Application Note CP600: Connecting to an ABB, IRC5 controller

Introduction

The purpose of this document is to guide the reader through the process of establishing communication between an existing ABB IRC5 robotic controller and an ABB CP600 HMI panel. Working knowledge of ABB Robot studio and Automation Builder software is assumed.

Using cross connections to control certain system functions (e.g motors on, motors off) from the HMI panel will also be covered.

Requirements

- ABB Robot / IRC5 Controller
- CP600 HMI Panel
- PC with Automation Builder V1.1 or later with *Robot Studio installed.
- Ancillary equipment: 10/100 Ethernet switch, Ethernet cables

*A separate license must be purchased to use Robot Studio off-line. However, it is not required and this procedure applies to on-line or off-line programming





Configure the IRC5 Robotic Controller

- 1. Connect the PC with Robot Studio to one of the Ethernet ports on the CP600 panel. Connect the IRC5 LAN Ethernet to the other.
- 2. Open existing, or create new Robot Studio Project. The Robot Studio and Panel Builder projects may be created discretely, or they may be contained within a single Automation Builder project.
- 3. Open Robot studio and navigate to the controller tab.
- 4. Click on the "Add Controller" icon, then select "Add Controller".
- 5. Select the robot you wish to work with and click "OK". The robot information will appear in the project tree.
- Click the *Controller* tab and then expand *Configuration* in the Controller tree as shown in Figure 1.a, and then double click *I/O System* to open the Configuration-I/O System tab. Next, select the *Signal* category to open the EIO configuration editor. See Figure 1.b.



Configuration - I/O System	n x			
Туре	Name	Type of Signal	Assigned to Device	Signal Identification Label
Access Level	AS1	Digital Input	PANEL	Automatic Stop chain(X5:11 to X5:6) and (X5:
Cross Connection	AS2	Digital Input	PANEL	Automatic Stop chain backup(X5:5 to X5:6) and
Device Trust Level	AUTO1	Digital Input	PANEL	Automatic Mode(X9:6)
DoviceNet Command	AUTO2	Digital Input	PANEL	Automatic Mode backup(X9:2)
Deviceiver command	CH1	Digital Input	PANEL	Run Chain 1
Deviceinet Device	CH2	Digital Input	PANEL	Run Chain 2
DeviceNet Internal Device	DI10_00	Digital Input	d328A	
EtherNet/IP Command	DI10_01	Digital Input	d328A	
EtherNet/IP Device	DI10_02	Digital Input	d328A	
EtherNet/IP Internal Device	DI10_03	Digital Input	d328A	
Industrial Network	DI10_04	Digital Input	d328A	
Pouto	DI10_05	Digital Input	d328A	
Circal	DI10_06	Digital Input	d328A	
Signal	DI10_07	Digital Input	d328A	
Signal Safe Level	DI10_08	Digital Input	d328A	
System Input	DI10_09	Digital Input	d328A	
System Output	DI10_10	Digital Input	d328A	
	DI10_11	Digital Input	d328A	
	DI10_12	Digital Input	d328A	
	DI10_13	Digital Input	d328A	
	DI10_14	Digital Input	d328A	
	DI10_15	Digital Input	d328A	
	DO10_00	Digital Output	d328A	
	DO10_01	Digital Output	d328A	
	DO10_02	Digital Output	d328A	
	DO10_03	Digital Output	d328A	
	DO10_04	Digital Output	d328A	
	DO10_05	Digital Output	d328A	
	DO10_06	Digital Output	d328A	
	DO10_07	Digital Output	d328A	
	DO10_08	Digital Output	d328A	
	DO10_09	Digital Output	d328A	
	DO10_10	Digital Output	d328A	



Figure 1.b- Edit the IO signals

SimpleProject:View1 140102918HMI22 (Station)

Note: Only I/O signals can be used and only output signals of the robot controller can be modified by the CP600 device. They can only be modified as long as the IRC5 controller is in automatic mode or the FlexPendant is not connected and the signal access level is ALL. Input signals are read only.

- 7. Add physical I/O points to the EIO configuration as necessary.
- Change the access level of any output signal that is to be written from the CP600 HMI to ALL. This step is important as the HMI will otherwise not have write access to these signals.
- Click Save Parameters in the Configuration group, as shown in figure 2. Save the EIO configuration file you your hard drive. Make a note where it is saved as this file will be imported into your Panel Builder project later on.



