only until, visual inspection has failed to indicate the failure or to confirm the functionality of the operation.

Checking the Input LEDs

- The MBC and DIO modules have green LEDs to monitor all inputs.
- Each input point has a unique location or sub-address. When the green LED is on, the input is ACTIVE.

LEDs Monitor Circuits

- With the circuit turned off: An amber LED comes on. (The amber LED indicates circuit integrity.) A circuit is complete and ready, but IT DOES NOT MEAN THE CIRCUIT IS ACTIVE.
- When the circuit is in use: A red LED will come on. This indicates that the circuit is ACTIVE. The amber LED turns off.

FIGURE: 5.1 – DATA COMMUNICATION STATUS LED DIAGRAM

NOTE: During normal operation, the red and amber LEDs alternate off and on.
The Data Communications Status LED

- The MBC, and DIO modules have Data Communications Status LED mounted on the left side of the face of the module, as shown in the figure above for a DIO module.

- The Data Link LED flashes at a rapid rate to indicate that the module is communicating.

- Modules in communication with DIOs respond with flashing LEDs. When multiple circuits respond, check the Data Link LED to see if it is flashing.

Tips on locating the site of a Failure using LEDs on the DIO modules

- If the load circuit is open -- i.e., bulb blown, burned solenoid, broken wire, etc.—the amber LED will not light up.

- If both amber and red LEDs are on when the circuit is active, check the fuse.

- If a module’s red LED is out,
  a) check the data communication status LED on the left side of the module
  b) check cable for loose connections or damage,
  c) or check the related input status.
FIGURE: 5.2 –LEDS VISUAL INSPECTION DIAGRAM

Tips on locating the site of a Failure using LEDs on the DIO modules

- Internal circuits in the multiplex units (DIO) allow a small amount of current to flow to the output load -- even when the load is inactive.

- Current from the battery bus bar will pass through the amber LED, a large resistor, and the load to get to ground.

- A blown fuse will still allow current to flow through the amber LED and the red LED will be on because the circuit is trying to activate itself.
The No Connection Circuit

FIGURE: 5.3 – FUNCTIONAL DIAGRAM OF DINEX MPX SYSTEM

- The simplified circuit on the previous page shows that there are no direct links among input, the data bus, and the output.

  - The green LED turns on the sensor and switch inputs.

  - A light sensing (solar) transistor closes and a CPU sends out a signal on the data bus.

  - The receiving CPU lights the red LED.

  - Another light sensing transistor closes and completes the circuit from the battery to the load.

- No direct wire links eliminates the need for external diodes.

- Danger of voltage spikes damaging the data loop or modules is eliminated.

LADDER CHARTS

Understanding the Ladder Charts
Think of ladder charts as logic diagrams, see below:

Active And Inactive Inputs
The MBC can be programmed to use open (inactive) or closed (active) switch input to determine a course of action.

Imagine a relay that is normally open. Imagine the LED as a relay coil:

- With no power to the relay, the LED is off. The relay is in the normally open position.
- When power is applied, the LED is on and the relay is in the closed position. The current flows through the control load.

**About Ladder Charts**

- Simple charts make diagnosing circuits easy.
- All conditions must be met to complete an action.
- Charts indicate any parallel circuits for an action.

**FIGURE: 5.4 – ACTIVE & INACTIVE COMPONENT DIAGRAM**

The MBC can be programmed to use open (inactive) or closed (active) switch input to determine a course of action.

Imagine a relay that is normally open. Imagine the LED as a relay coil:

- With no power to the relay, the LED is off. The relay is in the normally open position.
- When power is applied, the LED is on and the relay is in the closed position. The current flows through the control load.

**About Ladder Charts**

- Simple charts make diagnosing circuits easy.
- All conditions must be met to complete an action.
- Charts indicate any parallel circuits for an action.
FIGURE: 5.5 – LADDER CHARTS DIAGRAM

More About Ladder Charts

- The Ladder Chart above shows each step necessary for a vehicle to be started.
  1. The alternator must not be charging.
  2. Vehicle is in neutral.
  3. From the front -- the master switch is on.
  4. From the rear -- the rear ignition and starter switches may be used.
  5. From the rear -- the ignition and starter control switches are set in front start position.
  6. Use the starter button.
  7. “Latch On” function circuit is set for starter relay.
     a. Circuit remains complete as long as starter is cranking, even if alternator starts to charge.
     b. Starter can not be re-engaged if alternator is charging.
**BIST (Built-In Self Test)**

On the buses, the 'Left Turn' and 'Right Turn' lamps on the Dashboard LED display can display a flash code if there is any Dinex module communication failure or Output Feedback problem. These are generally known as BIST flash codes, for Built In Self Test. The Right Turn, Left Turn, and Diagnostic Light Test switch must all be on at once in order to begin a flash code cycle.

