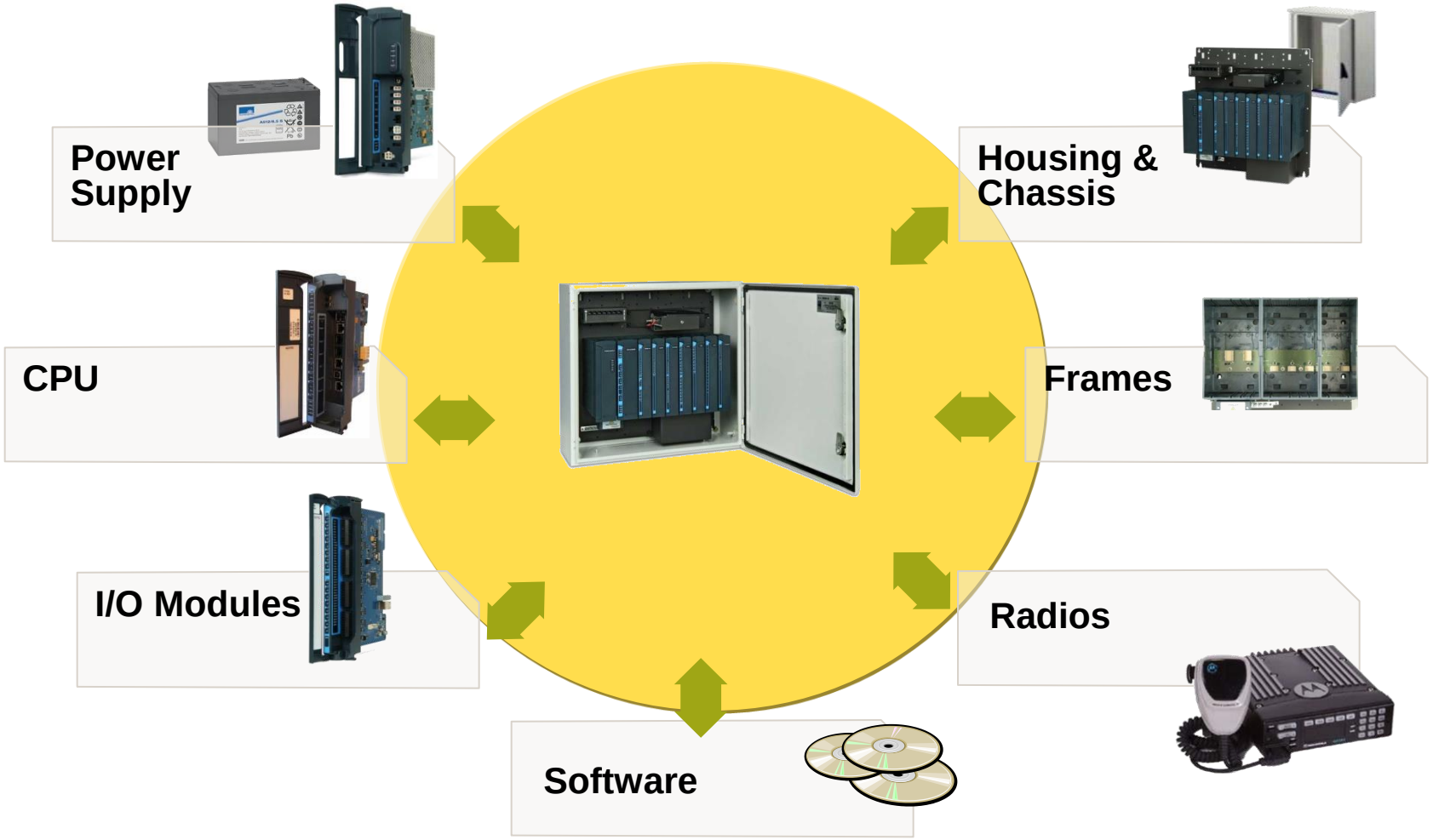
March, 2011

ACE 3600
Product Introduction

ACE3600 RTU - BUILDING BLOCKS



STRUCTURE AND CONSTRUCTION

- **The ACE3600 is available in various structures:**

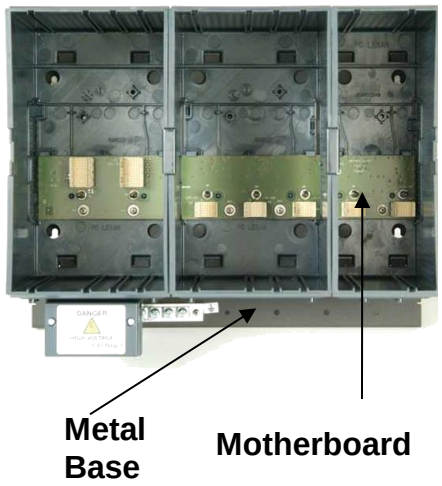
Frame only

On Metal Chassis

In Housing

FRAMES

- **The ACE3600 frames have the following tasks:**
  - To hold the Power-Supply, CPU and I/O modules
  - To connect the modules with operating voltages
  - To connect the modules to the CP
- **All frames can be installed on a wall**
- **The 8 I/O Frame can also be installed on a 19” rack**
- **The following frames sizes are available:**




No I/O


2 I/O

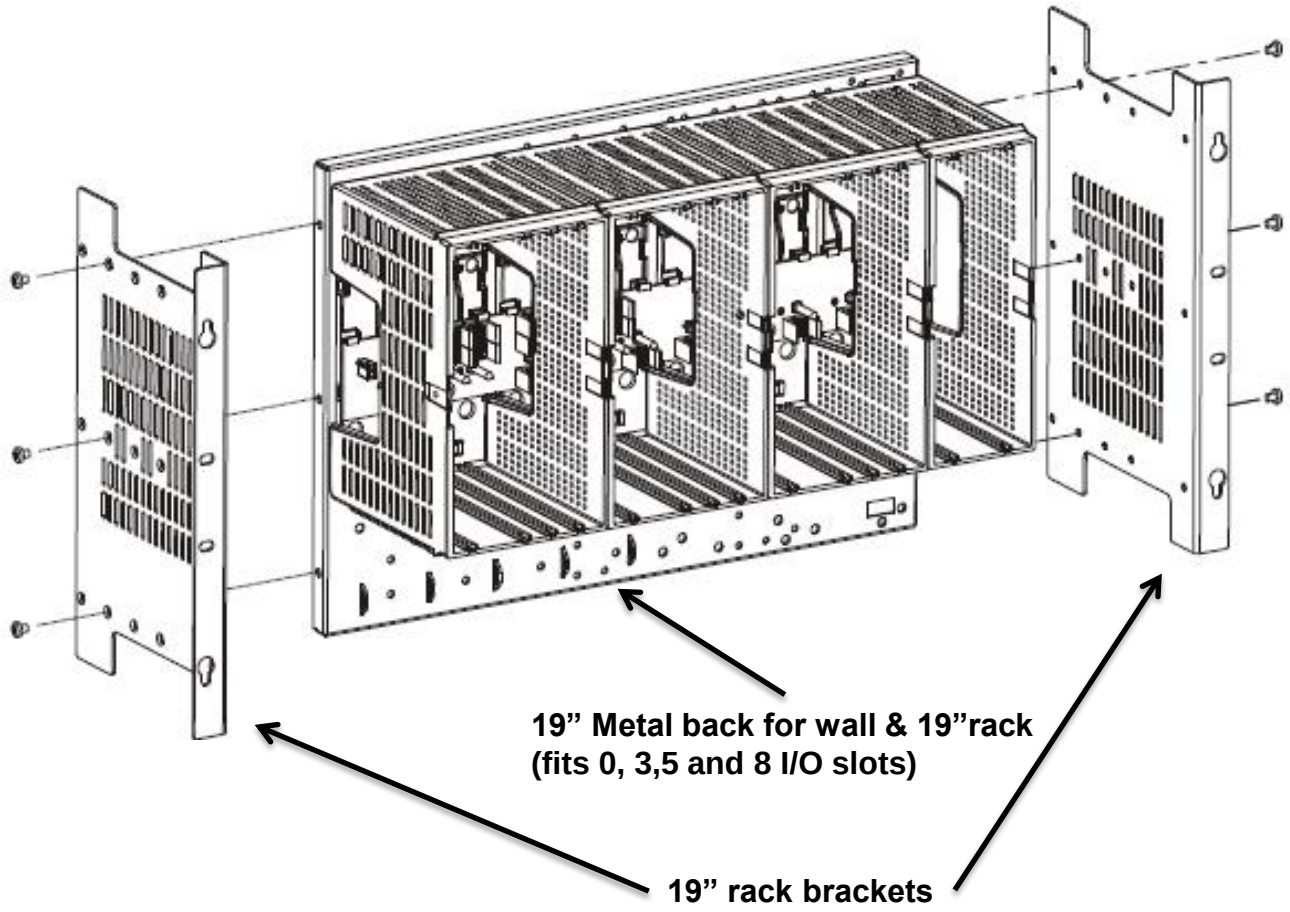

3 I/O


5 I/O


7 I/O


8 I/O

8 I/O SLOTS FRAME - 19” RACK



METAL CHASSIS AND HOUSING

Small Chassis
0 or 2 I/O slots

Medium Chassis
0 or 3 I/O slots

Large Chassis
Up to 7 I/O slots

19” Chassis
for radio & accessories

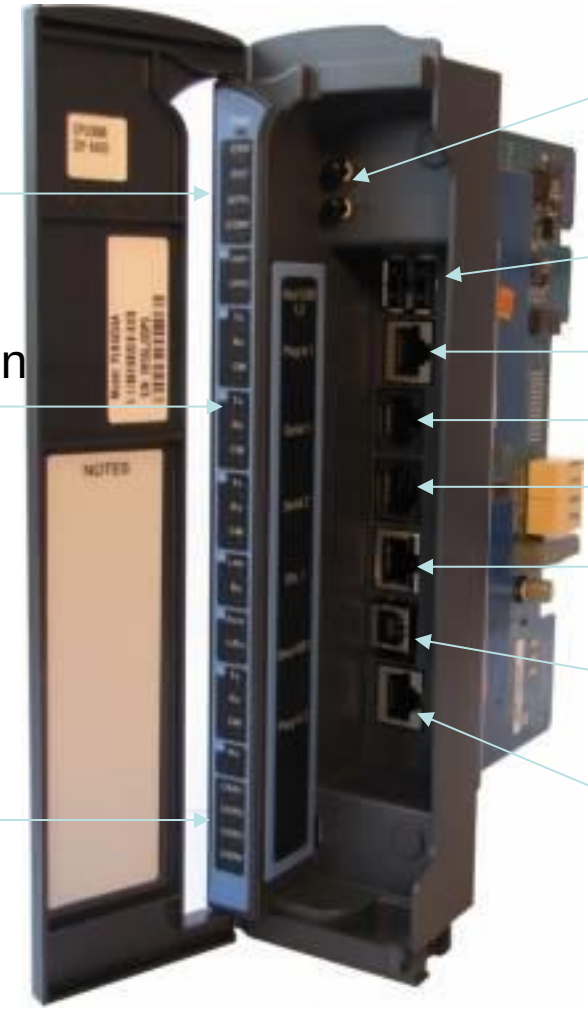
Small Housing
Up to 3 I/O slots

Large Housing
Up to 7 I/O slots

ACE3600 CPU MODULE

- **3 types of CPU modules are available:**
  - CPU 3640 and CPU 3680 (CPU 3610 – cancelled)
  - Wind River's VX-Works Real-time Operating System.
- **Controls the I/O modules, processes the gathered data and communicates with the outside world.**
- **The module's processor is Power Quick II MPC8270, 32 bit, with extended communication capabilities, DMA and floating point calculation.**
- **Includes Field Programmable Gate Array (FPGA).**

CPU MODULE DESCRIPTION



Pushbuttons

Status LEDs

2 USB Host Ports
(on CPU U3680 only - for MotoTrbo radios)

Communication Ports LEDs

Plug-In 1 Port (optional)

Serial 1 Port (RS-232/RS485)

Serial 2 Port (RS-232)

Ethernet 1 Port
(on CPU 3640 and CPU 3680)

USB Device Port (for Future use)

User LEDs

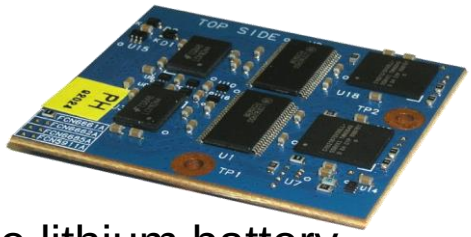
Plug-In 2 Port (optional)

CPU MEMORY

- **The ACE3600 CPU includes**

	CPU 3610	CPU3640	CPU3680
Flash memory	16 MB	16 MB	32 MB
SDRAM memory:	32 MB	32 MB	128 MB
User Flash:	3 MB	3 MB	19 MB
User SDRAM:	10 MB	10 MB	118 MB
SRAM Plug-In	4 MB	4 MB	4 MB

- **FLASH**
  - Stores the Firmware, configurations files, user program files, and the user data files.
- **The SDRAM**
  - Stores the Firmware run-time data and user program temporary data.



