Instruction Bulletin
30598-387-01A1
July 1997

24 VDC 0.5A 16 Output Base Unit with Wiring Check Function

TBX DSS16C22

User's Manual

SQUARE D

⚠ WARNING

UNINTENTIONAL EQUIPMENT OPERATION

To avoid improper handling of equipment:

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.

Failure to observe this instruction can result in death or serious injury.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

To avoid improper handling of equipment:

1. Never remove this device while power is ON.
2. Do not subject to static discharge. This module contains electronic components that are very susceptible to damage from electrostatic discharge.

Failure to observe this instruction can result in equipment damage.

DESCRIPTION

The TBX DSS16C22 is a distributed output base unit containing sixteen 24 VDC digital outputs. This base unit may be coupled with a compatible communications interface to form a complete distributed block, which is well suited for the control of discrete field devices located some distance from a host programmable logic controller (PLC). The application of distributed I/O blocks saves installation and maintenance cost, as compared to direct wiring of field devices to a centralized I/O system over long distances.

The TBX DSS16C22 base unit can be used with either SY/MAX® or Telemecanique PLCs, through the use of a compatible communications interface, or "top hat". The interface mounts directly on the base unit, and allows the PLC to read and write to the I/O points through a suitable control network. The Class 8030 Type CRM275 Distributed Remote IO/NET™ Interface (DRIO) supports connection to the IO/NET control network as part of the PASSPORT™ I/O System. The TBX LEP020 and TBX LEP030 communications interfaces support connection to the FIPIO network. The TBX CBS010 Expansion Interface allows connection of a second TBX base unit to a single communications top hat.

The DSS16C22 base unit supports the following TBX I/O features:

- *Sixteen 24VDC IEC1131-compatible output points* - Suitable for use with discrete field devices such as solenoids, contactors and pilot lights.
- *Output power loss indication* - Reports back to the processor if the output power supply drops below the valid level.
- *Output fallback state control* - Point-by-point control over output states when communication is lost.
- *Short-circuit protection and indication* - In an overload or shorted-load condition, output can be turned off to protect both the output and the load; a short-circuit fault is reported to the processor.
- *24 VDC logic power supply* - Converts to proper voltage levels for top hat and for on-board electronics; may be wired independently from input or output power supplies.
- *Removable field wiring terminal strip* - Mounts securely to the base unit without use of screws or fasteners.
- *Wiring-fault detection (including open-circuit detection)* - Open circuits are detected for outputs, or shorts to 0V or +24VDC.

This bulletin contains information on the installation and application of the TBX DSS16C22 base unit with either SY/MAX or Telemecanique PLCs. For information about programming a SY/MAX PLC for use with the TBX DSS16C22 base, refer to the Class 8030 Type CRM275 (DRIO) instruction bulletin (#30598-380). For information about programming a Telemecanique PLC for use with the TBX DSS16C22 base, refer to the Telemecanique TBX Distributed I/O Modules manual (TSX DM TBX V5E). Please read and keep all the appropriate manuals close at hand when using TBX base units.

Top hats receive +24 VDC from the primary base, which the top hat converts to logic power for the top hat and bases. For additional information on the DRIO Interface and the Expansion Interface, refer to instruction bulletins 30598-380 and 30598-371 respectively. The TBX SUP10 power supply may be used to provide 24 VDC for TBX bases and sensors from an AC source.

SPECIFICATIONS

Base Unit Power

Operating voltage: 24 VDC nominal; 19-30 VDC

Operating current at nominal voltage:

Configuration	Nominal
Base only	30 mA
Base with comms interface	100 mA
Base, interface and expansion base	125 mA

Inputs

Inputs per base unit	16
Number of input commons	1
Isolation rating	1500 V rms between outputs and earth terminal
Voltage operating range	19-30 VDC
Maximum output current	0.5 A
Maximum voltage drop	0.4 V
OFF state leakage current	< 2 mA
Maximum turn ON time	1 ms
Maximum turn OFF time	1 ms
I/O status indication	Visual indication provided by communications interface: 1 LED per input point
Output protection	Yes, see “Installation and Application Considerations” on page 9.