Once begun, the flash code sequence will go through and check all of the modules, so there is no need to hold all three switches continuously. The flash code sequence will cycle again if the three switches are on, otherwise the BIST sequence will check each module and then stop. The warning buzzer is usually on when the Diagnostic Light Test switch is on, but the buzzer is silenced during the BIST. If there is no BIST failure, then the warning buzzer will sound periodically while all three switches are held on and neither the Left Turn nor the Right Turn dashboard lamp will light.

The Right Turn lamp on the Dashboard LED display will flash quickly to show which module has a failure. The Left Turn lamp will flash slowly to show which output channel(s) from the failed module is actually bad. If the Left Turn lamp does not flash, then this indicates a module communications failure rather than an output failure.

<table>
<thead>
<tr>
<th>RIGHT TURN Lamp is:</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Dinex module is OK</td>
</tr>
<tr>
<td>One Flash</td>
<td>Module A2 #64 Fault</td>
</tr>
<tr>
<td>Two Flashes</td>
<td>Module A3 #65 Fault</td>
</tr>
<tr>
<td>Three Flashes</td>
<td>Module A4 #66 Fault</td>
</tr>
<tr>
<td>Four Flashes</td>
<td>Module C1 #67 Fault</td>
</tr>
<tr>
<td>Five Flashes</td>
<td>Module C2 #68 Fault</td>
</tr>
<tr>
<td>Six Flashes</td>
<td>Module D1 #69 Fault</td>
</tr>
<tr>
<td>Seven Flashes</td>
<td>Module D2 #70 Fault</td>
</tr>
<tr>
<td>Eight Flashes</td>
<td>Module D1 #71 Fault</td>
</tr>
<tr>
<td>14 Flashes</td>
<td>Module A1 (MBC) #77 Fault (internal)</td>
</tr>
<tr>
<td>15 Flashes</td>
<td>Module B1 #78 Fault</td>
</tr>
<tr>
<td>9 - 13, or 16 Flashes</td>
<td>Incorrect Dinex program, Incorrect Accessory (Palm PC).</td>
</tr>
<tr>
<td>LEFT TURN Lamp is:</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Off</td>
<td>Nothing (Or Communication Fail)</td>
</tr>
<tr>
<td>One Flash</td>
<td>Module output #1 failure</td>
</tr>
<tr>
<td>Two Flashes</td>
<td>Module output #2 failure</td>
</tr>
<tr>
<td>Three Flashes</td>
<td>Module output #3 failure</td>
</tr>
<tr>
<td>Four Flashes</td>
<td>Module output #4 failure</td>
</tr>
<tr>
<td>Five Flashes</td>
<td>Module output #5 failure</td>
</tr>
<tr>
<td>Six Flashes</td>
<td>Module output #6 failure</td>
</tr>
<tr>
<td>Seven Flashes</td>
<td>Module output #7 failure</td>
</tr>
<tr>
<td>Eight Flashes</td>
<td>Module output #8 failure</td>
</tr>
</tbody>
</table>
Testing Tools

G2A-MK-808 Test Kit

General Description

G2A-MK-808 is designed to diagnose and test G2A-DIO-888-K modules to support first line maintenance personnel. It is capable of testing the communications network function and simulating the direct output control of individual output point and monitor input status. It is also designed to check and support the integrity of the network. It does this by monitoring and scanning the ID of each network node. The versatility of G2A-MK-808 makes it the primary tool of the DINEX-G2A-MPX system.

![G2A-MK-808 Module Diagram](image)

**Warning:** ONLY AUTHORIZED AND TRAINED PERSONNEL SHALL USE THIS EQUIPMENT. The T2-MK-808 will override all safety preconditions. Mishandling may prove hazardous and harmful to the operator or third party. Special caution and authorization are required to operate this tool.

**FIGURE: 6.1 – G2A-MK-808 MODULE DIAGRAM**
G2A-MK-808 Tests DIO 888 Modules

- Tests communications network,
- Simulates outputs,
- Monitors inputs.

Target Device

G2A-DIO-888, and the network.

Major Test Component and Accessories

- G2A-MK-808
- I/O cables and ID Scan cable

**FIGURE: 6.2 – G2A-MK-808 CABLES DIAGRAM**
Operating Procedure

Module ID and Input/Output Test

1. Power up the vehicle battery. Ensure that the MBC’s PMS is in “wake up” mode to provide isolated power to DINEX G2A system.

