Honeywell

Excel 500/600
CONTROL SYSTEM

EXCEL5000**OPEN**™
S Y S T E M

CONTENTS

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CE

EN1R-1047GE51 R0902 / 95-7524-3

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REVISION OVERVIEW

On the following pages, changes have been made compared to the previous release of this document:

Page:	Change:
throughout	Information regarding Distributed I/O modules has been removed. Please refer instead to Distributed I/O Product Data (EN0B-0090GE51).
21	Fig. 44 has been changed.
23	Fig. 45 has been changed.
27	The technical specifications of the XF521A analog input module have been expanded and Table 7 and Table 8 added.
30	The technical specifications of the XF522A and XF527 analog output modules have been expanded.
34	Section "Pull-Up Resistor Handling (O.S. 2.04.00 or higher, except for XFL521A)" has been added.

SAFETY INSTRUCTIONS

— When performing any work (installation, mounting, start-up), all instructions given by the manufacturer and in particular the safety instructions provided in the Installation Instructions are to be observed.

— The Excel 500/600 controller may be installed and mounted only by authorized and trained personnel.

— If the unit is modified in any way, except by the manufacturer, all warranties concerning operation and safety are invalidated.

— Make sure that certain local standards and regulations are observed at all times. Examples of such regulations are VDE 0800 and VDE 0100.

— Use only accessory equipment which comes from or has been approved by Honeywell.

⚠ **CAUTION**

Disconnect the power supply before you start to install the Excel 500/600 Controller. Do not reconnect the power supply until you have completed installation.

⚠ **CAUTION**

Disconnect the power supply before plugging in or removing the communication module (Excel 500-XCL5010).

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MOUNTING
Control Unit Installation

The Excel 500 and 600 controllers have the same housing and can be installed two different ways:

— Installation inside a control panel (see page 8).
— Installation through a control panel door (see page 10).
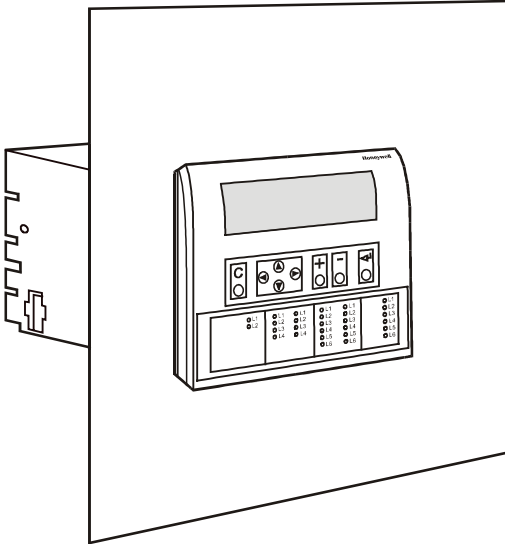
Fig. 1. Excel 500/600 panel door mounting

The Excel 500-XCL5010 can be mounted only on a DIN rail; control panel door installation is not possible.
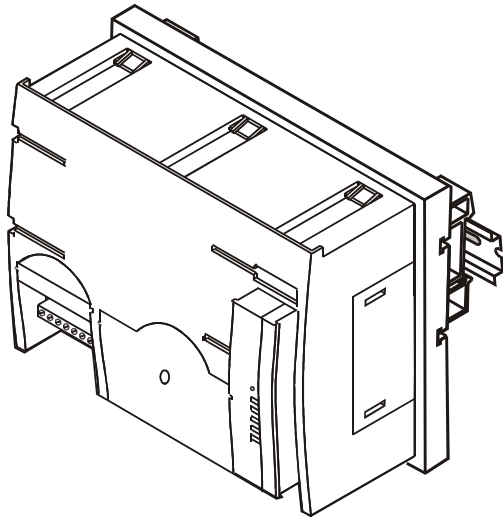
Fig. 2. Excel 500-XCL5010 DIN rail mounting

Excel 500/600 Housing Layout (not XCL5010)

A controller comprises from one to a maximum of five housings. The housings may be fitted alongside one another or, one above the other. Any combination is possible.

min. 1.5 in. (35 mm)
max. 2.0 in. (50 mm)

min. 1.5 in. (35 mm)
max. 3.0 in. (80 mm)
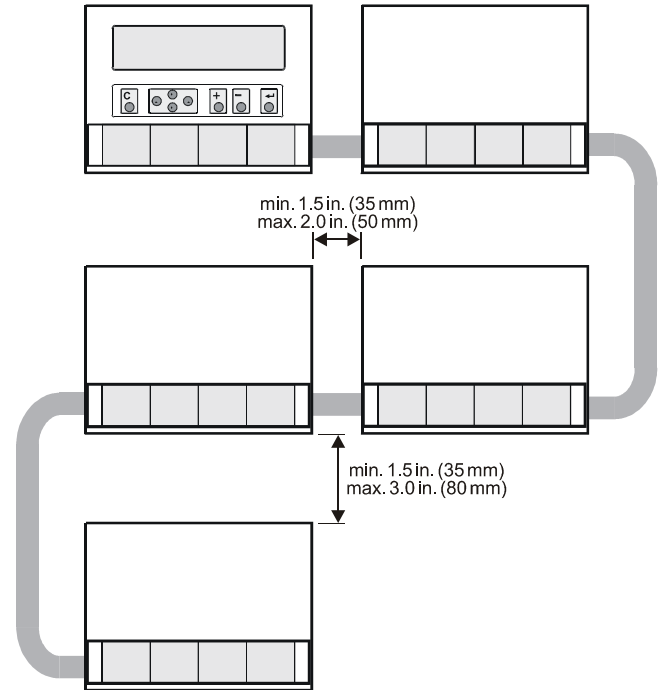
Fig. 3. Up to five housings can be connected together

When housings are alongside one another, a minimum spacing of 1.5 in. (35 mm) should be taken into consideration to enable the hinged cover to be opened. The maximum spacing between housings is limited by tailor-made internal bus cables as shown in Fig. 3.

Excel 500/600 Internal Bus Wiring (not XCL5010)

Each housing has four plug-in module locations. The individual modules are connected by an internal bus in the housing.

Configurations comprising more than one housing must have the individual busses in the housings connected to one another.

Start of Bus   End of Bus

Bus in Housing   Ribbon cable XW 568   Bus in Housing
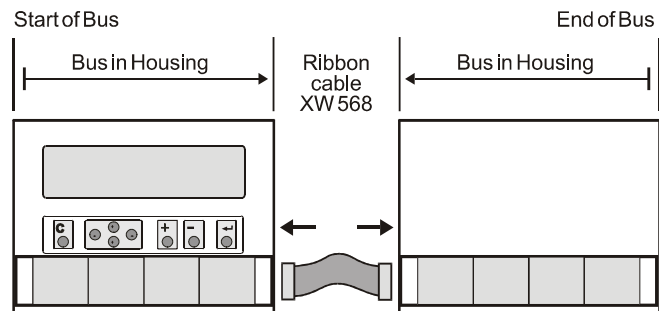
Fig. 4. Excel 500/600 bus wiring

The connection is made via tailor-made ribbon cables. Two different types are available:

— Type XW568 3 in. (80 mm) long (for housings alongside one another)

— Type XW569 13 in. (330 mm) long (for housings one above the other)

⚠ CAUTION

Incorrectly inserted bus cables can destroy the modules installed.

The internal bus begins at the first housing, containing the power supply and computer modules, and ends at the last housing.

The protective bus connection covers must be removed.
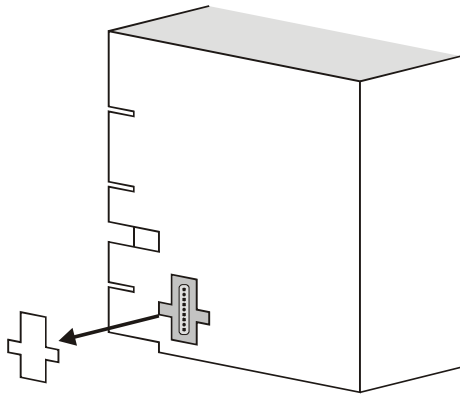
Fig. 5. Removal of bus connection cover

The overall internal bus length (bus cable and bus in the housings) must not exceed 6 ft (2m).

Bus cables must be routed at least 2 in. (50 mm) away from power cables to prevent possible inductive and capacitive interference.

Module Locations (not XCL5010)

Each housing has four plug-in module locations.
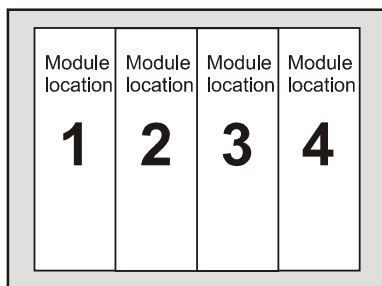
Fig. 6. Internal module numbering

Table 1 shows the plug-in location to which each module may be assigned:

Table 1. Internal module locations

Module	Type	Module location
CPU	XC5010C / XC6010	1st housing, location 4
Power supply	XP502	1st housing, location 1
AI	XF521A / XF526	any
AO	XF522A / XF527	any
DI	XF523A	any
DO	XF524A / XF529	not in the 1st housing
3-position output	XF525A	not in the 1st module housing

Coding the Terminal Block (not XCL5010)

The terminal block is coded with pins to prevent mixing the module types during commissioning or servicing. Mixing the modules can damage them.

You can code the terminal block by inserting pins into designated location holes on the terminal block in the base.
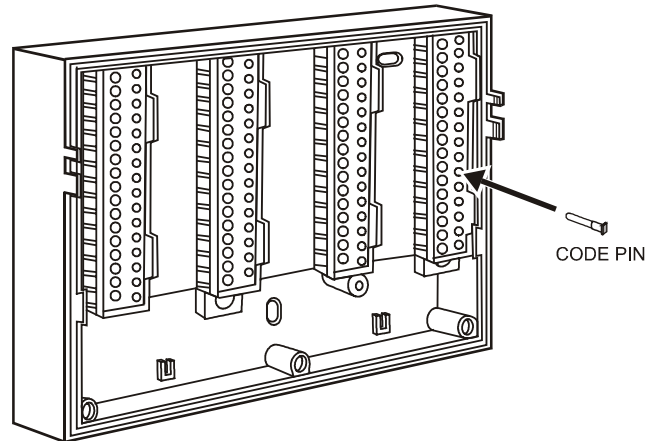
Fig. 7. Inserting the code pin in the terminal block

Table 2 shows the coding pin positions for the individual module types:

Table 2. Code pin position by module type

Module	Type	Pin position
CPU	XC5010C, XC6010	08
Power supply	XP502	06
AI	XF521A, XF526	07
AO	XF522A, XF527	11
DI	XF523A	09
DO	XF524A, XF529	10
3-position output	XF525A	12

NOTE: Distributed I/O modules are coded differently. See Distributed I/O Product Data (EN0B-0090GE51).

Setting the Module Address (not XCL5010)

In the case of application prior to CARE 4.0, you can set the module address using the rotary HEX switches located on the upper surface of the respective input and output modules. The rotary HEX switch of Distributed I/O modules is situated within the housing. The XP502 power supply module and the XC5010C / XC6010 computer modules do not need a hardware address.
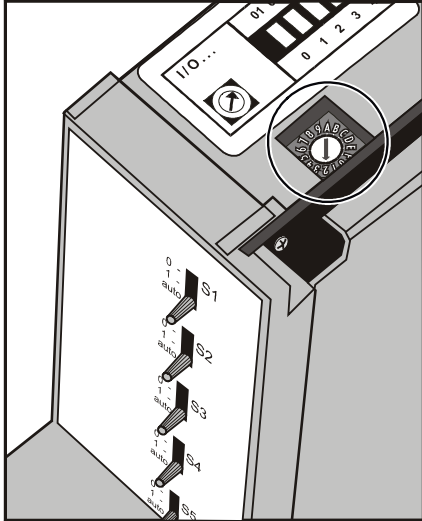
Fig. 8. Internal module HEX switch location

The 16 I/O modules (max. including Distributed I/O) are addressed by means of the rotary HEX switch settings 0 to F.
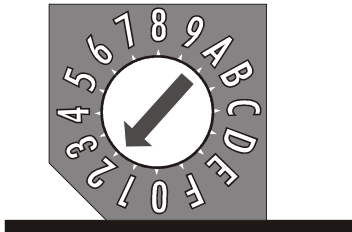
Fig. 9. Close-up of HEX addressing switch

The relationship between the rotary HEX switch and the module address can be seen on the label located next to the rotary HEX switch.

I/O...	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
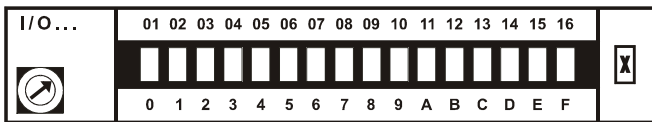
Fig. 10. HEX switch label

Care should be taken to ensure that each module gets its own module address. Addressing the modules in ascending order 0 through F is recommended for the sake of clarity for maintenance personnel.

⚠ CAUTION

Unplugging a module before switching OFF the power supply could destroy the module. Do not unplug modules with the power still connected. First switch S1 on the power supply module to the 0 position.

Installation Inside a Control Panel
Excel 500/600

IMPORTANT

> *Observe the minimum spacing of 1.5 in. (35 mm) when installing more than one housing. Do not exceed the maximum spacing; otherwise, the tailor-made internal bus cables will be too short.*

1. Break off cable entry strip segments.
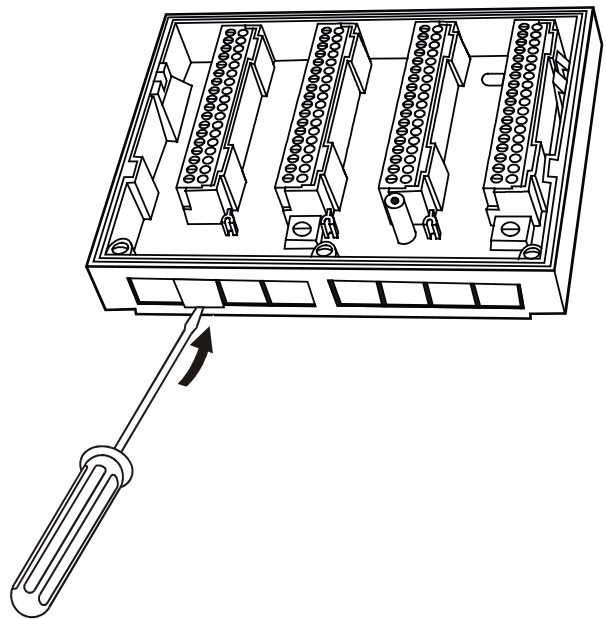
Fig. 11. Cable entry strip segments

2. Install the base.
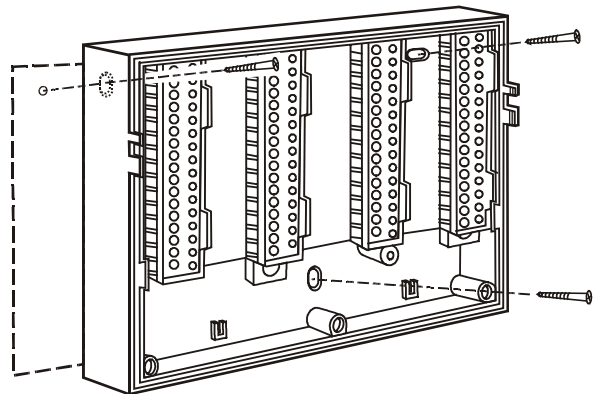
Fig. 12. Installing the base in the panel

3. Code the terminal block (see section "Coding the Terminal Block (not XCL5010)" on page 7).

4. Make sure that the locking screws are positioned as shown in Fig. 13.

5. Plug in the enclosure.
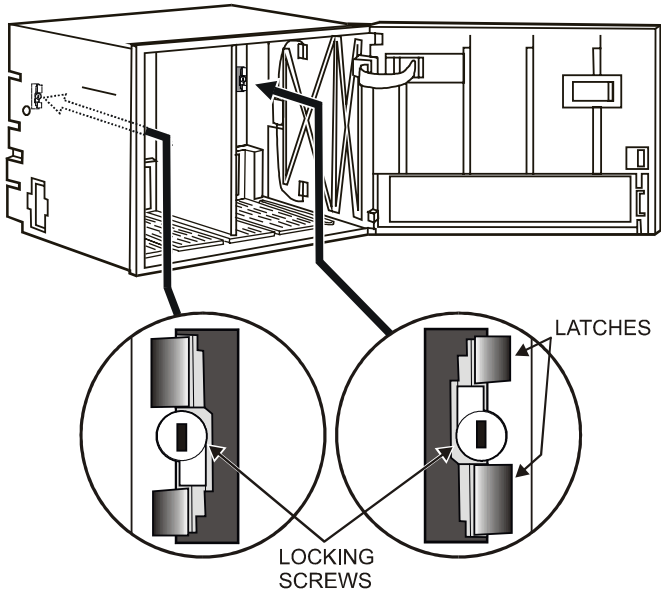
Fig. 13. Housing locking screws and latches

6. Shift latches inwards until the housing is released.

7. Set the module addresses (see section "Setting the Module Address (not XCL5010)" on page 8).

8. Insert the modules.
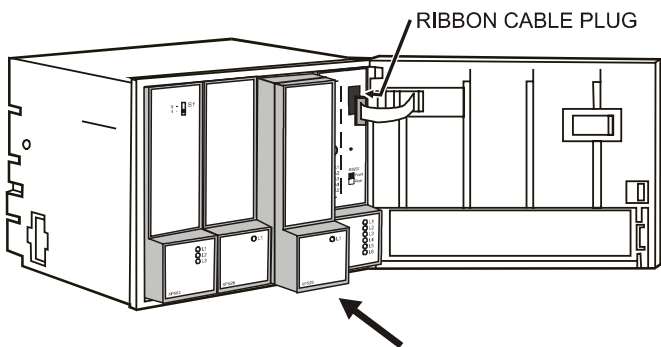
Fig. 14. Modules and ribbon cable

9. Plug the ribbon cable onto the computer module.

10. Close the cover.

Extended wiring base (wall-mounting, only; US, only):
As an alternative to the base plate, an extended wiring base may be used. This is available for the U.S. market, only, and can be ordered without cover plate (OS No. 14507274-001) or with cover plate (OS No. 14507274-002).
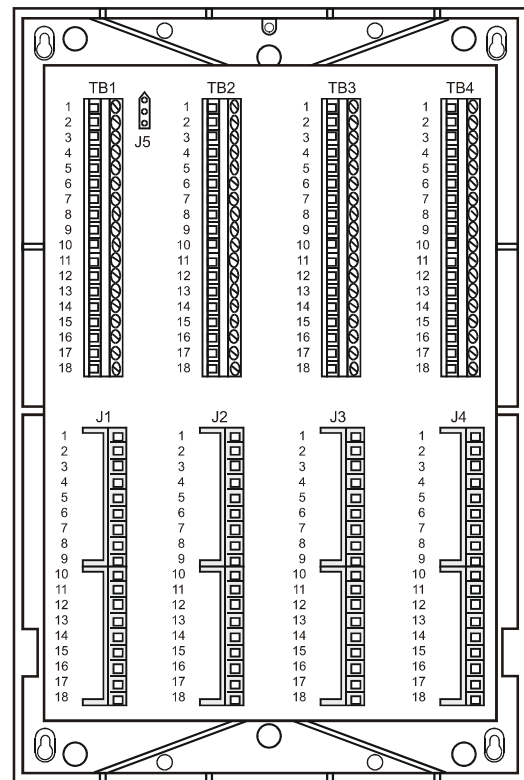
Fig. 15. Excel 500/600 extended wiring base

Using the extended wiring base the I/O terminals are accessible at run-time.

