



## **IC2 LONG RANGE**

**-STANDARD  
-ADDRESSABLE**

## **EARTH CONTINUITY RELAY**

**A00620  
A00638, A00639**

**Operation Manual**

## IC2 Long Range EC Relay Manual

Part number: A00620  
A00638  
A00639

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# Overview

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The IC2 Long Range EC Relay is a microprocessor based relay that monitors the condition of the pilot circuit in a supply cable, preventing a user from applying power to an outlet that has no load connected or a damaged supply cable.

The IC2 can provide either Local or Remote control at the flick of a switch, which allows remotely start and stopping of the supply to the machine from the remote machine pilot circuit.

Operates transparently on pilot circuits with Bramco Pilot node fitted.

It also has increased noise immunity, greater tolerance to cable capacitance, which in turn provides vast increases in operational distances.

These IC2 relays are particularly suited for operation on high voltage long distance supply cables.

## **Standard Version:**

Long range operation with/without SP Node.

## **Addressable Version:**

A feature of the IC2 is the ability to terminate the pilot circuit with a Bramco *Pilot Node* (A00254). The node provides additional protection by preventing the outlet from being powered when an incorrectly addressed node is terminating the pilot circuit. The basic concept is that a multi-outlet DCB can have each outlet set up with protection settings for specific machines. Each machine would have a node connected to its pilot termination. The node has been programmed with an address that corresponds to the outlet with the appropriate protection settings. If a machine is plugged into an outlet where the IC2 relay address differs from that programmed into the node, the IC2 WILL NOT energise its Control Relay contacts, regardless of the healthy state of the pilot circuit. This prevents a user from connecting machinery into an outlet with incorrectly set protection parameters.

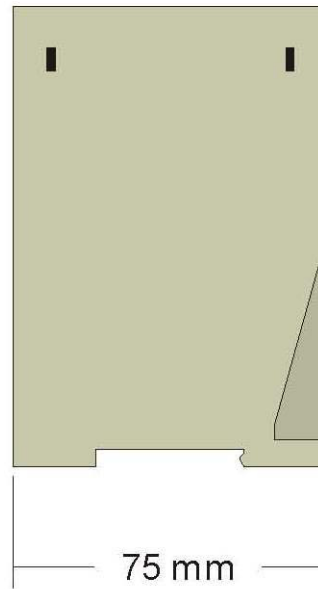
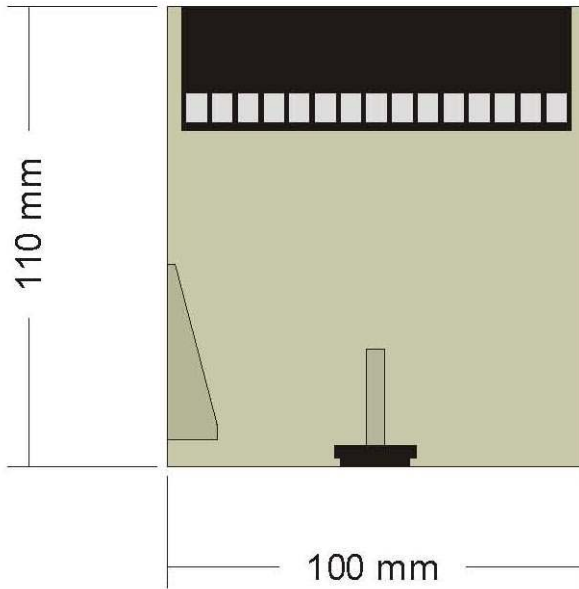
## 1. Physical Layout

The relay provides facilities for either DIN rail mounting or screw mounting. A diagram of the relay is shown below, along with dimensions.

See Appendix A for the typical connection diagram and pilot termination options.

See Section 3.3 for specifications and important power supply information.

# 1.1. Enclosure Dimensions



## 2. Operation

More detailed descriptions of the protection features follow.

See Appendix A for a typical connection diagram and pilot terminations for both Local and Remote modes of operation.