2. Turn the dial on the G2A-MK-808 to “IDSCAN” position.

3. Disconnect both data bus cable connectors from the target module.

4. Connect the test cable (‘I/O Modules’ Cable) to target test module Connect (G2A-DIO-888) by following cable markings, i.e. connect the “I/O Modules” side of the test cable to the data side of module, connect the “Power” side of the test cable to either of the disconnected data cable connectors.

5. Target module’s ID will now light up the corresponding LED on the tester.

6. Rotate the tester’s dial to select the target output channel (1 through 8).
   i. -Push the activate button to activate the selected output.
   ii. -Repeat for different output channels.

7. At the same time the module input LEDs on the tester will light on or off corresponding to the module input status.

8. Check the activation status of the target module and the corresponding output point and input to verify the function and circuit integrity.
   i. -Outputs - If the red LED on the module does not come on during the test of a selected output, the module or connection is suspect.
   ii. -Inputs - If an input LED on the module is lit and the corresponding LED on the tester fails to light up, the module or connection is suspect.
   iii. –A bad or open ground on the large AMP connector pin 23 can prevent proper module operation.

Note: Make sure that the module is connected to the tester cable first and removed last at the end of testing.
Network Integrity Test

1. Disconnect the Y cable used for I/O module test from the G2A-MK-808.
   (Reconnect the I/O Module to the ring loop)

2. Replace the Y cable with another Y cable that is marked ‘Comm. Cable’ for Network test onto the G2A-MK-808. Follow the cable markings.

3. Disconnect both data cables from the G2A-MBC-32.

4. Set the select switch on the G2A-MK-808 to ID Scan.

5. Connect G2A-MK-808 cable to the connector of MBC data bus.

6. The corresponding tester LED should illuminate, indicating that the correct modules are connected to the main data bus.

7. Verify the network configuration and check integrity.

8. Reconnect both data cables back to the G2A-MBC-32.
T2-MK-PROGRAM Test Kit

General Description

The PROGRAM KIT is designed to download program smoothly.

- T2-MK-PROGRAM holds program memory.
- T2-MK-CHARGER-R2 loads the program to the target MBC module in less than 60 seconds.

Module program changes (resulting from faults or updates) are easily corrected in the DINEX T2 system using the T2-MK-PROGRAM and T2-MK-CHARGER-R2, see the illustration above. The Charger will download the program to the target MBC in less than 60 seconds.

The PROGRAM and CHARGER are intended to be used as a pair without the aid of any additional equipment.

The LED device on the T2-MK-CHARGER-R2 can be helpful to monitor the status of downloading a new program, or verifying the program currently in the module.

<table>
<thead>
<tr>
<th>PIN</th>
<th>COL</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YEL</td>
<td>DNET PS-485+</td>
</tr>
<tr>
<td>2</td>
<td>GRN</td>
<td>DNET PS-485-</td>
</tr>
<tr>
<td>3</td>
<td>RED</td>
<td>+12V, ISOLATED</td>
</tr>
<tr>
<td>4</td>
<td>BLK</td>
<td>GROUND, ISOLATED</td>
</tr>
<tr>
<td>5</td>
<td>ORG</td>
<td>DNET PS-485+</td>
</tr>
<tr>
<td>6</td>
<td>CRY</td>
<td>DNET PS-485-</td>
</tr>
<tr>
<td>7</td>
<td>FPL</td>
<td>NC</td>
</tr>
<tr>
<td>8</td>
<td>BLU</td>
<td>NC</td>
</tr>
</tbody>
</table>

NOTE: 1. ALL DIMENSIONS ARE IN INCHES.
2. ALL CONNECTORS USE TUB-0003 3/4" BLACK HEAT SHRINK.
3. ALL CONNECTORS USE TUB-0016 PLASTIC TIE WRAP.
4. ALL CONNECTOR WIRES USE TUB-0002 1/4" BLACK HEAT SHRINK.
5. ALL WIRE LABELS USE TUB-0017 1/4" CLEAR HEAT SHRINK.
WIRE DRAWINGS ARE NOT TO SCALE.
Target Devices

G2A-MBC-32

NOTE: When replacing a new G2A-MBC-32 module, the same system unique program must be loaded to the new module as was used in the “old” system.

When the control system needs customer design changes, the updated program or programs must be loaded to the specific G2A-MBC-32 module to ensure that the system performs as required.

Up-loading a program to T2-MK-PROGRAM kit from a PC
(for Level 2 & Level 3 or Factory used only)

Operating Procedure

1. Prepare the PC-compatible computer with the T2-MK-232 (an RS232 to RS485 converter module) in normal programming mode.

