3 CPU - CP152 AND CP153

3.1 TECHNICAL DATA

Module ID	CP152	CP152	CP153
Model Number	3CP152.9	3CP152.90-2	3CP153.9
Short Description	2005 CPU 64 + 256 KB SRAM, 1 RS232 Interface, 1 electrically isolated RS485/RS422/TTY, RS485/RS422: network capable, 1 expansion master interface, Order application memory separately!	2005 CPU 64 + 256 KB SRAM, 1 RS232 Interface, 1 electrically isolated RS485/RS422/TTY, RS485/RS422: network capable, 1 expansion master interface, NC synchronisation, Order application memory separately!	2005 CPU 64 + 256 KB SRAM, 1 RS232 Interface, 1 electrically isolated RS485/RS422/TTY, RS485/RS422: network capable, Order application memory separately!
C-UL-US Listed	Yes	Yes	Yes
B&R ID Code	$21	$21	$21
Expansions Master	Yes	Yes	No
NC Synchronization	No	Yes	No
Instruction Cycle Time	0.8 µsec		
Dual Ported RAM (DPR)	64 KByte SRAM		
System RAM	256 KByte SRAM		
Application Memory (not incl.)	ME950, ME953, ME960, ME963		
Real Time Clock Resolution	Nonvolatile memory 1 sec		

Description	CP152	CP152	CP153
Standard Communication Interface			
Application Interface (IF1) Connection Electrical Isolation Max. Baudrate	RS232 9 pin D-type connector No 64 kBaud		
Application Interface (IF2) Connection Electrical Isolation Max. Baudrate	RS485 / RS422 / TTY [1] 9 pin D-type connector (F) Yes 347 kBaud		
Detachable Key Switch	Yes		
Reset Button	Yes		
Cold Start Button	Yes		
Status Display	LEDs		
Buffering the RAMs			
Lithium Battery (in APM)	min. 1 year [2]		
NiCd Battery (in CPU)	min. 1 week		
Gold Leaf Capacitor (in CPU)	min. 10 min		
Battery Monitoring	Yes		
Power Output (inc. APM)	max. 6 W		
Storage Temperature	with inserted APM inc. lithium battery: -20 °C to +60 °C		
Relative Humidity	0 to 95 % (non-condensing)		
Dimensions (H, W, D) [mm]	165, 80, 110		

[1] The interface can be set using software.

[2] Buffering is carried out by the APM lithium battery. Since the RAM in the APM and in the CPU is buffered, the buffer time is reduced to 6 months.
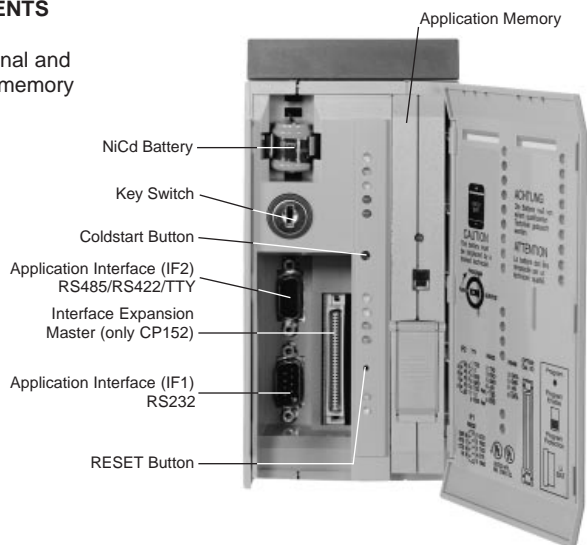
3.2 STATUS LEDs

READY	The "READY" LED lights up in SERVICE mode
RUN	The "RUN" LED lights up when the cyclic run time system is activated (task classes run in their assigned cycle times - also when no task is available).
FORCE	The "FORCE" LED lights up when at least one process variable is set to a defined value (see the PG2000 programming system **FORCE** function).
ERROR	When the PCC is in SERVICE mode, both the "ERROR" and "READY" LEDs are lit.
BAT	This LED displays the rechargeable battery and lithium battery status':
	Lit LED: either the rechargeable battery or the lithium battery is empty, or both.
Tx2	CPU is sending data via IF2.
Rx2	CPU is receiving data via IF2.
RS485	The application interface (IF2) is configured for RS485.
RS422	The application interface (IF2) is configured for RS422.
	When both the "RS485" and "RS422" LED's are lit, the application interface (IF2) is configured for TTY.
Tx1	CPU is sending data via IF1.
Rx1	CPU is receiving data via IF1.