### 2.1. Local Control Mode

This operation mode is selectable via the *LOCAL/REMOTE* slide switch on the front of the unit. In local mode, the relay monitors the continuity of the pilot circuit in a supply cable by grounding the pilot core via a diode and/or a *Pilot Node*. The unit is fail-safe and if the pilot resistance exceeds 45 Ohms, or the diode characteristic is not seen at the end of the line (i.e., the pilot is shorted to ground, or diode open circuit) the unit will trip and the Control Relay (CR) will de-energise.

### 2.2. Remote Control Mode

This operation mode is selectable via the *LOCAL/REMOTE* slide switch on the front of the unit. Remote control is an extension of the EC capabilities. It provides a facility for remotely starting and stopping a machine. A diode or *Pilot Node* is still required to terminate the pilot core. In this mode, a 100 Ohm resistor must be inserted into the pilot circuit. This allows the outlet power to be controlled from the machine itself. A *START* condition is recognised when the 100 Ohm resistor is momentarily shorted. A *STOP* condition occurs when the pilot is open circuited. An important issue that must be remembered whilst using Remote Control is that Local Start is NOT possible.

The Start Short Relay (SSR) is provided within the relay (TERM 11 and 12) for the Remote Control function. This relay is to be wired in parallel with the local start button. This is shown in the typical connection diagram in Appendix A. The SSR enables the module to bridge the local start button and hence allow remote control. Although Local Start is not possible when in Remote Control Mode, it is recommended that the starter be wired for both Local and Remote Control modes of operation. This allows greater flexibility as the operation mode can be changed at the flick of a switch.

The SSR is energised under the following conditions.

1. The pilot circuit has been analysed and found to have a resistance between 100 and 145 Ohms (100 Ohm starting resistor, 0 – 45 Ohms of pilot resistance). The *REMOTE START READY* LED will be on when the pilot resistance is in the range 100 – 145 Ohms.
2. The circuit resistance drops to 0 – 45 Ohms (indicating that *START* has been pressed). The *REMOTE START READY* LED will then go out and the Control Relay will energise. Under these circumstances the SSR will also close. The *START* pushbutton can then be released and the 100 Ohm resistor is brought back into the circuit.

The SSR and Control Relay will drop out if the Auxiliary contact input (AR, Term 13) is not closed within 2 seconds of the start condition. The reason for this is that the start condition should not be maintained if the main contactor has failed to close.

## 2.3. Latching/Non-Latching Modes

These operation modes are selectable via the *LATCH/NON-LATCH* slide switch on the front of the unit.

Any trip in Latch mode causes the relay to latch the Control Relay contacts in the fault position. A manual reset (bridging TERM 14 and 15) is required to allow the Control Relay contacts to operate.

**Note:** that when in Remote Control, Latching is disabled.

In Non-Latch Local mode, the Control Relay contacts will operate as soon as the fault is cleared and the pilot circuit is healthy.

In Non-Latch Remote mode, the Control Relay contacts will operate as soon as the fault is cleared, the pilot circuit is healthy and a *START* condition has occurred.

## 2.4. Node/Diode Modes – Addressable Model Only

These are selected via the rotary hexadecimal Address switch on the front of the unit.

### **Address Switch set to 0:**

The IC2 Relay operates in Diode mode. Either diode or node termination will operate the unit. The Control Relay will function as described above.

### **Address Switch set from 1 to F:**

The IC2 Relay operates in Node mode. As soon as the pilot circuit becomes healthy, the IC2 Relay will request the address of the node connected to the pilot circuit. If there is no node response (as with a diode connection or faulty node), or the returned address does not match that set by the rotary Address Switch on the front of the IC2 then the Control Relay will be held in a faulted state. The Relay will still display the condition of the pilot circuit as appropriate for the mode of operation selected. The Control Relay contacts will only operate if the node connected to the pilot has been programmed with the same address as the setting on the IC2 Address Switch.

## 2.5. Programming Nodes – Addressable Model Only

To program a node, a Programming Mode switch (NO, TERM 18 and 19) and a Start Program pushbutton (NO, TERM 20 and 21) must be connected as per the Programming Configuration in Appendix B.