2. Identify the target, G2A-MBC-32 module and verify the program to be downloaded.

3. Select the correct program to be downloaded.

4. Connect the T2-MK-CHARGER-R2 and the T2-MK-PROGRAM modules together via their DB-25 connectors.

5. Apply power to the T2-MK-CHARGER-R2 by connecting the 9-volt AC Power adapter supplied with the T2-MK-232 kit.

6. Select “Upload Mode” on the T2-MK-CHARGER and press ENTER

7. Execute the normal PC program upload/downloading procedure to upload:
   i. Select file to be uploaded
   ii. Select COM port
   iii. Select “G2A”
   iv. Select baud rate: 115K for G2A system
   v. Ignore the code length selection (It’s fixed length: 3FFF in hexadecimal)
   vi. Press button called ‘Program & Verify’
8. If an error message window is shown up, reset the CHARGER module by unplugging the power adapter. Plug it in again to reset the CHARGER. And repeat Step 6 again till a download completion message window is displayed.

9. Program download is now completed. The T2-MK-PROGRAM modules are ready for service.

Verifying or downloading the program from T2-MK-PROGRAM kit to the target module IN THE VEHICLE

Operating Procedure

1. Turn on the vehicle battery power.

2. Identify the target G2A-MBC-32 module and verify the program to be downloaded.

3. Choose the correct pre-loaded T2-MK-PROGRAM module to be downloaded.

4. Connect the T2-MK-CHARGER-R2 and the T2-MK-PROGRAM modules together via their connectors.

5. Connect the cable assembly via the 8-pin connector to target module, but disconnect the target module from the ring loop at both connections.

6. Select ‘Verify’ mode. By pressing ‘Enter’ button, it starts to verify the program in the PROGRAM module and the program in the target module.

7. If the ‘Verify’ OK, they both contain an identical program. The CHARGER will display ‘checksum’ and ‘Revision number’ on the LED device.

8. If the ‘Verify’ process shows ‘Checksum Error’, it means the target module has different program than in the PROGRAM module. Select ‘Download mode’ to start downloading process.

9. If ‘Download Error – verify cksum err’ status shows on the LED device, the download process is not successful. Repeat Step 6
through 9 till ‘Download Completed – Verify OK! Rev. #’ message is displayed.

10. Unplug the connector from the target module.

11. Disconnect program-related connectors.

12. Program download is now complete. Reconnect connectors to original configuration as required.

**Factory Troubleshooting and Repair**

- If Levels 1 through 3 troubleshooting and diagnostics fail to show the cause for failures or poor performances, the suspect module must be returned to the manufacturer for more rigorous troubleshooting and repair.

**Note:** DINEX module internal components are not field-repairable
7- Failure Analysis and Corrective Action

I/O Failure

This operation is to be used where a limited number of input or output points have malfunctioned within each module.

Visual Check -- Output Mode

- Check the fuse.
- Check feedback amber* and red LEDs. Amber* LED checks the circuit integrity. If the circuit is open for any reason during non-active/ red LED off mode, the amber* LED will be off. If the circuit is functioning the amber* LED will be on.
- The red LED confirms that the output is activated by the computer. If both the red and amber* LEDs are on, check the fuse.

Use Of Tools

- Use the T-MK-808 to confirm the test.

Corrective Action

- Check to see if a fuse is burned out.
- Check for possible short circuit.
- If amber* LED is off, check for open circuit.
- If both red and amber* LEDs are off, replace module and check circuit.
Module Failure

When a full bank of functions is not working, a module failure has occurred or the output section is missing the power connection.

Visual Check

- Check the communications.
- Check LEDs. If an LED is off, and remains off, module-networking capability is malfunctioning.
- Check powers supply yellow LED. Is every yellow LED on? If the yellow LED is on, system power is fine.

Use of Tools

- T-MK-808 is used to check ID and IO.

Corrective Action

- Check DATA BUS wires integrity. Reset the module by disconnecting the data bus. Replace module.
System Failure

This level of failure is indicated when the system operates as follows:

- Abnormally.
- System is dead.
- Control of the system is lost.

Before proceeding

- Reset the system.
- Shut down/ reset the battery.

Visual Check

- Check every network module LED. All modules should be blinking rapidly.
- If LEDs are not blinking rapidly, check the MBC data bus connection.
- If LED’s are blinking, run the BIST and check for DINEX module communication failure indication.

Use of Tools

- Use G2A-MK-808 ID checking mode for data bus integrity.