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Excel 500-XCL5010

1. Attach the DIN rail mounting clips to the housing.
2. Mount the controller on the DIN rail.
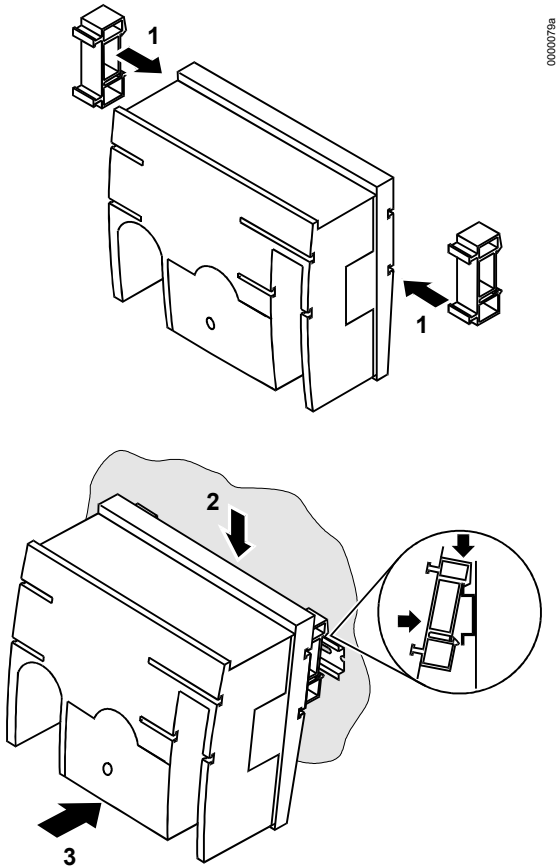
Fig. 16. Mounting Excel 500-XCL5010 on DIN rail

Excel 500-XCL5010 Communication Module

⚠ **CAUTION**

Always plug in the communication module *before* connecting the power supply.

Always disconnect the power supply *before* unplugging the communication module.
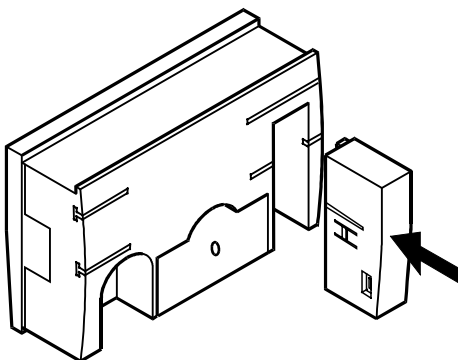
Fig. 17. Inserting the communication module

Plug in the communication module until it snaps into the controller housing

NOTE: If the communication module has been replaced or pulled out and plugged in again, push the reset button after power on.

Installation through a Control Panel Door (not XCL5010)

IMPORTANT

Observer the minimum spacing of 1.5 in. (35 mm) when installing more than one housing. Do not exceed the maximum spacing; otherwise, the tailor-made internal bus cables will be too short.

1, Prepare the door in accordance with the following. dimensions.
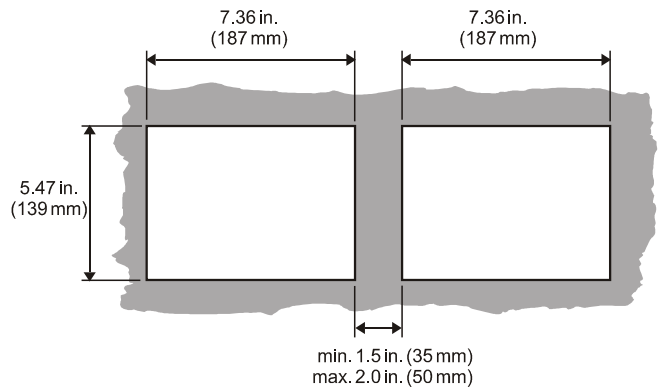

Fig. 18. Panel door mounting dimensions

2. Insert the housing.
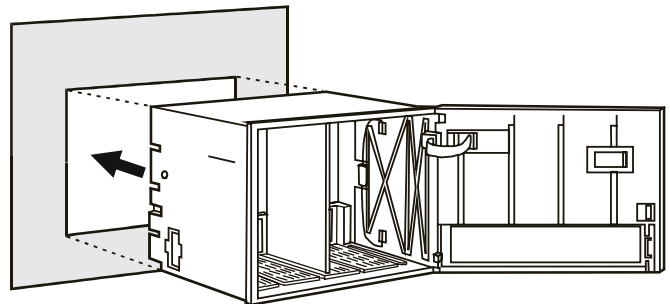
Fig. 19. Inserting the housing in the panel door

3. Insert the retaining clamp.
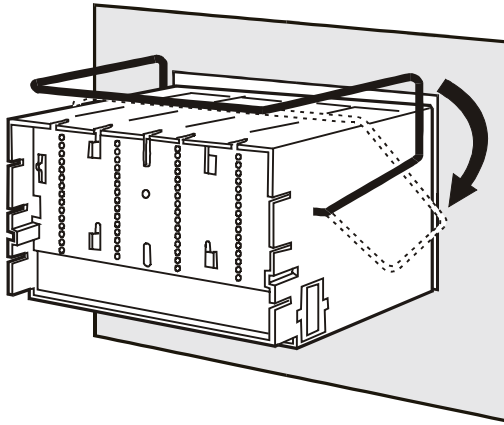
Fig. 20. Housing retaining clamp

4. Turn retaining clamp to fix housing.
5. Code the terminal block (see page 7).
6. Install the base.

WIRING BASE REAR VIEW   WIRING BASE FRONT VIEW
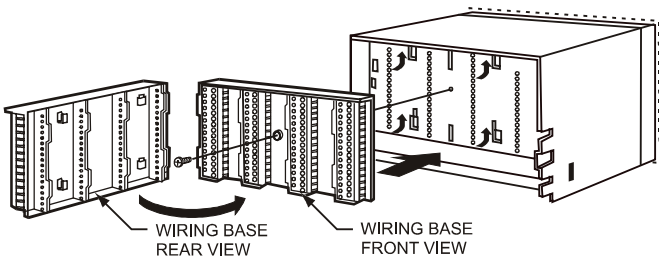
Fig. 21. Installing the wiring base

7. Complete electrical wiring.
8. Lock the cover.
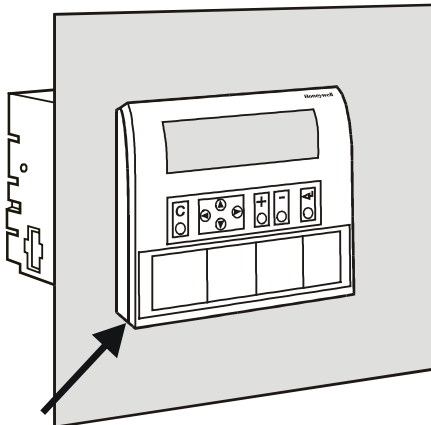
Fig. 22. Locking the MMI cover

External Installation of XI582AH Operator Interface

1. Remove the cover.
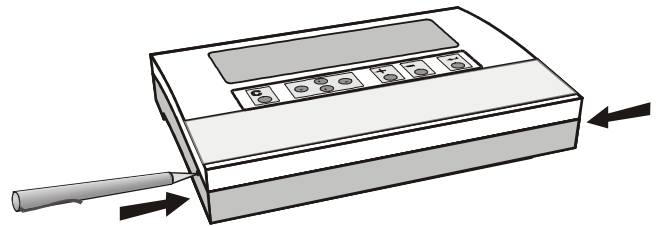
Fig. 23. Loosening the cover
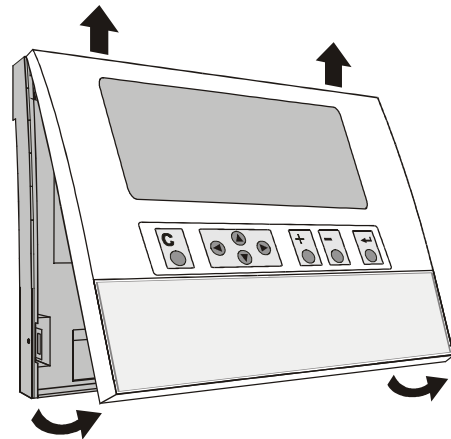
Fig. 24. Removing cover

2. If mounting on a wall, disconnect cable from panel for easier handling.
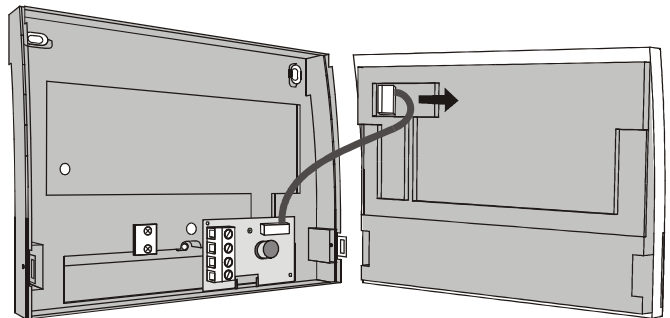
Fig. 25. Disconnecting cable from cover

3. Route cable from the computer module (XC6010, XC5010C, XCL5010).

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Fig. 26. Routing the cable

4. If mounting on a wall, remove feet.

Fig. 27. Removing feet

5. Attach the housing to the wall.

Fig. 28. Attaching to wall

6. Make electrical connections (gray wire not used).
7. Reconnect cable to panel if removed in step 2.
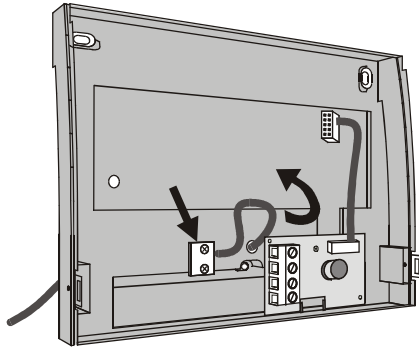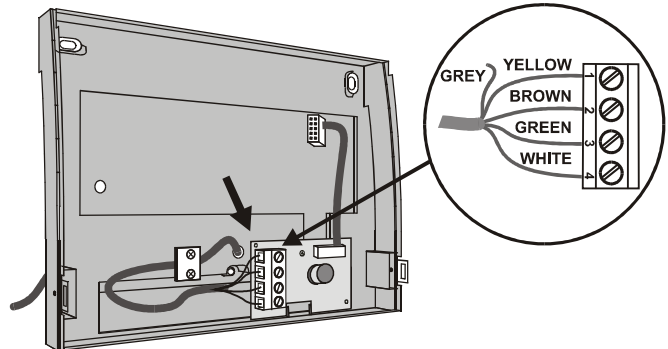
Fig. 29. Making electrical connections
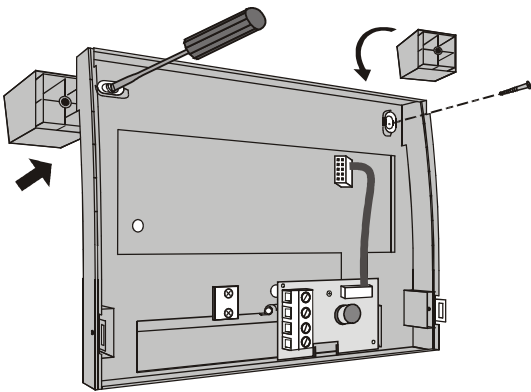
8. Reattach the cover.
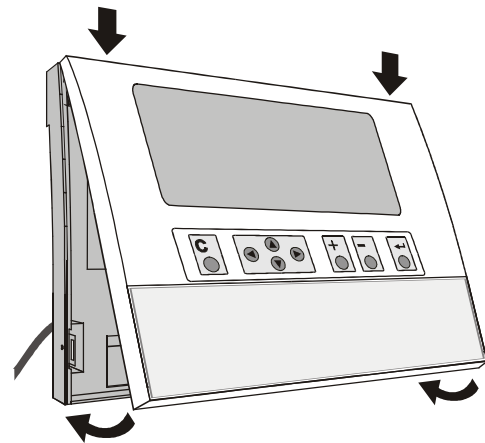
Fig. 30. Reattaching cover

Deactivating Backlit Display of the XI582AH

The XI582AH Operator Interface is equipped with an integrated backlit display to suit the display to the ambient lighting conditions. By default, this backlight is ON. This can be disabled by means of a jumper if required. The jumper is located at the back of the XI582AH cover.

Fig. 32. Backlight OFF jumper position

When the jumper is disabled (OFF-position), the backlight is permanently deactivated.

The contrast of the display can be adjusted using the potentiometer at the rear of the unit.

Fig. 31. Jumper location (backlight ON position)

The figure above shows the location of the jumper. To change jumper position, disconnect the connector first, then pull off jumper with tweezers or pincers and move to new position.

When the jumper is enabled (ON-position) the backlight will be activated with the first key press of any of the eight operating keys. If no entries are made for approximately two minutes, the backlight turns itself off automatically until the next key is pressed again.

Fig. 33. Contrast potentiometer

Distributed I/O Installation

Please refer to Distributed I/O Product Data sheet (EN0B-0090GE51) for more information.

Dimensions
Excel 500/600

0.82 in.
(21 mm)

6.00 in.
(127 mm)

0.80 in.
(20.5 mm)

3.83 in.
(97.5 mm)

0.16 in.
(4.2 mm)

0.40 in.
(10.2 mm)

7.51 in. (191 mm)

1.22 in.
(31 mm)

6.00 in. (152.5 mm)

5.62 in.
(143 mm)

7.55 in. (192 mm)

PANEL MOUNTING

1.22 in.
(31 mm)

6.00 in. (141.5 mm)

5.43 in.
(138 mm)

7.42 in. (177.5 mm)

DOOR MOUNTING

5.66 in.
(144 mm)

7.55 in. (192 mm)
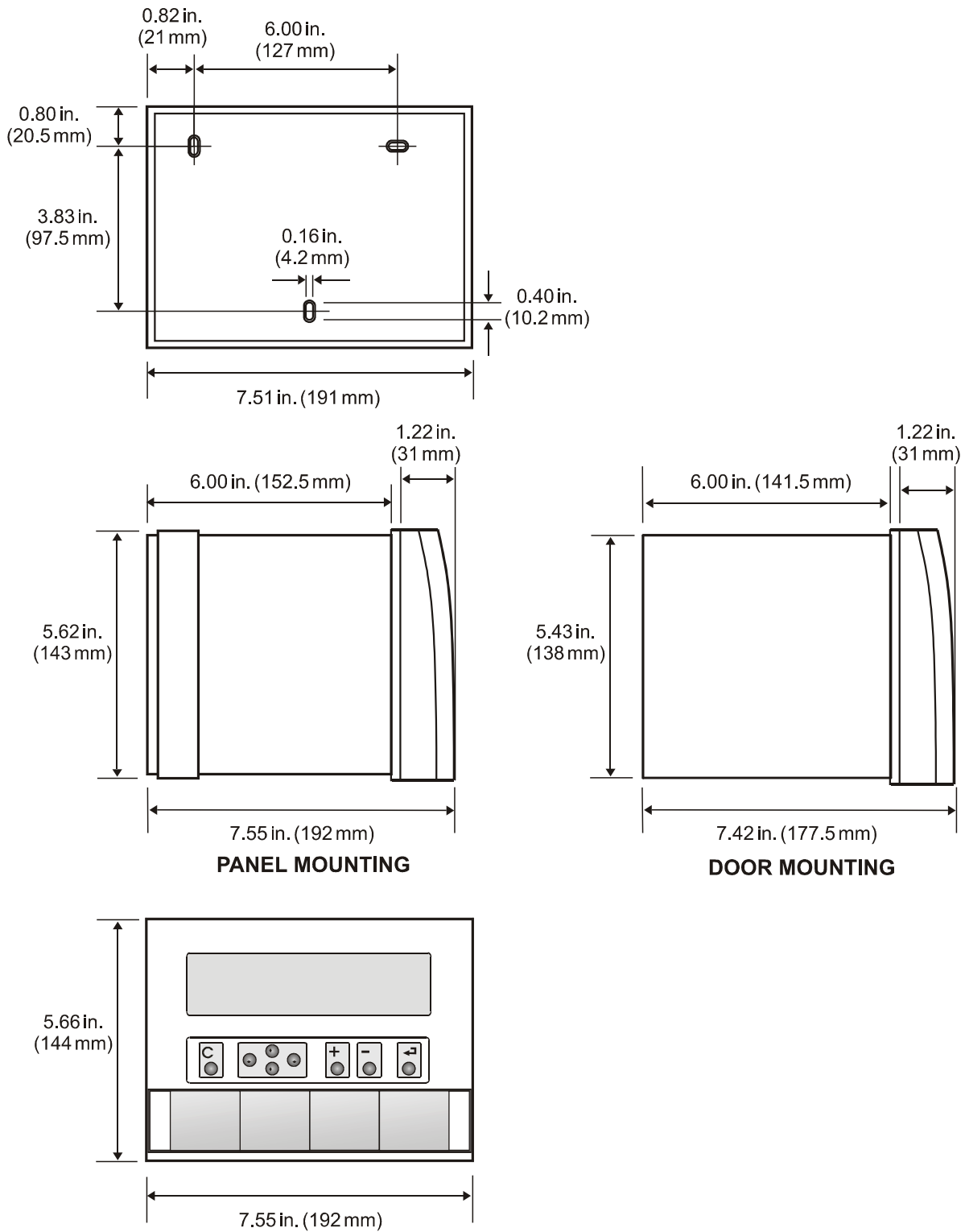
Fig. 34. Excel 500/600 outside dimensions