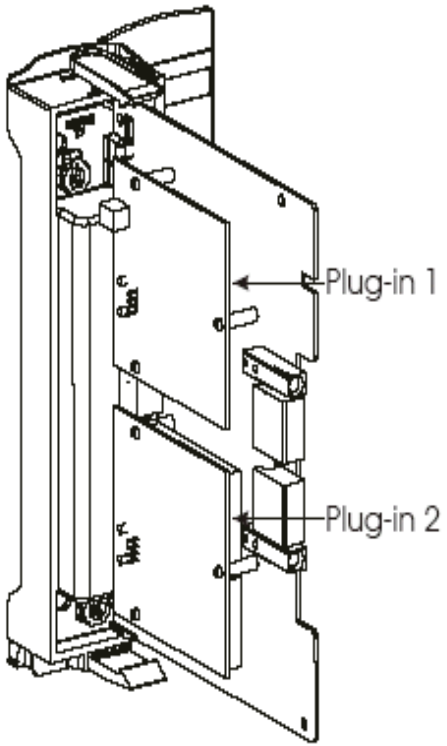
- **Plug-in SRAM memory expansion**
  - Option for logging user data.
  - Retained using by the on-board rechargeable lithium battery.

CPU COMMUNICATION PORTS

- **Includes several communication ports:**
  - On Board ports:
    - Serial 1 (SI1) – RS-232 / RS485 serial port (configurable)
    - Serial 2 (SI2) – RS-232 serial port
    - Ethernet1 (E1) - 10/100 Mbs Ethernet port
    - Internal Ethernet port (Int1) – Internal 100 Mbs Ethernet port (for CPU redundancy)
    - USB Host 1 (H1) – USB 2.0 host port (for MotoTrbo digital radio)
    - USB Host 2 (H1) – USB 2.0 host port (for MotoTrbo digital radio)
    - USB Device 1 (D1) – USB 1.1 device (HW for future SW release)
  - Plug-in Ports (options), for different types of ports:
    - Plug-in 1 (PI1) – fits RS-232, RS485, 10 MB Ethernet, 10/100 Mb Ethernet, or Radio Plug-in option
    - Plug-in 2 (PI2) – fits RS-232, RS485, 10 MB Ethernet, or Radio Plug-in port option.

CPU PLUG-IN PORT OPTIONS

- **Serial Ports**
  - RS232 up to 230 kb/s
  - RS485 up to 230 kb/s
- **Configurable conventional/ Trunk radio modems:**
  - DPSK 1.2 kb/s, FSK 2.4 kb/s , DFM 4.8 kb/s , Duo-Binary 9.6 kb/s
- **Ethernet**
  - 10/100 Mb/s (In Plug-in 1 only)
  - Ethernet 10 Mb/s



COMMUNICATION MEDIA OPTIONS

- **Motorola Radio Support:**
  - Mobile two-way radio - CM200, CM140, EM200, GM3188, CDM750
  - Portable two way radio - HT 750, GP320, GP328, PRO5150
  - Astro – XTL 5000 & XTL2500 (mobile digital and analog trunking), XTS 2500 (portable digital Trunking)
  - Dimetra – MTM700/800
  - MotoTrbo Digital - XPR4350, DM3400, XiR M8220, DGM4100

- **3rd party Radio / MODEM connectivity**
  - 3rd party two way radios
  - Data radios (MDS, Data radio, etc.)
  - Dial-up modems
  - Cellular modems (dial mode & PD, GPRS,CDMA)
  - Broadband (WLAN, Canopy, iNet900,etc.)

MDLC PROTOCOL

- **MDLC is the ACE3600 native protocol.**

- **MDLC over serial ports**
  - **RS-232 and RS-485 ports**
  - **Conventional and Analog Trunking radio ports (Plug-in 1 and 2)**

- **MDLC Over IP**
  - **On Ethernet Ports - UDP/IP, DHCP**
  - **On Serial Ports - PPP (for digital radios and wireless modems)**

3RD PARTY PROTOCOL DRIVERS

- **Enable the application programmer to implement communication based on the following protocols**
  - **ModBus RTU**
    - **Slave, RS-232 / RS-485 / IP**
    - **Master RS-232 / RS-485 / IP**
  - **DNP 3.0 Plus** (DNP 3.0 + MDLC on the same port)
    - **Master, RS-232 and IP ports**
    - **Slave, RS-232 and IP ports**
  - **Allan Bradley DF1** (compatible with PLC5 and SLC1-4)
    - **Master, RS-232**
  - **IEC 60870-5-101**
    - **Slave Driver for RS-232 ports**
  - **User Protocol Interface**
    - **Serial ports RS-232 and RS-485**
    - **Ethernet ports using TCP/IP**

IP FIREWALL

- **ACE3600 has an optional firewall on IP. By default it is disabled.**
- **When enabled, it inhibits any reception of TCP/IP and UDP/IP.**
- **When enabled, only packets from specific addresses or range of IP addresses will have access to the RTU.**
- **For permitted addresses, ACE3600 accept specific non configurable:**
  - UDP, TCP ports and ICMP.
  - MDLC, DNS, NTP, ping etc.

MDLC ENCRYPTION

- **Integrated Option:**
  - **Available on all the types of MDLC communication links.**
  - **The MDLC packets are encrypted with a 128 bit key.**
  - **An RTU can store up to 9 replaceable encryption keys.**
  - **The active key can be replaced in all RTUs at the same time**

- **The Encryption Tool**
  - **Enables setting and managing the encryption in the ACE3600 system. It has the following features:**
    - **Defining encryption keys and Key Files**
    - **Downloading the encryption Key Files to the RTUs**
    - **Setting Active Key index in RTUs and in the STS MDLC driver.**

CPU BUZZER & PUSHBUTTONS

- **The CPU module audio buzzer**
  - Indicates task completion such as end of download/upload, restart etc.
  - can also be controlled by the user program.
- **The CPU has two pushbuttons on the front panel**
  - PB1 and PB2.
- **These push buttons are used for:**
  - activating and testing the modules LED,
  - resetting the unit,
  - erasing the user FLASH memory
  - activating memory test.
- **The pushbuttons can also be monitored**
  - by the user program (when running).

BACKUP BATTERY FOR SRAM AND RTC

- **The CPU includes Real Time Clock**
  - Max. drift ±2.6 Seconds per day .
  - Date and time are set using the ACE3600 STS.
  - Date and time can be synchronized from other RTUs, M-OPC or from IP Gateway.

- **The CPU includes a rechargeable lithium battery**
  - Provides backup power and data retention for the SRAM and RTC.
  - The lithium battery is capable of preserving the data stored in the SRAM and RTC for minimum 90 days
    - accumulated power off time.
  - Low battery warning flag is available to the user program

CPU TIME SYNCHRONIZATION

- **CPU date & time synchronization methods:**
  - MDLC legacy time sync. on serial ports and conventional radio ports
    - Compatible with MOSCAD and MOSCAD-L, ΔT ≤ 5 ms.
  - MDLC extended time sync. on serial ports and conventional radio port, ΔT ≤ 2 ms (ACE3600 only).
- **Network Time Protocol (NTP) time sync.**
  - Time Sync. on IP ports (Ethernet, and serial), ΔT depends on the network.
- **3rd party GPS receiver supported**
  - Oncore M12 series, Oncore XT/VP and the Oncore GT.
  - RTU with GPS can act as NTP server that synchronize other RTUs.
  - GPS time sync. - on Serial ports connected to local GPS receiver, ΔT ≤ 0.5 ms.
- **Time sync. supports**
  - Time zone and Daylight Save Time (not supported in the legacy time sync.)

CPU STATUS AND DIAGNOSTICS

- **CPU warnings and errors are logged in the CPU memory.**
  - To indicate issues or errors during startup
  - Restart, user program execution and other modes of CPU operation.
  - Indicated on the front panel LED.

- **Detailed CPU status and diagnostics information**
  - Can be retrieved using the CPU Hardware Test.
  - Existence of CPU warnings / errors are indicated in the ERR LED on the front panel of the module
  - Existence of CPU warnings / errors is available to the user program.

- **Remote indications**
  - Remote RTU status and diagnostics is possible via any port using the STS.

REMOTE DOWNLOAD AND UPLOAD

- **Can be remotely downloaded to the RTU:**
  - Site configuration IP configuration tables
  - Network configuration and Network configuration source
  - Phone book and MODEM setup files (STM files)
  - User programs (Ladder & C) and sources and User Data files
  - I/O modules FPGA files (for version updates)
  - Firmware updates (for version updates)

- **Can be remotely uploaded from the CPU:**
  - Site configuration
  - Network configuration source
  - IP configuration tables
  - User programs (Ladder & C) and sources and User Data files