Corrective Action

- After resetting the system, if the condition persists. Replace the MBC module.
MODULE FEATURES

- Controller.
- Stores instructions for control and monitor.
- Programmable logic for sequence of operations.
- Software compiler available.
- Controls and monitors up to 16 sub-nodes.
- Interface for 32 inputs.
- Four groups of 16-8-4-4 input points may be source reference or ground reference inputs.
- Built-in timer interrupts function.
- Supports multiple, hierarchical network levels.
- Supports connections to other computers and Automatic Test Equipment.
- For control and monitoring of devices.
- All I/O points are optically isolated.
- LED status indicators provided on all I/O points.
- Replaces relays with solid state, electrical switching.
- Polarity of I/O signals is set by hard wiring, the next assembly wiring harness as appropriate.
- Communication with 115K Baud Dinex G2 Modules

STANDARD DINEX FEATURES

Network
- Integrates with intelligent network control system.
- Allows system expansion.
- Easy to use and program.
- Interfaces to Personal Computers and other host computers.

Construction
- Small, compact, light weight and rugged.
- Simple to field replace.
- Built-in high speed RISC microprocessor with EEPROM.
- Designed with CMOS circuitry for low power consumption.
- Designed with CMOS and FET circuitry for low power consumption.

Multiplex Communication
- Fault tolerant RS485 data communication bus.
- 115 Kbps data communication rate.
• LED status indicator during communication operation.
• Dual communication ports for ring-loop hook-up capability.

APPLICATIONS
• Main Bus Controller for Multiplexing Systems.
• Master Bus Controller replacing computers.
• Controller for on-board Self-Tests and/or connections to external Automatic Test Equipment for diagnostics.
• Interfaces to switches, such as limit switches, temperature and pressure switches, pushbutton and selector switches.

PRODUCT DESCRIPTION
The Main Bus Controller (G2A-MBC-32) is a network controller with power driver, which provides the complete functions acting as a full-size computer. The module can be established as a Bus Controller which controls multiple nodes or which can directly control other node modules. The MBC module can provide a direct interface for the operator interface, including switches, LED indicators and digital displays.

OPTIONS
Module
• Alternate connector types and configurations, or color coded wire pigtails.
• Resistance for exposure to the ambient environment, without a required enclosure.
• Optional RS-232 Port by special order.

Support Equipment
• DINEX T2-MK-232 Converter Box for RS232 serial port (PC compatible) to DINEX data communication bus.
• Handheld Field Programmer.
• Simulator.

TECHNICAL SPECIFICATIONS
General
• Operating temperature range: -40°C to +85°C
• Humidity: 10% to 100%, saturated
• Shock: up to 20 g
• Vibration: 5 to 35 Hz, 2mm double amplitude, 2 hours

MODULE
Inputs
• Input voltage: 16-32 VDC
• Reverse voltage protection: 32 VDC
• Input current at rated pick-up voltage: 5mA
• Input current at maximum voltage: 15mA
• Turn on/off time: 15 millisecond maximum

LED Indicators
• green indicators for inputs.

Module and Programming
• High speed microprocessors.
• 8000 programming lines of stack code.
• Integrated word look-up table.
• 16K byte of EEPROM.
• network data exchange registers
• Fast program cycle time 3 microseconds.
• I/O excursion time 1575 microseconds.
• Extended compiler instruction set.
• Swap and rotate capability.
• Programming direct jump capability.
• Extended instruction set built into firmware.
• Direct control of other sub-level Cell Net Controllers.
• Built-in error detection, check sum protocol for faster operation.
• Uses standard ASCII text editor to generate source code, such as Microsoft DOS Edit.
• Uses Dinex Ladder Logic GUI language to generate source code, object code, system documentation.

Network Linking Capability
• One uplink to higher level controller.
• 16 downlinks to lower level controller and/or other DINEX modules.
• Note: The 32 input section uses one downlink address. Those 32 inputs may be made available to a redundant MBC controller.

PROGRAMMING SUPPORT SOFTWARE
• DINEX Ladder Logic GUI language
• DINEX G2 Utility Program.
• High Speed Compiler (PC compatible).
• IOL2.3 Downloader (PC compatible).
• Debugger/Single Step Execution.