Environmental and Physical

Operating temperature rating	0 to 60°C (32 to 140°F)
Storage temperature rating	-40 to 80°C (-40 to 176°F)
Humidity rating	5-95% RH, non-condensing
Dimensions (H x W x D):	See Figure 1
Base unit w / terminal strip	3.43 x 9.25 x 2.4 in (87 x 235 x 61 mm)
Base w / comms. interface or Base w / CBS010 Interface	3.43 x 9.25 x 2.91 in (87 x 235 x 73.9 mm)
Weight (Base unit only)	1.3 lb (0.6 kg)

Agency Compliance

Complies with UL508, CSA C22-2 requirements, and FM Class I, Division 2 Hazardous Locations approval requirements

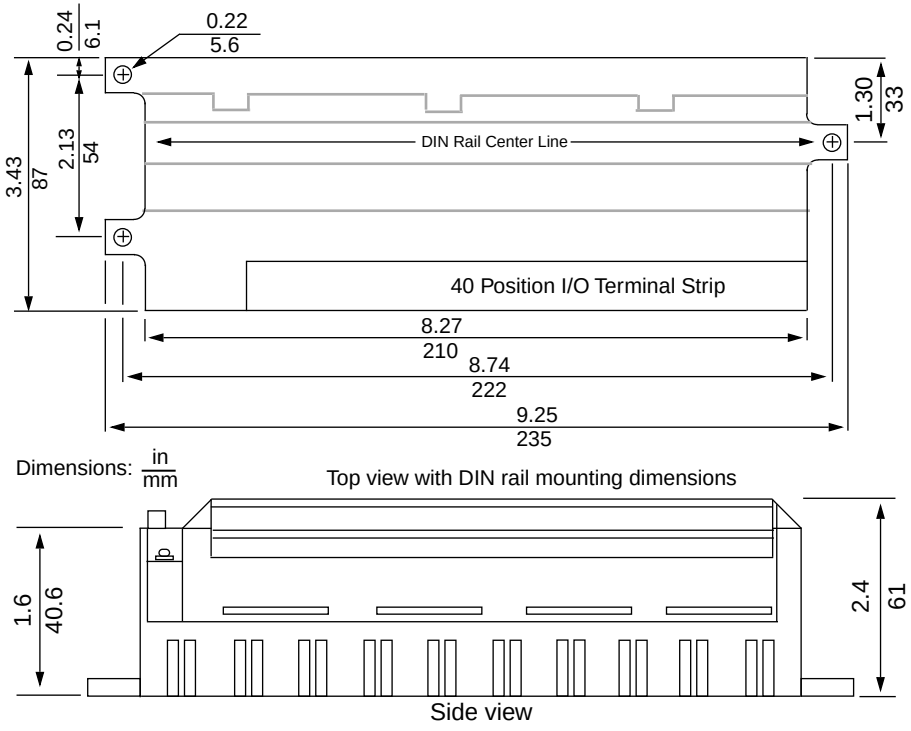


Figure 1: Dimensions

BASE UNIT WIRING

Output devices are wired to the terminal strip on the top of the base unit. Figure 2 shows the terminal strip pin-out for the base unit.

Two terminal strip labels are packaged with the base unit. If you are using the base unit with a SY/MAX system, use the terminal strip label with I/O numbered from **1-16**; if you have a Telemecanique system, use the terminal strip label with I/O numbered from **0-15**. These are both illustrated in Figure 2.

The TBX DSS16C22 provides separate terminals for base voltage and control output voltage. These terminals may be connected to a common 24 VDC supply or may be sourced by independent supplies (terminals 1 and 4 must be at the same potential).

⚠ WARNING

INCORRECT WIRING

The base must be properly grounded before applying power. Equipment MUST be grounded using the screw provided.

Do not use metallic conduit as a ground conductor.

Failure to observe these instructions can result in death or serious injury.

