

Toshiba inverter G3-Series 12-bit Binary Option

**HIGH PERFORMANCE TRANSISTOR INVERTER
TRUE TORQUE CONTROL SERIES**

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**TOSVERT-130
TRANSISTOR INVERTER**

12-BIT BINARY OPTION MANUAL

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Introduction

Thank you for purchasing the “12-bit binary option kit” for the Toshiba TOSVERT-130 G3 High-Performance Transistor Inverter. Before using the 12-bit binary option, please be sure to thoroughly read the instructions and precautions contained in this manual. In addition, please make sure that this instruction manual is delivered to the end user of the inverter unit into which the 12-bit binary option kit is installed, and keep this instruction manual in a safe place for future reference or inverter inspection.

The 12-bit binary option board functions only with G3 inverters with version 120 or later CPUs. The CPU version can be checked by displaying parameter `CPU VERSION` in `GROUP:UTILITY PARAMETERS`. If your CPU version is less than 120, please contact Toshiba International Corporation.

The 12-bit binary option kit contains the following items. If any of these items are missing, please contact Toshiba International Corporation for replacements.

- 12-bit binary option board (part #VF5X-4526)
- 2 nylon standoffs
- 2 wires (1 black, 1 red)
- This manual

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Usage Precautions

Operating Environment

- Please use the option board only when the ambient temperature of the inverter unit into which the option board is installed is within the following specified temperature limits:
Operation: -10 ~ +40°C (+14 ~ +104°F)
Storage: -25 ~ +65°C (-13 ~ +149°F)
- Avoid installation locations that may be subjected to large shocks or vibrations.
- Avoid installation locations that may be subjected to rapid changes in temperature or humidity.

Installation • Wiring

- Do not touch charged parts such as the terminal block while the inverter's CHARGE lamp is lit. A charge will still be present in the inverter unit's internal electrolytic capacitors, and therefore touching these areas may result in an electrical shock. Always turn all inverter input power supplies OFF, and wait at least 5 minutes after the CHARGE lamp has gone out before wiring the communication cables or motor wiring.
- When installing the option board into the inverter and making wiring connections, make certain that no clippings or wiring leads that could cause device failure fall into the inverter or onto electronic components.
- Whenever making wiring connections or installing/removing the 12-bit binary option board, be sure to turn all power sources to the inverter unit OFF.
- Route all signal cables separate from the inverter input/output power wiring.
- To avoid the possibility of electric shock due to leakage currents, always ground the inverter unit's E/GND terminal and the motor. To avoid misoperation, do not connect the 12-bit binary option board's CC terminal to either of the above-mentioned grounds or any other power ground.
- For maximum noise immunity, use shielded cable for all control signal connections.
- Use 0.75mm² or larger wire for all 12-bit binary option board connections.

Other Precautions

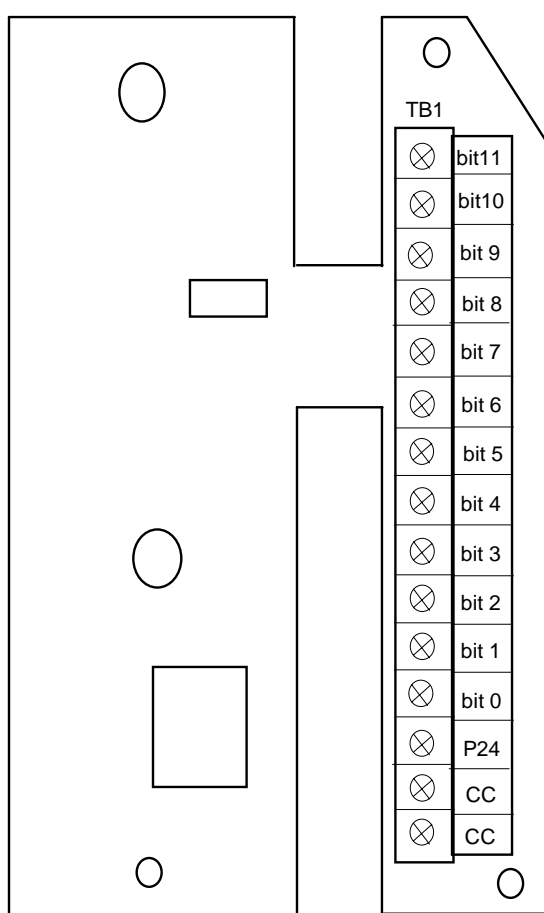
- Please do not attempt to modify or disassemble the 12-bit binary option board.
- Do not touch or insert a rod or any other item into the inverter while power is applied, as this may lead to electrical shock or inverter damage.
- Commission the disposal of the option board to a specialist.