SUPPORT DOCUMENTATION
### AMP 207121-1

<table>
<thead>
<tr>
<th>1-32</th>
<th>INPUT 1-32</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>COM1 FOR INPUT 1-16</td>
</tr>
<tr>
<td>34</td>
<td>COM2 FOR INPUT 17-24</td>
</tr>
<tr>
<td>35</td>
<td>COM3 FOR INPUT 25-28</td>
</tr>
<tr>
<td>36</td>
<td>COM4 FOR INPUT 29-32</td>
</tr>
</tbody>
</table>

### AMP 207441-1

| 1    | DNET-A     |
| 2    | DNET-B     |
| 3    | +VIN       |
| 4    | GROUND     |
| 5    | CNET-A     |
| 6    | CNET-B     |
| 7    | PROG_L     |
| 8    | RESET_L    |

### AMP 206705-1

| 1    | 12V (+)    |
| 2    | 12V (-)    |
| 3    | RESERVE    |
| 4    | WARNING OUTPUT |
| 5    | MASTER SW POS. 6 |
| 6    | A 485      |
| 7    | B 485      |
| 8    | GROUND     |
| 9    | BATTERY 24V |
G2A-DIO-888
Intelligent Digital Input/Output Module

MODULE FEATURES
- 8 input points.
- 8 output points, high power DC version.
- 8 internal feedback monitoring LEDs, for determining the status of control devices and loads.
- 8 internal feedback current less than 100 uA.
- Each Output point is fuse protected, and includes an easily accessible, sealed fuse holder.
- All I/O points are optically isolated.
- Outputs may be any combination of source and sink outputs.
- LED status indicators provided on all I/O points.
- Polarity of input/output signals is set by hard wiring the next assembly wiring harness as appropriate.
- Replaces relays with solid state, electrical switching.
- Communication with 115K Baud Dinex G2A modules

STANDARD DINEX FEATURES

Network
- Integrates with intelligent network control system.
- Allows system expansion.
- Easy to use and program.
- Interfaces to Personal Computers and other host computers.

Construction
- Small, compact, lightweight and rugged.
- Simple to field replaces.
- Built-in high speed RISC microprocessor with EEPROM.
- Designed with CMOS circuitry for low power consumption.
- Designed with CMOS and FET circuitry for low power consumption.

Multiplex Communication
- Fault tolerant RS485 data communication bus.
- 115 Kbps data communication rate.
- LED status indicator during communication operation.

APPLICATIONS
- Used for turning on and off electrical power to control devices and loads, such as solenoid valves, lights, electrical clutches, heaters and motor starters.
- Can apply electrical power to fareboxes, radios and other electrical subsystems.
- Interfaces to switches, such as limit switches, temperature and pressure switches, pushbutton and selector switches.

PRODUCT DESCRIPTION

The G2A-DIO-888 module is a digital input and output module for on/off state devices. The module includes both inputs for monitoring switches and outputs for control devices in a very compact package. Internal feedback monitoring provides the ability to determine if a load is active, in addition to the wiring and output fuse. Each I/O point is optically isolated and fused for protection against voltage spikes, transients and short circuits. The optical isolation also provides electrical noise immunity.

Each module has a unique programmable field address and each I/O point can be separately monitored and controlled by a Cell Net Controller or computer.

There are 8 inputs can be wired as ground-switched inputs or voltage-switched inputs. Polarity of input signals is set by hard wiring the next assembly wiring harness as appropriate.

The output section has two connections for circuit power and ground for purposes of applying power to control the output switching transistors. Each output may be a source output or a sink output. Polarity of
output signals is set by hard wiring the next assembly wiring harness as appropriate

**OPTIONS**

**Module**
- Alternate connector types and configurations, or color coded wire pigtails.
- Resistance for exposure to the ambient environment, without a required enclosure.

**Support Equipment**
- DINEX T2-MK-232 Converter Box for RS-232 serial port (PC compatible) to DINEX data communication bus.
- Handheld Field Programmer.
- Simulator.

**TECHNICAL SPECIFICATIONS**

**General**
- Operating temperature range: -40°C to +85°C
- Humidity: 10% to 100%, saturated
- Shock: up to 20 g
- Vibration: 5 to 35 Hz, 2mm double amplitude, 2 hours

**MODULE**

**Inputs**
- Input voltage: 8-32 VDC
- Reverse voltage protection: 32 VDC
- Input current at rated pick-up voltage: 5mA
- Input current at maximum voltage: 15mA
- Turn on/off time: 15 millisecond maximum

**Outputs**
- Load voltage: 8-32 VDC
- Continuous load output current: 7.5 Amp
- High power output option for ch1 to ch4: 15 Amp continuous load
- Leakage current at nominal load voltage: 100 uA max.
- Turn on/off time: 15 millisecond maximum
- Total output current is 40 Amp Maximum

**LED Indicators**
- 8 green indicators for inputs.
- 8 red indicators for outputs.
- 8 amber indicators for internal feedback monitoring of load.