3.3 OPERATIONAL / CONNECTION ELEMENTS

Behind the module door you will find operational and display elements, the slot for the application memory module and cable connectors.

Application Memory

NiCd Battery

Key Switch

Coldstart Button

Application Interface (IF2) RS485/RS422/TTY

Interface Expansion Master (only CP152)

Application Interface (IF1) RS232

RESET Button

3.4 DATA / /REAL TIME CLOCK BUFFERING

The following areas are buffered

❍ User RAM

❍ Dual Ported RAM

❍ System RAM

❍ Real time clock

Buffering is carried out by a gold leaf capacitor, a NiCd battery and battery in the following order:

1) Gold leaf capacitor: The capacitor is located in the CPU

2) NiCd battery: The battery is located in the CPU

3) Buffer battery: The buffer battery is located in the APM

Battery Monitoring

The battery voltage is monitored cyclically. The cyclic load test does not shorten the battery life significantly but serves to give an early warning of weakened battery capacity.
The status information "Battery OK" is available from the B&R-TRAP function "SYS_battery".

3.5 CHANGING THE NiCd RECHARGEABLE BATTERY

The CPUs are equipped with a NiCd rechargeable battery. It is found behind the module door.

NiCd Rechargeable Battery: 3.6 V / 40 mAh
Model Number: 0AC100.9   (5 NiCd rechargeable batteries)

Storage Conditions: Relative humidity of approx. 60 %:

Storage Time	Storage Temperature
Long-term Storage	-40 to +35 °C
6 Months	-40 to +45 °C
1 Month	-40 to +55 °C
1 Week	-40 to +65 °C

The design of the products allows the NiCd rechargeable battery to be changed when the PCC is not under power and also if the PCC is turned on. However, in some countries, changing batteries under power is not allowed. For this reason, B&R recommends that NiCd rechargeable batteries be changed with the PCC turned off.
During battery exchange, supplying RAM with power is done by the gold foil capacitor in the CPU and/or the lithium battery in the APM.

Take the following points into consideration when changing the NiCd rechargeable battery if the PCC is turned off and the APM is not inserted:

❍ The PCC must be turned on for at least 5 minutes without interruption before changing the NiCd rechargeable battery to guarantee that the gold foil capacitor is loaded.

❍ The NiCd rechargeable battery must be changed within 10 minutes of turning off the system.

Procedure when Changing the NiCd Rechargeable Battery

1) Remove power to power supply

2) Discharge electrostatic energy by touching the mounting rail or the ground connection (not in the power supply!)

3) Open module door

4) Pull the NiCd rechargeable battery from the battery compartment using the removal ribbon
Attention: Do not remove or damage connection wire

5) Desolder the NiCd rechargeable battery with a suitable tool (adjustable electronic soldering iron)

6) Resolder new NiCd rechargeable battery with proper polarity

7) Place NiCd rechargeable battery in the battery compartment (don't forget to replace the removal strip)

8) Close module door

9) Replace voltage to power supply

Removal Ribbon
NiCd Battery
Key Switch
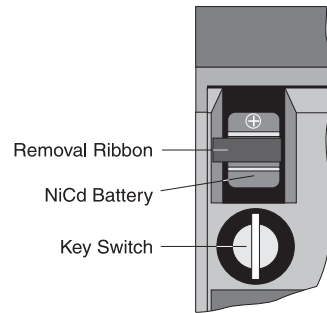
⚠ **NiCd rechargeable batteries are considered hazardous waste! Please dispose of batteries according to the guidelines in your area.**

3.6 RESET BUTTON

The reset button can be pushed with any small pointed object (e.g. a pencil). The reset button is protected behind the module door. If the reset button is pushed it causes a hardware reset, i.e.:

❍ All application programs are stopped.