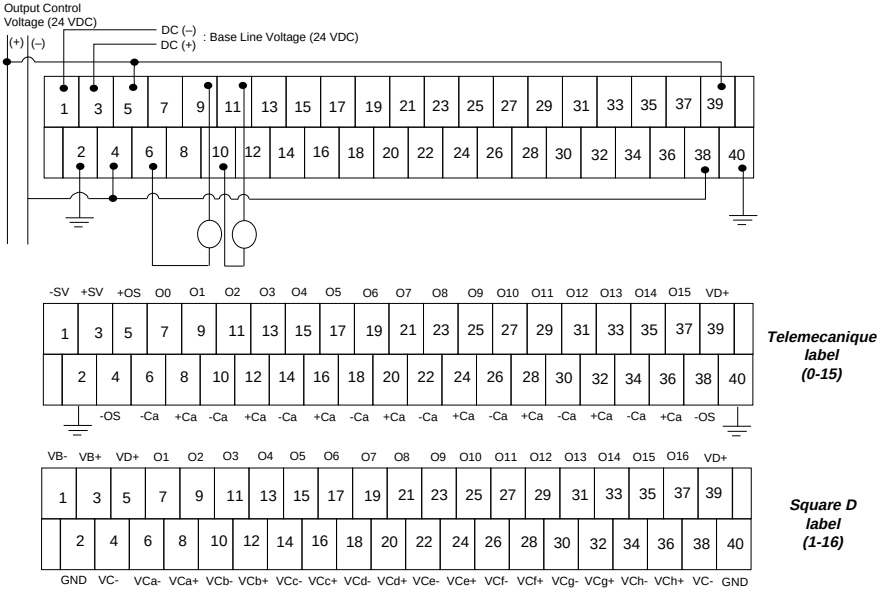


Figure 2: TBX DSS16C22 Wiring Connections and Terminal Block Signal Assignments

⚠ WARNING

UNINTENTIONAL EQUIPMENT OPERATION

Be sure to use the appropriate SY/MAX or Telemecanique terminal strip label when wiring inputs or outputs. Two terminal strip labels are packaged with the base unit. If you are using the base unit with a SY/MAX system, use the terminal strip label with I/O numbered from 1-16; if you have a Telemecanique system, use the terminal strip label with I/O numbered from 0-15.

Failure to observe these instructions can result in death, serious injury, or equipment damage.

MOUNTING INSTRUCTIONS

The base unit can be mounted horizontally or vertically as shown in Figure 3.

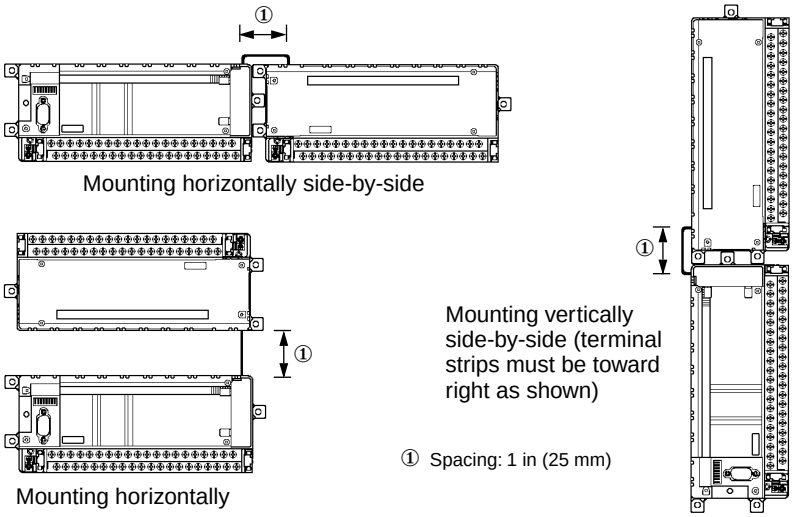


Figure 3: Base Unit Orientation Examples

To mount the base unit on a 35-mm DIN rail:

1. Hook the base unit onto the rail as shown in Figure 4.
2. Press down and toward the DIN rail until the base unit is secure. (There are two spring clips in the top of the groove on the back of the unit.)