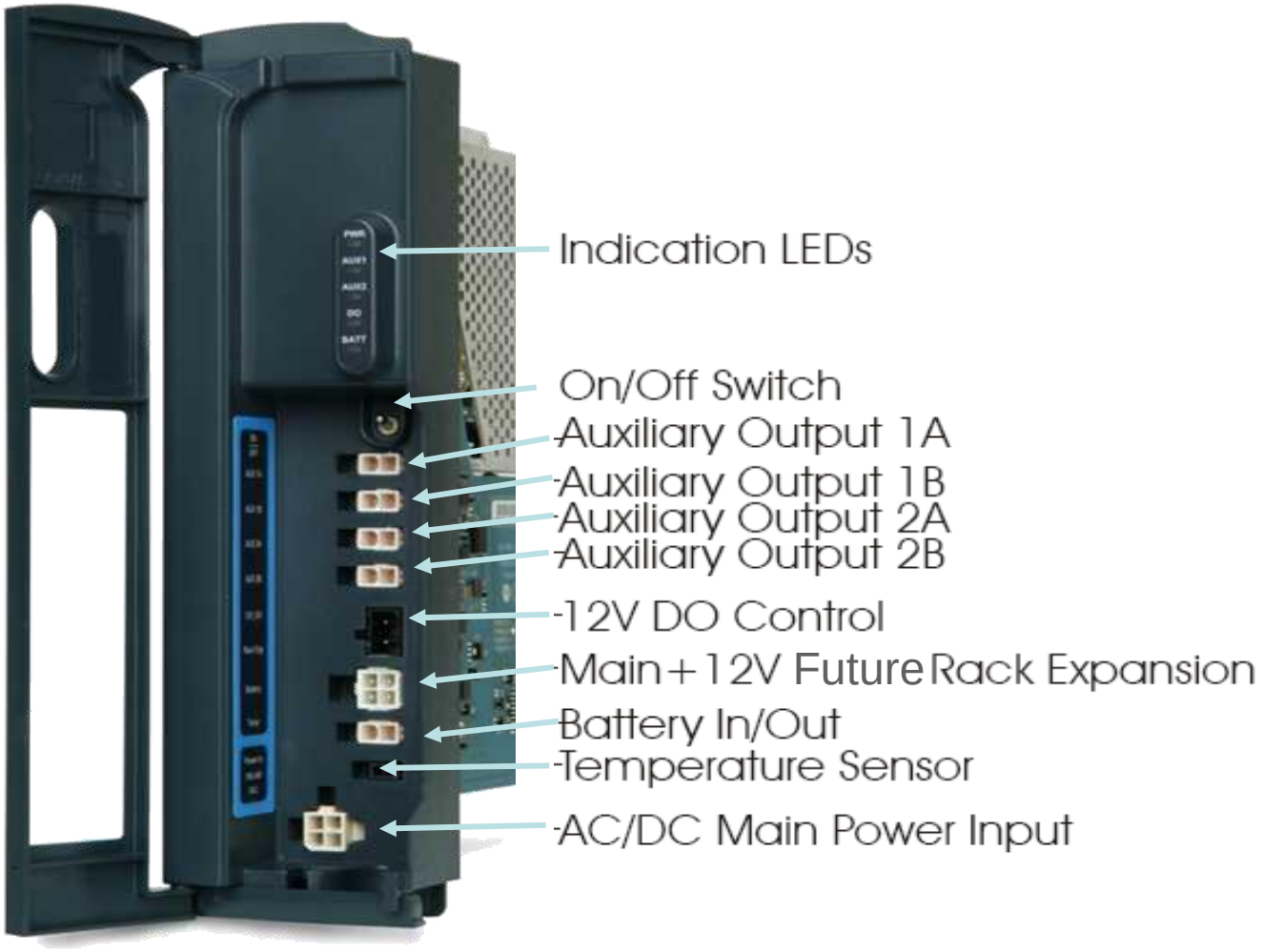
POWER SUPPLY

- **The ACE3600 power supply modules provide the CPU and I/O modules with their operating voltages via the motherboard bus.**

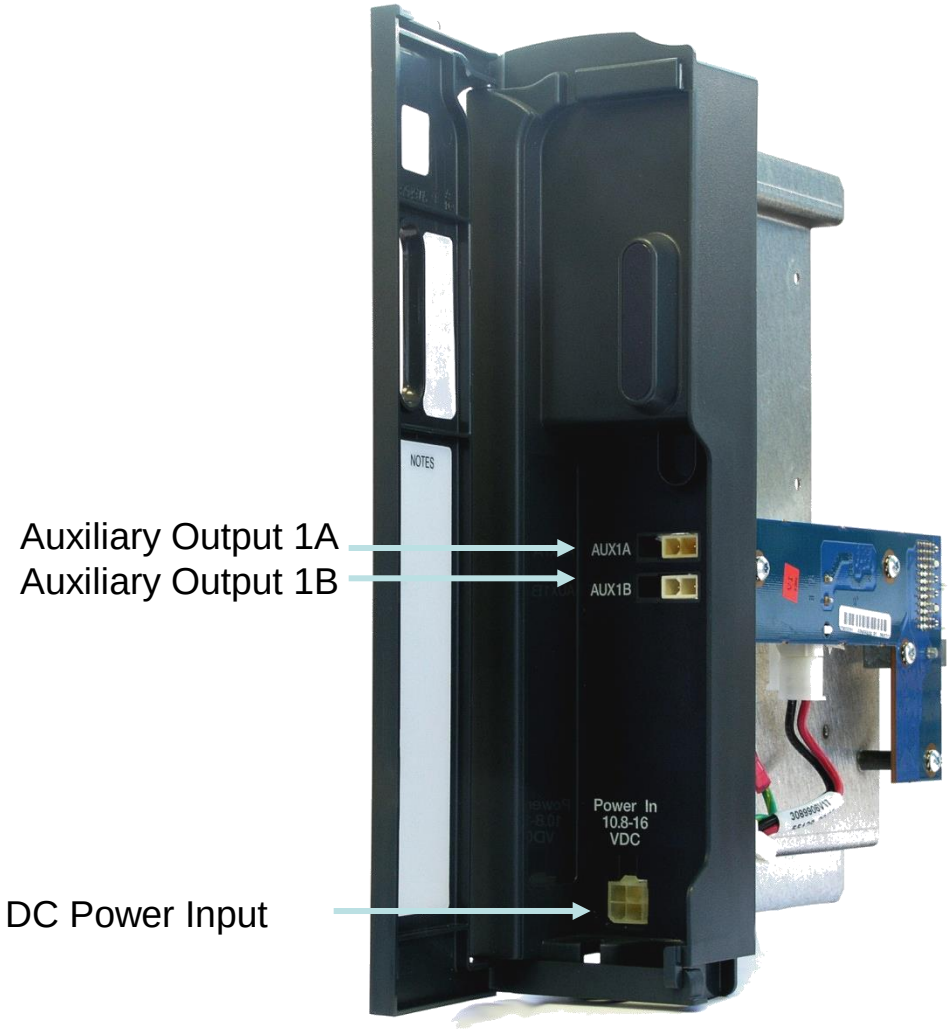
- **It also provides power to radios, modems and accessories.**

- **The available power supply models are:**
  - DC Power Supply 10.8 -15.5V (Default)
  - DC Power Supply 10.8 -15.5V Low-Tier
  - DC Power Supply 18-72 V
  - DC PS 18-72 V with Battery Charger
  - AC Power Supply 90-264 V
  - AC Power Supply 90-264 V with Battery Charger

POWER SUPPLY DESCRIPTION



LOW-TIER POWER SUPPLY DESCRIPTION



POWER SUPPLY CHARACTERISTICS

- **Protected On/Off switch on the front panel*.**
- **Controlled auxiliary voltage outputs*.**
- **Heat convection cooling .**
- **Short protection in outputs.**
- **Over heating protection.**
- **The PS is monitored by the CPU module.**
- **Status LEDs in the front panel*.**
- **The PS is located on the leftmost slot on the frame.**
- **Controlled power line enables centralized inhibiting of relay outputs in selectable DO modules*.**

* Excluding Low-Tier PS

BATTERY CHARGER CHARACTERISTICS

- **Support 6.5 or 10 Ah lead-acid backup battery.**
- **Automatically switches to the backup battery**
  - When the main AC or DC power source fails.
  - Automatic switchover to main power on power return.

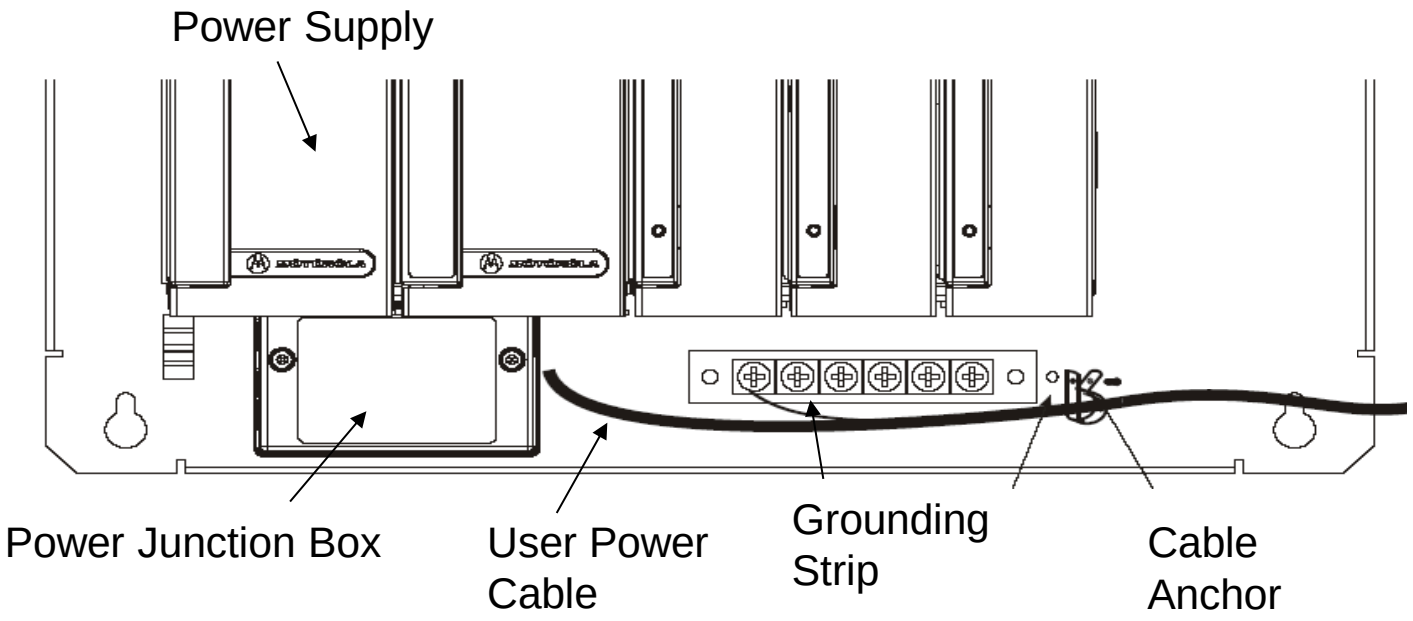
- **Optimized temperature compensated charging.**
  - Over charging protection.
  - Over discharge protection.

- **Performs battery test with battery controlled discharge.**

POWER AND GROUND CONNECTIONS

- **The power connection to all the ACE3600 Power Supply types is via the power junction box located on the frame beneath the Power Supply slot.**

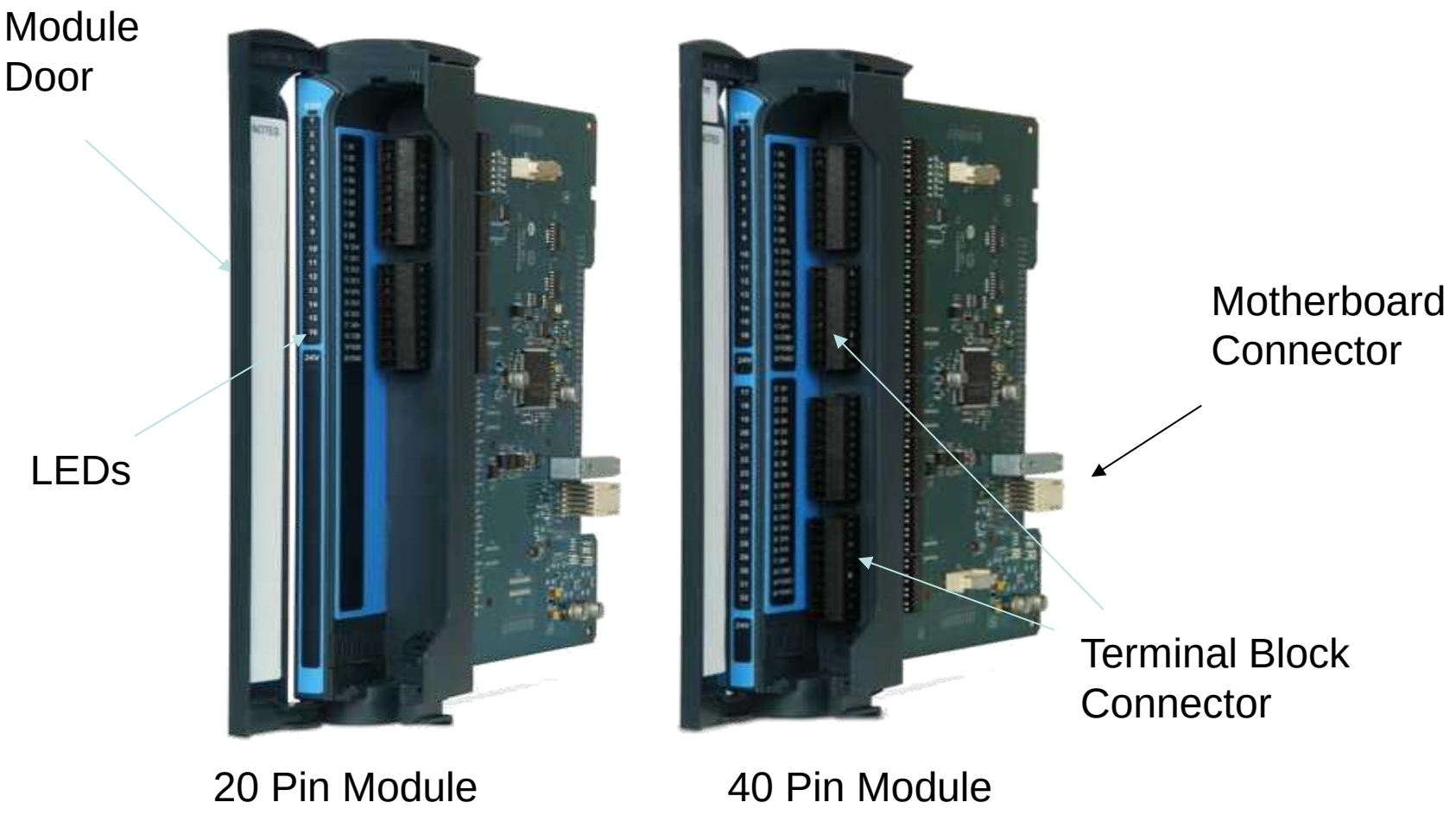
- **The power junction box is connected to the Power Supply with a power cable.**