❍ All outputs are set to zero.

The PCC then goes into SERVICE mode.

3.7 COLDTART BUTTON

The cold start button can be pressed with any small pointed object (e.g. a pencil). The button is protected by the module door. Pressing this button causes a cold start.

The cold start is the same as the first initialization of the CPU. The operating system is started completely new. All modules which are held in the application RAM are deleted, allocated memory is cleared and the contents of all application RAM is deleted. The system structures (all operating system information for proper functionality of the CPU) is reloaded. All variables (inputs, outputs and memory locations) are initialized with zero. Tasks, which are in the application EPROM or in RAM which is not affected by the cold start are started. At the same time, all available initialization subroutines (INIT subroutines) are executed.

The cold start button can be freely programmed by the user. See Chapter 2 section "2.5 Key Handling" in this user's manual and in "Library Reference Manual" (MASYS2LRM-E).

3.8 KEY SWITCH

The CP152 and CP153 CPUs have a key switch with three different positions (The following description refers to version 1.10 of the PCC operating system software.):
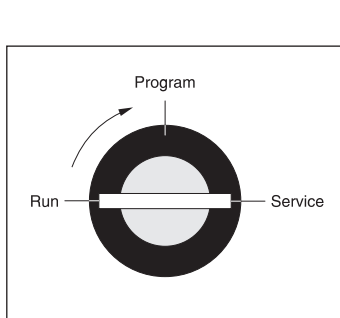
Run If the key switch is in this position, it is not possible to load application programs to the CPU or to influence running application programs from the programming system. Only limited status functions (reading and writing variables) are available to the user.

The cold start function is inactive. The PCC can only be stopped by pressing the RESET button.

If the key switch is in this position during Power-On, all tasks which are in the application EPROM or in RAM are started.

Program Programs which are in the CPU can be started or stopped and deleted from the programming device. Application programs can be transferred to the CPU. All status functions of the programming system are available to the user.

The cold start function is active. The PCC can be stopped by pressing the RESET button. Positions **Run** and **Program** can be switched between at any time while the PCC is running.
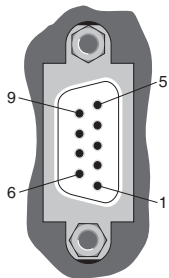
If the key switch is in this position during Power-On, all tasks which are in the application EPROM or RAM are started.

Service If the key is turned to this position during operation, the PCC is rebooted with a RESET, i.e. all application programs are stopped and all outputs are set to zero. The PCC is then switched to SERVICE mode. In SERVICE mode, only the system software runs, all application programs are inactive.

If the position **Program** is switched to during operation, the PCC is rebooted with the warm start boot mode. A warm start loads all battery buffered data (all tasks in the application RAM, all memory locations, I/O data, etc.). This causes all tasks to have the same status after a warm start (task started or task stopped) as before the warm start. All existing initialization subroutines (INIT subroutines) are executed.

If the key switch is in the **Service** position at Power-On, the PCC is automatically started in the SERVICE mode.

3.9 RS485/RS422/TTY INTERFACE (IF2)

Interface	Description	Pin Assignments			

Application Interface RS485/RS422/TTY	The electrically isolated application interface is freely available for the user. The configuration is made with software from the application program and is displayed on LEDs "RS485" and "RS422":		**RS485**	**RS422**	**TTY**
		1			TXD
		2		TXD	Current 1
		3	DATA	RXD	
		4			RXD
		5	GND	GND	GND
		6	+4.8 V / 150 mA		TXD Ret
		7		$\overline{\text{TXD}}$	Current 2
		8	$\overline{\text{DATA}}$	$\overline{\text{RXD}}$	
		9			RXD Ret

9 Pin D-type Connector (F)

State of the LEDs RS485 RS422	Active Interface
1 0	RS485
0 1	RS422
1 1	TTY

RS485/RS422:

  Max. Baudrate: 347 kBaud
  Max. Cable Length: 1200 m

TTY: Cable Length: max. 300 m

    CP152   Rev. < 25.00   max. 2400 Baud
                 Rev. ≥ 25.00   max. 9600 Baud
    CP153   Rev. < 04.00   max. 2400 Baud
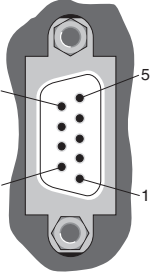   Rev. ≥ 04.00   max. 9600 Baud

3.9.1 TTY Interface (according to DIN 66348)

The sender and receiver of the TTY interface are passive. By means of the built-in current sources "Current 1" and "Current 2" (each 20 mA), the sender and the receiver can operate actively. Depending on the other station involved, senders or receivers are operated actively/passively. Here are a few connection examples (TTY series switching).
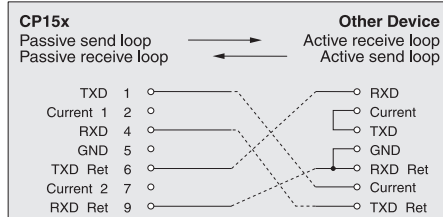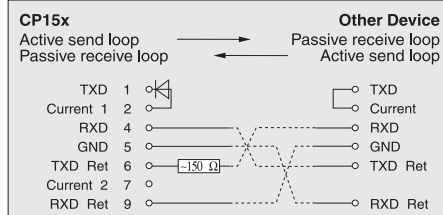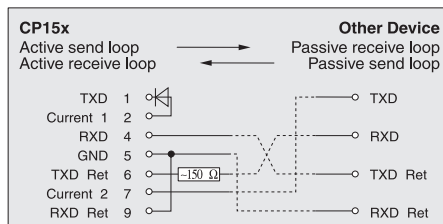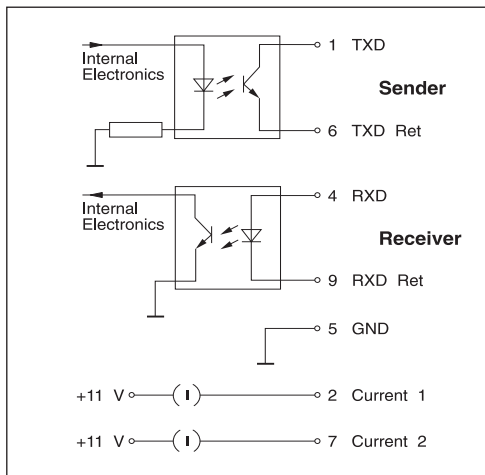
3.10 RS232 INTERFACE (IF1)

The application interface IF1 is not electrically isolated and is able to handle fibre optic cable. The fibre optic cable is supplied through the short circuit protected 4.8 V supply voltage (4.8 V ±6%, max. 150 mA) on pin 4 of the D-type connector (M).

Interface	Description	Pin Assignment		
PG Interface RS232 9 Pin D-type Connector (M)	The standard RS232 interface is freely available to the user. A standard RS232 cable is used for the online connection with PG. This cable is available from B&R: **Description / Model Number**: RS232 Cable — 0G0001.00-090 Max. Baudrate: 64 kBaud Max. Cable Length: 15 m		**RS232**	
		1	DCD	Data Carrier Detect
		2	RXD	Receive Signal
		3	TXD	Transmit Signal
		4	DTR	Data Terminal Ready (+4.8 V / 150 mA)
		5	GND	Ground
		6	DSR	Data Set Ready
		7	RTS	Request To Send
		8	CTS	Clear To Send
		9	RI	Ring Indicator (for modem)

3.11 EXPANSION MASTER INTERFACE

A expansion master is integrated into the CP152 CPU module. An expansion slave from either the 2005 or 2010 systems can be hooked up to this interface (see chapter "Project Planning and Installation" in section "System Configuration and Power Supply").

3.12 NC154 AXIS COUPLING OVER MULTIPLE MODULES

When coupling axes over multiple modules (gears, cams, CNC), the set positions of the master axis are sent to the NC154 modules with the slave axes in an interrupt routine on the main CPU . The interrupt routine is not allowed to be interrupted. These requirements are fulfilled by the following CPUs:

❍ CP152.90-2
❍ CP260
❍ IF260 when used as the main CPU