To remove the base unit from a DIN rail:

1. Press down on the base unit.
2. Swing the unit outward and lift it off the rail at the same time as pressing down.

NOTE: If the base unit is to be used in a high-vibration environment, mounting the unit on a panel rather than a DIN rail provides more stability. Use cable ties to secure the communication cable.

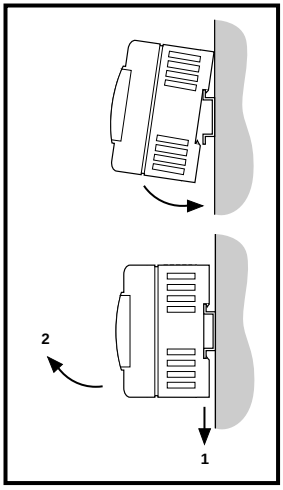


Figure 4: Mounting and Removing the Base Unit

INSTALLATION AND APPLICATION CONSIDERATIONS

NOTE: The base unit is not compatible with the Type CRM270 module.

- *Base Voltage* - The DSS16C22 base requires a 24 VDC operating voltage to be applied between VB+ and VB- (terminals 3 and 1, respectively).
- *Grounding* - The green ground wire must be connected to the ground screw beside the terminal block.
- *Jumper Wire* - A #16 AWG wire must be installed between terminals 2 and 40.
- *Commons* - The DES16C22 base unit has one common terminal for every two inputs.
- *Control Output Power* - Output devices can be powered from a supply other than the one used to provide base voltage. **Note that all power supplies must share the same commo**n.

  The control output voltage supply needs to be connected between VD+ and VD-) terminals 5 and 4. In addition, two jumpers must be installed, one from terminal 5 to 39 and one from terminal 4 to 38.

  If output devices are to be powered from base voltage supply, jumper wires are required from VB+ to VD+ (**terminal 3 to terminal 5**), from VB- to VD- (**terminal 1 to terminal 4**), from **terminal 5 to terminal 39** (VD+), and from **terminal 4 to terminal 38** (VD-).
- *Commons* - The TBX DSS16C22 base unit has one common terminal for every two outputs.
- *Fusing* - The base and control power lines must be externally fused by the user.
- *External Wiring* - Each terminal accommodates up to two #16 AWG gauge wires.
- *Noise Suppression* - The DSS16C22 base unit has internal transient noise suppression. Therefore, outputs may be wired in series or parallel with hard contact switches to control an inductive load (such as a motor starter to a solenoid).
- *Voltage Sensing* - The TBX DSS16C22 base unit monitors and reports the status of the inputs' power supply. (The status of this voltage is indicated in bit 2 of SY / MAX register S0003. See "Register Usage with SY / MAX Class 8030 Type CRM275 DRIO".)
- *Short-circuit Protection* - The TBX DSS16C22 base unit provides short-circuit protection and indication. If any output detects a short-circuit condition, the output device is reset (turned OFF), the appropriate bit of register S0005 is turned ON, and the LED for that output and the "RCK ERR" LED flashes (see "Register Usage with SY / MAX Class 8030 Type CRM275 DRIO").

There are two mechanisms by which to restore or re-arm a shorted output. In the automatic mode, the DRIO attempts to re-energize the output approximately every ten seconds. If the output remains shorted, the short will again be detected, repeating the above process. If the short was temporary, the output will return to normal operation.

In the manual mode, the Initiate Manual Re-arm bit(s) must be transitioned low to high and must remain high for at least twice the LIO (Type CRM250/255) Update Time (see instruction bulletin 30598-782 or 30598-393). When the DRIO receives this bit, it re-arms that output in the same manner as the Automatic Re-arm mode. This bit must be reset before it can be used again for the re-arm function.