Excel 500-XCL5010
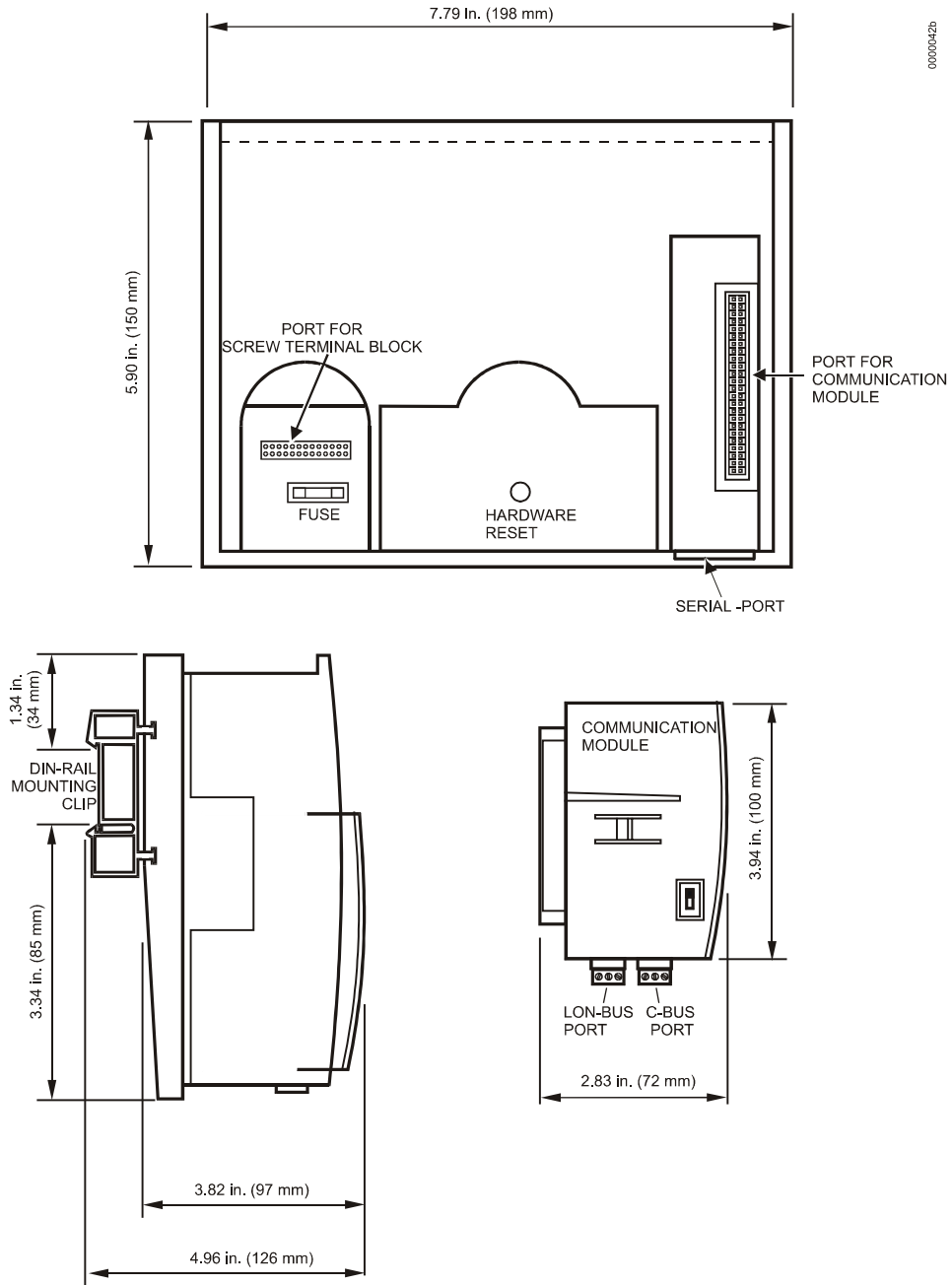
Fig. 35. Excel 500-XCL5010 dimensions

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XI582AH

Wall   Desk

1.57 in.
(40 mm)

7.56 in. (192 mm)

5.59 in. (142 mm)

6.69 in. (170 mm)

3.15 in.
(80 mm)

Base - wall mounting

0.47 in.
(12 mm)

0.47 in.
(12 mm)

6.54 in. (166 mm)

0.47 in.
(12 mm)

5.55 in. (141 mm)

4.13 in. (105 mm)

0.94 in.
(24 mm)

Cable hole

3.74 in. (95 mm)   3.74 in. (95 mm)

7.48 in. (190 mm)
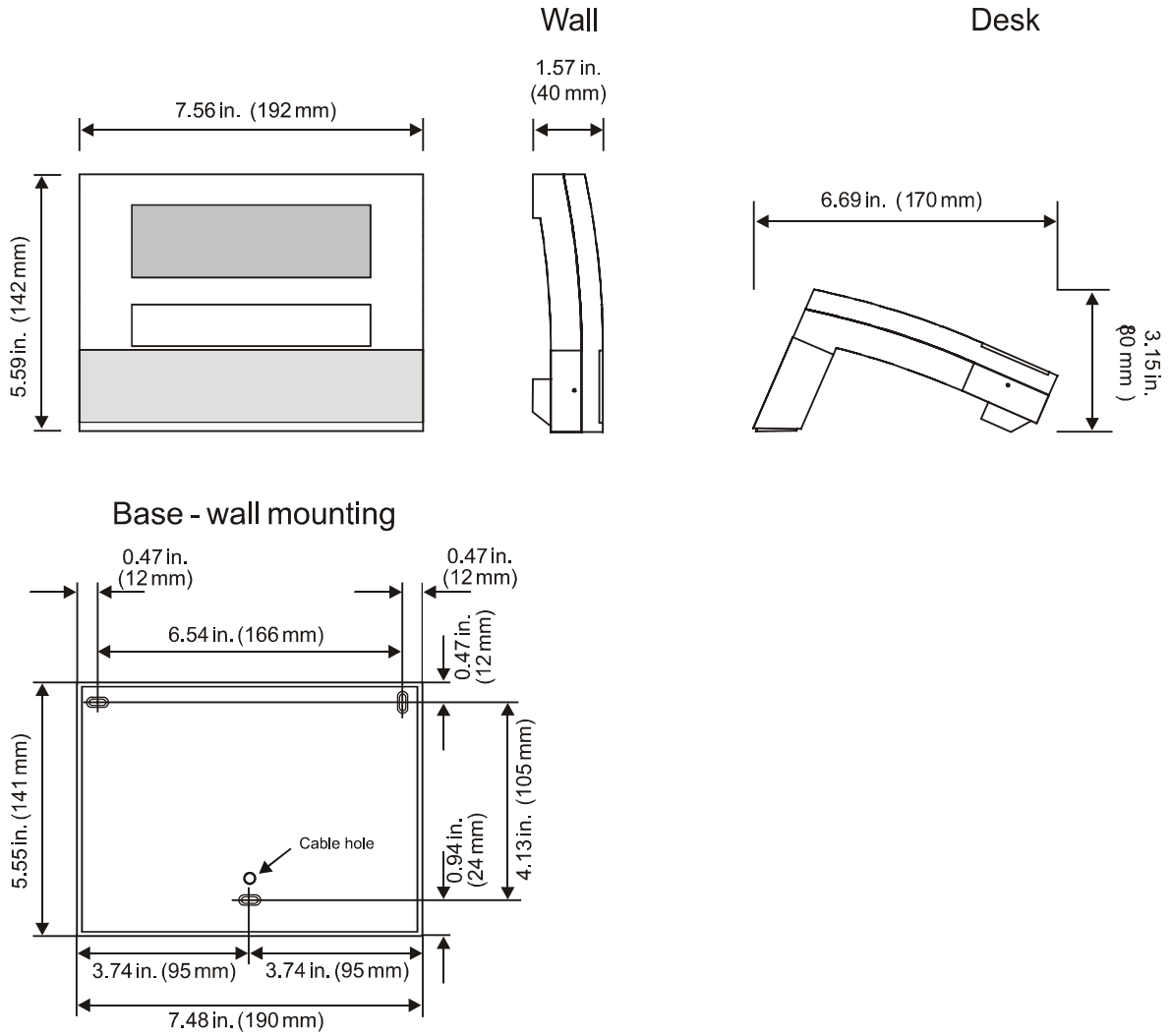
Fig. 36. XI582AH dimensions

Battery Activation during Commissioning (XC6010, only)

The controller is delivered from the factory with the battery in the computer module electrically isolated from the internal circuitry by a safety tag to prevent the battery from discharging in transit.

The controller is delivered from the factory with the battery in the computer module electrically isolated from the internal circuitry by a safety tag to prevent the battery from discharging in transit.

1. Unscrew the computer module cover with a screwdriver.
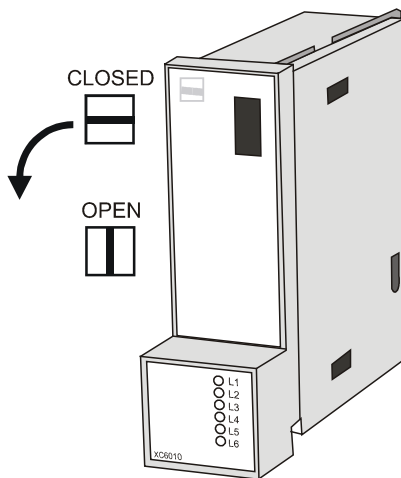
Fig. 37. Accessing the battery compartment
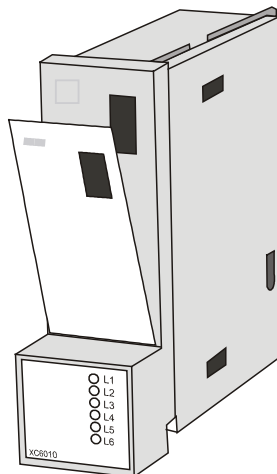
Fig. 38. Removing the faceplate
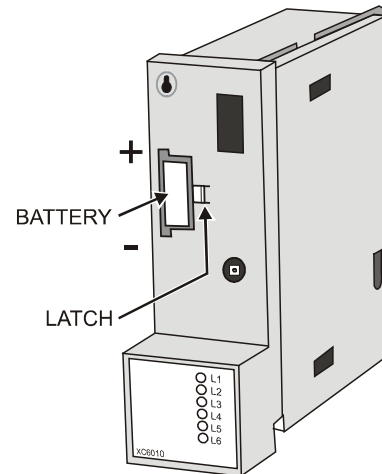
Fig. 39. Battery compartment

2. Remove the safety tag.
3. Install the cover.

Replacing the Battery

IMPORTANT

> *Batteries must not be disposed of as household waste. The law requires that you as the consumer return the waste batteries. Dispose of the battery according to legal regulations*

During normal operation, the battery is periodically tested under load. If the battery voltage falls below a threshold of 2.45 V during operation or under load, the computer module generates an error message which is displayed on the MMI as a system alarm. The battery must be replaced as soon as possible after the system alarm.

IMPORTANT

> *The line power supply must not be interrupted while replacing the battery; otherwise, all data held in RAM is lost.*

NOTE: In the event that your fingers touch the battery contacts, please clean the contacts with cleaning agent.

1. Unscrew the computer module cover with a screwdriver as shown in the previous section.
2. Release the latch holding the battery in its compartment (See Fig. 39).
3. Remove the old battery.
4. Insert the new battery with the positive contact pointing upwards.

Battery type:

Lithium battery 3 V, 1000 mAh, e.g. VARTA lithium battery CR1/2 AA – 3 V, 1000 mAh

NOTE: The CPU modules XC5010C and XCL5010 do not contain a battery. RAM is buffered for 3 days by a capacitor.

Dismantling the Control Panel Unit

Before dismantling the controller, the low voltage switch S1 of the power supply module must be switched OFF (position 0).

To dismantle the control panel unit, reverse the steps of the installation procedure (see page 8). To release the locking screws in order to remove the wiring base, turn them clockwise as shown in Fig. 40.
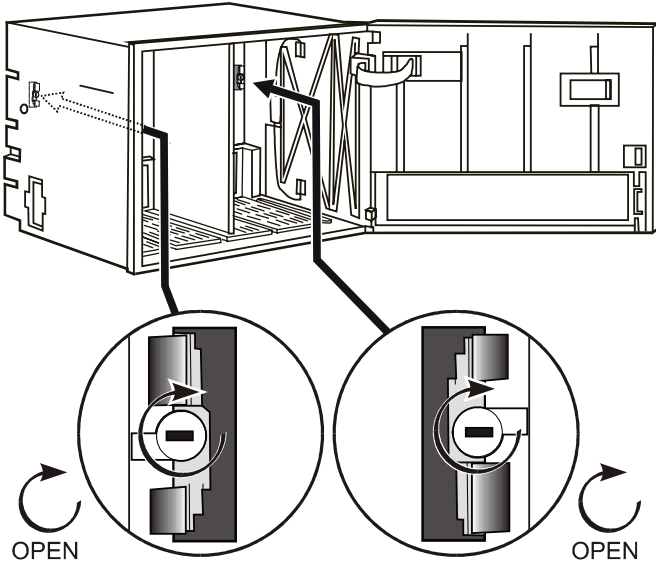
Fig. 40. Releasing housing locking screws

Dismantling the Control Panel Door Unit

Before dismantling the system, disconnect the power supply. To dismantle the control panel unit, reverse the steps of the installation procedure (see page 10).

Dismantling the Housing Cover

1. Release the metal retaining clamp.
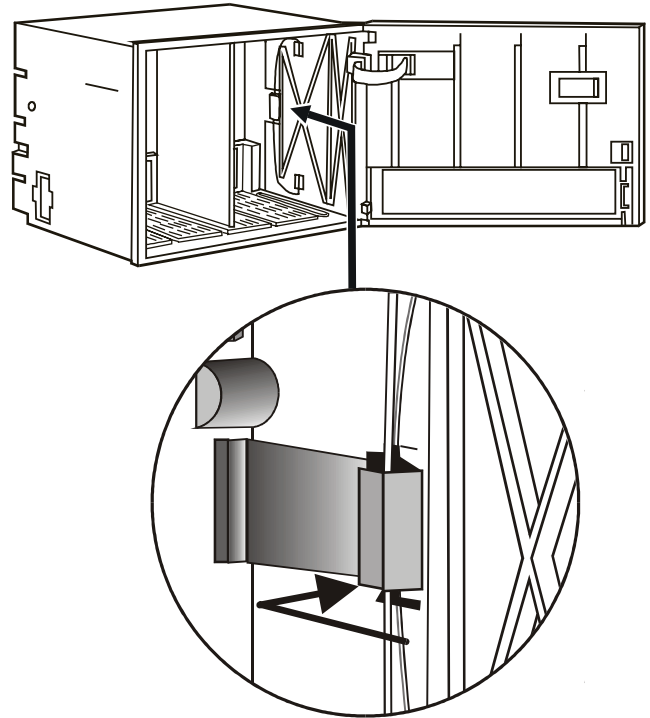
Fig. 41. Housing cover retaining clamp

2. Pull off the cover.

Dismantling the Excel 500-XCL5010 Control Panel Unit

Before dismantling the system, disconnect the power supply (e.g. by removing the terminal block or by an additional 3rd-party switch which should be installed onto the DIN rail close to the controller; see also warnings and notes in section "Electrical Connections" on page 20).

⚠ CAUTION

Always plug in the communication module *before* connecting the power supply.
Always disconnect the power supply *before* unplugging the Communication module.
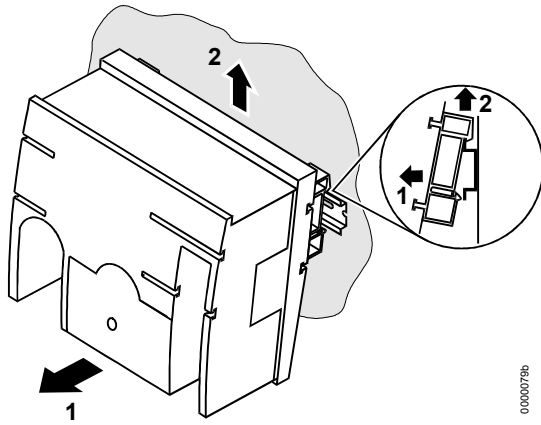
Fig. 42. Removing Excel 500-XCL5010 from DIN rail

1. Dismantle the controller housing as depicted.
2. Pull the lower part of the housing off the control panel.
3. Lift the housing from DIN rail.

Dismantling the XI582AH Operator Interface
Use a pencil or similar object to open the XI582AH Operator Interface.
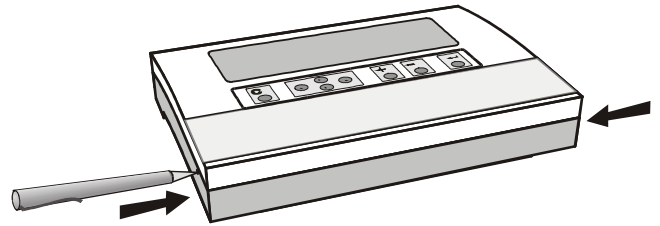
Fig. 43. Opening the XI582AH Operator Interface unit

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ELECTRICAL CONNECTIONS

When connecting the controller, both VDE, National Electric Code NEC (or equivalent) and any local regulations concerning grounding and zero voltage must be observed.

Electrical work should be carried out by a qualified electrician.

Under no circumstances should spare controller terminals be used as wiring support points. Doing so could damage the modules.

The electrical connections must be made at the terminal blocks. The corresponding connection diagrams are on the individual modules.

⚠ WARNING

Switch power OFF before making connections to or removing connections from terminals to avoid electrical shock or equipment damage.

IMPORTANT (FOR EUROPE, ONLY)

To comply with CE requirements, devices with a voltage in the range of 50...1000 Vac or 75...1500 Vdc which are not provided with a supply cord and a plug or with other means for disconnection from the supply having a contact separation of at least 3 mm in all poles, must have the means for disconnection incorporated in the fixed wiring.

Cable Routing

The minimum distance to power mains cables is 0.4 in. (10 mm) for shielded cable and 4 in. (10 cm) for unshielded cable.

All low-voltage signal and output cables should be regarded as communication circuits in accordance with VDE 0100 and VDE 0800 (or NEC or other equivalent), and should therefore be routed separately from mains cables.

Joining sensor cables should be avoided.

Shielding Input / Output Module and Power Supply Cables

Shielding input and output module and power supply cables is not necessary if the general guidelines for cable routing are observed. If, in certain cases, the routing guidelines cannot be observed, then shielded cable must be used.

The shield must not be terminated at a controller; instead, to avoid ground loops, the shield must be grounded (at only one end) at the control panel.

To prevent ground loops, shielding of input/output cables leading to peripheral devices must be grounded only at the control panel end.

Shielding of Data-Transmitting Cables

Connect the shield of the system bus (C-Bus) to system ground on both ends. Each end of the shield on the system bus should be connected to the system ground terminal of the respective computer module. Do not connect it to the control panel earth or any other earth ground points.

NOTE: The LONWORKS bus must not be shielded on the CPU side.

To connect remote operator interface units, ready-made cables are available (XW565; XW582, XW583, etc.) with the shield already connected to the computer module plug end.

Grounding (XC5010C / XC6010, only)

The controller should be grounded using as short a cable as possible (minimum 16 AWG [1.5 mm²]) between the control panel and the terminal block of the power supply module.

System Ground

⚠ WARNING

High voltage

Risk of electrical shock or equipment damage.

The controller's system ground must have no connection with the control cabinet ground!

NOTE: A document providing additional information on system grounding (if required) is available via the Honeywell Technical Assistance Center (TAC) or, for Honeywell employees, on the Docu Server under: *http://web.ge51.honeywell.de/dep/mc/TAC_Tips*.