I/O MODULES

- **The ACE3600 offers various I/O modules types:**
  - Digital Input
  - Digital Output
  - Analog Input
  - Analog Output
  - Mixed I/O
- **The I/O modules have the following common characteristics:**
  - I/O Isolation and protection
  - Module hot swap capability
  - Automatic module recognition (by the CPU for config. upload)
  - Indication LED per each I/O + module error LED
  - 20, 30 and 40 Pin Terminal Block (TB) connectors (3.81 mm/18 AWG)
  - TB connector holder with protection key
  - Cables (based on TB Holder

I/O MODULE DESCRIPTION



LOW VOLTAGE DIGITAL INPUT (DI) MODULES

- **16 DI/ 32 DI Modules**
  - 16 DI Fast 24V module
  - 32 DI Fast 24V module
  - 16 DI Fast 24V IEC61131-2 Type II module
  - 32 DI Fast 24V IEC61131-2 Type II module

DI CHARACTERISTICS (1/2)

Input ratings

- Fast Capture Resolution: 1 mS (Interrupt upon change of state)
- Event Time Tagging Resolution 1 mS (Interrupt upon change of state)

Module Type	FAST 24V	FAST 24V IEC 61131-2 TYPE II
DC Input Voltage (relative to input common)	Max. ± 40 V DC	Max. ± 40 V DC
"ON" DC Voltage Range	+9 to +30 V DC, -30 to -9 V DC	+11 to +30 V DC, -30 to -11 V DC
"OFF" DC Voltage Range	-3 to +3 V DC	-5 to +5 V DC
"ON" AC Voltage Range	10 to 27 V AC (RMS)	N/A
"OFF" AC Voltage Range	0 to 5 V AC (RMS)	N/A
Input Current	Max. 3.5 mA	6-10 mA

DI CHARACTERISTICS (2/3)

- **Each Input has a dedicated status LED.**
- **Optical isolation**
  - All inputs are optically isolated and surge protected.
- **Fast capture**
  - Each inputs can be configured as Fast Capture inputs.
  - 16 and 32 DI Fast 24V modules can be configured as AC inputs.
  - Multiple inputs act as Fast Counter Inputs (20 in 32 DI, all in 16 DI).

DI CHARACTERISTICS (3/3)

- **Filtering**
  - DC inputs filter – configurable up to 50.8 ms.
  - Fast Counter input filter - configurable up to 12.75 ms.
  - The filter setup can be changed during run-time by the user program.

- **Fast Event**
  - All inputs can be fast triggers to a high priority user process (Fast Event).

- **Other Characteristics**
  - In case of module failure, each input can be set to show to the user program a predefined value (1 or 0) or to show the last value.
  - Each input can be “masked” to show to the user program a predefined value constantly (ignoring the real input value).

HIGH VOLTAGE DIGITAL INPUT (DI) MODULE

- 16 Isolated inputs.
- Each DI can be connected to120V or 230V (HV).
- Input ratings:
  - AC Input Frequency: 47 – 63 Hz
  - AC Input Delay: Maximum 25.0 mS

DC Input Voltage	Max. ±264 V DC
"ON" DC Voltage Range	+79.0 V DC to +264.0 V DC, -79.0 V DC to -264.0 V DC
"OFF" DC Voltage Range	-40 to +40 V DC
"ON" AC Voltage Range	79 to 264 V AC (RMS)
"OFF" AC Voltage Range	0 to 40 V AC (RMS)
Input Current	At 110V DC 1.0 to 3.0 mA At 230V DC 0.4 to 2.0 mA At 110V AC > 2.0 mA RMS At 230V AC > 3.0 mA RMS

HV DI CHARACTERISTICS

- **Each Input has a dedicated status LED.**
- **Filtering**
  - DC inputs filter – configurable up to 50.8 ms.
  - The filter setup can be changed during run-time by the user program.
- **Fast Event**
  - All inputs can be fast triggers to a high priority user process (Fast Event).
- **Other Characteristics**
  - In case of module failure, each input can be set to show to the user program a predefined value (1 or 0) or to show the last value.
  - Each input can be “masked” to show to the user program a predefined value constantly (ignoring the real input value).
- **5 mm pitch Terminal Blocks**

DIGITAL OUTPUT (DO) RELAY MODULES

- **ACE3600 offers 8 DO and 16 DO Relay modules.**

- **The modules available are:**
  - 8 DO Electrically Energized (EE) Relay module
  - 16 DO Electrically Energized (EE) Relay module
  - 8 DO Magnetically Latched (ML) Relay module
  - 16 DO Magnetically Latched (ML) Relay module

DO RELAY CHARACTERISTICS (1/2)

- **Output Arrangement:**
  - 8 DO - 3 X Form C (SPDT) and 5 X Form A (SPST).
  - 16 DO - 6 X Form C (SPDT) and 10 X Form A (SPST).
- **Contact voltage ratings:**
  - Max. 60 V DC or 30 V AC RMS (42.4 V peak).
- **Contact Power Ratings:**
  - 2A @ 30 V DC, 0.6A @ 60V DC or 0.6A @ 30V AC (resistive load).
- **Each relay has a dedicated status LED.**

DO RELAY CHARACTERISTICS (2/2)

- **Each output has actual relay position back-indication available to the user program.**
- **Output can be controlled by high priority process (Fast Event).**
- **In case of CPU fail, each output can be set to a predefined value (1 or 0) or to stay in its last value.**
- **Each output can be “masked” to stay constantly in a predefined value (ignoring the user program command).**
- **All relays are central disable / enable**
  - Selectable per module
  - Controlled from the power supply panel.

HIGH VOLTAGE DIGITAL OUTPUT (DO) RELAY MODULES

- **Two modules available:**
  - **12 DO EE Relay 120/230V.**
  - **12 DO ML Relay 120/230V.**
- **Provides 12 Relay DOs.**
- **Support AC and DC.**
- **Max voltage: 125VDC or 230V AC.**
- **Max. Contact rating:**
  3A @ 250 VAC
  3A @ 30 VDC
  0.2A @ 125 VDC
- **5 mm pitch Terminal Blocks**

HV DO RELAY CHARACTERISTICS

- **Output Arrangement:**
  - 12 DO - Form A (SPST) Normally Open (NO).
- **Each relay has a dedicated status LED.**
- **Each output has actual relay position back-indication available to the user program.**
- **Output can be controlled by high priority process (Fast Event).**
- **In case of CPU fail, each output can be set to a predefined value (1 or 0) or to stay in its last value.**
- **Each output can be "masked" to stay constantly in a predefined value (ignoring the user program command).**
- **EE relays are central disable / enable**
  - Selectable per EE relay module
  - Controlled from the power supply panel

ANALOG INPUT (AI) MODULES

- **ACE3600 offers 8 AI and 16 AI Relay modules.**

- **The modules available are:**
  - 8 AI ±20 mA (4-20 mA) module
  - 16 AI ±20 mA (4-20 mA) module
  - 8 AI ±5 V (0-5 V, 1-5 V) module
  - 16 AI ±5 V (0-5 V, 1-5 V) module

AI MODULES CHARACTERISTICS 1/2

- **16 bit A/D (including sign)**
  - Accuracy ± 0.1% of full scale.
- **Input Impedance**
  - ± 20 mA input : < 250 Ω, ±5 V input : > 1 MΩ.
- **Programmable 50 or 60 Hz filtering**
  - Input Scan time 10 ms @ 50 Hz filtering, 8.33 ms @ 60 Hz filtering.
  - Selectable smoothing (input filtering): 2, 4, 8, 16, 32, 64 or 128 samples.

AI MODULES CHARACTERISTICS 2/2

- **Factory and User Input Calibration.**
- **Individual input Scaling.**
- **Other Characteristics**
  - In case of module failure, each input can be set to show to the user program a predefined value or to show the last value.
  - Each input can be “masked” to show to the user program a predefined value constantly (ignoring the user program input value).
- **Overflow and Underflow levels can be configured to:**
  - Current inputs: ± 20 mA or 4-20 mA.
  - Voltage Inputs: ± 5 V, 0-5 V, or 1-5 V.

ANALOG OUTPUT (AO) MODULE

- **4 AO Module.**
- **Each AO channel can be used as:**
  - **0 to20 mA (4-20 mA) channel, or**
  - **0 to 10 V DC channel.**
- **Internal isolated power source for the AO channels**

AO MODULE CHARACTERISTICS 1/2

- **14 bit D/A**
  - Accuracy ± 0.1% of full scale @25 ° C .
- **Output Load**
  - Voltage: > 1.0 kΩ, < 1.0 µf
  - Current: < 750 Ω (internal power source).
- **Temperature Stability**
  - Minimum ±30 PPM/° C.
- **Internal Channel Settling Time**
  - Max. 1 ms.

AO MODULE CHARACTERISTICS 2/2

- **Factory and User Output Calibration.**
- **Individual Output Scaling.**
- **Supports AO handling of Legacy MOSCAD & MOSCAD-L applications program (12 bit).**
- **Other Characteristics**
  - In case of CPU fail, each output can be set to a predefined value or to stay in its last value.
  - Each output can be “masked” to stay constantly in a predefined value (ignoring the user program command).

MIXED ANALOG MODULES

- **The modules available are:**
  - 4AO + 8AI ± 20mA.
  - 4AO + 8AI ±5 V.
- **Each AO channel in both modules provides:**
  - 0 to20 mA (4-20 mA) channel, or
  - 0 to 10 V DC channel.
- **Supports AO handling of Legacy MOSCAD & MOSCAD-L applications program (12 bit).**
- **AI channels have the same characteristics as in the 8AI and 16AI modules**

DO / DI MODULES

- **The modules available are:**
  - 16 DO/DI module.
  - 32 DO/DI module.

- **Each module has groups of 8 MOSFET outputs.**

- **Each group can be configured to operate as 8 dry contact inputs.**

32 DO/DI configurations

I/O combination	DI location	DO location
32DO	-	1-32
8DI + 24DO	1-8	9-32
16DI + 16DO	1-16	17-32
24DI + 8DO	1-24	25-32
32DI	1-32	-

DO/DI MODULE CHARACTERISTICS 1/2

- **Outputs**
  - Up to 500 mA per output (current sink).
  - Dedicated status LED.
  - Back-indication showing the actual output state (available to the user program).
  - Output can be controlled by high priority process (Fast Event).
  - All outputs central disable / enable - Selectable per module, controlled from the power supply panel.