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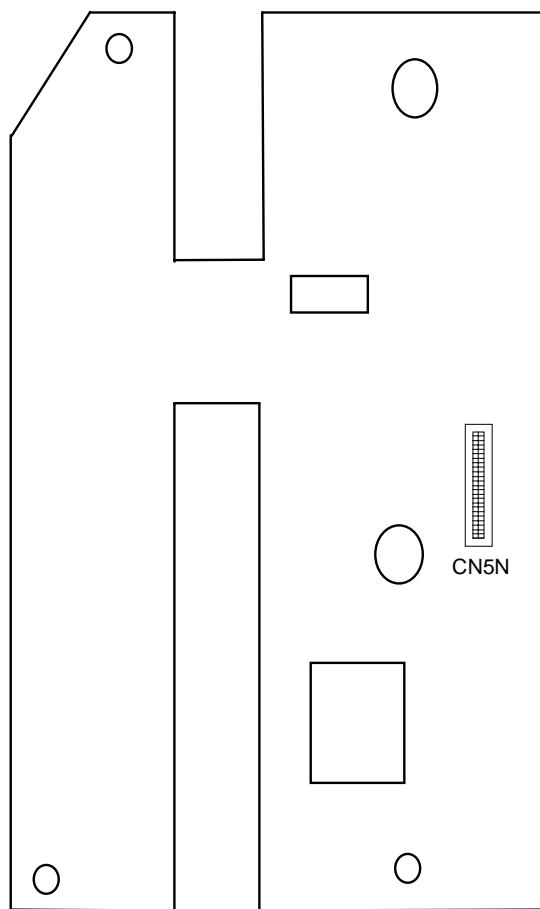
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1. Option Board Layout

The following diagrams indicate the 12-bit binary option board layout and general connection locations.



(Front View)



(Back View)

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2. Specifications

Item	Specification
Operating Environment	Indoors, less than 1000m above sea level, do not expose to direct sunlight or corrosive or explosive gasses.
Operating Temperature	-10 ~ +40°C (+14 ~ +104°F)
Storage Temperature	-25°C ~ +65°C (-13 ~ +149°F)
Relative Humidity	20% ~ 90% (without condensation)
Vibration	5.9m/s ² {0.6G} or less (10 ~ 55Hz)
Cooling Method	Self-cooled

3. Maintenance And Inspection

Preventive maintenance and inspection is required to maintain this option in its optimal condition, and to ensure a long operational lifetime. Depending on usage and operating conditions, perform a periodic inspection once every three to six months. Before starting inspections, always turn off all power supplies to the inverter unit, and wait at least five minutes after the inverter's "CHARGE" lamp has gone out.

Inspection Points

- Check that the wiring terminal screws are not loose. Tighten if necessary.
- Check that there are no defects in any wire terminal crimp points. Visually check that the crimp points are not scarred by overheating.
- Visually check the wiring and cables for damage.
- Clean off any dust and dirt with a vacuum cleaner. Place special emphasis on cleaning the ventilation ports of the inverter and all installed PCBs. Always keep these areas clean, as adherence of dust and dirt can cause premature component failure.
- If use of the inverter unit is discontinued for extended periods of time, turn the power on at least once every two years and confirm that the unit still functions properly.
- Do not perform hi-pot tests on the inverter or option card, as this may damage the unit's internal components.

Please pay close attention to the periodic inspection points and to maintaining a good operating environment.