RFI Suppression

Honeywell actuators are RFI (Radio Frequency Interference) suppressed as standard in accordance with VDE 0871/B and VDE 0875/N.

XC5010C / XC6010 Cable Lengths and Sizes

Table 3. Cable sizing

Type of signal	Cross sectional area		
	≤ 300 ft (100 m)	≤ 550 ft (170 m)	≤ 1300 ft (400 m)
24 Vac power supply	≤ 16 AWG (≥ 1.5 mm^2)	≤ 14 AWG (≥ 2.5 mm^2)	-
Low voltage signals[1]	≤ 20 AWG (≥ 0.5 mm^2)		

[1] 0 to 10V sensors, totalizers, digital inputs, 0 to 10V signals for actuators, etc.

A cable length of 1300 ft (400m) with a cross sectional area of 0.5 mm^2 (20 AWG) is permissible for a two-core, 0 to 10 Vdc signal cable.

Lightning Protection

Please contact your local Honeywell representative for information on lightning protection.
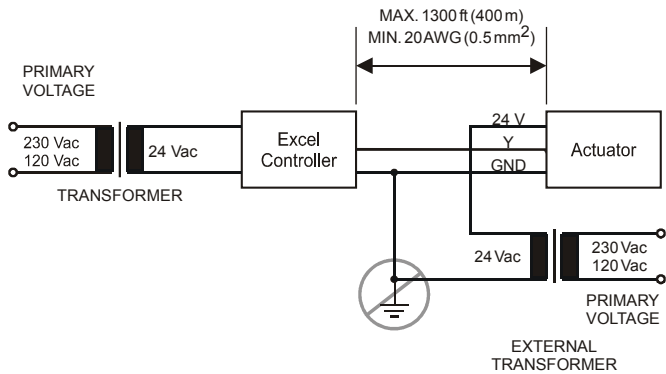
Fig. 44. Connection of XL500/600 controller and a 24 V actuator with <u>separate transformers</u>

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Summary of Internal Modules

Table 4. Summary of Excel 500/600 internal modules

Module	Name	Inputs	Outputs	Manual override switches	LED display
Computer module	XC5010C, XC5210C			Reset button LONWORKS service button RS232 front-rear switch	LONWORKS Service LED C-Bus transmit C-Bus receive Normal System error RS232 transmit RS232 receive Ground loop error
Computer module	XC6010			Reset button	Normal System error RS232 transmit RS232 receive C-Bus transmit C-Bus receive
Power supply module	XP502		1	0 (1 x)	Power supply Watchdog ext. battery operation
Analog input module	XF521A	8			
Analog input module	XF526	8			CPU active
Analog output module	XF522A		8	0 (5 x) 1 Auto	8 x Output intensity
Analog output module	XF527		8		8 x Output intensity
Digital input module	XF523A	12			12 x Status, invertible
Digital output module	XF524A		5 changeover 1 NO contact	0 (5 x) 1 Auto	6 x Status
Digital output module	XF529		5 changeover 1 NO contact		6 x Status
Three-position output module	XF525A		3 three-position	+ (3 x) 0 - Auto	3 x Open Close
C-bus repeater (10 KBit)	XD509				

NOTE: With XC6010 CPU only, there are submodules for system bus combination, XD505A (10 KBit) / XD508 (1 MBit), and for stand-alone modem communication, XDM506.

Line Power Supply

⚠ WARNING

A separate CRT 6 or 1450 series (U.S.) transformer must be used for each of the EXCEL 500/600 controller's 24 V supply.

No additional loads may be connected !

Each additional XL500/600 controller requires its own transformer.

An additional transformer, appropriate to the power requirements, should be used to power input/output peripherals (e.g. actuators).
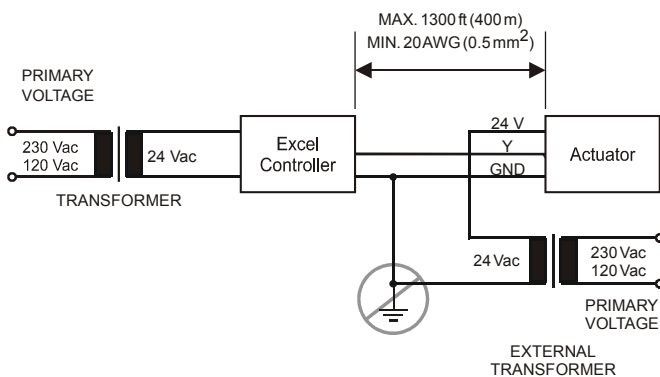
Fig. 45. Connection of XL500/600 controller and a 24V actuator with <u>separate transformers</u>
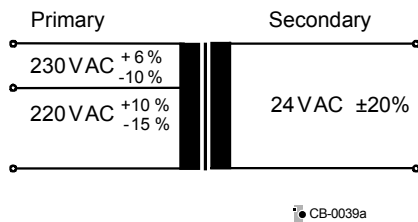
Fig. 46. Excel 500/600 power supply

To avoid interference, the cable between the transformer and the power supply module should be kept as short as possible (max. 6 ft (2m)). The transformer should therefore be positioned close to the power supply module.

Fuse the transformer primary with its own fast-acting 10 A back-up fuse (or H 16 or L 16 miniature circuit breaker).

The primary coil of the CRT 6 contains a 0.8 A / 250 V quick-blow fuse.

Table 5 gives an overview of the transformers of the 1450 series (U.S.):

Table 5. 1450 series transformers data

Part # 1450 7287	Primary side	Secondary side
-001	120 Vac	24 Vac, 50 VA
-002	120 Vac	2 x 24 Vac, 40 VA, and 100 VA from separate transformer
-003	120 Vac	24 Vac, 100 VA, and 24 Vdc; 600 mA
-004	240/220 Vac	24 Vac, 50 VA
-005	240/220 Vac	2 x 24 Vac, 40 VA, and 100 VA from separate transformer
-006	240/220 Vac	24 Vac, 100 VA, and 24 Vdc; 600 mA

The 1450 series includes built-in fuses, line transient /surge protection and AC convenience outlet, it meets NEC class 2 requirements.

XC6010 Computer Module

⚠ CAUTION

Do not unplug the computer module with the power still connected, since this could destroy the module. First, switch S1 on the power supply module to the 0 position.

If one of the C-bus submodules XD505A or XD508 is installed on the XC6010, follow Fig. 47.
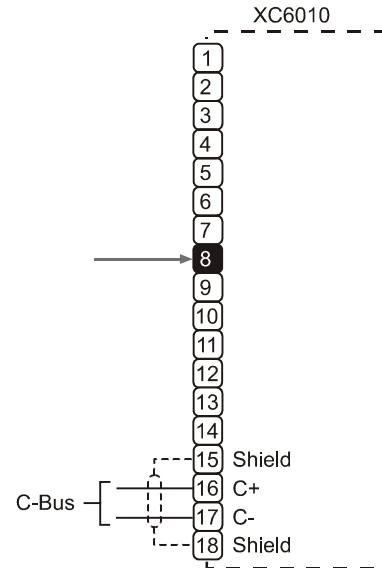
Fig. 47. Excel 600 CPU module C-Bus connections

The system bus is connected to terminal 16 (C+) and terminal 17 (C-). See also section "C-Bus Termination (Excel 600)" on page 38.

If the XDM506 Modem Submodule is installed on the XC6010, follow Fig. 48. Use the XW571 modem cable to connect the appropriate modem to the wiring terminals.

Modem Cable
XW571   XC6010
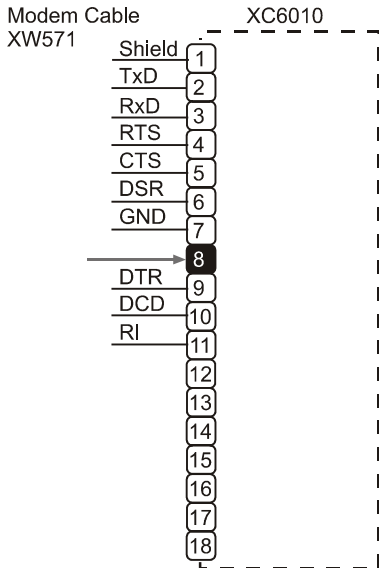
Fig. 48. Excel 600 CPU modem connection

The XC6010 has 2 EPROMs for the operating system and one flash EPROM for the application software. Their locations are shown in Fig. 49.
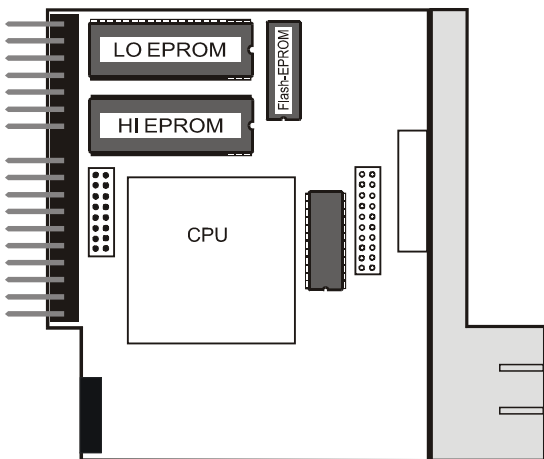
Fig. 49. Excel 600 EPROM locations

Communication between several Excel 600 controllers is possible only if the system bus submodule is plugged into every computer module printed circuit board. This submodule must be installed when joining several controllers, when connecting a modem, or when monitoring via a central. XD505A or XD508 can be used for local bus communication, XDM506 is used for modem communication. A stand-alone controller can be operated without a submodule.

XD505A / XD508
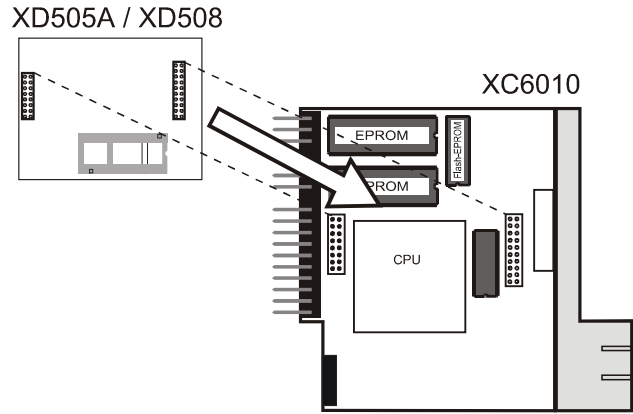
Fig. 50. Excel 600 submodule mounting location

For information pertaining to system bus baud rates and termination switch settings, see section "C-Bus Termination (Excel 600)" on page 38.

XC5010C Computer Module

⚠ **CAUTION**

Do not unplug the computer module with the power still connected, since this could destroy the module. First, switch S1 on the power supply module to the 0 position.

The XC5010C computer module contains both the system bus and the field bus. Fig. 51 shows the pin-out of the module.
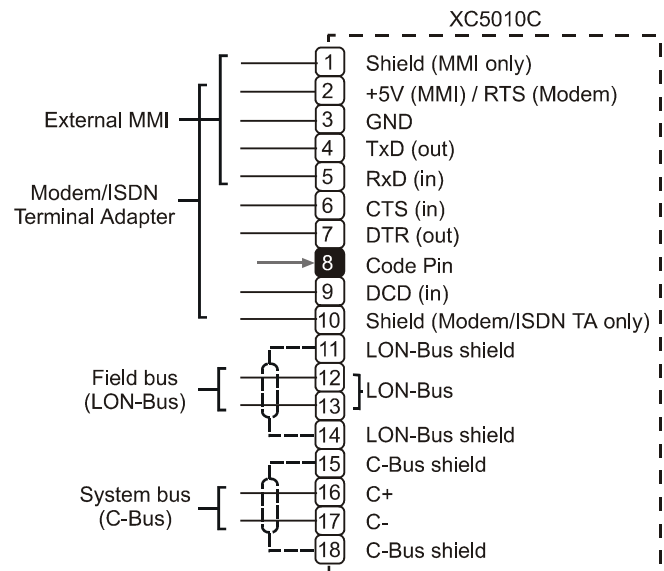
Fig. 51. Excel 500 CPU module pin-out

The system bus is connected to terminal 16 (C+) and terminal 17 (C-). The field bus (LONWORKS bus) is connected to terminals 12 and 13. The LONWORKS bus is non-polarized, i.e. there is no + or – pin. See section "LONWORKS Bus Wiring" (page 36) and "System Bus (C-Bus)" (page 37) for more information.

NOTE: Shielded cable is not necessary for the LONWORKS bus.

The serial port connections at the back of the module can be used to connect an XI582 MMI or, for CPUs with firmware version V2.1.0 or newer, a modem or ISDN terminal adapter. See section "Remote Communications" on page 43 for more information.

Each XC5010C contains an application submodule that is different from the XD505A/XD508 submodule. The submodule for the XC5010C contains the C-Bus, LONWORKS bus, as well as part of the RAM and flash EPROMs. For information on C-Bus baud rates and the bus termination switch, see section "C-Bus Termination (Excel 500)" on page 38.

LA1: Wink LED
LA2: C-Bus Transmit
LA3: C-Bus Receive
LA4: not used
LA5: not used

L1: Normal
L2: System error
L3: RS232 Transmit
L4: RS 232 Receive
L5: Not used
L4: Ground loop
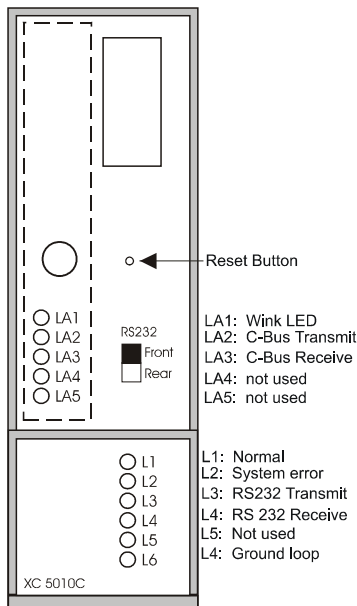
Fig. 52. Excel 500 CPU module front panel

The operator interface on the front of the computer modules allow the XI581AH/XI582AH Operator Interface or the XI584 Operator and Service Computer to be connected. As an option, the XI582AH can be connected at the rear of the computer module XC5010C. When connecting to the back of the module, the switch on the front panel of the XC5010C must be set to "Rear".

XP502 Power Supply Module

Fig. 53 shows the pin-out of the XP502 Power Supply module.
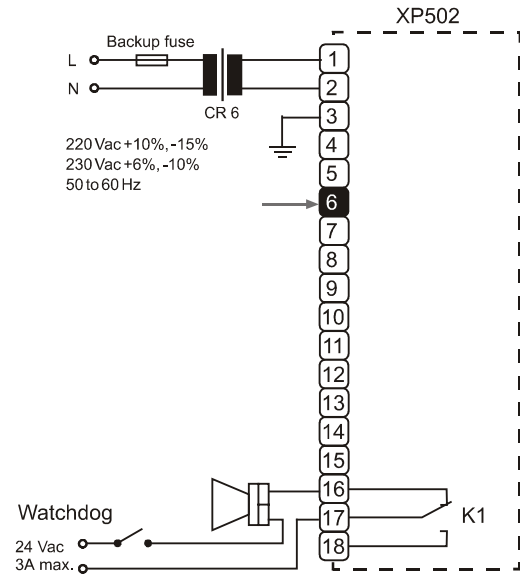
Fig. 53. XP502 Power supply module and watchdog circuit

To monitor the line power supply, the watchdog alarm must be provided with its own power or battery supply.

Controller in operation:
Watchdog relay terminals 17 and 18 connected.

Controller non-operational:
Watchdog relay terminals 16 and 17 connected.

XP502 with External UPS XAPU 24-2F (Internal Modules, Only)

The Uninterruptable Power Supply XAPU 24-2F contains a relay contact and 24 Vac, which can be used for external controls, or for the connection from XP502 terminal A7, A8. In case of failure, the relay contacts C and NO are closed and the 24 Vac supply is interrupted.

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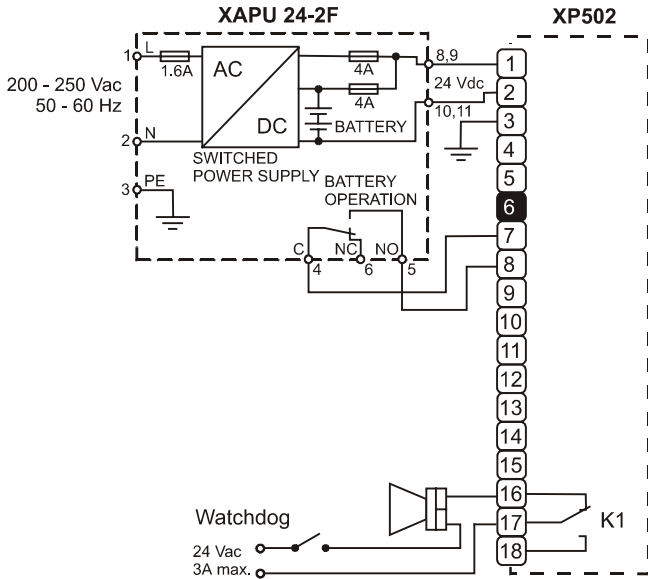
Fig. 54. Connection of XAPU 24-2F UPS (internal modules)

LED (L3) shows operation by battery.

NOTE: The output from the XAPU 24-2F must not be connected with other devices.

The fully-equipped Excel 500/600 controller will be completely supported with the battery for at least 15 minutes, without the mains power 230 Vac.

XP502 with External UPS XAPU 24-2F (Distributed I/O Modules, Only)

The wiring diagram below is for Excel 500 installations using only Distributed I/O modules. No internal I/O modules may be used. No other devices may be connected to the XAPU 24-2F.
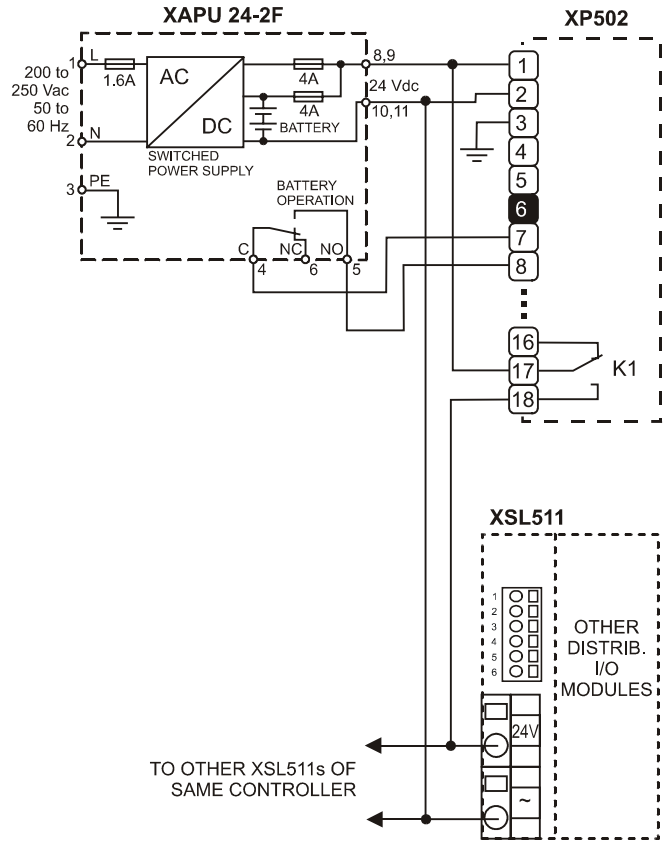
Fig. 55. Connection of XAPU 24-2F UPS (Distributed I/O modules)

NOTE: There must be no connection between GND of the XC5010C CPU module and the GND of Distributed I/O modules.