Note that the IC2 Addressable Relay will not program a node if AR is in, ie power is applied to the outlet. The IC2 Control Relay will not energise when in Programming Mode.

- Close the Programming Mode switch to enable node programming.
- Set the required address on the IC2, noting that setting the unit to 0 enables Diode mode of operation and disables the node programming function.
- Connect the node to be programmed to the IC2 Addressable.
- Wait for the *EC HEALTHY* LED to be lit (and *REMOTE START READY* if in Remote Control mode). If it does not turn on, either the node is connected incorrectly, or the node is faulty.
- Press the Start Program pushbutton and hold until the following LEDs are all lit – *OPEN*, *SHORT*, *EC HEALTHY* and *REMOTE START READY*.
- The pushbutton can now be released. The unit will program the node with the selected address.
- Upon completion, the unit performs a programming verification.
- If the node has been programmed correctly, the *EC HEALTHY* LED will flash 3 times. If a programming failure has occurred both the *OPEN* and *SHORT* LEDs will flash 3 times.
- The relay will then return to monitoring the pilot circuit and the *EC HEALTHY* LED will be lit, as will the *REMOTE START READY* LED if in Remote Control mode.

## 3. Installation

### 3.1 General Recommendations

For optimum performance of the IC2 Relay, good installation practices are essential. Following is a list of some key recommendations for installation.

A typical connection diagram is included in Appendix A.

Wherever possible, use shielded cable for the following inputs, 13, 18, 19, 20 and 21, as shown in Appendix A and B.

It is recommended that cable runs are minimised and maximum clearance from high

voltage is maintained as much as practically possible.

It is recommended that Pilot Protection Units (A00511, see Appendix C) and fuses be installed in the starter panel and at the pilot termination in the machine, as shown in the Typical Connection Diagram in Appendix A. It is also good practice to use a reasonably large rectifier diode for pilot termination, such as a 1N5404 or similar. The use of these components will greatly reduce the likelihood of transient voltage spikes, such as those that can occur during main contactor closure or via a lightning strike, causing damage to either the IC2 or the Node. By following these guidelines optimal performance of the IC2 Relay will be obtained.

### 3.2 Terminal Connections – A00620 Only

Terminal Number	Description
1	AC/DC power
2	AC/DC power
3	No connection
4	No connection
5	CR1 NO
6	CR1 COM
7	CR1 NC
8	CR2 NO
9	CR2 COM
10	CR2 NC
11	SSR
12	SSR
13	AUX RELAY

Terminal Number	Description
16	No connection
17	No connection
18	No connection
19	No connection
20	No connection
21	No connection
22	No connection
23	No connection
24	No connection
25	No connection
26	No connection
27	No connection
28	No connection

### 3.3 Terminal Connections – Addressable Model Only

Terminal Number	Description
1	AC/DC power
2	AC/DC power
3	No connection
4	No connection
5	CR1 NO
6	CR1 COM
7	CR1 NC
8	CR2 NO
9	CR2 COM
10	CR2 NC
11	SSR
12	SSR
13	AUX RELAY
14	RESET
15	RESET

Terminal Number	Description
16	No connection
17	No connection
18	Programming mode enable
19	Programming mode enable
20	Start Programming
21	Start Programming
22	No connection
23	No connection
24	No connection
25	No connection
26	No connection
27	No connection
28	No connection
29	PILOT
30	EARTH

### 3.4 Specifications

Supply Voltage	A00620 – 110V AC A00638 - 24V AC/DC (TERM1 & 2) A00639 – 110V AC (TERM1 & 2)
Local Control	Relay trips at >45 ohms. Failsafe. Latching or Non-Latching.
Remote Control	Relay trips at >145 ohms (45 ohms + 100 ohm start resistor). Failsafe. Non-Latching only.
Relay Contact ratings	CR1, CR2 and SSR - 5A 250Vac, 100VA max