DO/DI MODULE CHARACTERISTICS 2/2

- **Inputs**
  - 16/20 Inputs can be used as Counter Inputs (up to 1 KHz).
  - Dedicated status LED.
  - In case of CPU fail, each output can be set to a predefined value (1 or 0) or to stay in its last value.
  - Each output can be “masked” to stay constantly in a predefined value (ignoring the user program command).
  - All inputs can be fast triggers to a high priority user process (Fast Event).
  - Inputs filter – configurable up to 50.8 ms.

MIXED I/O MODULES

The modules available are:

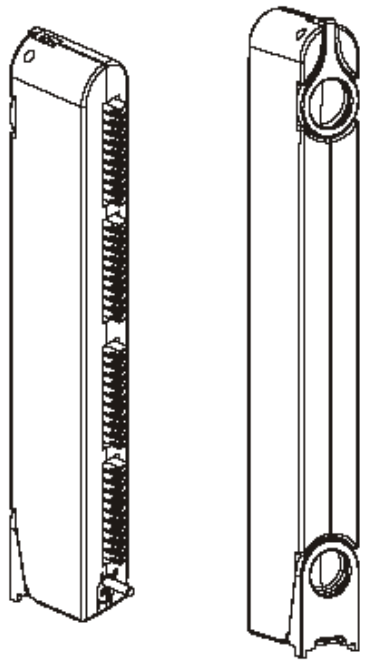
- **16 DI / 4DO EE / 4AI :**
  - 16 Digital Inputs – Fast 24V IEC61131 Type II
  - 4 Digital Outputs – Electrically Energized (EE) Relay
  - 4 Analog Inputs - ± 20mA (4-20 mA)
- **16 DI / 4DO ML / 4AI :**
  - 16 Digital Inputs – Fast 24V IEC61131 Type II
  - 4 Digital Outputs – Magnetically Latched (ML) Relay
  - 4 Analog Inputs - ± 20mA (4-20 mA)
- **I/O characteristics are equivalent to DI, DO and AI modules.**

I/O MODULE TERMINAL BLOCK (TB) HOLDER

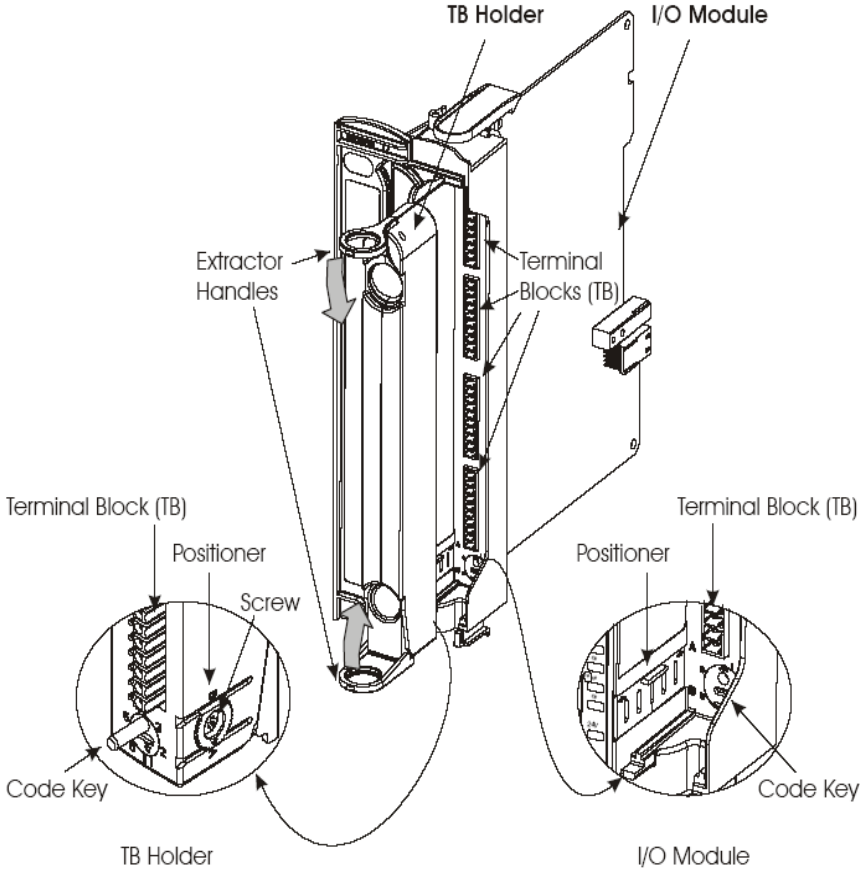
- **Structure**
  - The holder secures the I/O connections and TBs neatly in place and forms a single connector plug per module.
  - The TB cable wires are concealed and each TB can be labeled.

- **A coding mechanism**
  - Is provided to prevent cabling errors.
  - The coding mechanism has a number of combinations that exceeds the maximum number of I/O slots on a Frame.

- **Cabling**
  - Three meter cable suitable for I/O module, based on TB Holder.
  - A TB holder kits can be ordered separately (does not include cables).



TERMINAL BLOCK (TB) HOLDER DESCRIPTION



PLUG-IN 24V FLOATING POWER SUPPLY

- **24V DC floating output plug-in power supply can be added to certain I/O modules, as detailed in the table below:**

32 DI	2x PS
16 DI	1x PS
16 AI	1x PS
8 AI	1x PS
Mixed I/O	1x PS
Mixed Analog	1x PS

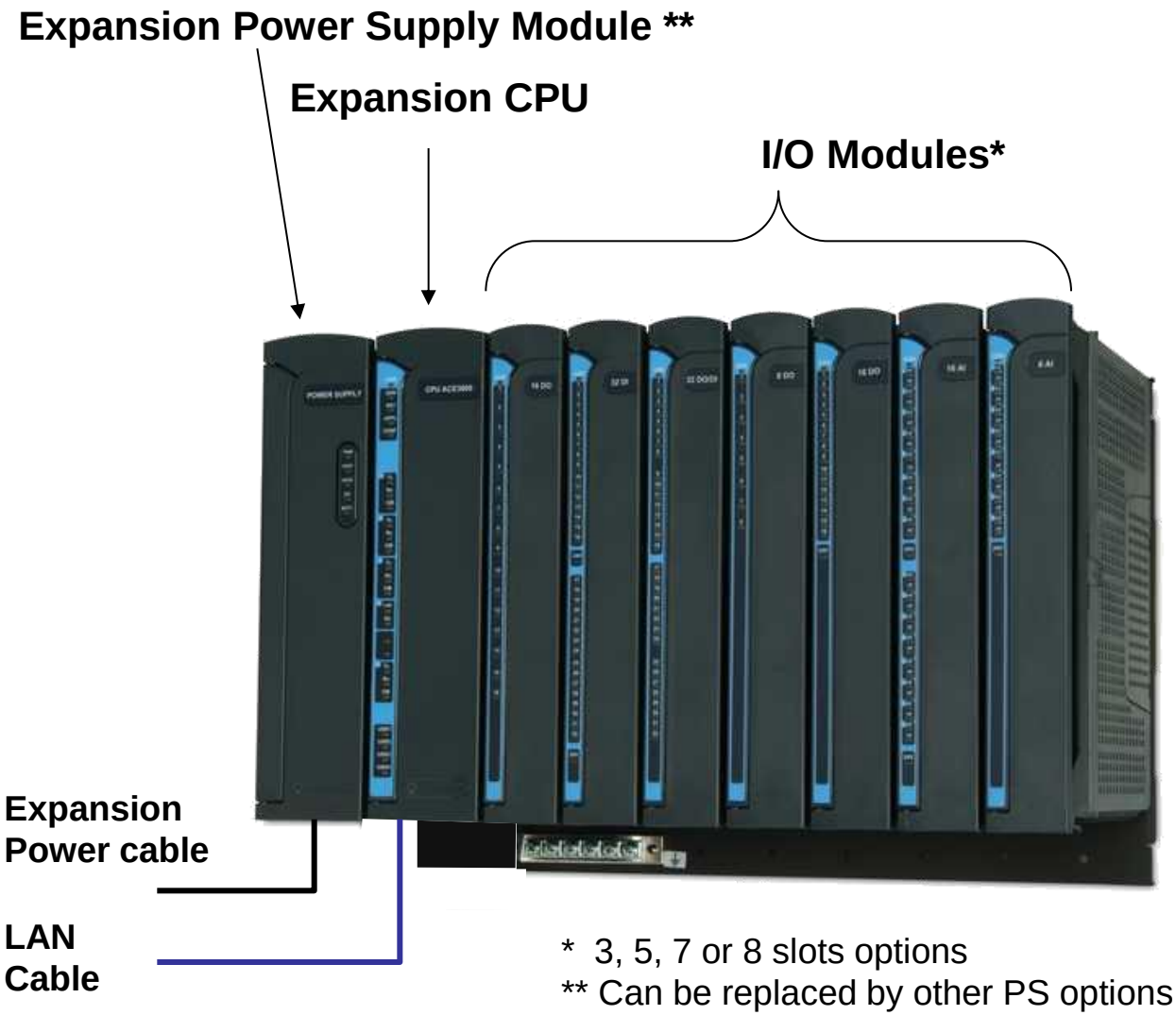
- **Each plug-in power supply output is controlled by the CPU module. By default, the plug-in power supply is ON and can supply up to 150mA.**

- **The power supply plug-in can be turned ON/OFF via the user application program or Hardware Test utility.**

ACE3600 I/O EXPANSION

- **Up to 13 Expansion Frames - max. 110 I/O modules per RTU.**
- **Each I/O Expansion Frame can be 3, 5, 7 or 8 I/O slots.**
- **Based on dedicated 100 Mb/s Ethernet LAN for reliable communication between the Main Frame CPU and each I/O Expansion Frame.**
- **Expansion Frames can be installed up to 50m distance from the main frame.**
- **Expansion Frames can be cascaded to the main frame Power Supply** (per main PS max. power limitations).

