Application Note

Applying Hardwired SCADA Connections to the PCD

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Occasionally, a utility cannot set up direct communication to their IEDs through the unit's RS-232 port using a protocol such as DNP3.0 or Modbus. This may be because the RTU does not have the capability, or the utility doesn't have the resources to convert to a protocol interface between the RTU and the IED at one or more installations.

However, it is still possible to establish basic communication with a recloser to obtain status and control, allow quick visibility of status and condition, and operate remotely. This type of communication can be done through physical contacts on the back of the PCD and does not require a RS-232 port. The user needs only to program the hard contacts on the rear of the control, using the programming software, WinPCD. This paper will guide you through the set up of the programmable inputs and outputs to make the physical contacts work.

The PCD in the VR configuration is limited to 4 physical outputs and 6 physical inputs, plus one self-check alarm and a loss of AC alarm (on units with the capacitor assist module). The outputs are dry and the wetting voltage may be AC or DC and must not exceed the ratings listed for output contacts in the ratings section of the PCD Instruction Book. The physical inputs, however, must be wetted by same voltage as listed at the bottom of the DIO Type 1 card, and the same as the DC output voltage of the UPS / Power Supply card. This is typically 48 VDC in VR applications, 24 VDC in recloser retrofit applications.

This paper will concentrate on VR applications since the recloser retrofits typically come pre-mapped from the factory. Figure 1 shows a typical arrangement for a PCD used on the VR-3S recloser. Note the physical input and output contacts on the DIO Type 1 module.

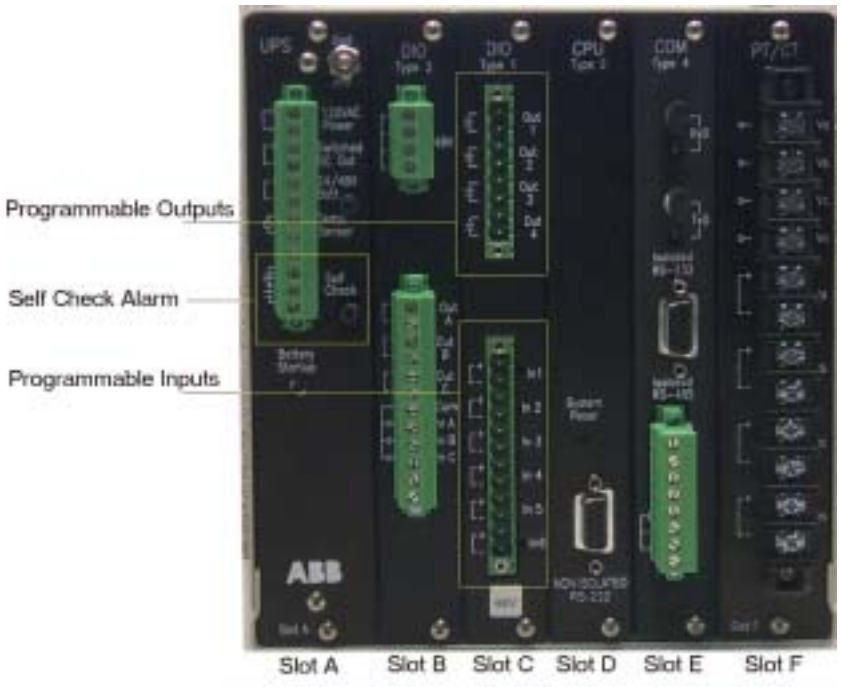

Figure 1 – Rear View of PCD

The following inputs and outputs will be mapped in the following example. Note, contacts are identified by their number and the slot ID as shown above:

OUTPUTS:
Out1c: 52a - Breaker Status - Closed when unit is closed
Out2c: 79DA - Reclose Blocked Status - Closed when reclosing is blocked
Out3c: GRD-D - Gound Blocked Status - Closed when ground tripping is disabled
Out4c: 79 LOA - Closed when unit is open and locked out
Self Check: Form C contact indicating normal operation of the unit
Power Loss: Form C contact closed when AC is not applied and battery has drained below approximately 40 VDC (Located above the Capacitor Assist Module in the VR-3S)

INPUTS:
Input1c: OPEN - Open Breaker - Energize when necessary to trip the unit remotely
Input2c: CLOSE - Close Breaker - Energize when necessary to close the unit remotely
Input3c: 43a - Recloser Enable - Energize to disable reclosing
Input4c: GRD - Ground Block - Energize to disable ground tripping
Input5c: ALT1 - Alternate 1 Settings - Energize to switch to Alternate 1 settings

Note: For the VR-3S configuration, contacts on the B slot are reserved for operation of the magnetic actuators and are not available for customer use.

