SIEMENS

SIMATIC TI560/TI565 Redundant I/O System

User Manual

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Third Edition

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SIMATIC TI560/TI565 Redundant I/O System User Manual

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Redundant I/O provide for an enhanced Hot Backup Unit (HBU) configuration that extends the redundant hardware capabilities. The Redundant I/O system (illustrated in Figure 1) consists of the following elements.

- Two SIMATIC[®] TI560™/TI565™ controllers in an HBU configuration
- One to eight channels of SIMATIC[®] TI500™ remote I/O
 - Dual remote base controllers (RBCs)
 - Dual cables
 - Dual base power supplies

The Redundant I/O system uses the TI560/TI565 controller hardware unchanged and provides the same major functions as the standard system. It supports memory configuration, I/O configuration, TI500 operational modes, I/O cycles, Relay Ladder Logic execution, SF communication, and operator interfaces.

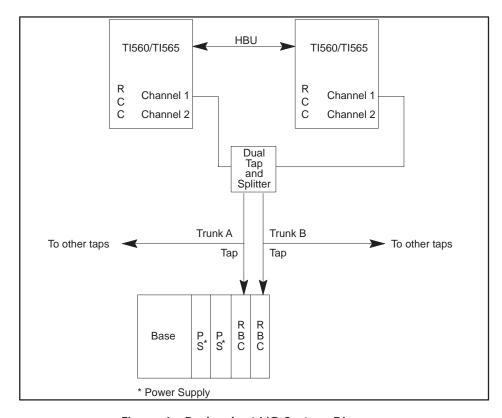


Figure 1 Redundant I/O System Diagram

Communication between Units

Standard CATV taps and splitters combine I/O channels from the remote channel controllers (RCCs) to form two separate trunks (redundant I/O). Each trunk leads to one of two RBCs located in an adapter chassis that also houses two power supplies. When the active RCC transmits, the dual tap and splitter arrangement splits the signal three ways: to the standby RCC, to Trunk A, and to Trunk B. When the active RBC transmits, the dual tap and splitter arrangement splits the transmitted signal from either Trunk A or Trunk B two ways: to the standby RCC and to the active RCC.

Each redundant RCC, RBC, or power supply can detect internal operating faults. During normal operation, the RCC detects trunk faults and recognizes the appearance or disappearance of redundant RBCs and power supplies. When a fault is detected in the unit designated as active, the corresponding backup unit automatically assumes control with minimal process interruption and without operator intervention.

All input, output, and SF message transactions occur between the active RCC and the active RBC. The active RCC directs configuration messages to both the active and standby RBCs, and the addressed RBC is responsible for acknowledging the message. A "status request" command goes to the active RBC to determine dual power supply status and to the standby RBC to determine the condition of the standby transmitters. If the standby does not respond to this request, the RCC directs the active RBC to command the standby to assume a failed state. When communication problems develop between the RCC and the active RBC, the RCC directs a "role swap" command to the standby RBC.

Planning Redundant I/O Installation

The $SIMATIC^{\circledR}$ $TI560T^{\ref{M}}/TI565T^{\ref{M}}$ System Manual (PPX:560/565–8109–x) contains detailed instructions for installing remote I/O and for developing a power budget. The SIMATIC TI560/565 Hot Backup Installation Manual (PPX:560/565–8103–x) provides details about the additional signal losses with the Hot Backup Unit. Consult these manuals for installing the overall I/O system.

Determining Signal Losses

The installation of the Redundant I/O system requires dual cables and a dual tap/splitter arrangement as shown in Figure 2. In developing the power budget, you must include the dual tap and splitter losses. Table 1 lists typical losses obtained when using taps and splitters with the values shown.

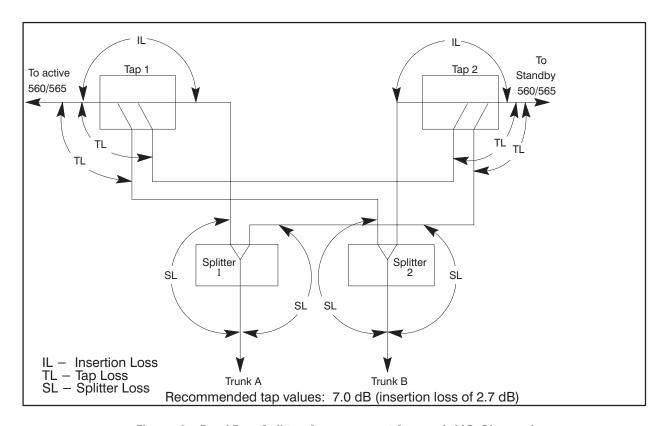


Figure 2 Dual Tap-Splitter Arrangement for each I/O Channel

Table 1 Dual Tap Losses (dB)