Relay K1 insures that the supply of the Distributed I/O modules will be switched OFF by switching OFF the XP502 Power Supply module.

The power consumption of the Excel 500 controller is shown in the table below. For the power consumption of Distributed I/O modules, please refer to the corresponding Product Data (EN0B-0090GE51)

Table 6. Power consumption of Excel 500 controller

Devices powered	Supply voltage	
	24 Vdc	**28.8 Vdc**
XP502, XC5010C, XI581 (backlight ON)	170 mA	155 mA
XP502, XC5010C	140 mA	130 mA

XP502 with External UPS XAPU 24-2F (Distributed I/O and Internal Modules)

As shown in the figure below, two XAPU 24-2F UPSs are required when the controller has both internal and Distributed I/O modules connected.
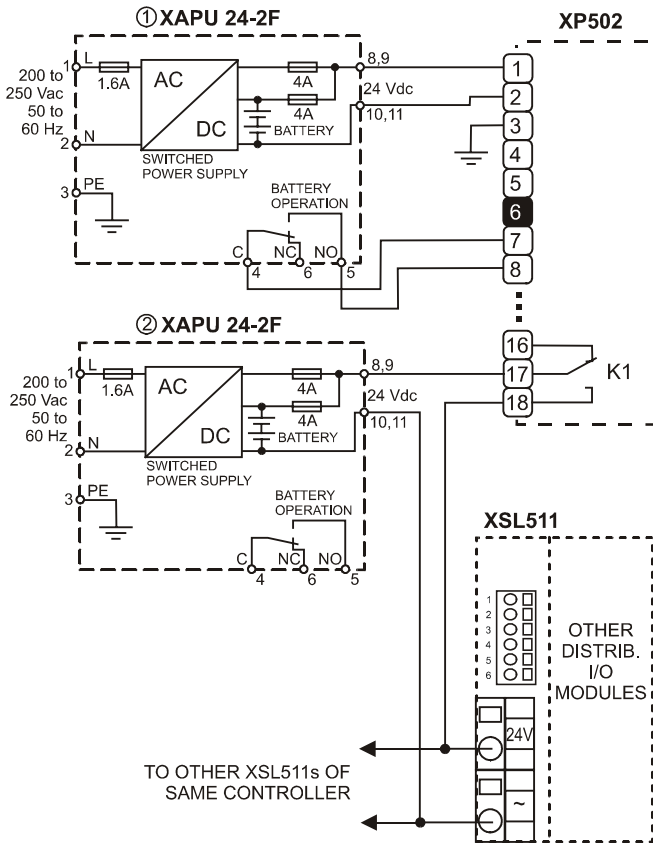
Fig. 56. Connection of XAPU 24-2F UPS (internal and Distributed I/O modules)

XAPU 24-2F number 1 is connected to the XP502 for the controller, only. No other devices may be powered by XAPU number 1.

XAPU 24-2F number 2 is connected to the XSL511 LONWORKS connector modules for powering the Distributed I/O modules. The connection through relay K1 of the XP502 insures that the power supply to the Distributed I/O modules will be switched OFF when the XP502 is switched OFF.

XF521A Analog Input Module

Technical Specifications

Number:

eight inputs (AI1 – AI8)

Input:

0...10 Vdc (low-input impedance, 25kOhm to 10 V / 200kOhm to GND);
0...20 mA (via external 500-ohm resistor);
4...20 mA (via external 500-ohm resistor);
NTC 20K ohm (-50...+150 °C);
PT1000 (-50...+150 °C)

Protection:

up to 40 Vdc / 24 Vac

Resolution:

12-bit resolution

Accuracy:

±75 mV or 0.75% (0...10 V)

Table 7. Accuracy of analog input sensors

Range	Measurement error (without sensor tolerance)	
	PT1000	NTC 20K
-58...-4 °F (-50...-20 °C)	≤ 1.2 K	≤ 5.0 K
-4...+32 °F (-20...0 °C)	≤ 0.7 K	≤ 1.0 K
+32...86 °F (0...30 °C)	≤ 0.5 K	≤ 0.3 K
86...158 °F (30...70 °C)	≤ 0.7 K	≤ 0.5 K
158...212 °F (70...100 °C)	≤ 1.2 K	≤ 1.0 K
212...266 °F (100...130 °C)	≤ 1.2 K	≤ 3.0 K
266...302 °F (130...150 °C)	≤ 1.2 K	≤ 5.5 K

With current sensors, a terminating resistor of R1 = 499 ohms ± 0.25 % must be connected.

Terminal 18 is an auxiliary output voltage (+10 Vdc, I_{max} = 5 mA) available for various sensor circuits.

Fig. 57. XF521A Analog Input module connections

27

Fig. 58 shows several connection examples for various sensors: WS21 Wind Sensor; SAF 25 Solar Sensor; and VMP Feedback Potentiometer.
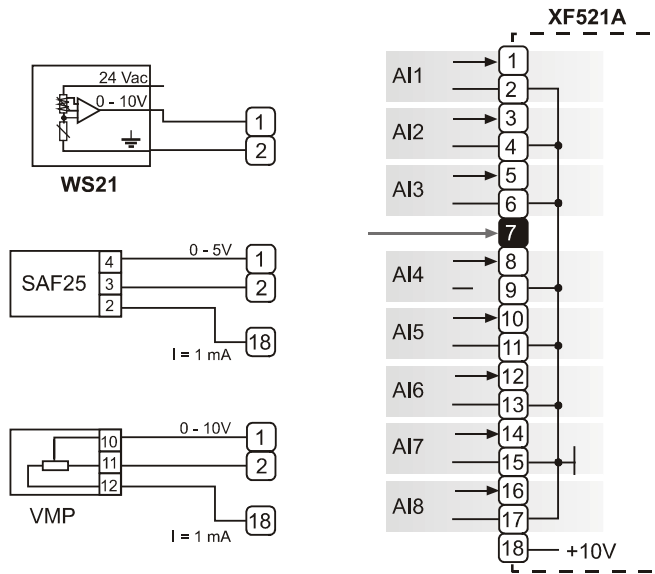
Fig. 58. XF521A connection examples

Fig. 59 shows connections to a TF26.

Terminals 1, 3:   temperature adjustment
Terminals 5, 3:   room sensor
Terminals 6, 3:   LED
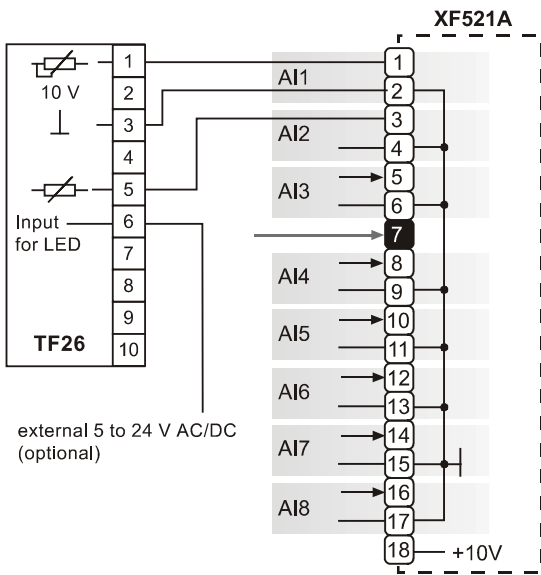
Fig. 59. XF521A and TF26 example

XF526 Analog Input Module

Technical Specifications

Number:

eight inputs (AI1 – AI8)

Input:

0...10 Vdc (low-input impedance, 25kOhm to 10 V / 200kOhm to GND);
0...20 mA (via external 500-ohm resistor);
4...20 mA (via external 500-ohm resistor);
NTC 20K ohm (-50...+150 °C);
PT1000 (-50...+150 °C)
PT1000 (0...+400 °C)
PT100 (-50...+150 °C)
PT3000 (-50...+150 °C)
Balco 500 (-50...+150 °C)

Protection:

up to 40 Vdc / 24 Vac

Resolution:

12-bit resolution

Accuracy:

±75 mV or 0.75% (0...10 V)

Table 8. Accuracy of analog input sensors

Range	Measurement error (without sensor tolerance)	
	PT1000	NTC 20K
-58...-4 °F (-50...-20 °C)	≤ 1.2 K	≤ 5.0 K
-4...+32 °F (-20...0 °C)	≤ 0.7 K	≤ 1.0 K
+32...86 °F (0...30 °C)	≤ 0.5 K	≤ 0.3 K
86...158 °F (30...70 °C)	≤ 0.7 K	≤ 0.5 K
158...212 °F (70...100 °C)	≤ 1.2 K	≤ 1.0 K
212...266 °F (100...130 °C)	≤ 1.2 K	≤ 3.0 K
266...302 °F (130...150 °C)	≤ 1.2 K	≤ 5.5 K

With current sensors, a terminating resistor of R1 = 499 ohms ± 0.25 % must be connected.

Terminal 18 is an auxiliary output voltage (+10 Vdc, I_{max} = 5 mA) available for various sensor circuits.

Fig. 60. XF526 Analog Input module connections

XF523A Digital Input Module

The digital input module can process DC or AC voltage signals. The module has 12 digital inputs. When the input voltage reaches 5 V, the digital signal is set to a status of "1". With a hysteresis of 2.5 V, the digital input signal must fall below 2.5 V before a digital status of "0" is reported.
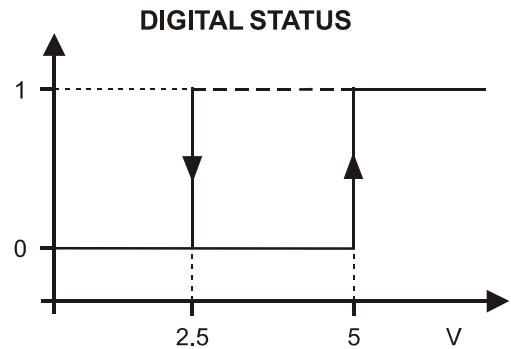
Fig. 61. Digital input hysteresis

The LED functionality of each digital input channel can be altered via 12 internal DIP switches. In the ON position (default), the LED will illuminate when energized (normally open contacts). In the OFF position, the LED will illuminate when de-energized (normally closed contacts).

Max. signal voltage from non-Honeywell voltage sources:
  DC Voltage: V_{max} = 40 V
  AC Voltage: V_{max} = 28 V / $\geq$ 50 Hz
Input resistance:
  R_i = 15k ohms
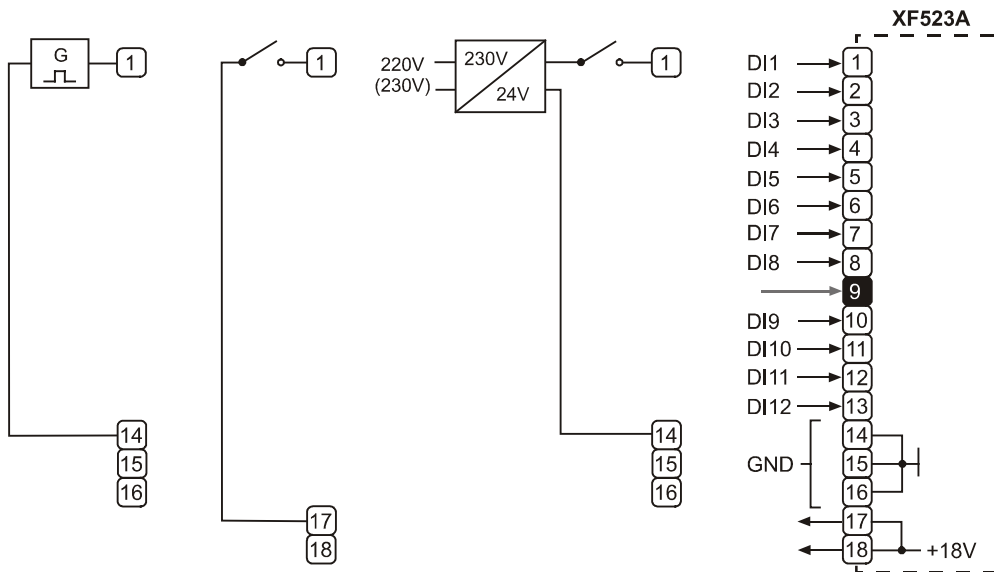
Fig. 62. XF523A connection examples

If the inputs are used as totalizers, Table 9 applies.

Table 9. Totalizer inputs specifications

Input	Frequency	Pulse duration	Pulse internal	Chatter time
1, 2	max. 15 Hz	min. 20 ms	min. 33 ms	max. 5 ms
3 to 12	max. 0.4 Hz	min. 1.25s	min. 1.25 s	max. 50 ms

The inputs shown in row one (Input 1 to 2) may be used as fast totalizers. In this case, the input signal characteristics of row one are valid. If they are not used as fast totalizers, the values of row two (Inputs 3 to 12) apply to them as well.

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XF522A and XF527 Analog Output Modules

Technical Specifications

Number:

8 analog outputs

Voltage rating:

0 to 10 V, max. 11V

Current rating:

1 mA max.

Resolution:

8 bit

Accuracy:

±150 mV or 1.5% deviation from output voltage

Manual override switches:

| XF522A | 5 manual override switches (AO1 to AO5) |
| XF527 | No manual override switches |
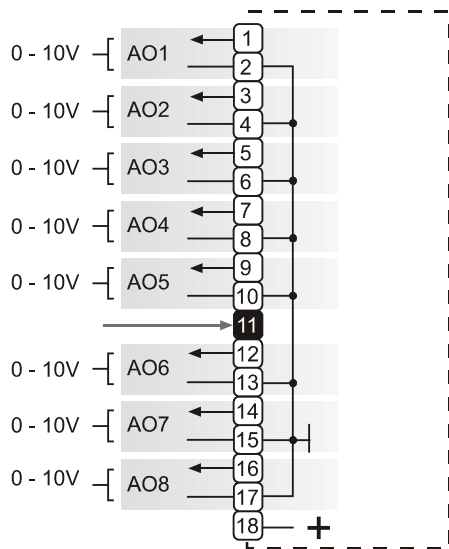
Fig. 63. XF522A and XF527 Analog Output modules

NOTE: The maximum output current of 1 mA must not be exceeded.

NOTE: Both modules are fully pin compatible.

XF524A and XF529 Digital Output Modules

Technical Specifications

Number:

6 digital outputs

Voltage rating:

240 Vac max. per contact and per module

Current rating:

4 A max. per contact, 12A max. per module

Relay contacts:

K1 to K5:

changeover contact (voltage-free)

K6:

normally open contact (voltage-free)
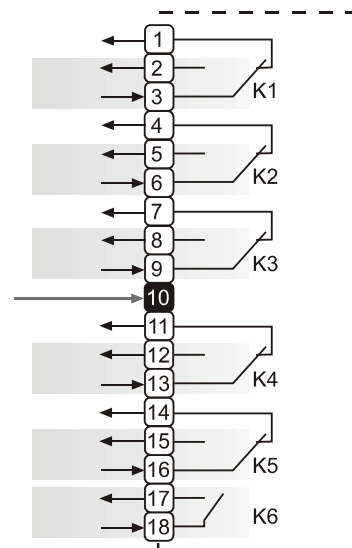
Fig. 64. XF524A and XF529 Digital Output module

NOTE: Maximum voltage for U.S. is 24 V.

NOTE: Both modules are fully pin compatible.

Beginning with V3.04.00 firmware, the online point attribute normally open/normally closed (NO/NC) defines the relation between the physical input signal and its logical status. See Table 10.

Table 10. NO/NC attribute and output characteristic

Relay On/Off	NO/NC attribute	Logical status
On	NO	1
Off	NO	0
On	NC	0
Off	NC	1

XF525A Three-Position Output Module

Technical Specifications

Voltage rating:

240 Vac or 28 Vdc max.

Current rating:

0.2A max. at 240 Vac

1.2A max. at 28 Vdc

An L 16 miniature circuit breaker or G 10 A quick blow fuse should be used to protect the 240 Vac mains supply.

NOTE: The maximum voltage for the U.S. is 24 V.
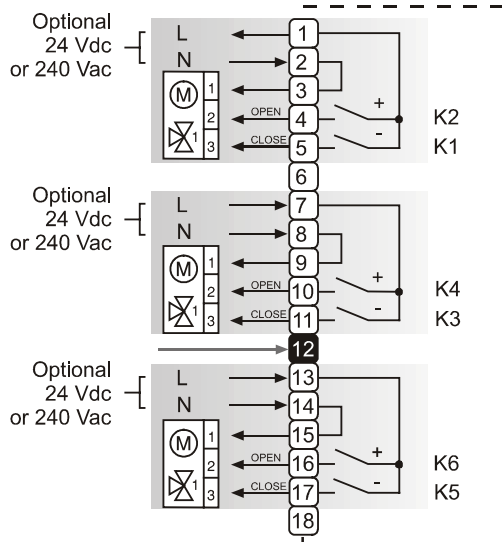
Fig. 65. XF525A Three-position output module

Excel 500-XCL5010

The Excel 500-XCL5010 housing comprises a removable screw terminal block for direct power supply wiring. For proper installation of the terminal block, follow these instructions:

1. Read the complete chapter "Installation" carefully.
2. Follow the instructions from the chapter Screw Terminal Block Installation Procedure on page 33.

The screw terminal block is attached directly to the controller housing.
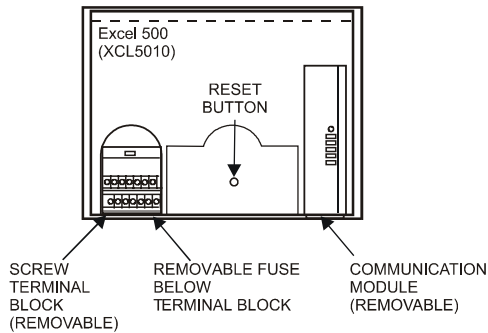
Fig. 66. Excel 500-XCL5010 terminal block location

Serial Port
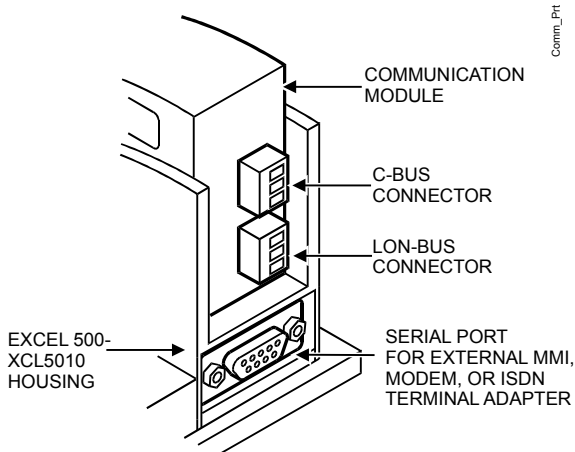
Fig. 67. Serial port

The serial port has a 9-pin sub-D connector and has a default communication speed of 9.6 Kbaud.