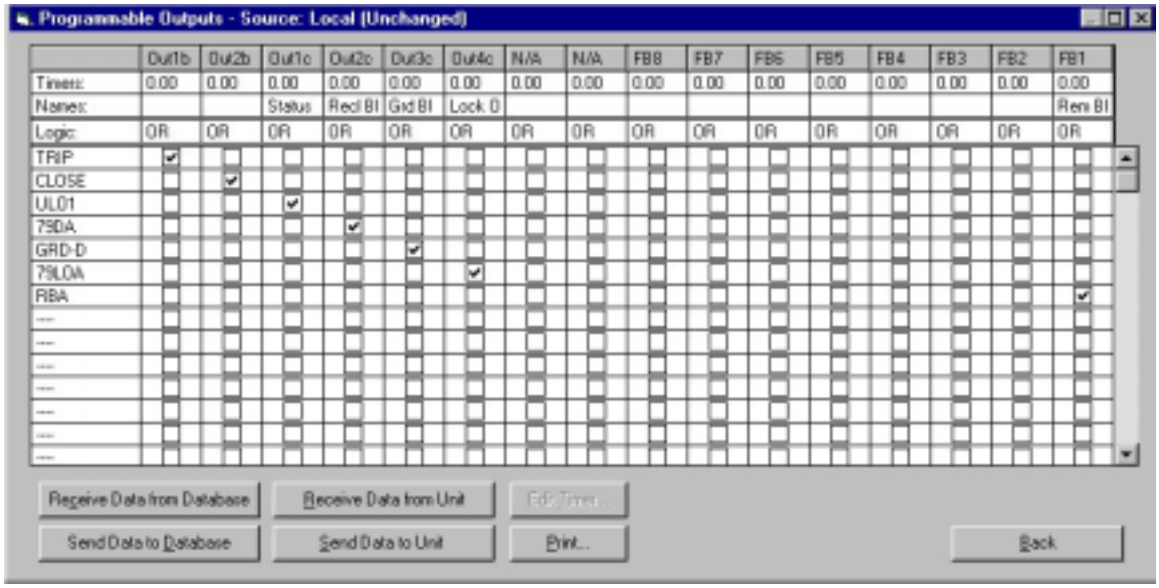

Figure 2 – Programmable Output Mapping

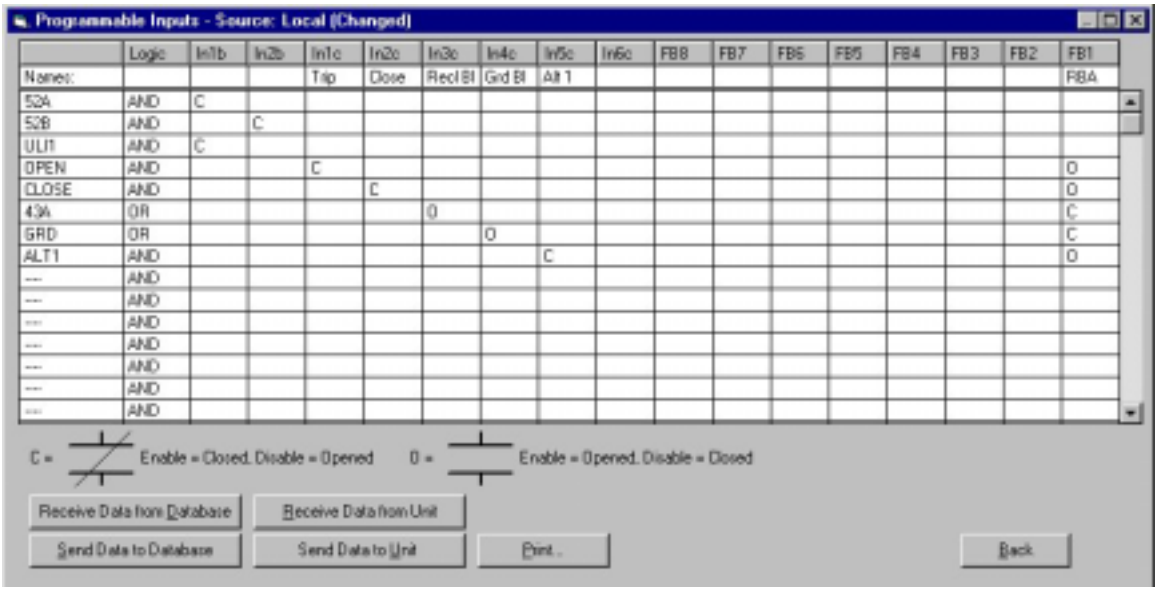

Figure 3 – Programmable Input Mapping

STEP 1: Program the physical outputs using WinPCD. See Figure 2 for mapping of example.