Active to standby	14.0 dB
Active to trunk A	6.2 dB
Active to trunk B	10.5 dB
Standby to trunk A	10.5 dB
Standby to trunk B	6.2 dB
These losses are based on the following	ng assumed values:
Tap loss	7.0 dB
Tap insertion loss	2.7 dB
Splitter loss	3.5 dB

The tap losses shown in Table 1 were obtained in the following manner. See Figure 2 for location of the different losses. For example, loss for Active to Standby is the sum of the two tap losses: 7.0 + 7.0 = 14.0. Active to Trunk A loss is the sum of the insertion loss and the splitter loss: 2.7 + 3.5 = 6.2. Active to Trunk B loss is the sum of the tap loss and the splitter loss: 7.0 + 3.5 = 10.5.

The remote I/O for the Redundant I/O system consists of a Hot Backup installation, plus the following components for each redundant I/O base.

WARNING

Do not use either the PPX:500-2151 power supply or non-dual RBCs with a PPX:500-9940 adapter chassis in a redundant I/O configuration. To do so may cause improper operation of your system.

- Two PPX:500-9912 Remote Base Controllers (RBCs)
- Two PPX:500–2151A 110/220 VAC Power Supplies
- PPX:500–5864, 8-Slot Base or PPX:500–5828, 16-Slot Base
- PPX:500–9940 Redundant Controller Adapter Chassis
- User-supplied cables, grounding materials, and taps

Software Requirements

The RCC, CPU, SFCPU, and HBU software must be Rel 2.1, or greater. With earlier software releases, a redundant I/O base with dual RBCs causes the RCC to fail that base. Either the dual RBC or dual Power Supply may be used in single mode operation with any RCC software releases. Non dual RBCs may be used with any RCC.

Status Words

Rel 2.1 includes additional status words to indicate the presence of Redundant I/O components. Status Words 168–175 indicate whether or not dual RBCs are present; status words 176–183 indicate the presence of dual power supplies. Table 2 lists the status words and shows the channel and base indicated by each word.

If a "1" appears in a bit showing the status of a base containing dual RBCs, check the corresponding bit for that base in status words 2–9 to determine if the other RBC is still functioning.

Table 2 Status Words

Statu	s Words Indi	cating Dual	RBCs	Status Wo	rds Indicatir	ng Dual Pow	er Supplies
Word	Bit*	Base	Channel	Word	Bit**	Base	Channel
168	16 1	0 15	1	176	16 1	0 15	1
169	16 1	0 15	2	177	16 1	0 15	2
170	16 1	0 15	3	178	16 1	0 15	3
171	16 1	0 15	4	179	16 1	0 15	4
172	16 1	0 15	5	180	16 1	0 15	5
173	16 1	0 15	6	181	16 1	0 15	6
174	16 1	0 15	7	182	16 1	0 15	7
175	16 1	0 15	8	183	16 1	0 15	8

*Bit = 0: Dual RBCs present and good Bit = 1: Error condition or single RBC

** Bit = 0: Dual power supply present and good

Bit = 1: Error condition or single power supply

MSB	TI560/TI565 BIT ORDER	LSB
	1 2 3 4 5 6 7 8 9 10 11 12 13 14	15 16

Remote Base Controller

Each RBC (Figure 3) in the Redundant I/O system is an intelligent interface between an RCC and a remote base containing either 8 or 16 I/O slots. The dual RBCs are installed in an adapter chassis connected to the I/O base, which can be located up to 15,000 feet from the PLC. If both RBCs are installed and operational at power-up, the RBC on the right assumes the active role.