Figure 2- Save the EIO Config file which will later be used to import t ags into the Panel Builder HMI project.

10. Close or minimize Robot Studio.

Creating the HMI Project in Panel Builder

 If using Panel Builder 600 stand-alone software package to create your HMI then create a new project and proceed to step 4.3. Otherwise, from within Automation Builder create a new *CP600* project by right-clicking project name at the top of the *Devices* tree and adding a new *CP600* or *CP600-eCo* object as shown in Figure 3.

CP600_to_IR0	C5.projec	t* - Autom	ation Bu	ilder Pr	emium 1 Y	ear			(PMR, RCLASSING	stor, New Joy Million	-	
<u>F</u> ile <u>E</u> dit <u>V</u> iew [™] ⊡ ⊯ ∭ ∭ ∰	r <u>P</u> rojec ⊯correl	t <u>T</u> ools <u>V</u> #Nit≨i⊡	<u>V</u> indow	<u>H</u> elp								
Devices					, a x							
= ③ <i>CP60_to</i>	Add	object ate objects Folder Object upare Object	ts			Add ot Obje C:\U Obje Categ Categ B: PL B: PL	yet below : et path senjugicku:(OneD) ories ves meric objects nei - CP600 (.C - Jokeb	ive @ ABB(CP600 IRC)	S Controller(CP600_to_IRCS prop Search object name Name CP600 Control Panel CP600-eCo Control Panel	sct Short Description CP600 Panel project CP600-eCo Panel project	Version 2500 2500	Orde ISAP ISAP
						Clo	se this dialog after e	ach transaction	Display all versions			

Figure 3- Creating a new Panel Builder project within Automation Builder.

- Double-click the newly created *Panel Project* in the *Devices* tree to open Panel Builder 600. When prompted, select *new* project and click *OK*.
- 3. When panel builder opens your project for the first time the Project Wizard dialog appears. Select the panel type and display orientation, then click **OK** (see Figure 4).



Figure 4- Configure the Panel Builder project

- 4. Open the Protocols tab by double-clicking the Protocol icon in the ProjectView tree.
- 5. Click the add protocol, + icon at the top left of the Protocol tab, and then select the ABB IRC5 protocol from the PLC dropdown list (see Figure 5). The protocol editor dialog will open.

ŝ.	ProjectView #	× 1:Page1 Protocols* ×			_
Object	+ - 4 ∧ ∨ ■ ■ Panel Project	+ - ^ / 2	Configuration	Dictionaries	Enable
/iew	→ Project properties → Pages → 1: Page1 → Dialogs → Templates →	ABB CoDeSys ETH ABB CoDeSys Serial ABB Mini Controller HCP ABB Modus RTU ABB Modus RTU ABB Modus RTU ABB Pluo Donet Done	ABB IRC5 PLC Network Alias IRC5 IP address 192.168.3.10 PLC Models default	OK Cancel	

Figure 5- Add and configure the ABB IRC5 communication protocol.

6. The only mandatory setting in the protocol editor is the *IP address*. Enter the IP address of the IRC5 in this field. If desired, enter an arbitrary *alias* to identify the IRC5 controller in your project.

Check the *PLC box* only if the panel will connect to more than one IRC5 controller, then enter the IP address for each controller. 7. Next, open the *Tags* tab by double-clicking the *Tags* icon in the *ProjectView* tree.

8. Ensure the IRC5 protocol is selected in the dropdown at the top of the Tags tab, then click the import tags button, >], as illustrated in figure 6. When prompted select the *CFG_1.0:5:0:* importer and click *OK*.



Figure 6- Import the EIO config file, which Panel Builder will use to create tags for the IRC5 protocol.

Navigate to the EIO config file saved in step 3.9, and then click Open. All of the available tags from the IRC5 controller will appear in a list at the bottom of the Tags tab. Select one or more tags to import into your project and click the Import Tags button (Figure 7).

Panel builder supports the following tag (signal) types:

- Bool (DI, DO)
- UINT (GI, GO)
- Real (GI, GO, AI, AO)

Hint: Use shift-click or Ctrl-click key combinations to select multiple tags.