Table 11. Signals of serial port

Signal type	Controller output	Controller input
Signal ground		
Transmit	x	
Receive		x
Carrier detect		x
Clear to send		x
Data terminal ready	x	
5 V	x	

MMI Connection

For direct communication the external operator interface XI582 and the PC-based MMI XI584 can be connected to the serial port.

Power Supply

The Excel 500-XCL5010 controller is powered by an external transformer.

IMPORTANT

Only the terminals 1 and 2 of the terminal block may be used for power supply. Do not wire any of the terminals 3 to 14.
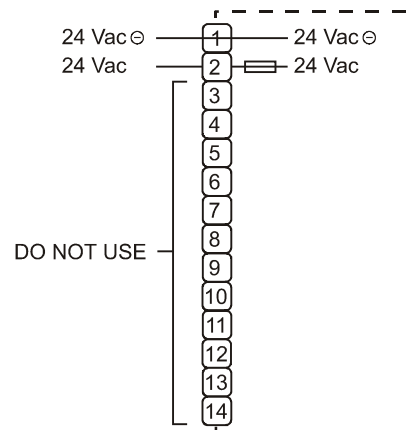
Fig. 68. Excel 500-XCL5010 power terminals location

Terminal 2 is protected by a 4 A quick-acting fuse.

Transformer requirements for one Excel 500-XCL5010 Controller:
Voltage 21 to 26.5 Vdc or 24 Vac ± 20%
Current 1.6A max.

The transformer, already installed in the cabinet, can be used to supply several controllers, communication devices, or peripherals like actuators, etc. if the transformer provides sufficient power.
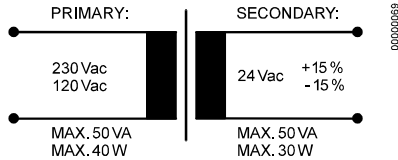
Fig. 69. Transformer example

Use quick-acting backup fuse 10 A (or automatic H16 or L16) to protect transformer primary side. On the primary side of the CRT 2, there is a fusible output of type M 0.315 A (T) 250 V for the purpose of fine fusing.

NOTE: When selecting the appropriate transformer, consider the number of Distributed I/O modules (see worst-case power consumption information below) to be used as well as the power requirements of all active sensors and actuators connected to the transformer.

CRT-Series

Table 12. Overview of CRT Series AC/DC current

Transformer	max. AC current	max. DC current
CRT 2	2 A	0.5 A = 500 mA
CRT 6	6 A	1.3 A = 1300 mA
CRT 12	12 A	2.5 A = 2500 mA
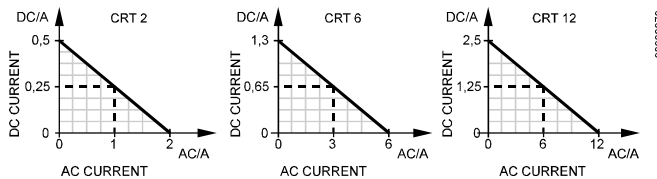
Fig. 70. AC/DC current graphs

1450 Series

All transformers of the 1450 series are designed for 50/60 Hz AC and have insulated accessory outputs. The transformers include built-in fuses, line transient/surge protection and AC convenience outlets and meet NEC class 2 requirements.

Table 13. 1450 Series transformers

Part # 1450 7287	Primary side	Secondary side
-001	120 Vac	24 Vac, 50 VA
-002	120 Vac	2 x 24 Vac, 40 VA and 100 VA from separate transformer
-003	120 Vac	24 Vac, 100 VA and 24 Vdc 600 mA
-004	240/220 Vac	24 Vac, 50 VA
-005	240/220 Vac	2 x 24 Vac, 40 VA and 100 VA from separate transformer
-006	240/220 Vac	24 Vac, 100 VA and 24 Vdc 600 mA

Standard Transformers

Standard commercially available transformers must fulfill the specifications stated in Table 14.

Table 14. Requirements for standard transformers

Output voltage	Impedance	AC current
24.5 Vac to 25.5 Vac	≤ 1.15 ohms	max. 2 A
24.5 Vac to 25.5 Vac	≤ 0.40 ohms	max. 6 A
24.5 Vac to 25.5 Vac	≤ 0.17 ohms	max. 12 A

Screw Terminal Block Installation Procedure

⚠ **WARNING**

High Voltage

Risk of death or electrical shock.

— Do not connect line power supply directly to the terminals.

— Insulate devices with 120 Vac / 230 Vac by a transformer.

1. Make sure that the power supply of the cabinet is disconnected.

2. Make sure that the power supply of the cabinet is disconnected and the communication module is plugged in the housing.

IMPORTANT

When installing a separate external transformer, do not connect the cabinet ground to the controller system ground.

3. If the distance between the controller and an actuator or sensor with 24 Vac supply is greater than 550 ft (170m):

   a) Choose a transformer from the transformers listed in section "Power Supply" on page 32.

   b) Connect the chosen transformer directly to the actuator or sensor.

4. Select one of the transformers of the CRT-series or 1450 series from the tables on the previous page or take a commercially available standard transformer fulfilling the requirements listed in Table 14.

5. Make sure that the communication module is attached to the controller housing.

IMPORTANT

>*The transformer feeding the Excel 500 Controller must be in the same cabinet. For the selection of the transformer, the max. DC current must be considered if field devices with DC load are used.*

>*The secondary side of the transformer must not be connected to earth ground.*
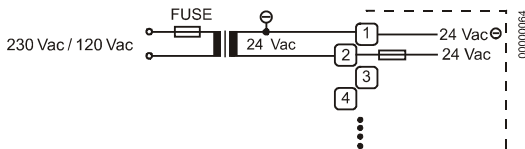
Fig. 71. Connecting the power supply

6. Connect the 24 Vac (-) on the secondary side of the transformer to terminal 1 on the Screw Terminal Block.

7. Connect the 24 Vac on the secondary side of the transformer to terminal 2 on Screw Terminal Block.
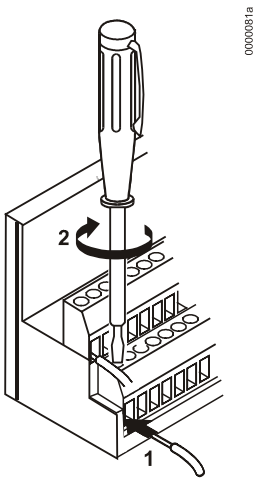
Fig. 72. Connecting to a screw terminal

IMPORTANT

>*If there already are additional transformers, for example supplying actuators or active sensors, connect the 24 Vac (-) (secondary side) of the transformers together.*

8. Attach the terminal blocks to the housing as shown in Fig. 73.
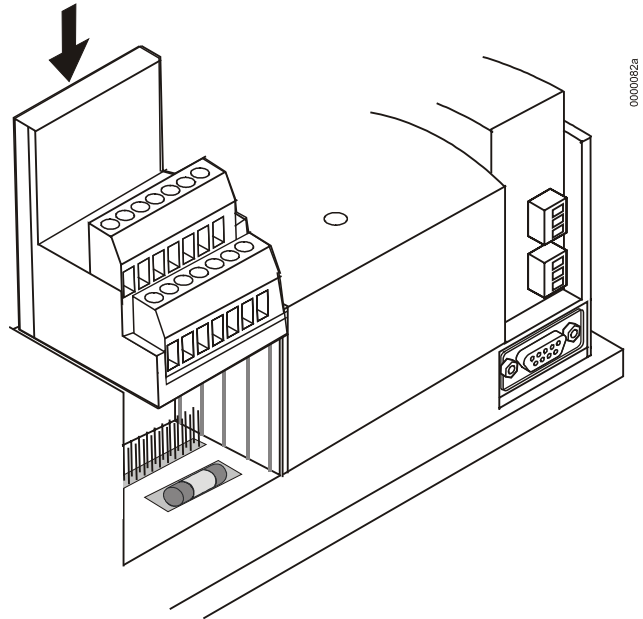
Fig. 73. Attaching screw terminal block

Pull-Up Resistor Handling (O.S. 2.04.00 or higher, except for XFL521A)

High-Impedance Sensors and Active Sensors

When high-impedance sensors and active sensors are connected to the inputs, the recognized value will not differ significantly from the measured value if the pull-up resistor is de-activated as follows:

Put the character "@" as the first digit of the chosen input characteristic name in the CARE text editor.

Example:

Characteristic name: @0-10V; the internal pull-up resistor is disabled.
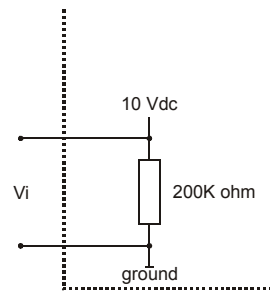
Fig. 74. Analog input / high-impedance sensors

NTC and Low-Impedance Sensors

Characteristic name: NTC; the internal pull-up resistor is enabled.
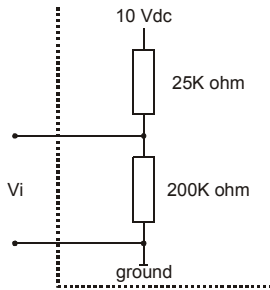
Fig. 75. Analog input / low-impedance sensors

Pull-Up Resistor Handling when Using Analog Inputs as Digital Inputs (O.S. 2.03.xx)

When the input is identified as a DI point in CARE (DI subtype AI), the internal pull-up resistor is enabled.
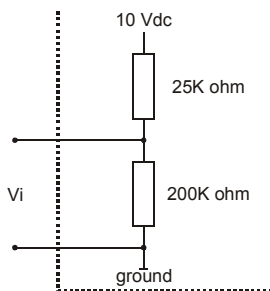
Fig. 76. Analog inputs identified as DI point (O.S. 2.03.xx)

Pull-Up Resistor Handling when Using Analog Inputs as Digital Inputs (O.S. 2.04.00 or higher)

When the input is identified as a DI point in CARE (DI subtype AI), the internal pull-up resistor is disabled.
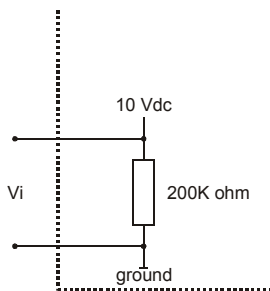
Fig. 77. Analog inputs identified as DI point (O.S. 2.04.00 or higher)

Sensors and Transducers

Passive sensors (NTC 20k ohms)
  Room temperature sensor RF20
  Inlet temperature sensor VF20A
  External temperature sensor AF20
Active sensors (0 to 10 V):
  Duct Humidity Sensor H7011A1000
  Duct Humidity Sensor H7012A1009
Active sensors (0 (4) to 20 mA):

  Immersion temperature sensor VF 100
  Air duct temperature sensor LF 100
Wind sensor:
  Wind sensor WS21.
Further connections:
  Temperature sensor terminal TF26

Table 15. Accuracy of analog input sensors

Range	Measurement error (without sensor tolerance)	
	Pt1000	NTC (20k ohms)
-58 to –4 °F (-50 to –20 °C)	≤ 1.2 K	≤ 5.0 K
-4 to 32 °F (-20 to 0 °C)	≤ 0.7 K	≤ 1.0 K
32 to 86 °F (0 to 30 °C)	≤ 0.5 K	≤ 0.3 K
86 to 158 °F (30 to 70 °C)	≤ 0.7 K	≤ 0.5 K
158 to 212 °F (70 to 100 °C)	≤ 1.2 K	≤ 1.0 K
212 to 266 °F (100 to 130 °C)	≤ 1.2 K	≤ 3.0 K
266 to 302 °F (130 to 150 °C)	≤ 1.2 K	≤ 5.5 K

35   EN1R-1047GE51 R0902

COMMUNICATIONS

LONWORKS Bus Wiring

Connection between the Distributed I/O modules and the CPU are made from the LONWORKS connector module XSL511. The LONWORKS bus is a 78-kilobit serial link that uses transformer isolation so that the bus wiring does not have a polarity; that is, it is not important which of the two LONWORKS bus terminals are connected to each wire of the twisted pair.

The LONWORKS bus can be wired in daisy chain, star, loop or any combination thereof as long as the maximum wire length requirements given below are met. The recommended configuration is a daisy chain with two bus terminations. This layout allows for maximum LONWORKS bus length, and its simple structure presents the least number of possible problems, particularly when adding on to an existing bus.

Table 16. Doubly-terminated bus specifications

Cable type	Max. bus length
Belden 85102	2700 m (8900 ft)
Belden 8471	2700 m (8900 ft)
Level IV, 22 AWG	1400 m (4600 ft)
JY (St) Y 2x2x0.8	900 m (3000 ft)
TIA568A Categ. 5 24AWG, twisted pair	900 m (3000 ft)

NOTES: The cable types listed above are as recommended by Echelon in their FTT-10A User Guide. The cable recommended by Honeywell is the level IV, 22 AWG, solid core, nonshielded cable. Belden part numbers are 9H2201504 (plenum) and 9D220150 (non-plenum).

IMPORTANT

It is recommended that ferrules not be used to terminate stranded wires to be inserted in the Distributed I/O Terminal blocks spring-clamp terminals.

The FTT specification includes two components that must be met for proper system operation. The distance from each transceiver to all other transceivers and to the termination must not exceed the *maximum node-to-node distance*. If multiple paths exists, the *maximum total wire length* is the total amount of wire used.

Table 17. Free topology (singly-terminated) specifications

Cable type	Max. node-to-node distance	Max. total wire length
Belden 85102	1650 ft (500m)	1650 ft (500m)
Belden 8471	1300 ft (400m)	1650 ft (500m)
Level IV, 22AWG	1300 ft (400m)	1650 ft (500m)
JY (St) Y 2x2x0.8	1050 ft (320m)	1650 ft (500m)
TIA568A Category 5 24AWG, twisted pair	825 ft (250m)	1500 ft (450m)

IMPORTANT

Do not use different wire types or gauges on the same LONWORKS network segment. The step change in line impedance characteristics would cause unpredictable reflections on the bus.

NOTE: In the event that the limit on the total wire length is exceeded, then FTT physical layer repeaters (FTT 10A) can be added to interconnect segments and increase the overall length by an amount equal to the original specification for that cable type and bus type for each repeater used. For example, adding repeaters for a doubly-terminated bus using JY (St) Y 2x2x0.8 cable increases the maximum length 3000 ft (900 m) for each repeater.

On the Excel 500-XCL5010 controller, the LONWORKS bus connections are located on the communication module as shown in Fig. 78:
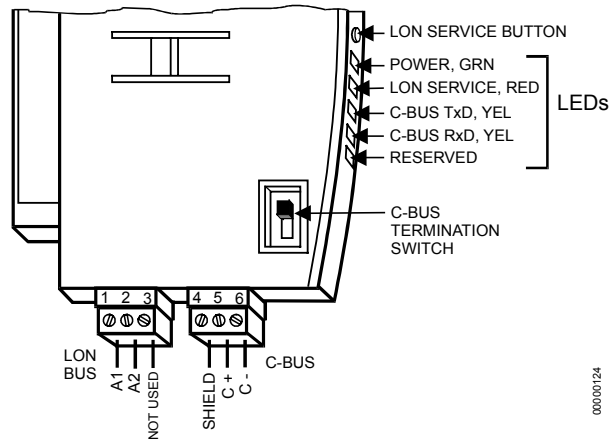
Fig. 78. Excel 500-XCL5010 communication module

LONWORKS Bus Termination

Depending upon the configuration, either one or two termination modules are required for terminating a LONWORKS bus with FTT devices on it. The following two different LONWORKS termination units are available for this purpose:

- 209541B LONWORKS Bus Termination Module (see Fig. 79 and Fig. 80) and
- XAL-Term LONWORKS connection and termination module (see Fig. 81), which can be mounted on DIN rails and in fuse boxes.
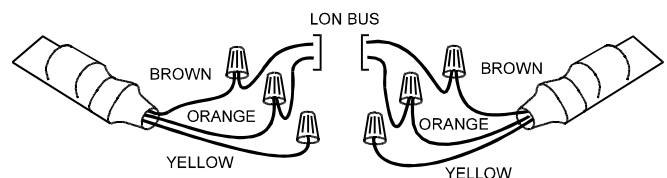
Fig. 79. Termination Module 209541B connections for doubly-terminated FTT network
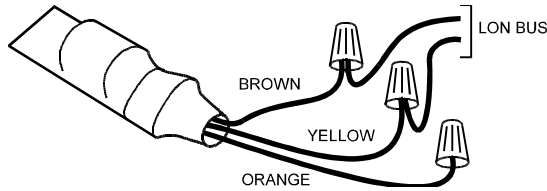
Fig. 80. Termination Module 209541B connections for a singly-terminated FTT network
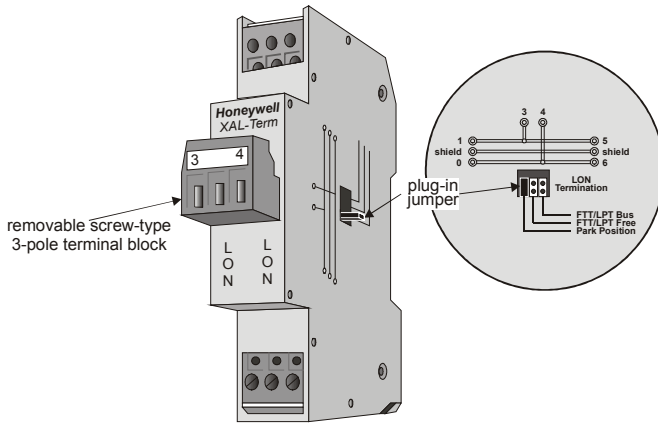
Fig. 81. XAL-Term

In the case of either a daisy chain or free-topology LONWORKS bus layout, the maximum lengths described above must be adhered to.

System Bus (C-Bus)

Up to 30 controllers can communicate with one another and a PC central via the system bus. Instead of an Excel 500/600 controller, other system bus compatible components can also be connected. (Excel IRC Multicontroller; Excel EMC).

The system bus must be connected through the individual controllers (open ring).

Fig. 82. C-bus topology

IMPORTANT

Star connection is not permissible because uncontrollable line reflections may occur.

For setting up the system bus in the right way, three steps have to be followed:

1. Select submodule for system bus communication (XC6010, only)
2. Specify cable for system bus.
3. Set up submodule (XC6010), CPU module (XC5010C), or communication module (XCL5010).

Submodule Selection (XC6010)

Two submodules for system bus communication are available. The selection depends on the communication speed.

Table 18. C-Bus submodule baud rates

Submodule	Possible baud rates
XD505A	9600 baud
XD508	9600 baud
	19200 baud
	76800 baud

If the system bus speed throughout the system life-time is restricted to 9600 baud, then a submodule XD505A should be chosen. Otherwise, the XD508 must be used.