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4. Storage And Warranty

4.1 Storage

Observe the following points when the option board is not used immediately after purchase or when it is not used for an extended period of time.

- Avoid storing the option board in places that are hot or humid, or that contain large quantities of dust or metallic dust. Store the option board in a well-ventilated location.
- When not using the option board for an extended period of time, turn the power on at least once every two years and confirm that it still functions properly.

4.2 Warranty

The 12-bit binary option kit is covered under warranty for a period of 12 months from the date of installation, but not to exceed 18 months from the date of shipment from the factory. For further warranty or service information, please contact Toshiba International Corporation.

Please perform adequate maintenance and inspection procedures.

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5. Installation

To install the 12-bit binary option board into a G3 inverter, complete the following steps:

1. Verify that all input power sources to the inverter have been turned OFF.
2. Remove the inverter's cover.
3. Wait at least 5 minutes after the inverter's CHARGE LED has gone out before continuing installation of the 12-bit binary option board.
4. Remove the 4 screws attaching the LCD panel support bracket to the control PCB / terminal block PCB support bracket.
5. Lift off the support bracket and LCD panel assembly.
6. Locate the 2 right-side option board standoff holes in the control PCB / terminal block PCB support bracket. Insert the 2 nylon standoffs (support arms end down) into these holes.
7. Place the 12-bit binary option board over the control PCB, lining up the 40-pin CN5N connector on the back side of the option board with the 40-pin CN5 connector on the left-side of the control PCB.
8. Press gently but firmly on the option board, aligning CN5N with CN5 and the 2 nylon standoffs with the standoff holes on the right-hand side of the option PCB. Verify that the CN5N / CN5 connection is secure and properly aligned, and that the ends of the standoffs fully protrude out through the standoff holes in the option PCB.
9. Connect the P24 terminal on TB1 on the option board to the P24 terminal on the G3's terminal block board using the red wire contained in the 12-bit binary option board kit. Connect one of the CC terminals on TB1 on the option board to one of the CC terminals on the G3's terminal block board using the black wire contained in the 12-bit binary option board kit. **NOTE:** The 12-bit binary option board has 2 CC terminals on TB1. They are internally connected. It therefore does not matter which one of these terminals is connected to the G3 terminal block board's CC terminal.
10. Perform all other wiring connections for the bit 0 ~ bit11 terminals on TB1 of the option board. Route all control wiring down through the inverter's wiring access cover, being sure to keep it away from all internal power and heat-generating devices that may damage the wire's insulation.
11. Place the support bracket and LCD panel assembly back onto the inverter unit, making sure that the connector on the back of the LCD panel properly mates with the control board connector protruding through the 12-bit binary option board.
12. Reinstall the 4 screws attaching the LCD panel support bracket to the control PCB / terminal block PCB support bracket.
13. Reinstall the inverter's cover.
14. Turn all power sources to the inverter unit ON, and verify that the inverter functions properly. If the inverter unit does not appear to power up, or does not function properly, immediately turn power OFF and verify all connections. Contact Toshiba International Corporation for assistance if the problem persists.

6. Functions

The 12-bit binary option board can be configured to provide either a 12-bit binary frequency command or 3-digit binary-coded decimal (BCD) frequency command. If 3-digit BCD is selected, resolutions of either 1Hz (allowing inputs of 0 ~ 999Hz) or 0.1Hz (allowing inputs of 0.0 ~ 99.9Hz) can be selected.