	ABB IRC5:prot1	▼ 6. □			
Name	Group Driver	Address	Encoding	Comment	Simulator
RC5/DI10_00	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_01	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_02	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_03	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_04	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_05	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_06	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_07	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_08	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_09	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_10	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_11	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10_12	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10 13	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10 14	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DI10 15	ABB IRC5:prot1	192.168.3.10 IOSignals DI1			Variables
RC5/DO10 00	ABB IRC5:prot1	192.168.3.10 IOSignals DO			Variables
RC5/DO10 01	ABB IRC5:prot1	192.168.3.10 IOSignals DC			Variables
RC5/DO10 02	ABB IRC5:prot1	192.168.3.10 IOSignals DC			Variables
RC5/DO10 03	ABB IRC5:prot1	192.168.3.10 IOSignals DO			Variables
RC5/DO10 04	ABB IRC5:prot1	192.168.3.10 IOSignals DO			Variables
	400,000 11	1001000 1000			AZ 2.11
**7					
ecursive	Search	Filter by: Data			
ta Type			 Property 	/ Value	
ABB IRC5:prot1					
ABB IRC5:prot1 Alias: IRC5 Container					
ABB IRC5:prot1 Alias: IRC5 Container Model: default			_		
ABB IRC5:prot1 Alias: IRC5 Container Model: default DI10_00 boolean DI10_01 boolean					
ABB IRC5:prot1 Alias: IRC5 Container Model: default DI10_00 boolean DI10_01 boolean DI10_02 boolean			=		
ABB IRCS:prot1 Alias: IRCS Container Model: default DI10_00 boolean DI10_01 boolean DI10_02 boolean DI10_03 boolean			=		
ABB IRCS:prot1 Alias: IRCS Container Model: default DI10_00 boolean DI10_01 boolean DI10_02 D010_02 boolean DI10_02 D010_02 boolean DI10_02 D010_03 boolean DI10_04 D000 boolean DI10_05			=		
ABB IRC5:pr011 Alas: IRC5 Container Model: default DI10_00 D10_010 boolean DI10_02 boolean DI10_03 boolean DI10_04 boolean DI10_05 boolean DI10_06 boolean DI10_07 boolean DI10_08 boolean DI10_09 boolean			Ξ.	Too many itom	e colacted
A88 IRC5:prot1 Alas: IRC5 Container Model: default DI10_00 boolean DI10_00 boolean DI10_02 boolean DI10_04 boolean DI10_05 boolean DI10_06 boolean DI10_06 boolean DI10_07 boolean			E .	Too many item; On only show one	s selected. item at a time.
ABB IRC5:prot1 Allas: IRC5 Container Model: default DIL0_00 DIL0_01 boolean DIL0_02 boolean DIL0_03 boolean DIL0_04 boolean DIL0_05 boolean DIL0_06 boolean DIL0_07 boolean DIL0_06 boolean DIL0_07 boolean DIL0_08 boolean			=	Too many item: Can only show one	s selected. item at a time.
ABB IRCS:prot1 AlBa: IRCS Container Model: default DII0_00 boolean DII0_01 boolean DII0_02 boolean DII0_02 boolean DII0_04 boolean DII0_02 boolean DII0_04 boolean DII0_04 boolean DII0_05 boolean DII0_05 boolean DII0_06 boolean DII0_06 boolean DII0_07 boolean DII0_08 boolean DII0_09 boolean			E	Too many item Can only show one	s selected. Item at a time.
ABB IRC5:prot1 Allas: IRC5 Container Model: default D110_01 boolean D110_01 boolean D110_02 boolean D110_02 boolean D110_04 boolean D110_06 boolean D110_06 boolean D110_07 boolean D110_09 boolean			Ξ.	Too many item: Can only show one	s selected. item at a time.
ABB IRC5:prot1 Allas: IRC5 Container Model: default DI10_00 boolean DI10_01 boolean DI10_01 boolean DI10_02 boolean DI10_04 boolean DI10_05 boolean DI10_05 boolean DI10_07 boolean DI10_09 boolean DI10_09 boolean DI10_01 boolean				Too many item Can only show one	s selected. item at a time.
ABB IRC5:prof1 Allas: IRC5 Container Model: default DID_00 DID_01 boolean DID_02 boolean DID_03 boolean DID_04 boolean DID_05 boolean DID_04 boolean DID_05 boolean DID_06 boolean DID_07 boolean DID_06 boolean DID_07 boolean DID_08 boolean DID_09 boolean DID_10 boolean DID_11 boolean DID_12 boolean			E .	Too many item Can only show one	s selected. item at a time.
ABB IRCS:prot1 Alias: IRCS Container Model: default D10_00 boolean D10_01 boolean D10_01 D10_01 boolean D10_02 D10_02 boolean D10_03 D10_03 boolean D10_04 D10_04 boolean D10_05 D10_05 boolean D10_06 D10_06 boolean D10_07 D10_07 boolean D10_08 D10_08 boolean D10_01 D10_01 boolean D10_01 D10_02 boolean D10_02 D10_03 boolean D10_04 D10_04 boolean D10_04 D10_05 boolean D10_04 D10_01 boolean D10_04 D10_01 boolean D10_01 D10_12 boolean D10_13 D10_014 boolean D10_014			Ξ.	Too many item Can only show one	s selected. item at a time.