NOTE: All communication submodules on one bus must be of the same type, i.e. either uniquely XD505A or uniquely XD508. Do not use a mix between submodules XD505A and XD508 on the same bus.

IMPORTANT

For communication with more than 9600 baud it is required to enable the termination of the first and the last device on the C-bus (see the following sections). The controllers with termination must be switched ON prior to the controllers in the middle of the C-bus. The C-bus might not work if the controllers with termination are switched OFF.

The maximum communication speed of the XC5010C / XCL5010 is 76800 baud. The XC5010C/XCL5010 can be mounted together with the XC6010 (with XD505A or XD508 submodule) since the XC5010C/XCL5010 communication speed can be changed to match either submodule.

NOTE: When changing the baud rate of bus devices, proper communication cannot be ensured until all bus devices are set to the same baud rate again.

NOTE: When adding or removing a controller to/from the C-Bus, it may take up to two minutes to re-initialize the bus. During this time, communication on the C-bus is lost.

System Bus Cable Specification

The maximum cable length is 4000 ft (1200 m). There are regional differences as to whether shielded or unshielded cable must/can be used.

IMPORTANT

In Europe, only shielded cable is permitted, while in the US, shielded or unshielded cable can be used.

Inside the cabinet:
> J-Y-(ST)Y 2 x 2 x 0.8

Outside the cabinet:
> A-Y-(ST) 2 x 2 x 0.8

In principle, data transmitting cables should be shielded in case of RFI.

The following summarizes cable types and gives selection guidance. Note that baud rate and maximum bus length are related to each other.

Table 19. C-Bus cable types

Cable type	Description	Recommended for
J-Y-(ST)Y 2 x 2 x 0.8	shielded, twisted pair	Europe Inside cabinet
A-Y-(ST)Y 2 x 2 x 0.8	shielded, twisted pair	Europe Outside cabinet
AK 3702	unshielded, twisted pair	US not approved for Europe
AK 3740A	shielded	US (low-cost) not approved for Europe
Belden 9842	twisted pair	Europe US also possible
Belden 9841	shielded	US
AK 3702	unshielded, twisted pair	US not approved for Europe
AK 3740A	shielded	US (low-cost) not approved for Europe

Each end of the shield on the C-Bus should be connected to the shield terminal of the respective device. Do not connect it to the cabinet ground or any other ground points.

C-Bus Extension by Using Repeaters

The C-Bus length can be extended by using repeaters. Each repeater extends the bus length by 4000 ft (1200 m).

For the US the repeater is available either with or without housing. In Europe, only the version with housing is allowed.

Table 20. Order no. for repeaters

Description	US order No.	European order no.
without housing	14507324-001	-
with housing	14507324-002	XD509

C-Bus Termination (Excel 600)

The XC6010 CPU module may have either the XD505A or the XD508 submodules mounted on them for C-Bus communication. Table 18 provides baud rate information for selecting the module.

The XD508 submodule is equipped with a DIP switch which activates (ON position) deactivates (OFF position) a terminating resistor. Depending on where the controller is located on the bus the DIP switch settings must be as follows:

Table 21. XD508 DIP switch settings for C-Bus termination

Controller location	DIP switch setting
beginning or end of bus	ON
middle of bus	OFF

C-Bus Termination (Excel 500)

The XC5010C CPU module contains a switch for setting different C-Bus baud rates.
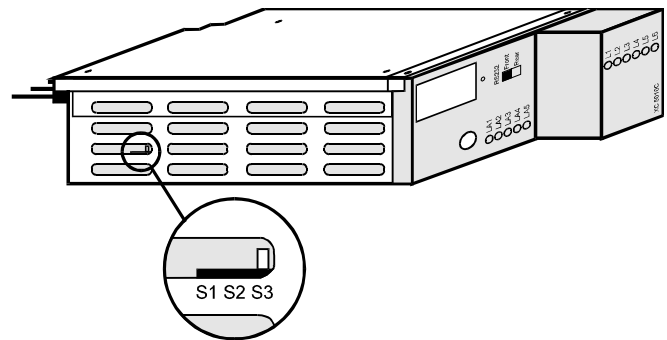
Fig. 83. XC5010C C-Bus termination switch location

The bus termination switch for setting the baud rate has three settings:

Table 22. XC5010 C-Bus termination switch settings

Switch setting	Baud rate	Notes:
S1	up to 76800 baud with bus termination	same functionality as XD508A, up to 76800 baud
S2	up to 76800 baud without bus termination	same functionality as XD508A, up to 76800 baud
S3	up to 9600 baud	same functionality as XD505A - **Default setting**

C-Bus Termination (Excel 500-XCL5010)

The communication module for the XCL5010 is equipped with a DIP switch for the C-Bus to set the bus termination appropriate for the communication speed.
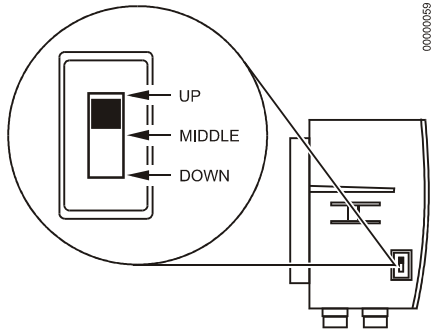
Fig. 84. Excel 500-XCL5010 C-Bus DIP switch location

Table 23. DIP switch settings for C-Bus termination (Excel 500-XCL5010)

DIP switch setting	Communication speed	Controller location	Com-patibility
up	max. 9.6 Kbaud	-	XD505A, XL20XD
middle	max. 76.8 Kbaud	middle of bus	XD508, XL20XD508
down	max. 76.8 Kbaud	beginning or end of bus	XD508, XL20XD508

NOTE: Modules listed in Compatibility column are used in Excel 20/100B/500/600 Controllers.

Excel 600 Cable Specifications

For connection to the XI582 Operator Interface, two tailor-made cables are available.

— **XW564** cable, length 7 ft (2.5 m)
— **XW565** cable, length 15 ft (5 m)

Fig. 85. Excel 500 / XI582 cable details

For connection to the XI584 Operator and Service Computer, a tailor-made cable is available with plugs on both ends.

— **XW567** cable, length 7 ft (2.5m)

Fig. 86. Excel 600 / XI584 cable details

Excel 500 Cable Specifications

The XI582AH Operator Interface can be connected either to the or the back of the XC5010C.

— **XW582** cable, front connection, length 15 ft (5 m)

— **XW583** cable, back connection, length 15 ft (5 m)
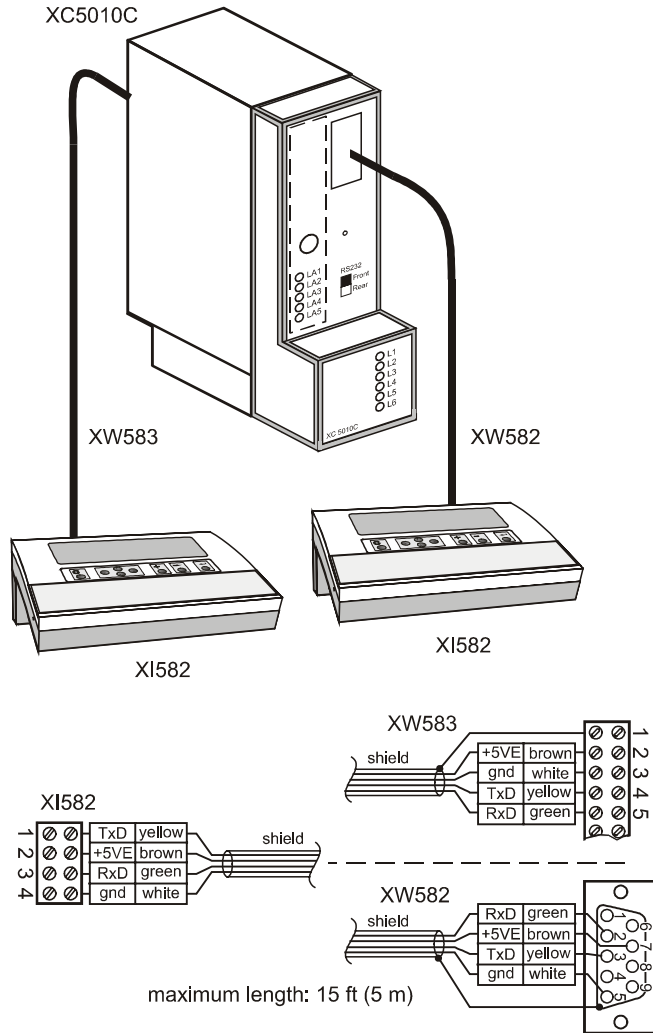
Fig. 87. Excel 500 / XI582 cables

The XI584 Operator and Service Computer can be connected to the front of the XC5010C computer module with the following cable:

— **XW585** cable, length 15 ft (5 m)
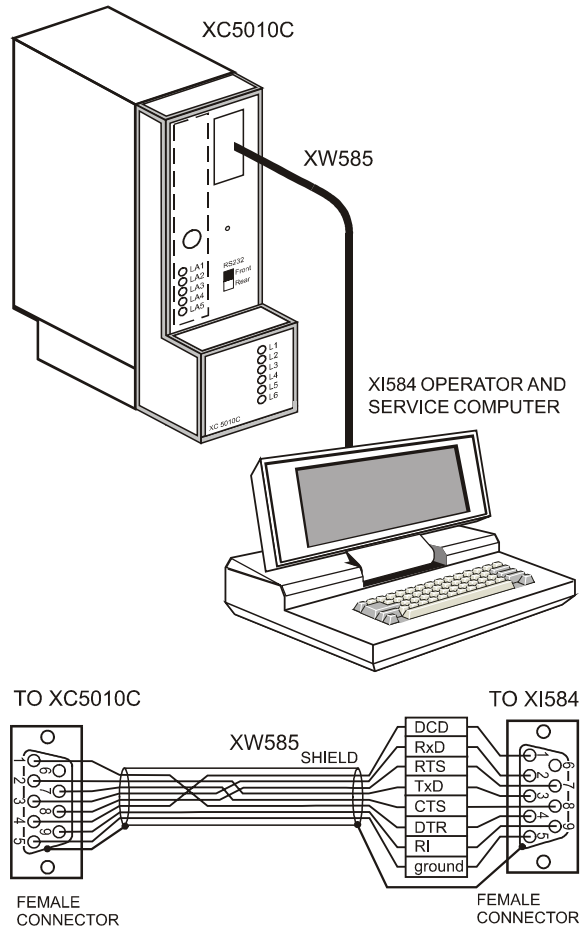
Fig. 88. Excel 500 / XI584 operator and service computer cable details

NOTE: You can also use a standard null modem cable.

An adapter cable is needed when the same MMI unit XI582AH or XI584 is used on a site where there is a mix of XC5010C and XC6010 CPU modules. Always use the new cables XW582 and XW585 with the XC5010C CPU module and the additional adapter cable XW584 for connecting to the XC6010 CPU module.

Excel 500-XCL5010 Cable Specifications
MMI Cables

Ready-made cables with the shield already connected to the computer module plug end are available for the connection of external MMIs.

Table 24. Cable specifications

MMI type	Cable	Length
XI582 (remote MMI)	XW582	17 ft (5m)
XI584 (PC-based MMI)	XW585	17ft (5m)

For connection to the XI584, a standard null modem cable may be used.
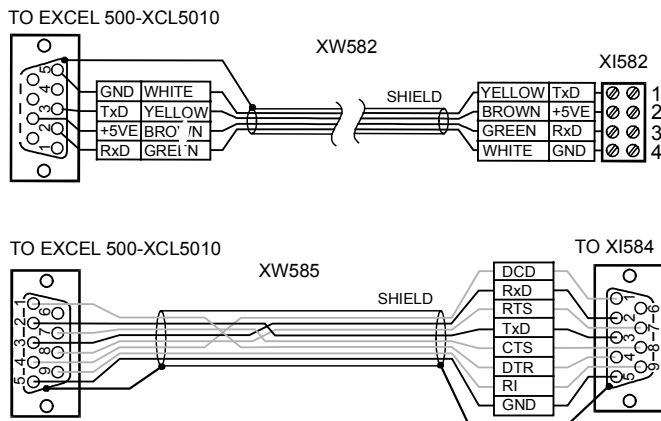
Fig. 89. Excel 500-XCL5010 / MMI cable details

Modem or ISDN Terminal Adapter Connections

For remote communications, a modem or ISDN terminal adapter can be connected directly to the serial port of the Excel 500-XCL5010 Controller.

The serial port of the Excel 500-XCL5010 controller accepts a standard modem cable with a female 9-pin connector. Use the cable that is supplied with the modem/ISDN terminal adapter.

The communication speed is 9600 baud by default but can be set as high as 38.4 Kbaud.

For more details, see section "Remote Communications" on page 43.

Changing Between MMI and Modem Connection

The Excel 500-XCL5010 will detect when an MMI or modem/ISDN terminal adapter is connected and will adjust the communication speed automatically according to the preset values. This automatic detection can take up to 5 seconds.
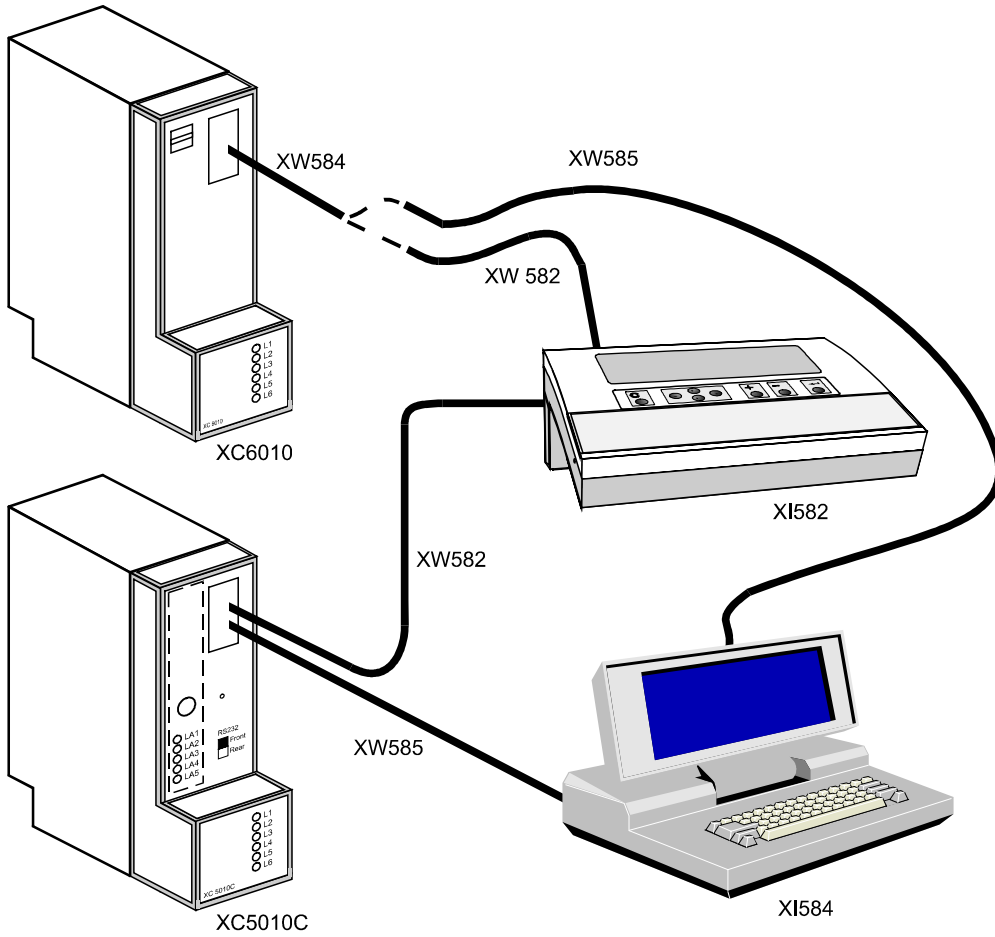
Fig. 90. Excel 500 and Excel 600 used together with XI584 and XI582 Operator Interfaces
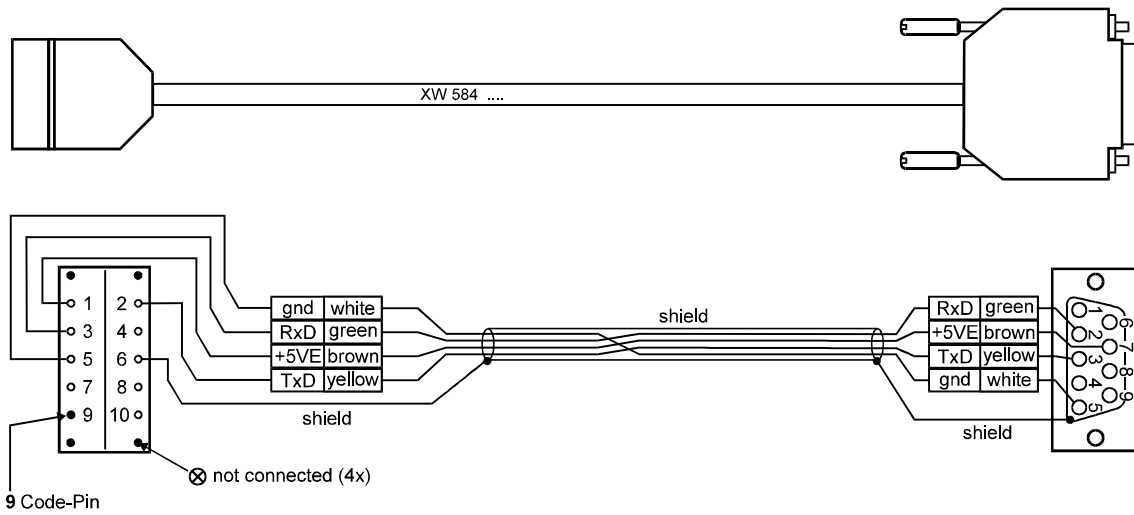
Fig. 91. XW584 cable details

REMOTE COMMUNICATIONS

The following applies to the XC5010C and XCL5010, only.

For remote communications with up to three XBS Building Centrals, a modem or ISDN terminal adapter can be connected directly to the serial port of the XC5010C CPU (either front or rear connection) or the serial port of the XCL5010.

NOTE: Remote communication via modem or ISDN terminal adapter requires firmware version V2.1.0 or higher.

NOTE: XBSi building supervisors are not supported for remote communication.

Modem or ISDN Terminal Adapter Connections

The front serial port of the XC5010C CPU accepts a standard modem cable with a female 9-pin connector.
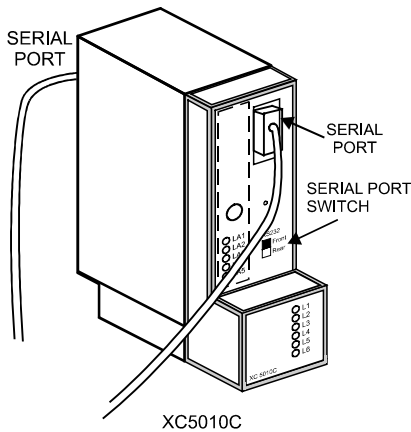
Fig. 92. Serial port locations on Excel 500

Use the cable that is supplied with the modem/ISDN terminal adapter. To connect to the terminals of the rear serial port of the XC5010C, use cable XW571 (length: 6 ft (1.9m)).