---

**PIN ASSIGNMENT**

<table>
<thead>
<tr>
<th>PIN</th>
<th><strong>POWER OUTPUT CONNECTION</strong></th>
<th>SINK OUTPUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2</td>
<td>CH 1 POWER</td>
<td>CH 1 OUTPUT</td>
</tr>
<tr>
<td>5,6</td>
<td>CH 1 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>9,10</td>
<td>CH 2 POWER</td>
<td>CH 2 OUTPUT</td>
</tr>
<tr>
<td>13,14</td>
<td>CH 2 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>17,18</td>
<td>CH 3 POWER</td>
<td>CH 3 OUTPUT</td>
</tr>
<tr>
<td>21,22</td>
<td>CH 3 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>25,26</td>
<td>CH 4 POWER</td>
<td>CH 4 OUTPUT</td>
</tr>
<tr>
<td>29,30</td>
<td>CH 4 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>3,4</td>
<td>CH 5 POWER</td>
<td>CH 5 OUTPUT</td>
</tr>
<tr>
<td>8</td>
<td>CH 5 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>12,16</td>
<td>CH 6 OUTPUT</td>
<td>CH 6 OUTPUT</td>
</tr>
<tr>
<td>20</td>
<td>CH 7 POWER</td>
<td>CH 7 OUTPUT</td>
</tr>
<tr>
<td>24</td>
<td>CH 7 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>28</td>
<td>CH 8 POWER</td>
<td>CH 8 OUTPUT</td>
</tr>
<tr>
<td>32</td>
<td>CH 8 OUTPUT</td>
<td>GROUND</td>
</tr>
<tr>
<td>23</td>
<td>GROUND</td>
<td>GROUND</td>
</tr>
<tr>
<td>34</td>
<td>POWER 24V/12V</td>
<td>POWER 24V/12V</td>
</tr>
<tr>
<td>3</td>
<td>INPUT 1</td>
<td>INPUT 1</td>
</tr>
<tr>
<td>7</td>
<td>INPUT 2</td>
<td>INPUT 2</td>
</tr>
<tr>
<td>11,15</td>
<td>INPUT 3,4</td>
<td>INPUT 3,4</td>
</tr>
<tr>
<td>19</td>
<td>INPUT 5</td>
<td>INPUT 5</td>
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<tr>
<td>23</td>
<td>INPUT 6</td>
<td>INPUT 6</td>
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<tr>
<td>27</td>
<td>INPUT 7</td>
<td>INPUT 7</td>
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<tr>
<td>31</td>
<td>INPUT 8</td>
<td>INPUT 8</td>
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<tr>
<td>35</td>
<td>INPUT COMMON</td>
<td>INPUT COMMON</td>
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<td>36</td>
<td>N/C</td>
<td>N/C</td>
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**AMP 207441-1**

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>DNET-A</td>
</tr>
<tr>
<td>2</td>
<td>DNET-B</td>
</tr>
<tr>
<td>3</td>
<td>+VIN</td>
</tr>
<tr>
<td>4</td>
<td>GROUND</td>
</tr>
<tr>
<td>5</td>
<td>LOOP 5</td>
</tr>
<tr>
<td>6</td>
<td>LOOP 6</td>
</tr>
<tr>
<td>7</td>
<td>LOOP 7</td>
</tr>
<tr>
<td>8</td>
<td>LOOP 8</td>
</tr>
<tr>
<td>9</td>
<td>N/A</td>
</tr>
</tbody>
</table>

---

G2A-DIO-888: Intelligent Digital Input/Output Module
T2-DIO-24OG-R7
Intelligent Digital 24 Output
Gateway Module

MODULE FEATURES

- For driving the LED module.
- 24 transistor 20 mA sink output points.
- Acts as gateway on DINEX network and other host system.
- Isolation output.

STANDARD DINEX FEATURES

Network
- Integrates with intelligent network control system.
- Allows system expansion.
- Easy to use and program.
- Interfaces to Personal Computers and other host computers.

Construction
- Small, compact, lightweight and rugged.
- Simple to field replaces.
- Potted for environmental protection.
- Built-in high speed RISC microprocessor with EEPROM.
- Designed with CMOS circuitry for low power consumption.
- 2 data communication connectors for in/out.

Multiplex Communication
- Fault tolerant RS-485 data communication bus.
- 115K bps data communication rate.
- LED status indicator during communication operation.

APPLICATIONS

- Interfaces with panel LED display module or with load less than 20mA output.

PRODUCT DESCRIPTION

The T-DIO-24OG-R2 is a digital gateway module for on/off state signals. The module is designed for grounding the output in open collector format. Each module has a unique programmable field address and each I/O point can be separately monitored and controlled by a Cell Net Controller or computer.

OPTIONS

Module
- Alternate connector types and configurations, or color coded pigtails.