Figure 7- Import tags from the EIO Config file.

- 10. Now the HMI pages can be created. Start by clicking the empty page in the *ProjectView* tree. By default this page will be the first page that appears when the CP600 boots up. More pages can be created by right-clicking the *Page* folder and selecting *Insert New Page* from the context menu.
- 11. As shown in Figures 8.a and 8.b, various elements, or widgets can be dragged from the Widget Gallery and dropped onto your project. Attach IRC5 tags to the widgets simply by clicking the add tag [+] icon in the Value property for the currently highlighted widget and selecting the tag from the tag list.



Hint: click on a palate heading in the Widget Gallery to bring up more widget options (see Figure 10).

Figure 8.a- Drag control elements, or widgets onto the HMI screen.

				8											
1:Page	el* ×	Protocols	Tags*								Pro	perties		a x	Ŵ
	0 A 2	10096					1 -	. M. w			Ð	🐺 💭			15
ada	442	100%									Ð	Light : Ligh	ntsStd1		10
a a 2	- ÷ 0	1 E Ø	Sector Se		▼ 8 ▼ <u>A</u> ▼ B .	/ <u>U</u> III: 3	Ξ.					Value	0	1	18
	_	_					-					Calas	wh(400,400,400) wh(055,0,0)	1.1	1 3
- Lia	ht.value								-	XI		COIOI	rgb(120,120,120);rgb(255,0,0)		9
									_			Label		+	1
Source:	: 💿 та	g 🔘 Alias	🔘 System 🕚	🕑 Widget 🔘 Recipe								Show Frame	true		
Dr. Sc	arch			V Filter by Data	Protocol: Show all	-	m	Show all tags			۲	Events			
										_					
Data	^	Туре	Tag name				^	Property	Value	^					
	DI10 11	boolean	IRC5/DI10 11					Driver							
	DI10_12	boolean	IRC5/DI10_12	2				Allac	TRCS.						
	DI10_13	boolean	IRC5/DI10_13	3				Madal	defends						
	DI10_14	boolean	IRC5/DI10_14	1				Model	berouic	_					
	DI10_15	boolean	IRC5/DI10_15	5				Protocol	ABB IRC5:prot1	_					
	DO10_00	boolean	RC5/DO10_0	0		_		🖯 🕀 Tag		÷					
	0010_01	boolean	RC5/D010_0	1			_	Active	false						
	0010_02	boolean	IRC5/0010_0	12			18	Comment							
	0010_03	boolean	IRC5/0010_0	13			16	Data Type	hoolean						
	0010_04	boolean	IRCS/DO10_0	5				Defaulturelue	boolean	_					
	DO10_05	boolean	IRC5/DO10_0	16			18	Derault value		- H.					
	DO10_07	boolean	IRC5/DO10_0	17			18	Encoding		_					
	DO10 08	boolean	IRC5/DO10 0	8				Groups							
	DO10 09	boolean	IRC5/DO10 0	9				Max value							
	DO10_10	boolean	IRC5/DO10_1	.0				Min value							
	DO10_11	boolean	IRC5/DO10_1	1				PLC tag name	APR 12C5-prot1-uid0-D010_00						
-	DO10_12	boolean	IRC5/DO10_1	2				Daw.	Date:						
	DO10_13	boolean	IRC5/DO10_1	3			11	N/W	P(YY	_					
-	DO10 14	boolean	IRC5/DO10 1	4				Rate	500						

- 12. You can edit other properties for each widget such as text, size, color etc... Anywhere the + icon appears you can attach a tag to change that property dynamically during run time.
- 13. Save your project by clicking the Save Project icon 🗊
- 14. Before loading the HMI project to the panel, the panel IP address must be configured to communicate on the same subnet as the IRC5 controller. Choose a unique network address that exists on the same subnet. That is to say if the IRC5 IP address is AAAA.BBBB.CCCC.DDDD the panel address must be set to AAAA.BBBB.CCCC.EEEE where EEEE is a value between 0000 and 0254 and is a unique ID on the network.