Table 25. XW571 Connection

Pin XC5010C	RS232 signal	Wire color
2	RTS	Blue
3	GND	White
4	TxD	Yellow
5	RxD	Green
6	CTS	Violet
7	DTR	Black
8 (not used)	SG	White
9	DCD	Brown
10	Shield	Clear
11 (not used)	RI	Red

NOTE: Pin numbers shown are for the rear connector of the XC5010C Computer Module.

The serial port of the XCL5010 CPU accepts a standard modem cable with a female 9-pin connector.
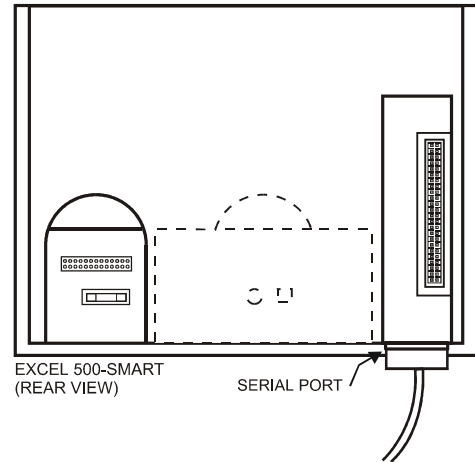
Fig. 93. Serial port location on Excel 500-XCL5010

Use the cable that is supplied with the modem/ISDN terminal adapter. The communication speed is 9600 baud by default but can be set as high as 38.4 Kbaud.

NOTE: See section "Serial Port" on page 32, for signals of serial port.

Modem Requirements

- Modem must support Hayes compatible command set (not V150 or V151 = Microsoft command set)
- Modem must support alpha-numeric return codes
- Modem must follow serial baud rate of the CPU
- Modem must support auto-bauding (baud rate fall-back)
- When carrier detect (connect) is reported, the carrier must be on simultaneously at both modems (on CPU side and on XBS side)   use same modem
- After a switch-ON of the DTR line by the CPU or XBS, the modem must accept a dial command after 3 seconds
- Modem must answer AT commands in less than 3 seconds

No Set-up for Standard Modem Behavior

If no special modem behavior is required, there is no need to set up or initialize the modem/ISDN terminal adapter. The XC5010C/XCL5010 CPU will automatically detect the device (MMI or modem) attached to the serial port and set the appropriate communication speed. The controller will also automatically adapt to alphanumeric return codes used by the modem. This automatic detection and adjustment can take up to 5 seconds.

NOTE: It is highly recommended to use a state-of-the-art modem and leave it in its factory setting.

Automatic Baudrate Synchronization

The default communication speed between the XC5010C/XCL5010 CPU and the local modem/ISDN terminal adapter is 9600 baud.

The communication speed between the XC5010C/XCL5010 CPU and XBS modems/ISDN terminal adapters is automatically synchronized by the two devices to the highest speed that both of the devices are capable of. This feature is called autobauding and is a feature that all state-of-the-art modems/ISDN terminal adapters provide when left in their factory default settings.

The communication speed between the XBS and its modem/ISDN terminal adapter is part of the modem set-up at the XBS.

Auto / Manual Answer Detection

The XC5010C/XCL5010 CPU will automatically detect whether the modem/ISDN terminal adapter is initialized in auto-answer or manu-answer mode, and it will set the modem to manual answer mode (S0 = 0).

Resetting the Modem

For those cases where it is not clear if the modem to be used is in its factory setting, the modem can be reset to its factory setting by using the RESET MODEM command in the Start-up sequence or through the HW Config. part of the System Info. sequence on the MMI. This will allow a quick and easy modem reset without the need to run the modem set-up software or the Windows™ terminal program.

The RESET MODEM command causes the following commands to be sent to the modem:
1. ATZ
   executes hardware reset on modem
2. AT&FX3&W
   resets modem to factory configuration settings, configures the modem not to wait for the public phone system dial tone, and writes this to nonvolatile memory.

Set-up for Special Modem Behavior

If special modem/ISDN terminal adapter behavior is required, the communication device should be set up according to the instructions provided with it. This typically involves running a setup program on a computer with the device connected to the computer serial port or using the Windows™ terminal program.

Set-up for In-house Telephone Systems

A common case of special modem behavior is when the modem is connected to an in-house telephone network requiring a prefix to be dialed before the destination number to provide access to the public telephone network. There are two important aspects of the special initialization of the modem to consider:

1. Do not wait for the public network dial tone. Typically the init command ATX3 will trigger the modem to dial

without waiting for a public network dial tone. Save this modem set-up in the modem EEPROM with the command AT&W. Check the modem handbook to verify the correct commands. Note that these commands are executed automatically with the RESET MODEM command.

2. Add the prefix required for access to the public telephone network to the destination telephone number. Depending on the in-house telephone system, a certain prefix may have to be added to the destination number in the XBS system configuration/site definition screen prior to sending the set-up to the remote Excel 500 controller.

Set-up for Limited Communication Speed

The communication speed of the modem can be fixed to a lower rate in case of data transmission errors due to telephone line limitations. See the XI581/582 Buswide Operator Interface User Guide (EN2B-126GE51) for the procedure for fixing the baud rate.

Troubleshooting

In case of any problems the handbook of the modem or ISDN terminal adapter must be consulted.

A "Frequently Asked Questions and Troubleshooting" document is available via the Honeywell Technical Assistance Center (TAC) or, for Honeywell employees, on the HIVE under:
Technical Assistance Center/Controllers/Excel 80 and 100 and 500 and 600/ technical literature/modemfaq.doc
or on the Docu Server under:
http://web.ge51.honeywell.de/dep/mc/TAC_Tips/Modem FAQ.doc

TCP/IP Dial-Up via TCP/IP Modem XM500

The Honeywell TCP/IP modem XM500 allows use of a TCP/IP network (e.g. Ethernet LAN/WAN networks) to achieve a dial-up connection between an XBS building supervisor and an Excel 500 controller. The set-up is identical to that of a telephone modem connection with the exception of the additional need for definition of the Ethernet address.

Details can be obtained from the XM500 Product Data Documentation on the Honeywell Intranet under:

http://web.ge51.honeywell.de/dep/mc/HVAC_Products/Automation_and_Control/CentralPlantControls/Modem-Interface/xm500/xm500_pd.zip

GSM Communication (Europe, only)

For communication via the Global System for Mobile communications (GSM), a Siemens M20 Terminal (cellular engine) is required and must be connected directly to the serial port of the Excel 500 controller. The M20T translates the Excel CPU data received in transparent mode into the GSM standard. The M20T behaves like a Hayes-compatible

modem connected to the Excel controller serial port, and it then transmits via GSM like a cellular (mobile) phone.

NOTE: Communication via GSM requires firmware version V2.3.0 or higher.

IMPORTANT

With the M20T, data communication is possible only in 900 MHz GSM networks. GSM networks operating at 1800 MHz or 1900 MHz are not supported.

The maximum communication speed is determined by the current GSM standard, which is 9600 baud. Due to a special transmission mechanism, the effective communication throughput is lower than 9600 baud – however this will be noticeable only when high data volumes are transmitted, e.g. when application download is performed.

M20T Safety Precautions

⚠ **CAUTION**

Use of the M20 Terminal on-board aircraft is forbidden. Use of a Cellular Engine in an aircraft, such as for the purpose of wireless connection of an aircraft based HVAC system to an XBS central, can endanger navigation, it interferes with the cellular network and it is illegal. Failure to comply with this prohibition may lead to temporary suspension or permanent cancellation of Cellular Engine services for the person who disregards this prohibition and/or to legal action against said person.

⚠ **CAUTION**

Users are advised to NOT use the M20T in automotive service stations.

Users are reminded of the necessity of complying with restrictions regarding the use of radio devices in fuel depots, chemical plants and locations where explosives are ignited.

Additional precautions are as follows:

- When receiving calls on a public highway, such as a cooling control system of a refrigeration truck being called by an XBS central, the M20T is not permitted to use "warning" devices which causes the vehicle's horn to sound or the lights to flash.

- Drivers are advised not to use the handheld microphone or the telephone handset while their vehicle is in motion, except in emergencies. Use the hands-free facility to speak only if it does not divert your attention from the traffic.

- Operation of the M20T can disrupt the operability of inadequately protected medical devices. Please

address all questions to a doctor or the manufacturer of the medical device.

- The M20 Terminal shall not be used within wet environment, such as in public baths.

- If your M20 Terminal, your SIM card or both go missing, notify your network operator immediately in order to avoid misuse.

Required Third-Party Equipment

The Siemens M20 Terminal (shown below) is required for GSM communication. In addition, a 3V Mini SIM card with personal identification number (PIN) is required for the M20T. The Mini SIM card, supplied by the GSM Network Provider, must be released for data communication at 9600 baud.
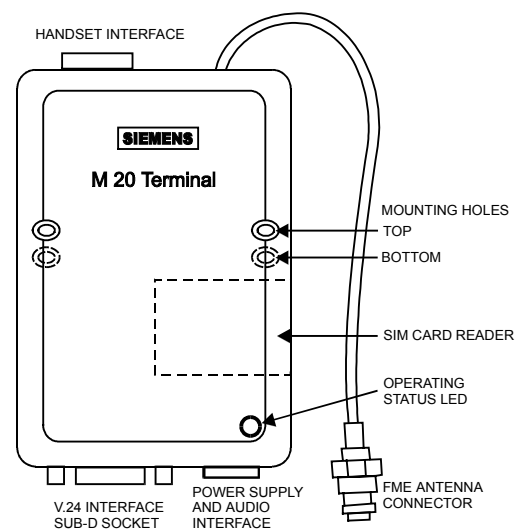
Fig. 94. Siemens M20 terminal

A separate telephone number is required for data communication with the same SIM card (one telephone number for voice communications and one for data).

Mechanical characteristics:

Weight	145 g
Dimensions (max) LxWxH	107.0 x 63.5 x 31.3 mm
Temperature range	-20°C to 55°C
Protection-class	IP40
Mechanical vibrations	Amplitude 7.5mm at 5 to 200 Hz sine
Max. pulse-acceleration	30 g pulse with 18 ms duration
Air humidity	5–98%

Electrical characteristics:

Operating voltage range	8 to 28.8 Vdc, ±5% ripple
Undervoltage/overvoltage protection:	0 V / 45 V
Power consumption at 12V	<200 mA speech mode, <14 mA idle mode
Max. line-in/out cable length	2 m (e.g. modified NOKIA 2110 for M20T)

Protection fuse   1 A, fast blow
Max. RF power   2 W at 900 MHz
Power supply connector   6-pin modular

CE conformity:
• 89/336/EC (EMC guideline)
• 73/23/EC (Low voltage guideline)
• 91/263/EC (Telecommunications devices guideline)

Standards:
• EMC: ETS 300 342-1
• Safety: EN 60950
• GSM network: TBR 19, TBR 20

Serial Cable

For connecting the M20T to the Excel 500 controller, a standard RS232 cable (9-pin V24 sub-D sockets) is required.

GSM Antenna Requirements

All major suppliers of GSM antennas can supply GSM900 Antennas with FME plugs to connect with the M20 Terminal for a variety of applications. Some antenna examples are shown below.

The antenna must satisfy the following electrical requirements:

Frequency TX   890-915 MHz
Frequency RX   935-960 MHz
Impedance   50 ohms
VSWR TX: max. 1.7:1 installed
VSWR RX: max. 1.9:1 installed
Gain   > 1.5 dB referenced to $\lambda/2$ dipole
3dB width of cone
vertical: 80°
horizontal: 360°
Max. power: 1 W (cw), 2 W peak; at ambient
                       temperature of 55°C

Depending on the application and the RF field at the local site, the GSM antenna may be mounted directly or via cable. The maximum antenna cable length is 8.0 m (including 20 cm M20 Terminal-cable)

NOTE: The maximum number of push/pull cycles shall not exceed 100.

The antenna interface connector of the M20 unit is a FME connector (of type SMR nano (male)). Hence, the connector on the GSM antenna or antenna cable has to be of type SMR nano (female, or use a double female connector in between).
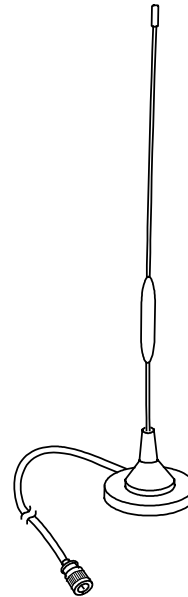
Antenna Examples

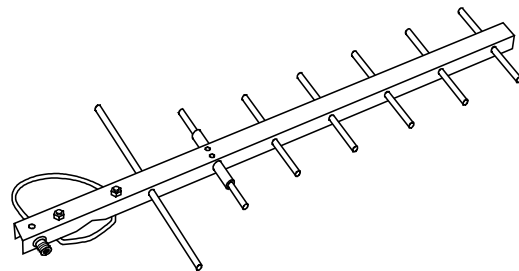**Fig. 95. Round radiation antenna, magnetic base, 5 DBi**

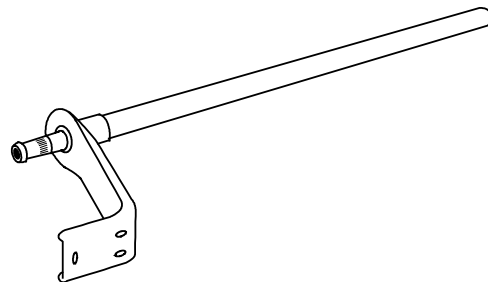**Fig. 96. Directional antenna (YAGI), 12 DBi**

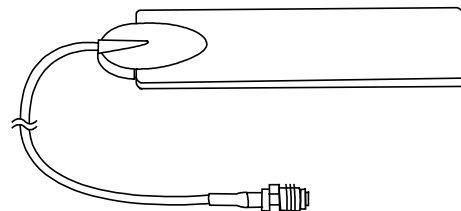**Fig. 97. Round radiation antenna, 6.5 DBi**

Fig. 98. Window patch antenna, 2 DBi

GSM Antenna Installation

The maximum antenna cable length is 8.0m (including the 20 cm M20 Terminal cable). Use a cable that is specified by the supplier of the GSM antenna. Improper cables with resistances that are too high will reduce the amplification of the antenna.

- Ideally you should know in which direction the next GSM station is located in order to position of the antenna accordingly.

- The easiest way to check the signal quality is to operate a cellular (mobile) phone at the very place where you want to place the antenna.

    — The cellular phone must operate in the same GSM network as the M20T.

    — Drop-outs in voice communication indicate that the reception is too weak. The data communication will never work where you have drop-outs in voice communication with the cellular phone. The pre-ferred way is to set-up the M20T on a terminal program and check the reception with the SIEMENS AT commands – see the M20T handbook.

    — An alternative way to verify the signal quality is to use the terminal program on the CD that is supplied with the M20T. You will find a special button on it that allows checking on the signal quality.

- Dipole antennas - e.g. antennas with a magnetic foot - must sit on metal ground to achieve the specified amplification. The larger the metal ground, the better.

- The antenna must be mounted vertically, NOT horizontally.

- Avoid barriers for the antenna signal. Ideally, within a range of approximately 3 meters there should not be any vertical barriers that would block the antenna signal, such as doors, PCs, cupboards, etc.

- Select the most suitable antenna. Location and mounting limitations may require that special antennas be used, such as antennas with higher amplification or directional antennas.

- Avoid loose contacts. All connections from the M20T to the antenna must be tight.

- Increase the distance between the antenna and Excel CPU if you experience electromagnetic interference of the antenna signal to the CPU. An indication of this might be that the functioning of the MMI of the CPU is disturbed or that the outputs behave abnormally.

M20 Terminal Set-up

Prior to beginning the set-up, get the M20T manual (or CD-ROM, if it was delivered with one). Everything is described in it and you will need it.

IMPORTANT

> *It is absolutely mandatory to use a serial data line monitor for the set-up of the M20T. Without such a device being connected between the serial port of the PC and the M20T, you will get no information on the set-up process.*

1. Insert the SIM card into the M20T.
2. Connect the serial cable to the M20T and a PC or laptop.
3. Connect the antenna cable and antenna to the M20T connector.
4. Start a terminal program, e.g. Windows™ HyperTerminal
5. Connect the power supply to the M20 Terminal and plug into mains.
   The M20T LED will be blinking now.
6. Set terminal program to 19200 baud.
7. Verify the correct operation of the M20T serial interface by entering: AT.
   The M20T will respond: OK.
8. Change the M20T's baud rate from 19200 (factory default) to 9600: AT+IPR=9600.
9. Set terminal program back to 9600 baud.
10. Command the M20T to cut the line whenever the DTR signal is dropped (OFF) or toggled ON/OFF: AT&D2
11. Store setting in nonvolatile memory: AT&W.
12. You may now enter the PIN number or let the Excel CPU do this. If you want to enter the PIN number now, enter the PIN with the command AT+CPIN="xxxx", where xxxx represents the PIN number.

NOTE: Regarding the PIN entry, the M20T shows the same behavior as a regular cellular phone, as it uses the same type of SIM card. This means, for example, that after 3 false PIN inputs, the SIM card will lock and need to be released via the "PUK" Personal Unlocking Key (Master PIN).

Repeated input of the wrong "PUK" (more than 2 false inputs) will destroy the SIM card irrevocably.

13. Once the M20 has accepted the PIN it will log into the GSM net.
    The terminal window will show "OK".
    The M20T LED will be on continuously.
14. Disconnect the serial cable from the PC/laptop and connect it to the Excel CPU.
15. Verify that the M20T dials out on the telephone number for data communication, otherwise, its call will not be recognized by the XBS. The M20T can be forced to do so by adding the letter <i> to the telephone number, e.g.<ATDi1234567891234>

NOTE: As soon as the PIN is entered into the Excel controller, the following mechanisms will take place automatically:

— Cyclical check (once per minute) for existence of the PIN number in the M20 (AT+CPIN?)

— Sending of PIN number to M20T, if it has lost it. This guarantees communication will resume automatically after exchange of the SIM card or after power to the M20T has been lost.

Deletion of the PIN number or resetting the controller will stop the above mechanisms.

Verification of the PIN

You can verify the PIN without connecting a terminal program by following these steps:

1. Connect the XI582AH MMI.
2. Enter PIN.
3. Disconnect the XI582AH MMI.
4. Connect the M20T.
5. Reconnect the XI582AH MMI.
6. View the "PIN" field.
7. If it shows "0", the PIN was wrong.
8. If it shows "PIN", the PIN was correct.

Additional information about the M20 terminal may be found at the following website:
http://www.siemens.de/ic/products/cd/english/index/products/cellular/m20t.html

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