Breaker Status: In order to obtain status of the unit, it is best to monitor the 52a switch that resides in the high voltage unit. This limit switch follows the pole position and is wired into the PCD as Input 2b. To monitor this contact, go to the programmable inputs, place a "C" under Input 1b on a free line and select the term ULI1 (User Logical Input 1) as shown on Figure 3. The ULI1 passes logical information from the programmable inputs (ULIs) to the programmable outputs (ULOs). Next, go to the programmable outputs and on a free line select the term ULO1. This will pass the 52a status to a physical output which can be monitored by an RTU. For this example, use Output 1c. When the unit is closed, this contact will be closed.

79DA: This logical output is energized when reclosing is blocked from either a remote source or from the front panel pushbutton. In this example, the logical output is mapped to Output 2c. When reclosing is blocked, this contact will be closed.

GRD-D: This logical output is energized when ground tripping is blocked from either a remote source or from the front panel pushbutton. Map this logical output to Output 3c. When the ground tripping is blocked, this contact will be closed.

79LOA: This logical output is energized whenever the unit is locked out. For this example, the logical output is mapped to Output 4c. When the unit is locked out, this contact will be closed.

Self Check: Wire as desired to the Form C contact on the UPS/PS card. Note that when the unit is energized and healthy, the contacts are held in the OPPOSITE of normal (as shown on the module) state. This way, if power is lost or the unit has a problem, this contact will fall out.

Power Loss Indicator: Wire as desired to the Form C contact on the top of the Capacitor Assist Module. This is only applicable to the VR-3S design. Note that when AC is applied and the battery voltage is above 40 VDC, the contacts are held in the OPPOSITE from normal (as shown on the module) state. This way, if power is lost or the unit has a problem, this contact will fall out.

STEP 2: Program the physical inputs using WinPCD. See Figure 3 for mapping of example.

For all the outputs, it is necessary to "interlock" the input signals with the unit's internal Remote Blocked Alarm (RBA) in order to prevent control when the unit operator activates the remote blocked button. This is automatically taken care of when doing serial communications using a protocol, but when using the physical inputs it must be mapped. This is done by monitoring the RBA output.

To do this, first map the RBA to one of the Feedback (FB) outputs. In this example, we map RBA to FB1. Feedbacks pass logical outputs to the logical inputs table. Then, map the FB1 input terms to each of the control points we wish to interlock.

OPEN: When energized with a momentary signal, this logical input causes unit to trip the breaker. Map the OPEN command with a “C” to Input 1c. Also, interlock with FB1 using “AND” logic as shown.

CLOSE: When energized with a momentary signal, this logical input causes unit to close the breaker. In this example, map the CLOSE command with a “C” to Input 2c. Also, interlock with FB1 using “AND” logic as shown.

43a: When energized with a continuous signal, this logical input causes the control to block reclosing, i.e.: the unit becomes a one shot device. Map the 43a command with an “O” to Input 3c. Note that this must be inverted because reclosing is blocked when the contact is NOT energized as explained in the PCD manual. Also, interlock with FB1 using “OR” logic as shown.

GRD: When energized with a continuous signal, this logical input causes the control to block ground tripping. Map the 43a command with an “O” to Input 4c. Note that this must be inverted because ground tripping is blocked when the contact is NOT energized as explained in the PCD manual. Also, interlock with FB1 using “OR” logic as shown.

ALT1: When energized with a continuous signal, this logical input causes the control to block ground tripping. Map this logical input to Input 5c. Also, interlock with FB1 using “AND” logic as shown.

STEP 3: Test the Input and Output Contacts

The user has several tools available to verify the success of programming before placing the unit into service. From the HMI, input contacts can be forced to the closed state without a voltage source. In the Main Menu, select Operations – Force Physical Input. To force a trip, select In1c and select Forcing State of “C”. If the unit was closed, it should trip. Reset this back to “N” to remove the forcing of the contact, and move to the next Force Physical Input. Alternatively, WinPCD will allow you to Force Physical Inputs through its Operation Menu, as well as monitor the contact status from its Test Menu. Important: When activating contacts through the Force Physical Output function, remember to reset the contact to the Normal “N” state, or it will remain active. Or cycle power to the unit as it will also reset the contacts to the normal state.

The latest information on the PCD control can be found at our website at www.abb.com/mediumvoltage.
(Select PCD from the dropdown Shortcuts menu.)

For additional support or information please call ABB Inc. at 1-800-929-7947 Ext. 5 or +1-407-732-2000 Ext. 5.