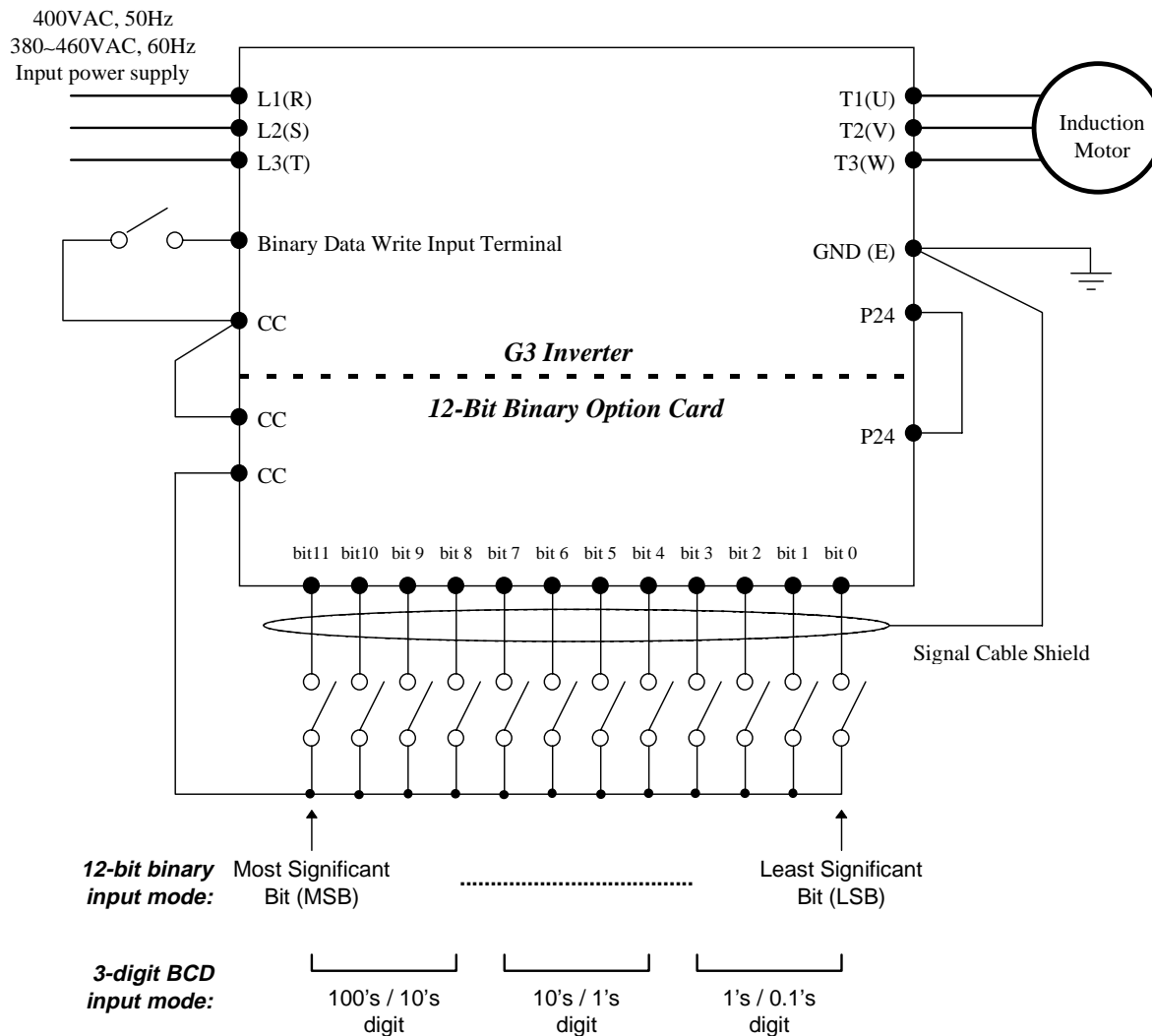
The 12-bit binary option board will accept signals from a programmable logic controller (PLC), relay sequence, or any other mechanism that provides contact-closure signals. When 12-bit binary input mode is selected, a maximum resolution of 1/4095 of the `MAXIMUM OUTPUT FREQUENCY` parameter setting can be obtained. When 3-digit BCD input mode is selected, a maximum resolution of 1/999 of either 1000Hz or 100.0Hz can be obtained.

In addition, by using a binary data write signal, multiple inverters can be configured for a certain frequency command, and then synchronously accelerate/decelerate to that frequency by selecting the binary data write signal to validate the selected frequency command. If no input terminal is assigned the function of the binary data write signal, changes to the 12-bit binary / BCD input signal connections will immediately be reflected in the inverter's output frequency. If an input terminal is assigned the function of the binary data write signal, however, changes to the 12-bit binary / BCD input signal connections will not be recognized by the inverter until the input terminal to which the binary data write signal is assigned is connected to CC.