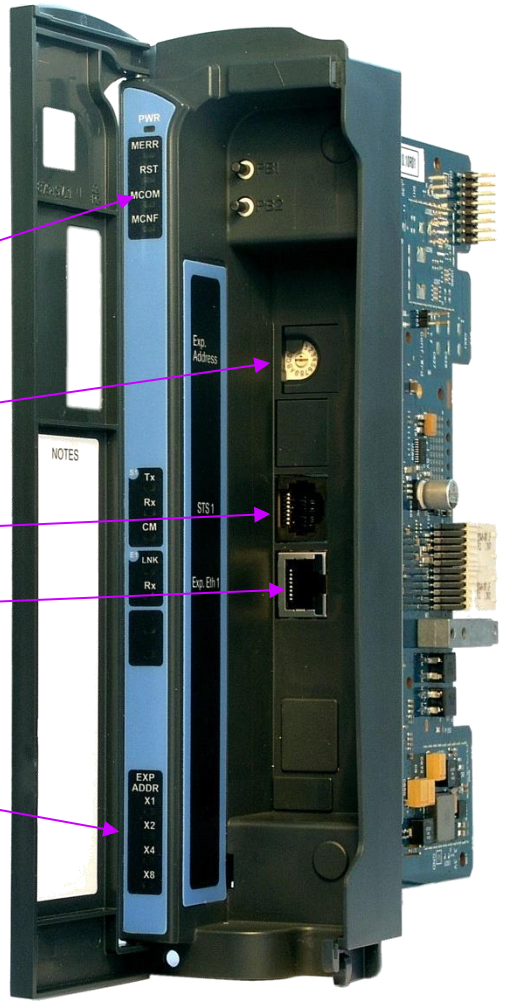
EXPANSION FRAME



* 3, 5, 7 or 8 slots options
** Can be replaced by other PS options

EXPANSION CPU

- **Automatically connects the I/O Expansion Frame to the Main Frame CPU.**
- **Enable the main CPU to monitor and control the I/O modules on the Expansion Frame.**
- **Includes:**
  - Status and port activity LEDs
  - Frame Number selector switch
  - RS-232 port for local STS connection (interconnects to the main frame CPU)
  - Dedicated Ethernet port for connection to the main frame CPU
  - LEDs for indicating Frame Number



EXPANSION POWER SUPPLY MODULE

- **Default PS* for I/O Expansion Frame.**
- **Can be cascaded to Main PS.**
- **Can be cascaded to the next Expansion Frame PS.**
- **Includes Expansion PS Power Cable**

Expansion PS output

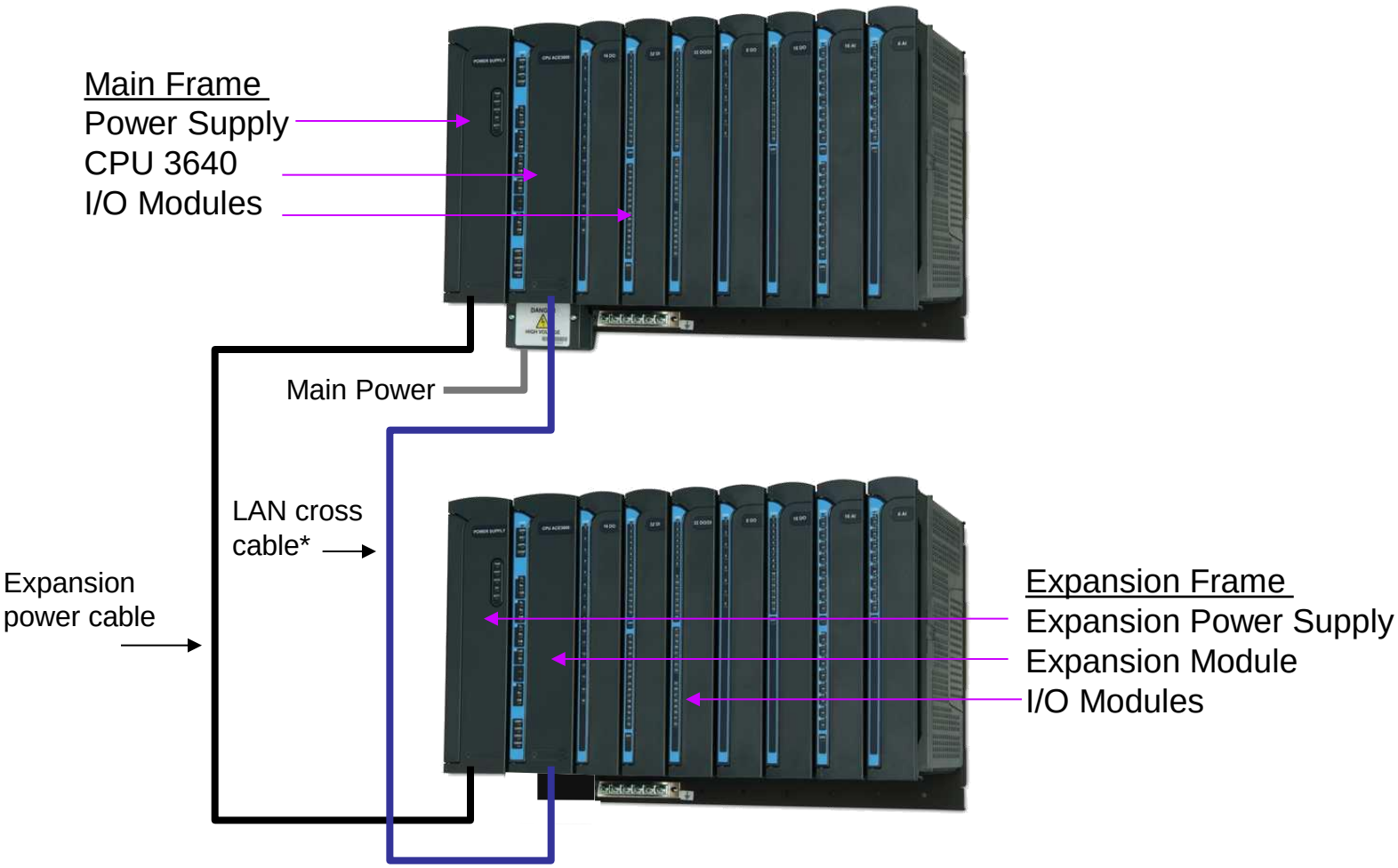
Expansion PS input

* Can be replaced by the other PS options (excluding Low-tier PS)

EXPANSION 8 PORT ETHERNET SWITCH MODULE

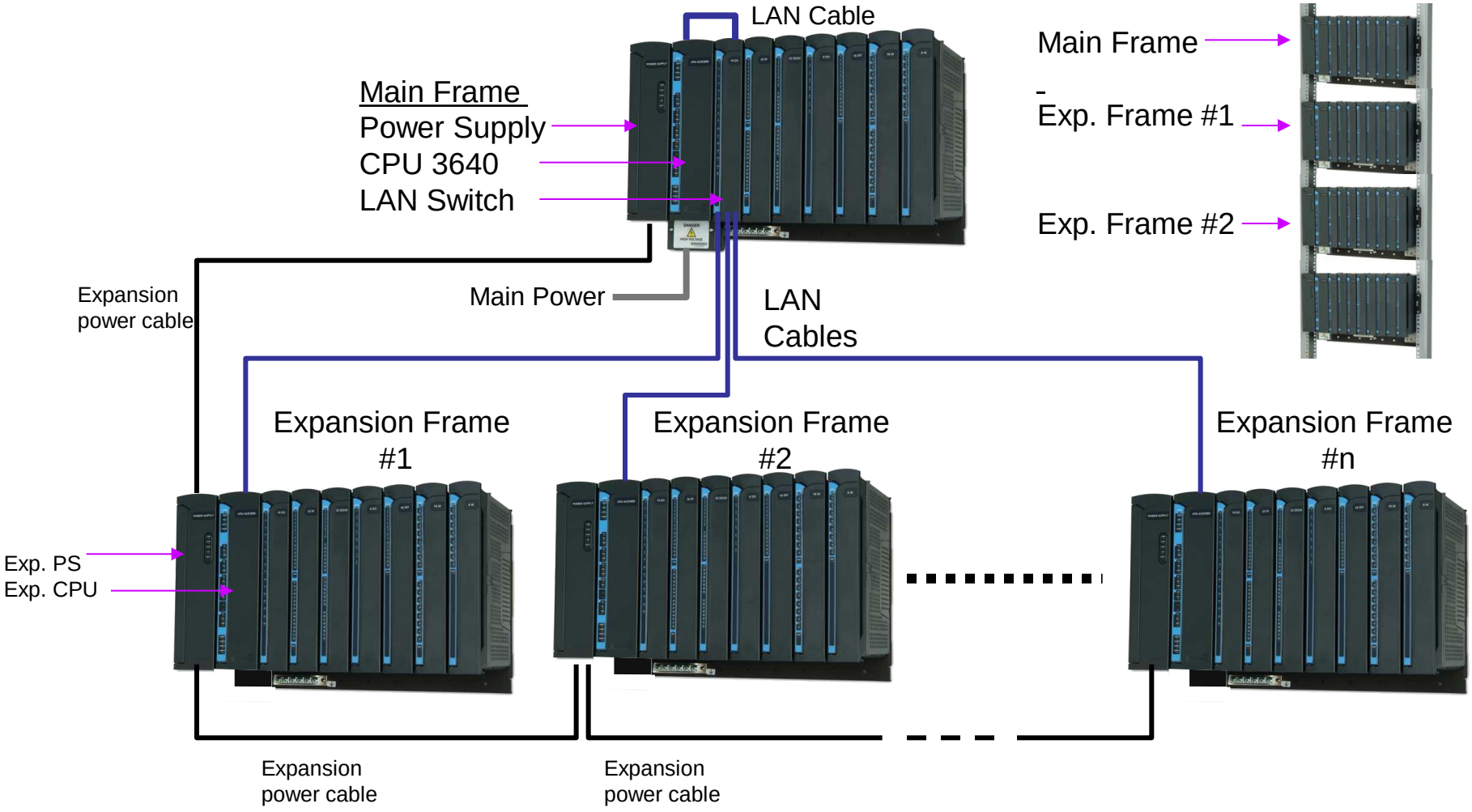
- **100 Mb/s managed Ethernet Switch.**
- **Located in standard I/O slot on the main frame.**
- **One Switch module enables connecting up to 7 I/O Expansion Frames to the main frame.**
- **Two Switch modules enable connecting up to 13 Expansion Frames to the main frame.**
- **Link, Speed and Activity LEDs per each port**

SINGLE EXPANSION FRAME (UP TO 16 I/O MODULES)



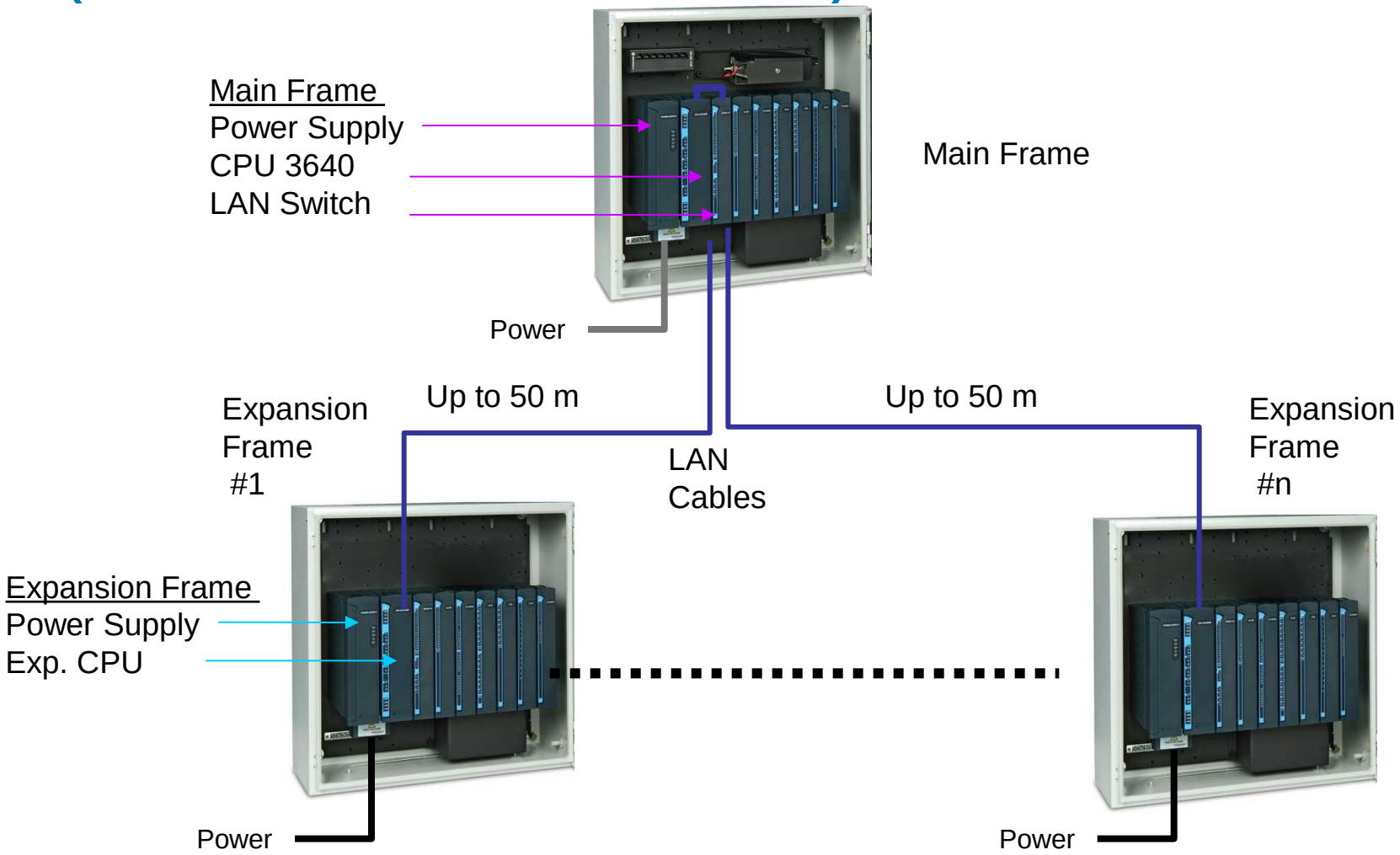
* Up to 50 m

MULTIPLE EXPANSION FRAMES
(UP TO 13 I/O EXPANSION FRAMES)