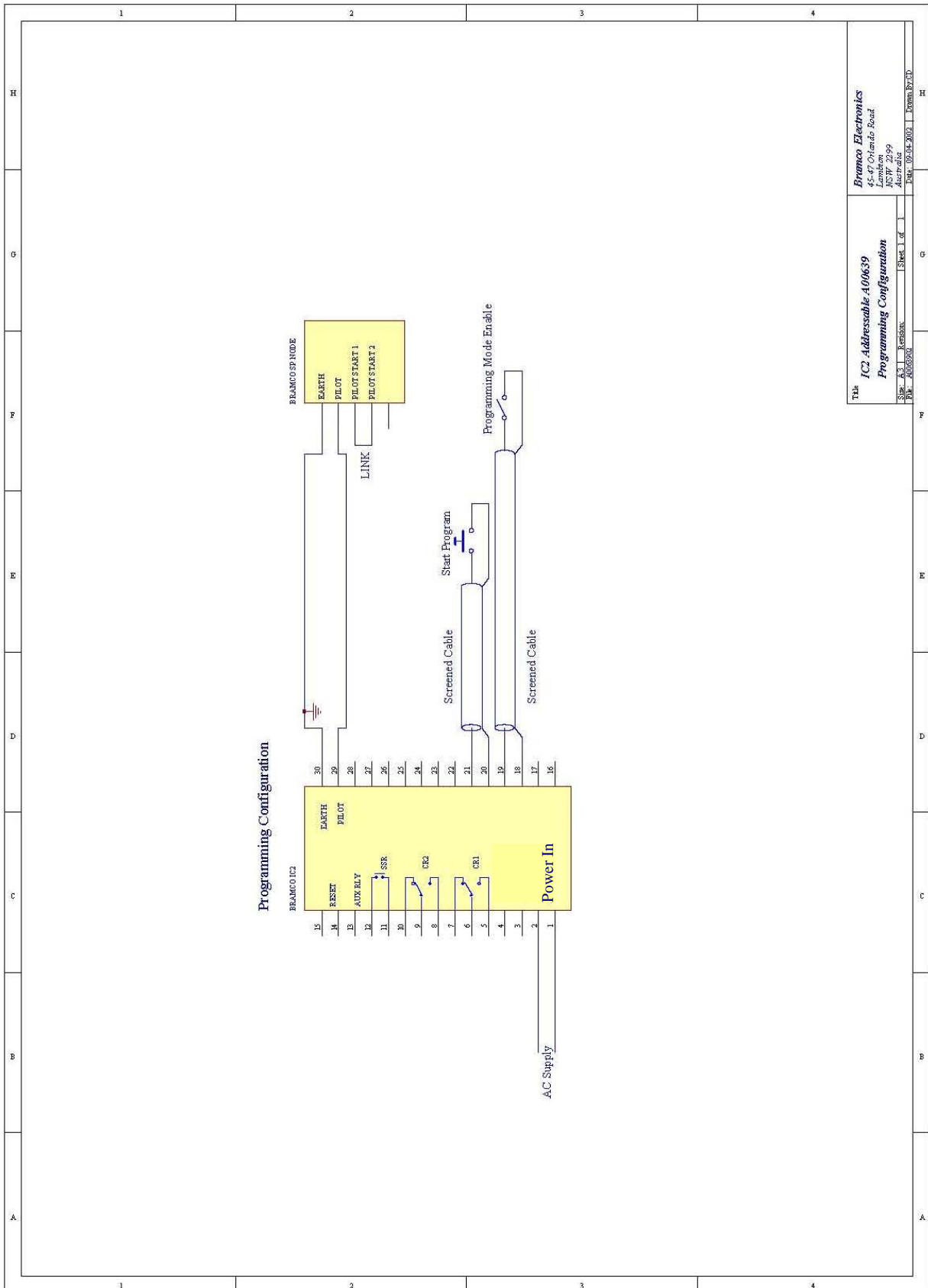
## 4. Fault Diagnosis

To assist in fault diagnosis, a variety of typical faults are shown, with possible solutions given.