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6.1 Standard Connections

In either 12-bit binary input mode or 3-digit BCD input mode, frequency command signal bits are input to the 12-bit binary option board by connecting each respective “bit” terminal to CC. Refer to the following diagram for a typical connection configuration:

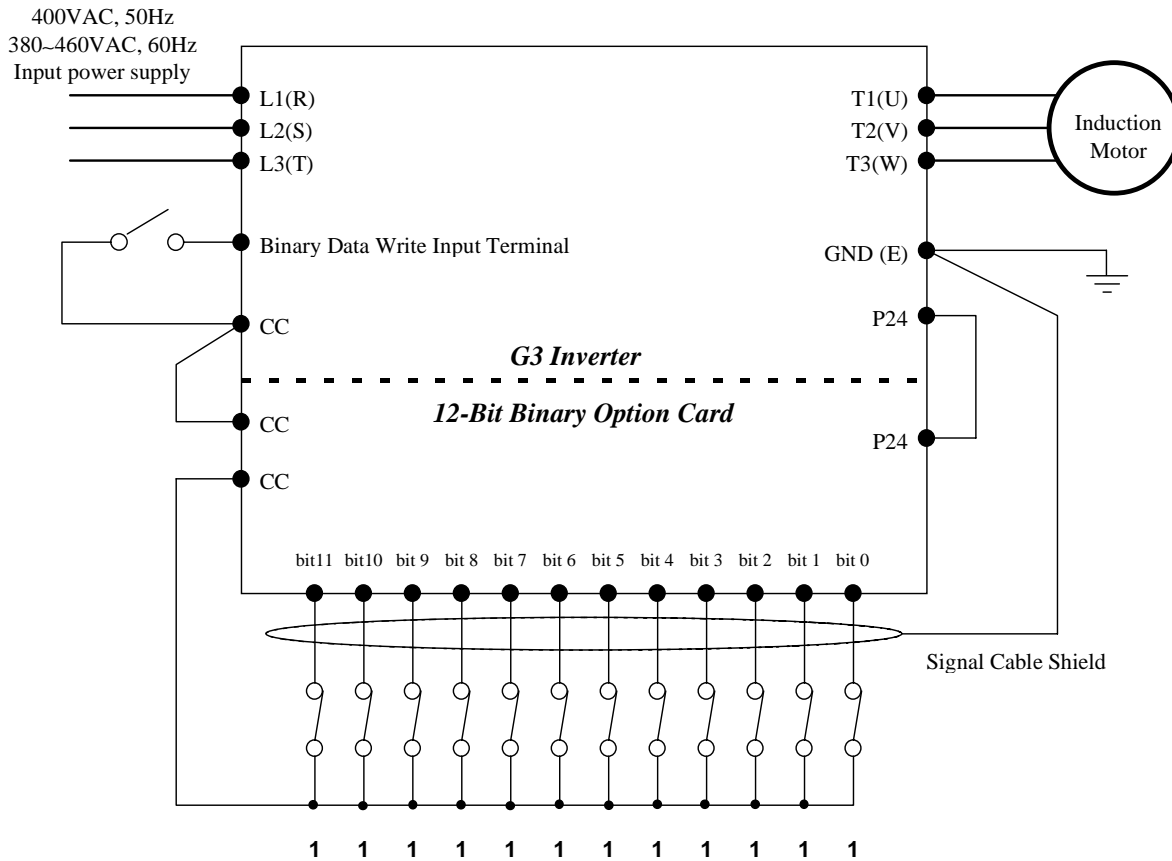


To use the binary data write signal, program an unused input terminal on the G3 to “Binary data write” (set one of the “R” INPUT TERMINAL FUNCTION ~ “S7” INPUT TERMINAL FUNCTION parameters in GROUP:TERMINAL SELECTION PARAMETERS to 42), and connect that terminal and CC. For proper operation, the binary data write signal must be ON for 12ms or longer. For further information regarding parameter setting methods, refer to the *G3 Operation Manual*.