DISTRIBUTED I/O EXPANSION FRAMES

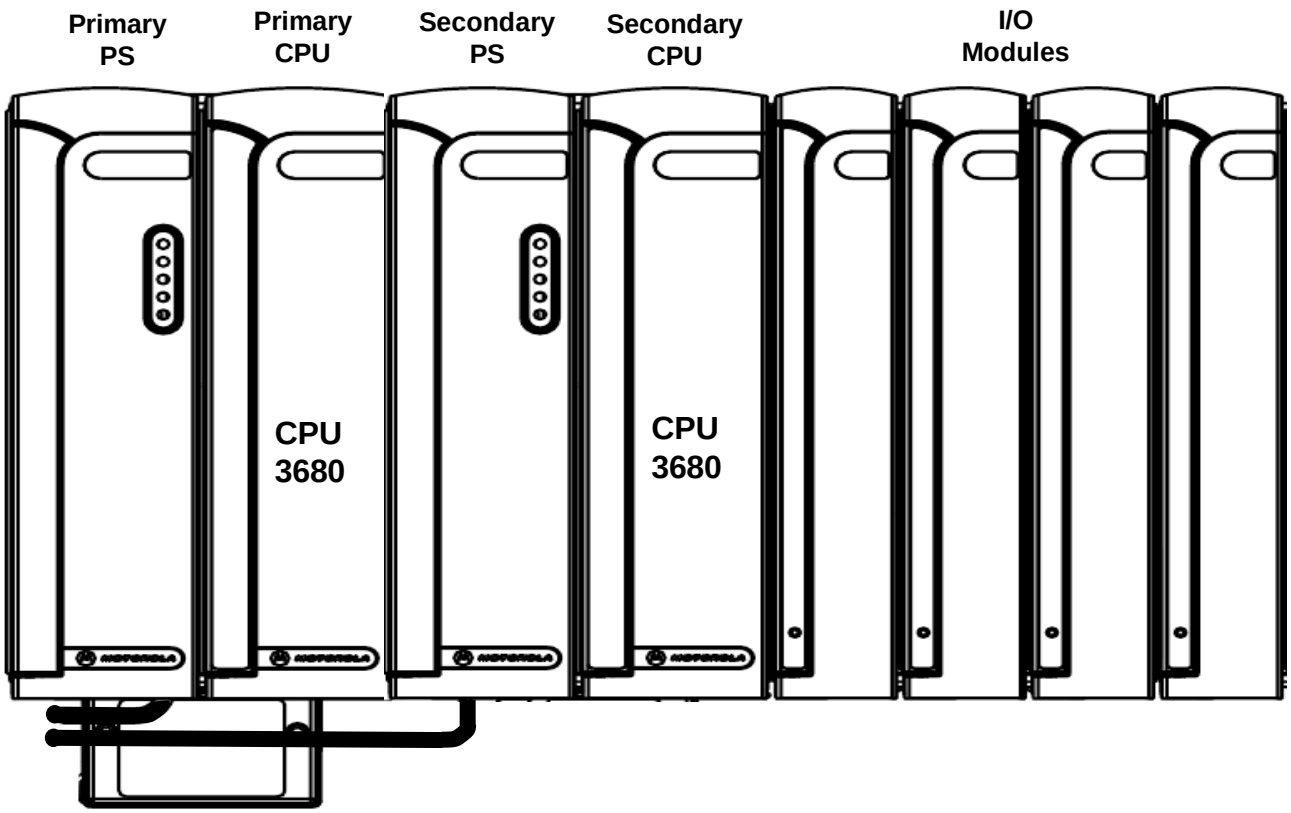
(UP TO 13 I/O EXPANSION FRAMES)



EXPANSION COMBINATIONS

Number of I/O Slots		9-16	17-23	24-31	32-39	40- 47	48-55	56-63	64-70	71-78	79-86	87-94	95-102	103-110
Main Frame F75XX		1	1	1	1	1	1	1	1	1	1	1	1	1
Exp. Frame F7510		1	2	3	4	5	6	7	8	9	10	11	12	13
LAN Switch Module		0	1	1	1	1	1	1	2	2	2	2	2	2

REDUNDANT CPU AND PS OPTION



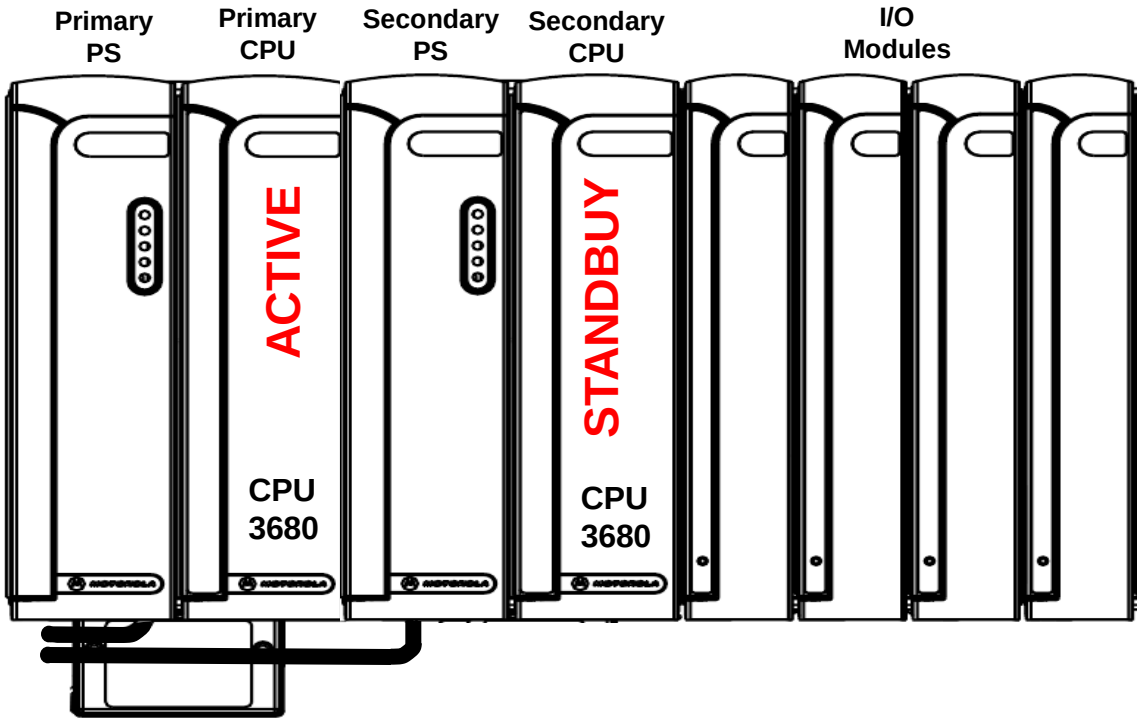
- The frame includes Redundant CPU & PS.
- This frame fits wall mount installation, 50 x 50 cm metal chassis, 50 x 50 cm metal housing or 19” chassis.

REDUNDANCY DEFINITIONS

- **Primary CPU/PS – Left side CPU/PS**
- **Secondary CPU/PS – Right side CPU/PS**
- **Active CPU – the CPU that controls the I/O modules.**
- **Standby CPU – the CPU that doesn’t control I/O modules.**
- **Peer CPU – the adjacent CPU**

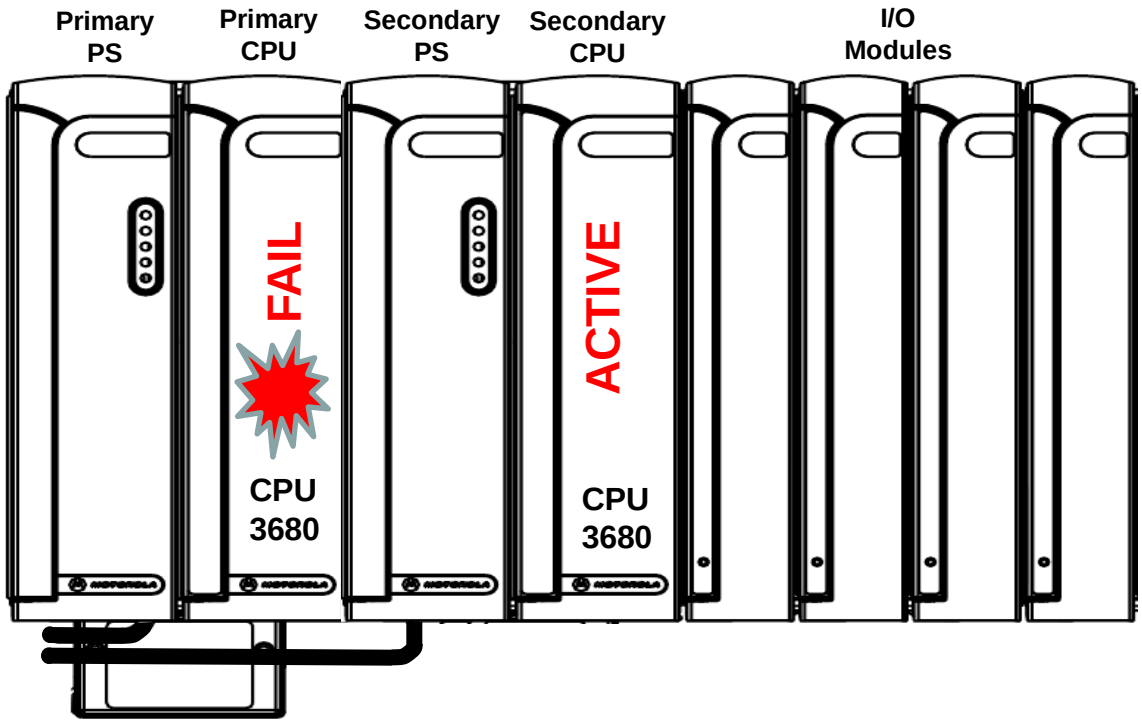
ACTIVE AND STANDBY CPUS

- On startup, the Primary CPU becomes the Active CPU.
- Only the Active CPU has control on the I/O modules.