The output re-arm function operates on groups of eight outputs, OØ1-OØ8 and OØ9-O16. Only the shorted outputs are re-armed. The other outputs will continue to function normally.

- *Freeze State Control* - TBX Distributed I/O feature an enhancement to the Freeze Outputs capability of the IO/NET control network. In the default configuration, when the IO/NET Freeze bit is set and if communication between the LIO and DRIO fails, the DRIO will maintain the outputs in their last state before the communication failure. This operation is the same as the Freeze State for the RIO (Type CRM260).

  With TBX Distributed I/O, the user may also have the DRIO set the outputs to a pre-defined state. By defining the output fallback states in register S0006 and setting the Freeze State control bits in S0004 to the fallback option, the DRIO sets the outputs to the fallback state when a Freeze condition occurs. When communications are restored, the outputs will return to normal operation.

REGISTER USAGE WITH THE SY/MAX CLASS 8030 TYPE CRM275 DRIO MODULE

The DES16C22 base unit supports the assignment of 10 registers for I/O, diagnostic and configuration registers. Additional information about base unit register usage is contained in the DRIO instruction bulletin (#30598-380).

This base unit supports I/O power loss indication (Register 3), output fallback state control (Register 4, bits 5-6; Register 6), input pulse latching (Register 4, bits 7-10; Register 9) and wiring fault check (Register 7, bits 1-16). Refer to Chapter 4 of the DRIO instruction bulletin for more information about register assignments.

⚠ WARNING

UNINTENTIONAL EQUIPMENT OPERATION

Do not use reserved registers and bits in PLC programs. Erratic operation may result.

Failure to observe this instruction can result in death, serious injury, or equipment damage.

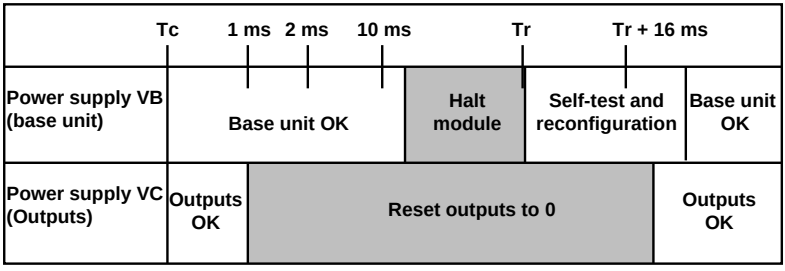
OUTPUT WIRING CHECK FUNCTION

All transistors are protected against short-circuits for loads at 0 V and at 24 V and against overloads (see Figure 5). The output wiring check function also continuously checks the quality of the connection between output devices and the TBX base unit. This function enables diagnosis of a short-circuit or an open circuit depending on the channel state. It is indicated:

- On the interface module display, by a flashing LED corresponding to the channel
- On the SY/MAX processor by the wiring fault status register bit corresponding to the channel changing to state 1.

The output wiring check function (open circuit) is enabled channel by channel. If a dry contact is in series with the load, the wiring check function must be disabled.

The supply voltage to the outputs is continuously monitored. If it drops below 14 V for more than 2 ms, the module outputs are forced to state 0. They are re-enabled 16 ms after the supply to the preactuators rises above 19.2 V.



Tc = Time duration of power cut to power supplies (voltage < 14 V)
Tr = Time duration of power return to power supplies (voltage > 19.2 V)

Figure 5: Behavior on Power Cut and Power Return

If the power cut to the base unit is less than 10 ms, it will cause a fault in the base unit. A break greater than 10 ms can cause the base unit to stop and therefore reconfigure on return to power. The voltage supplied to the base unit is not monitored by the base unit.

If power to the outputs is cut for more than 1 ms, voltage monitoring detects this fault and sets the outputs to 0. When the power supply voltage exceeds 19.2 V, the voltage monitoring system waits for 16 ms before signaling and validating the outputs as new.

A break in the power supply to the outputs does not cause any internal fault in the base unit.

GROUPE SCHNEIDER

■ Merlin Gerin ■ Square D ■ Telemecanique

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