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6.2 Input Data Interpretation

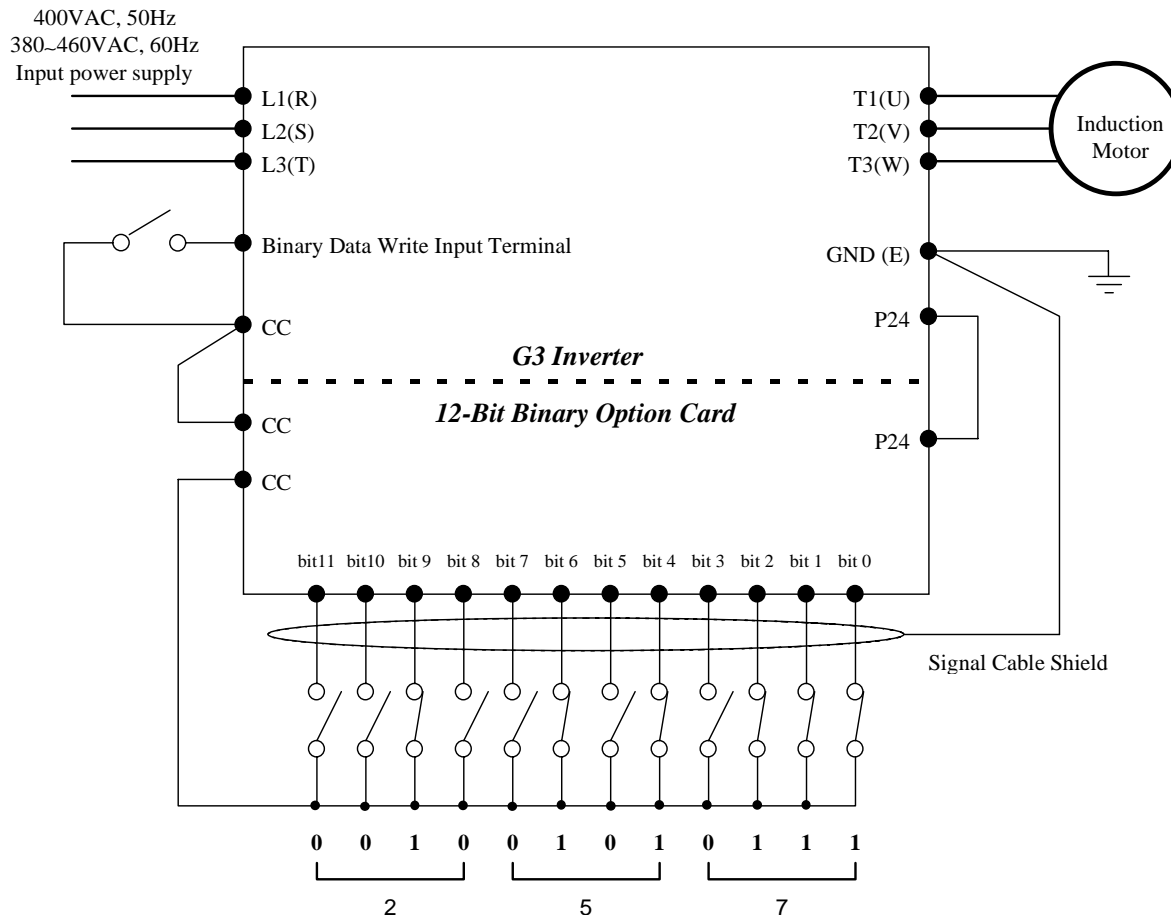
When a “bit” input terminal is connected to CC, that bit is interpreted as a “1” (ON). When a “bit” input terminal is not connected to CC (left floating), that bit is interpreted as a “0” (OFF). For an example of 12-bit binary data coding, refer to the following diagram:



When all bits are ON as shown above, the data is interpreted as FFF (base 16), or 4095 (base 10).