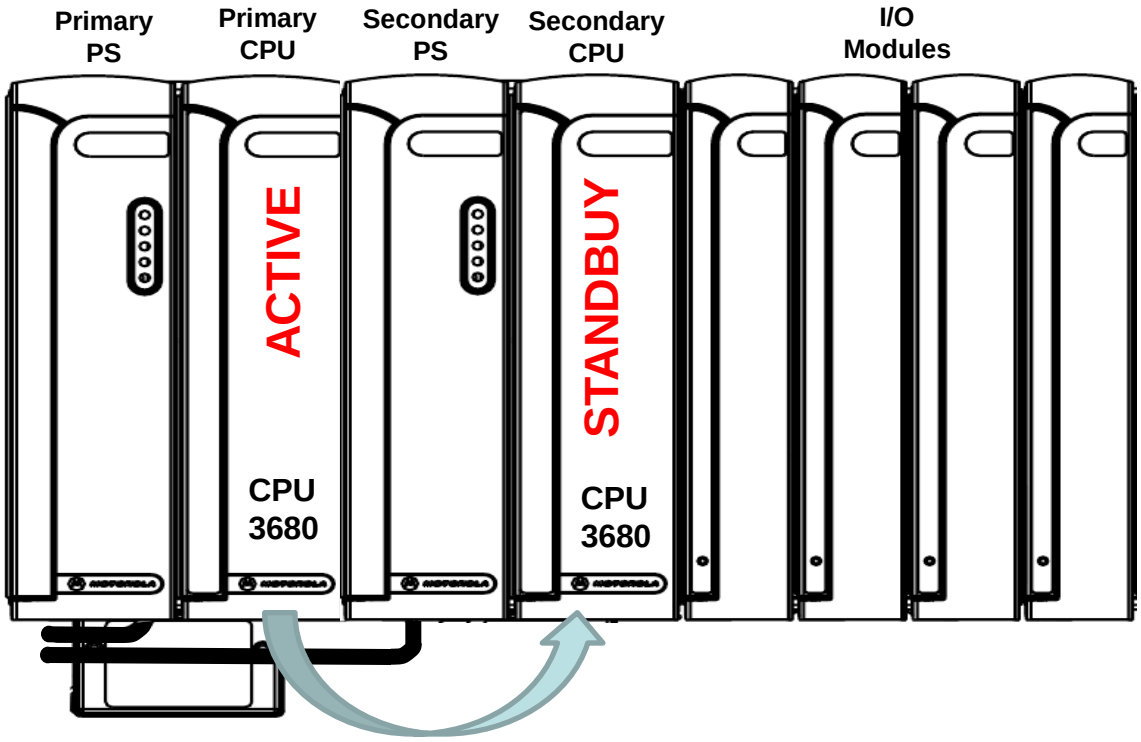
AUTOMATIC CPU SWITCHOVER

- **The Standby CPU continuously monitors the Active CPU.**
- **When the Standby CPU detects that the Active CPU has failed, it automatically becomes the Active CPU.**



INTER CPUS COMMUNICATIONS

- **The new CPU3680 and the new redundant RTU motherboard enable the Active and Standby CPUs to communicate via internal Ethernet interconnect on the motherboard.**



POWER SUPPLY REDUNDANCY

- **The primary power supply always has priority in providing power to the CPUs and I/O modules. The secondary power supply takes over if the primary fails or if the voltage level of the primary is lower than the secondary voltage level by 0.4V.**

- **The primary PS takes over after a failed primary PS is replaced or when the primary PS voltage level is higher than the secondary voltage level by 0.4V.**

- **In a normal condition when both power supplies are operational (and the primary has control) the auxiliary power outputs of both power supplies can be used to power external devices such as modem, radio, etc.**

ACE3600 RADIO MODELS

- **The Following radios models are available in the ACE3600:**
  - Conventional (two-way) models:
    - Mobile Radio CM200, CM140, EM200, GM3188
      - 146-174 MHz, 438-470 MHz
    - Mobile Radio CDM750 models
      - 136-174 MHz (including splinter channels), 403-512 MHz
    - Portable Radio GP320, GP328, PRO5150
      - 136-174 MHz, 403-470 MHz
  - Analog Trunking:
    - Mobile Radio XTL2500 Analog model
      136-174 MHz, 380-520 MHz, 800 MHz
  - Digital Trunking:
    - Mobile Radio XTL2500 Digital
    - Portable Radio XTS2500 Digital
      - 136-174 MHz, 380-520 MHz, 800 MHz
  - Digital Trunking:
    - Mobile Radio XPR4350, XPR4380, DM3400, M8220, DGM4100
      - 136-174 MHz, 403-470 MHz, 450-512 MHz, 800/900 MHz

ACE3600 RADIO INSTALLATION KITS

- **The kits enable installation of Motorola radios on ACE3600 model F7509:**
  - **CDM750 Installation kit.**
  - **CM200, CM140, EM200, GM3188 Installation kit.**
  - **GP320, GP328, PRO5150 Installation kit.**
  - **XTL5000/XTL2500 Analog Installation kit.**
  - **XTL5000/XTL2500 Digital Installation kit.**
  - **XTS2500 Digital Installation kit.**
  - **XPR4350, XPR4380, DM3400, M8220, DGM4100 Installation kit.**

INSTALLATION KITS FOR MDS (GE) RADIOS

- **The kits enable installation of MDS radios on ACE3600 model F7509:**
  - MDS X710/9810 installation kit
  - MDS iNET900/Transnet Installation Kit
  - Transnet900 OEM Installation Kit

Transnet 900 OEM

Transnet 900 / iNET 900

MDS X710/9810

OPERATING CONDITIONS

- **Operating Temp.: - 40 ºC to +70 ºC (-40 ºF to 158 ºF)** [1,2]
- **Storage Temp.: - 55 ºC to +85 ºC (-67 ºF to 185 ºF)**
- **Radio operating temp. range: -30 ºC to +60 ºC**
- **Operating Humidity: 5% to 95% RH @ 50 ºC without condensation**
- **Mechanical Vibrations: Per EIA / TIA 603 Base-station, Sin 0.07mm @ 10 to 30 Hz, 0.035 mm @ 30-60 Hz**
- **Operating Altitude: - 400m to + 4000 meter (-1312 ft to + 13120 ft)** [3]

Notes:
(1) when using a metal housing option, the maximum operating temp. outside the housing is +60 ºC (140 ºF).
(2) Motorola radios and ACT module operating temp. range is: -30 ºC to +60 ºC (-22 ºF to 140 ºF)
(3) When using 18-72V DC or 90-264 VAC Power supply the operating altitude is -400 to +3000m

REGULATORY STANDARDS

- **Safety: UL 60950 (UL listed), CSA 22.2-950, EN60950, IEC 60950, AS/NZS 60950.**

- **Emission: Per Industrial environments FCC part 15, subpart B (class A); CE EMC: EN50081-2/EN61000-6-4 (CISPER 11 / EN55011 class A).**

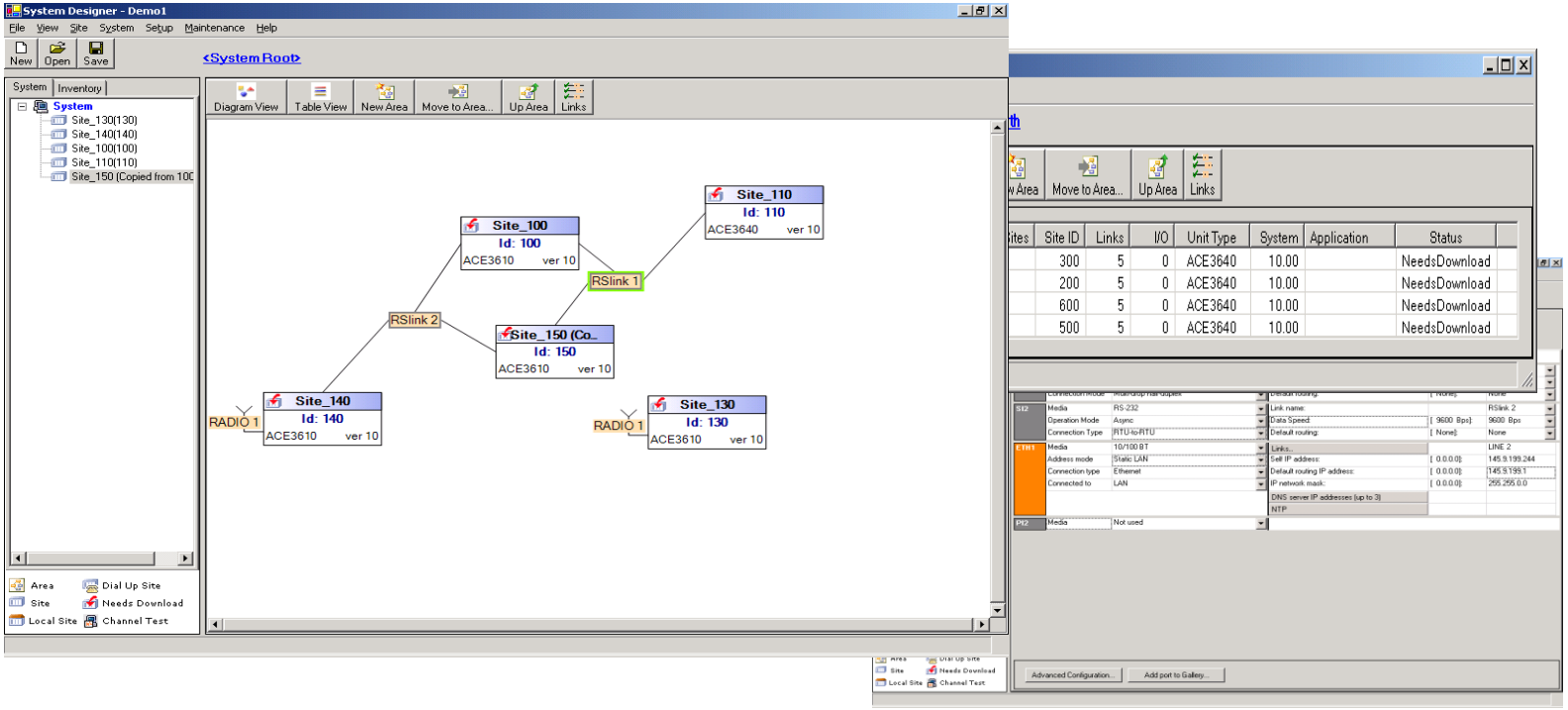
- **Immunity: Per Industrial environments Per EN50082-2 /IEC 61000-6-2**

ACE3600 Tools

SYSTEM TOOL SUITE (STS)

The main benefits of the STS:

- **Project oriented tool - handles multiple sites from a system design approach.**
- **Integrates all SCADA related functions in a single tool – Configuration, Setup, Programming, Debagging and maintenance.**



ENHANCED PID

- **The ACE3600 Enhanced PID is an add-on program that adds advanced PID control functionality to the user programs with minimum effort.**

- **The Enhanced PID supports up to 32 PID loops running simultaneously.**

- **Each PID loop can be monitored and tuned with a user friendly PID Monitor Tool built into the STS.**

- **Several PID loops can be monitored at the same time**

ENHANCED PID LOOP MONITOR TOOL

- **Displays graphically the PID loop Process Value (PV) and Control Value (CV) on a time scale**
- **Enables changing and saving the:**
  - PID On/Off state
  - PID loop parameters
  - PID loop control mode
  - Set Point / Process Value scaling
- **Displays PID loop status.**
- **Enable Logging PV and SV values to a log file.**
- **Scalable Graphic PID loop display**

THE PID MONITOR TOOL

Loop setup & Parameter

Process Variable & Set point

Control Output

ACE3600 AGA CALCULATIONS 1/2

- **AGA refers to *American Gas Association.***
- **AGA Report no' 3 specifies how orifice meters should be used for custody transfer measurement of natural gas.**
- **AGA Report no' 7 specifies how turbine meters should be used for custody transfer measurement of natural gas.**
- **AGA Report no' 8 specifies how to calculate the density, compressibility, specific gravity, super compressibility and the volumetric gross heating value.**
- **The compressibility factors and densities calculated by AGA 8 are being used by AGA 3 and AGA7 in order to calculate the gas mass and volumetric flow rates.**

ACE3600 AGA CALCULATIONS 2/2

- **ACE3600 ‘AGA 7 & 8’ and ‘AGA 3+8’ software packages are an optional ‘C’ application block that can be downloaded to the RTU.**
- **No additional vendor-specific library functions or utilities are required.**
- **The application enables the programmer to configure the parameters and I/Os required for each turbine meter run.**
- **Up to 24 meter runs can be configured in a single RTU** (depending on memory availability)**.**

Thank You