Note: The IP address of the IRC 5 controller can be viewed on the Flex Pendant

- Apply power to the panel and allow it to boot-up.
- If the panel boots to a black screen with two icons in the upper left corner then select *System Settings* to open the system menu (if this is the case the panel does not yet have a runtime system installed. Configure the IP address as instructed below and then refer to appendix A for instructions on installing the runtime system). If the panel boots to anything other than described above press a spot on the screen for several seconds until the contextual menu appears and select *Show System Settings*...
- Press *Next* or *Back* until *Network* is highlighted. Change the IP address of the panel and ensure the Subnet Mask is set to 255.255.255.0. Close the Network settings dialog and reboot the panel.
 Hint: the touchscreen is resistive so a pen cap or other stylus can be used to type values into the IP value field.
- 15. Now the project can be loaded to the panel by selecting *Download to Target* from the *Run* menu. When the *Download to Target* dialog opens simply enter the IP address of the CP600 panel (or click [V] to find the panel on the network) and click *Download*.
- 16. Test your HMI project.

Creating Cross Connections

- 1. To create a cross connection open your project in Robot Studio.
- Click the Controller tab and then expand *Configuration* in the Controller tree as shown in Figure 1.a, and then double click *I/O System* to open the Configuration-I/O System tab. Next, select the *Signal* category.
- 3. Create the desired signals to be cross connected to controller output signals. Remember to set the Access Level to ALL.
- 4. Now select the *Cross Connection* category.
- 5. Right-click the *Cross Connection* category and select *New Cross Connection* from the context menu.
- 6. Enter settings for the cross connection as follows:

Setting	Value
Name	Unique but arbitrary tag name
Resultant	Destination signal (i.e. output) for the cross connection
Actor	This is the signal that will be cross connect, or copied to the Resultant signal
Invert	Optional, if Yes is selected the Resultant signal will be the reciprocal of the Actor signal
Operator	Optional, logical operation if the Resultant signal is to be the logical AND or OR of multiple Actors.
Actor25	Actors that will be ANDed or Ored with the Actor if an operator is selected

- 7. Select **Save Parameters** from the **Configuration** group once all of the desired cross connections have been created.
- 8. Refer to steps 7-9 in *Creating the HMI Project in Panel Builder section* to import cross connection signals to the Panel Builder HMI project.

Appendix A – Installing the CP600 Runtime System

HMI devices are delivered from factory without Runtime. When you power up the device for the first time, the Runtime Loader window is displayed.



The Runtime Loader presence depends on the device Operating System and may not be available on all the units.

Installing Runtime with a project

1. Click *System settings*: the *System* menu is activated in user mode.

Ready to download	Target device does not have Runtime Do you want to install Runtime ?
192 , 168 , 7 , 129	

- 2. Download a project with PB610 Panel Builder 600 to install the Runtime. When you download a project the Runtime is automatically installed if needed. See *"Transferring the project to HMI device"* for details.
- 3. Click Install Runtime: the procedure is run automatically.

Installing Runtime from a USB drive

Important: Old versions of HMI devices may not include the Runtime Loader. Contact technical support if you need further information.

1. Prepare the Update Package by selecting Run > Manage Target. Next click Update Package.

Update Package	×
-	
Target	٣
V Project	
IMI Runtime & Plug-In	
I Binary format	
Veb Project	
Set Target Password	
User Files	
C:\Workspace\	
Encrypted	
Location :	
C:\Workspace\	

- 2. Plug the USB drive in the device and click **Transfer from disk**.
- 3. Follow the instructions displayed.

Reference Document

Document Name	Document Number	Rev/Ver
Panel Builder programming software manual for CP600 control panels	3ADR059001M0207_PB610_Panel_Builder_600_EN.pdf	Rev 2.00
Panel Builder programming software manual for CP600-eCo control panels	3ADR059056M0201_PB610-B_Panel_Builder_600_EN.pdf	Rev 2.00
Communication protocols for CP600 control panels	3ADR059053M0201.pdf	V1.91
Robot Studio programming manual	3HAC032104-001	Rev 6.01