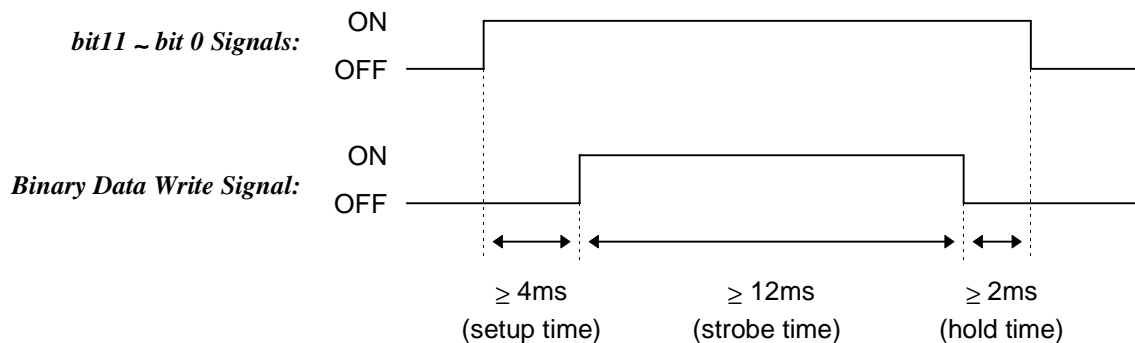
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For an example of 3-digit BCD data coding, refer to the following diagram:



When the bits are connected as shown above, the frequency command data is interpreted as either 257Hz (when 1Hz resolution is selected) or 25.7Hz (when 0.1Hz resolution is selected).

To ensure proper and consistent operation when using the binary data write signal, be sure that the switching equipment (PLC, etc.) that you use provides the following minimum timing considerations:



6.3 Parameter Settings

In order to use the 12-bit binary option card frequency command input, `FREQUENCY MODE SELECTION` in `GROUP:UTILITY PARAMETERS` must be set to 3 (communication / 12-bit binary option board input valid).

6.3.1 12-Bit Binary Input

1. Unblind the terminal selection parameters group and communication setting parameters group:
 - Set `BLIND FUNCTION SELECTION` in `GROUP:UTILITY PARAMETERS` to 1 (selective unblinding).
 - Set `TERMINAL SELECTION PARAMS BLIND` and `COMMUNICATION PARAMS BLIND` in `GROUP:UTILITY PARAMETERS` to 1 (unblind).
2. If the binary data write signal is going to be used, set `INPUT TERMINAL SELECTION` in `GROUP:TERMINAL SELECTION PARAMETERS` to 1 (individual selection). Then, program an unused input terminal to perform the binary data write function by programming the corresponding terminal function selection parameter ("`R`" `INPUT TERMINAL FUNCTION` ~ "`S7`" `INPUT TERMINAL FUNCTION`) to 42 (binary data write).
3. Set `COMMUNICATION SELECTION` in `GROUP:COMMUNICATION SETTING PARAMETERS` to 4 (12-bit binary input).
4. Reset the inverter by cycling power to it. The option board selection parameter set in step 3 will only be recognized by the inverter at initialization (power-up / reset).
5. The inverter's frequency command can now be set according to the following equation:

$$\text{Frequency Command} = \frac{\text{12 - bit binary data}}{4095} \times \text{MAXIMUM OUTPUT FREQUENCY (Hz)}$$

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To set the frequency command to correspond directly to the 12-bit binary input data (1 LSB = 0.1Hz), perform the following steps:

1. Unblind the terminal selection parameters group and communication setting parameters group:
 - Set BLIND FUNCTION SELECTION in GROUP:UTILITY PARAMETERS to 1 (selective unblinding).
 - Set TERMINAL SELECTION PARAMS BLIND and COMMUNICATION PARAMS BLIND in GROUP:UTILITY PARAMETERS to 1 (unblind).
2. If the binary data write signal is going to be used, set INPUT TERMINAL SELECTION in GROUP:TERMINAL SELECTION PARAMETERS to 1 (individual selection). Then, program an unused input terminal to perform the binary data write function by programming the corresponding terminal function selection parameter ("R" INPUT TERMINAL FUNCTION ~ "S7" INPUT TERMINAL FUNCTION) to 42 (binary data write).
3. Set the following parameters in GROUP:COMMUNICATION SETTING PARAMETERS:
 - RS485/12-BIT BINARY BIAS,GAIN = 1
 - RS485/12-BIT BINARY POINT #1 = 0 (factory setting)
 - RS485/12-BIT BINARY PT. #1 FREQ = 0.0 (factory setting)
 - RS485/12-BIT BINARY POINT #2 = 50
 - RS485/12-BIT BINARY PT. #2 FREQ = 204.8

NOTE: To make the above setting for RS485/12-BIT BINARY PT. #2, MAXIMUM OUTPUT FREQUENCY in GROUP:FUNDAMENTAL PARAMETERS #1 must be set to at least 204.8.
4. Set COMMUNICATION SELECTION in GROUP:COMMUNICATION SETTING PARAMETERS to 4 (12-bit binary input).
5. Reset the inverter by cycling power to it. The option board selection parameter set in step 4 will only be recognized by the inverter at initialization (power-up / reset).
6. The inverter's frequency command can now be set according to the following equation:

$$\text{Frequency Command} = 12 - \text{bit binary data} \times 0.1 \text{ (Hz)}$$

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6.3.2 3-Digit BCD Input (0.1Hz Resolution)

1. Unblind the terminal selection parameters group and communication setting parameters group:
 - Set `BLIND FUNCTION SELECTION` in `GROUP:UTILITY PARAMETERS` to 1 (selective unblinding).
 - Set `TERMINAL SELECTION PARAMS BLIND` and `COMMUNICATION PARAMS BLIND` in `GROUP:UTILITY PARAMETERS` to 1 (unblind).
2. If the binary data write signal is going to be used, set `INPUT TERMINAL SELECTION` in `GROUP:TERMINAL SELECTION PARAMETERS` to 1 (individual selection). Then, program an unused input terminal to perform the binary data write function by programming the corresponding terminal function selection parameter ("`R`" `INPUT TERMINAL FUNCTION` ~ "`S7`" `INPUT TERMINAL FUNCTION`) to 42 (binary data write).
3. Set `COMMUNICATION SELECTION` in `GROUP:COMMUNICATION SETTING PARAMETERS` to 5 (3-digit BCD input (0.1Hz units)).
4. Reset the inverter by cycling power to it. The option board selection parameter set in step 3 will only be recognized by the inverter at initialization (power-up / reset).
5. The inverter's frequency command can now be set according to the following equation:

$$\text{Frequency Command} = \text{BCD data} \times 0.1 \text{ (Hz)}$$

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6.3.3 3-Digit BCD Input (1Hz Resolution)

1. Unblind the terminal selection parameters group and communication setting parameters group:
 - Set `BLIND FUNCTION SELECTION` in `GROUP:UTILITY PARAMETERS` to 1 (selective unblinding).
 - Set `TERMINAL SELECTION PARAMS BLIND` and `COMMUNICATION PARAMS BLIND` in `GROUP:UTILITY PARAMETERS` to 1 (unblind).
2. If the binary data write signal is going to be used, set `INPUT TERMINAL SELECTION` in `GROUP:TERMINAL SELECTION PARAMETERS` to 1 (individual selection). Then, program an unused input terminal to perform the binary data write function by programming the corresponding terminal function selection parameter ("`R`" `INPUT TERMINAL FUNCTION` ~ "`S7`" `INPUT TERMINAL FUNCTION`) to 42 (binary data write).
3. Set `COMMUNICATION SELECTION` in `GROUP:COMMUNICATION SETTING PARAMETERS` to 6 (3-digit BCD input (1Hz units)).
4. Reset the inverter by cycling power to it. The option board selection parameter set in step 3 will only be recognized by the inverter at initialization (power-up / reset).
5. The inverter's frequency command can now be set according to the following equation:

$$\text{Frequency Command} = \text{BCD data} \times 1 \text{ (Hz)}$$