INDICATION	POSSIBLE CONDITION/SUGGESTION
<i>OPEN</i> LED is on	<p>An open pilot circuit has been detected, or there is a measurable resistance in the pilot that is outside the legal range (ie &gt;45 Ohms in Local Mode, or &gt;145 Ohms in Remote Mode).</p> <ul style="list-style-type: none"> <li>-Ensure that a machine is plugged into the appropriate outlet.</li> <li>-Ensure that there are no "stop" or safety circuits in place that may be holding the pilot circuit open.</li> <li>-Perform a complete continuity and resistance test on the pilot circuit.</li> <li>-Ensure that the termination diode/Node is wired with the correct polarity.</li> <li>-The Node or Diode termination may be faulty. Try replacing them.</li> </ul>
<i>SHORT</i> LED is on	<p>A pilot short has been detected.</p> <ul style="list-style-type: none"> <li>-Perform a complete short circuit test on the pilot circuit.</li> <li>-Inspect panel wiring and termination wiring for obvious shorts due to poor connections etc.</li> <li>-Inspect the trailing cable for damage. Replace cable if necessary.</li> <li>-The Node or Diode termination may be faulty. Try replacing them.</li> </ul>
Both <i>OPEN</i> and <i>SHORT</i> LEDs are on	<p>The IC2 relay has developed an internal fault.</p> <ul style="list-style-type: none"> <li>-Return to Bramco Electronics for repair.</li> </ul>
<i>EC HEALTHY</i> LED is on, but Control Relay will not energise.	<ul style="list-style-type: none"> <li>-Ensure the IC2 Relay is not still latched due to a previous fault.</li> <li>-If in Node Mode, ensure there is a node terminating the Pilot, not a diode.</li> <li>-If in Node Mode, check that the terminating node is programmed with the same address that the IC2 is set at.</li> <li>-If in Node Mode, check that the Programming Mode has not been enabled (See section 2.5 Programming Nodes).</li> </ul>
INDICATION	POSSIBLE CONDITION/SUGGESTION
Both <i>HEALTHY</i> and <i>REMOTE START READY</i> LEDs are on but shorting the 100 Ohm start resistor does not start the machine.	<ul style="list-style-type: none"> <li>-Ensure the IC2 Relay is not still latched due to a previous fault.</li> <li>-If in Node Mode, ensure there is a node terminating the Pilot, not a diode.</li> <li>-If in Node Mode, check that the terminating node is programmed with the same address that the IC2 is set at.</li> <li>-If in Node Mode, check that the Programming Mode has not been enabled (See section 2.5 Programming Nodes).</li> </ul>
Shorting the 100 Ohm start resistor starts the machine, but power drops out after a few seconds.	<p>The Auxiliary Relay is not closing in the required time.</p> <ul style="list-style-type: none"> <li>-Ensure that the AR input (TERM13) is wired correctly as per the Typical Connection Diagram in Appendix A.</li> <li>-Check that the AR contacts do actually close.</li> </ul>
The <i>RELAY ON</i> LED is on, but the machine does not start.	<ul style="list-style-type: none"> <li>-Ensure that there are no "stop" or safety circuits in place that may be holding the control circuit open.</li> </ul>



# APPENDIX B – PROGRAMMING CONFIGURATION – ADDRESSABLE MODEL ONLY



The IC2 Addressable A00639  
 Programming Configuration  
 Sheet 1 of 1  
 Rev. A.3 Revision  
 P/N: A00639/01  
 Date: 09/04/2009  
 Drawn: B.Y.C.D.

## **APPENDIX C – OPTIONAL ACCESSORIES**

### ***A00254 Pilot Node***

This device is a small (approx 50 x 50 x 50mm) pilot termination unit that can be programmed by an IC2 to provide load discrimination. It is a self-contained entity, requiring no additional power supply or connections.

### ***A00511 Pilot Protection Unit (PPU)***

This device is connected between the Pilot wire and Earth. It provides protection for the IC2 and *Smart Pilot Node* by clamping voltage spikes that may occur on the pilot wire.