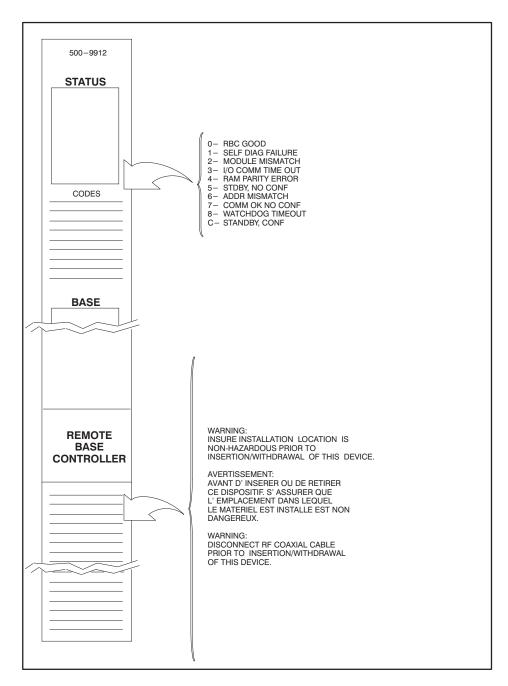


Figure 3 Remote Base Controller

LED Display

The LED at the top of each RBC displays a number to indicate RBC status or errors. The messages conveyed by the numbers are shown in Table 3.

Table 3 LED Messages

Number	Meaning
0	RBC good configuration match
1	Self-diagnostics failure
2	Module mismatch
3	Communications time-out
4	RAM parity error
5	Standby unit, not configured
6	Standby good, wrong address
7	Communications good, but no I/O configured
8	Watchdog time-out
С	Standby unit, configured

NOTE: If an RBC is configured in the PLC (LED display 0) and you delete it from PLC memory, the LED display does not change (LED display 7) until a restart or power cycle is performed.

To reset an RBC with a 1 displayed, move the base address thumbwheel switch to another address for 0.5 seconds, then return the switch to the correct address. The RBC will attempt to come on-line.

Setting the RBC Number The top thumbwheel switch on the face of each RBC allows you to select the RBC number (0-15) on the RCC channel. RBC numbers must not be duplicated on another base; however, the active and standby RBCs on the redundant base must have the same number.

Power Supply

The Redundant I/O system uses two PPX: 500-2151A, 110/220 VAC power supplies that are installed in the adapter chassis, along with the RBCs. During normal operation, both power supplies are active. These units convert user-supplied power (either 110 or 220 VAC) to DC power. Each power supply module is protected from internal short circuits by a 3 A, 250 VAC slow-blow fuse. The internal circuitry maintains two DC voltages at -5 V and +5 V.

On each module, the indicator labeled "DC GOOD" is on when the module is producing the correct DC power. The indicator is off when overvoltage, undervoltage, or overcurrent faults are detected.

NOTE: To allow replacement of a unit without taking down the entire base, AC power to each power supply must come from separate sources with the commons at the same potential, and you must provide a means of disconnecting AC power from each power supply.

I/O Base and Adapter Chassis

To install the dual RBCs and power supplies, use either the PPX:500–5864, 8-Slot Base or the PPX:500–5828, 16-Slot Base with the PPX:500–9940 Redundant Controller Adapter Chassis. The adapter chassis attaches to the right side of the I/O base and provides slots for the two power supplies and the two RBCs.

In planning the installation of the I/O bases for the Redundant I/O system, follow the guidelines in the manual that comes with the bases. To mount the PPX:500–9940 Adapter Chassis, see Figure 4 for template dimensions, and follow these steps.

- 1. When preparing the mounting panel, be certain the base and adapter are positioned for proper contact of the connectors.
- 2. Partially insert the two top screws in the panel.
- 3. Fit the screws into the holes in the adapter base (see Figure 4). Slide the assembly down and to the left until the screws support the adapter chassis and the base connectors are fully seated.
- Attach the lower portion of the assembly to the panel with two #10 screws.
- 5. Tighten all screws.

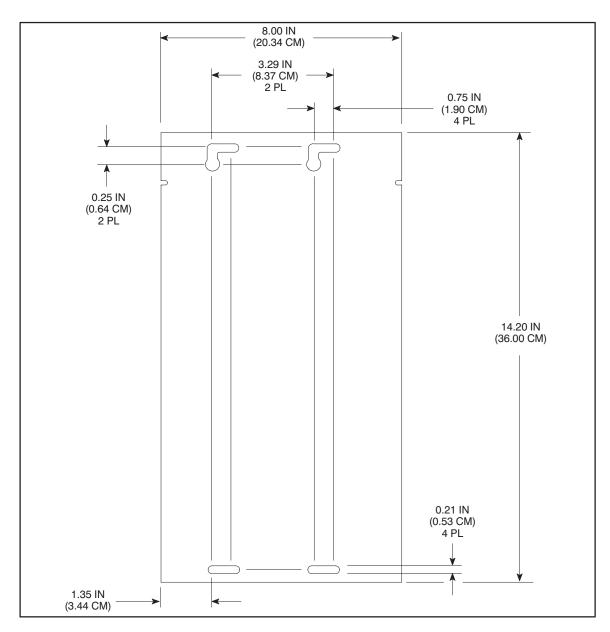


Figure 4 Dimensions for the PPX:500-9940 Adapter Chassis

RBC and Power Supply Installation and Removal

To install the Redundant I/O components:

! WARNING

When you install Redundant I/O components or when you need to replace a unit, ensure that the installation location is non-hazardous; i.e. before you insert or remove an RBC or power supply, be certain that flammable gases are not present.

WARNING

In order to prevent disruption of the I/O channel, disconnect the coaxial cable before removing or installing an RBC.

- Plug an RBC into each of the two connectors at the right side of the adapter chassis and tighten the top and bottom screws on each unit. The RBC in the right slot assumes the active role when the base is powered up.
- 2. Connect a coaxial cable to the top of each RBC.

! WARNING

Before removing or installing a power supply, disconnect the AC power to the slot for that power supply.

- 3. Plug the power supplies into the two slots on the left side of the adapter chassis. Be certain the module is fully seated and that the tabs at the top and bottom have snapped into place.
- 4. After the power supply is inserted, attach the AC and ground wires as shown in Figure 5. To reduce the probability of failure, power to each module should come from different sources with the commons at the same potential. Use the voltage selector on the PPX:500–2151A to set the input power for either 110 or 220 VAC. (See the *PPX:500–2151 and PPX:500–2151A 110/220 VAC Power Supply Installation Manual* for details on setting input voltage.)

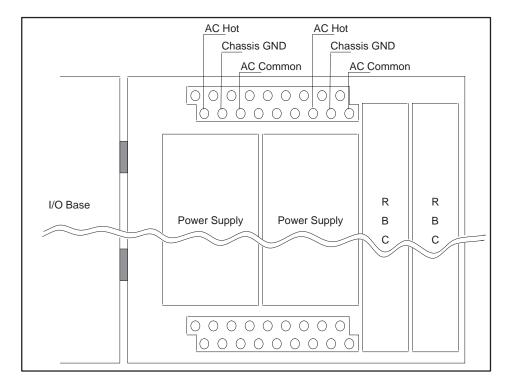


Figure 5 Power Connections

User-Supplied Materials

To install the Redundant I/O system, you need the following additional materials:

- CATV grounding blocks or bulkhead coaxial connectors to install at each RCC and RBC to shunt noise on the coaxial cable shield to ground
- Semi-rigid coaxial cable (two sizes) to use for trunk line(s) and for drop lines
- CATV taps to insert in the trunk distribution cable to provide drops from the active and standby PLCs to the RBCs
- Taps and splitters to distribute the signal from the active RCC to the standby RCC, Trunk A, and Trunk B
- Taps and splitters to distribute the signal from the active RBC (either Trunk A or B) to the standby RCC and the active RCC
- Semi-rigid coaxial cable fittings to connect trunk distribution cable to tap housing
- F-type connectors to connect drop cable to tap housing
- Terminators to install on all unused terminals on a multi-drop tap

The user-commanded role swap feature of the Redundant I/O system allows an orderly transition of the active unit to standby status. The original standby unit then assumes the active role. This feature is accessed via a task code formatted as follows:

TC = 43FE + LAR + 0310 + RCC + RBC

where

LAR = two hex digits, F0 for role swaps on bases on channels 0 and 1,

F2 for role swaps on bases on channels 2 and 3,

F4 for role swaps on bases on channels 4 and 5,

F6 for role swaps on bases on channels 6 and 7

RCC = single hex digit corresponding to channel number (0 - 7)

RBC = single hex digit corresponding to base number (0 - F)

This task code may be transmitted either directly to the Redundant I/O system as formatted above, or as the body of a native primitive "01" to a SIMATIC TIWAY Host Adapter. For example, to command base 0 on channel 1 to do a role swap, send either the task code, 43FEF0031010, or the TIWAY command, 0143FEF0031010. To command base 15 on channel 7 to conduct a role swap, send either the task code, 43FEF603107F, or the TIWAY command, 0143FEF603107F.

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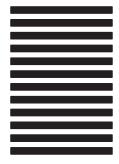
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