TECHNICAL SPECIFICATIONS

General
- Operating temperature range: - 0°C to +65°C
- Optional extended temperature: -35°C to +85°C
- Humidity: 10% to 100%, non-saturated
- Shock: up to 20 g
- Vibration: 5 to 35 Hz, 2mm double amplitude, 2 hours

INTERFACE INFORMATION

Computer input power: 9 VDC +3/-2V at 200mA Maximum, isolated supply.
Data communication bus and power connector: IOC MPX side: DEUTSCH DTM04-08PA 8-pin

Connector
- Pin #1 = RS-485 A
- Pin #2 = RS-485 B
- Pin #3 = V+
- Pin #4 = GND
- Pin #5 = direct circuit bypass
- Pin #6 = direct circuit bypass
- HOST side: AMPHENOL 17D-B25P DB-25 male connector or equivalent.
- Pin 1 to Pin 24 = BIT #1 to BIT #24
- Pin 25 = GND

SUPPORT DOCUMENTATION

T2-LED32-OB-01
32LED Indicator Panel

MODULE FEATURES
- For monitoring of devices.
- 32 low level LED output.
- Each point assigned as an output point.
- Non-isolated IO.
- Acts as node in DINEX network.

STANDARD DINEX FEATURES

Network
- Integrates with intelligent network control system.
- Allows system expansion.
- Easy to use and program.
- Interfaces to Personal Computers and other host computers.

Construction
- Small, compact, lightweight and rugged.
- Simple to field replaces.
- Potted for environmental protection.
- Designed with CMOS and FET circuitry for low power consumption.

Multiplex Communication
- Fault tolerant RS-485 data communication bus.
- 115K bps data communication rate.
- LED status indicator during communication operation.

APPLICATIONS
- As instrument panel warning light cluster.
- Customized LED arrangement.

PRODUCT DESCRIPTION

The T2-32LED-OB-01 module is a digital LED output unit for on/off state signals. The module includes 32 high brightness LED blocks for warning indicator or status indicator. Each module has a unique programmable field address and each I/O point can be separately monitored and controlled by a Cell Net Controller or computer.

OPTIONS

Module
- Alternate connector types and configurations, or color coded pigtails.
- Discrete input connections for special items. Such as stop engine signal, check engine signal, directly connected to engine controls. Such a fire signal or ABS signal, directly connected to other control system.

TECHNICAL SPECIFICATIONS

General
- Operating temperature range: - 40°C to +85°C
- Humidity: 10% to 100%, non-saturated
- Shock: up to 20 g
- Vibration: 5 to 35 Hz, 2mm double amplitude, 2 hours

Outputs
Non-isolated LED blocks.
ID Keys for G2A System

General Description

In Dinex G2A system, each module has been signed a unique ‘ID’ number to identify himself. The unique address symbol (two digits of numerical number) which is assigned to each ID key. Each ID key should be connected with each functional unit (module) in the network. Each ID Key’s number can not be changed (no re-writable). Some special module has built in ID function such as MBC, T2-DIO-240G-R7, and RT2-32LED-OB-01; the ID number can be changed.

Typical Information

<table>
<thead>
<tr>
<th>Module’s Name</th>
<th>Zone Location</th>
<th>ID # XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 (MBC)</td>
<td>Zone A</td>
<td>ID # = 77 (built in &amp; re-writable)</td>
</tr>
<tr>
<td>A2</td>
<td>Zone A</td>
<td>ID # = 64</td>
</tr>
<tr>
<td>A3</td>
<td>Zone A</td>
<td>ID # = 65</td>
</tr>
<tr>
<td>A4</td>
<td>Zone A</td>
<td>ID # = 66</td>
</tr>
<tr>
<td>B1</td>
<td>Zone B</td>
<td>ID # = 78 (built in &amp; re-writable)</td>
</tr>
<tr>
<td>C1</td>
<td>Zone C</td>
<td>ID # = 67</td>
</tr>
<tr>
<td>C2</td>
<td>Zone C</td>
<td>ID # = 68</td>
</tr>
<tr>
<td>D1</td>
<td>Zone D</td>
<td>ID # = 69</td>
</tr>
<tr>
<td>D2</td>
<td>Zone D</td>
<td>ID # = 70</td>
</tr>
<tr>
<td>D3</td>
<td>Zone D</td>
<td>ID # = 71</td>
</tr>
</tbody>
</table>

**FIGURE: 9.1 – ID KEY’S TABLE**

**NOTE:** On some models, according to specification of each particular customer, the module’s ID number may be assigned differently.
ID Keys for G2A System

NOTE:
1. PLASTIC CAP IS GREEN.

FIGURE: 9.2 – ID KEY’S DIAGRAM