Instruction Manual Model 80626
Behavioural Net Controller Mk2
BNC2 Control Interface
for use with
Whisker Server

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Introduction

Congratulations on acquiring the Behavioral Net Controller Mark 2, the largest and most flexible operant control system available.

BNC was developed especially to control the 5/9 hole chambers that originated in the Laboratories of Prof. Trevor Robbins and Prof. Lawrence Wilkinson, but can be used with any equipment requiring digital I/O control.

The requirement for high numbers of input and output functions (I/O), the complexity of some of the tasks and the need for accurate millisecond timing were the main requirements that lead to the development of the BNC.

The system comes with 32 to 1,920 I/O lines; user configurable as I or O in blocks of 8, enabling you to attach any number (and type) of experimental chambers (up to 1,920 I/O lines). Each chamber can then be controlled separately using any number of schedules.

BNC will run with two completely different software packages the BNC Icon Based Program Builder and the Whisker Server developed at University of Cambridge.

You have chosen the Whisker Server, a software package that enables you to write schedules in any common software language you may be familiar with.

Hardware Description.

The 80626 BNC2 control is a modular digital input/output (I/O) system which can run up-to five 384 channel I/O racks of off one computer PCI interface.

Each interface rack has slots for upto12 digital I/O cards. Each I/O card has 32 I/O channels split into four banks. The banks are hardware configurable as either inputs or outputs. Output from the card is via a 37 way 'D' connector.

The rack has an in-built 27 Amp, 24 or 28V DC power supply. Each Output channel is short circuit protected and current limited to 1.5A. The card and rack also has in-built over-current protection.

When using multiple racks, the first rack connects directly to the PCI card, extra racks then daisy chain out of the previous rack. Each rack has a hardware selectable address.

Set-up for use with Whisker Server Control Software

1. Install the Advantec card and drivers as described in the manufacturers instruction manual.
2. From the start menu, 'Programs – Advantec Device Driver – Advantec Device Manager'. Choose the correct driver 'Advantec PCI-1753/1753A'. Click *Add* and then *Close*. See Figure 1.
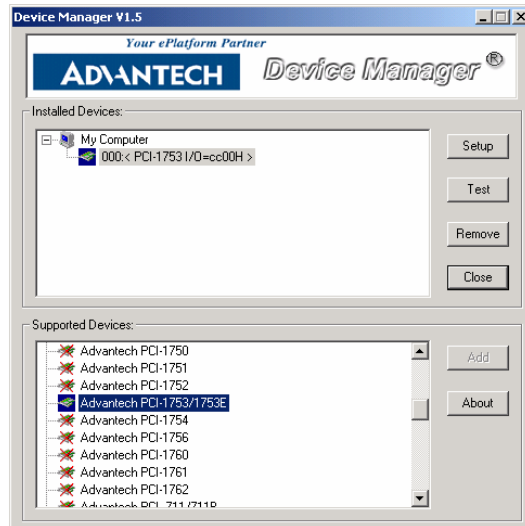
Figure 1: Advantec device manager

3. Reboot the PC.
4. Install Whisker Server software by running the WhiskerServer.Setup.exe file provided on the software CD. Follow the on screen instructions. Ensure the option *for use with BNC hardware* is clicked. Once installed you will find further information and help on running Whisker in the 'Help' menu. The help menu can also be accessed from 'Start\Programmes\Whisker\Whisker Help'
5. Shut down the PC.
6. Connect the BNC2 interface to the PC using the Advantec card cable (see figure 2). Daisy chain additional interface units as required using daisy chain cables (P/N 80626-11). If more than one interface unit is used it may be necessary to change the rack address on the additional interfaces. The rack addresses are usually set up as required when shipped from the factory. For information on selecting rack address please contact Campden Instruments.
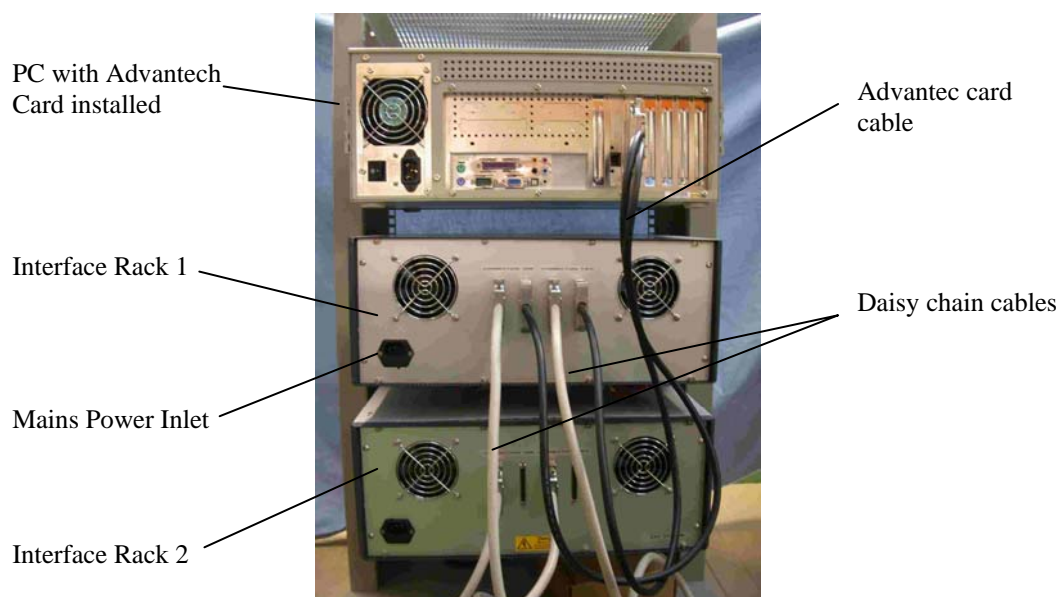7.

Figure 2: Rear panel connections

8. Connect the interface racks to the Mains power. The IEE inlet socket is on the rear of the interface rack (see figure 2).
9. Switch on the interface rack on the front panel. See figure 3 for the layout of the controller front panel. The LED to the right of the interface rack should light to indicate the internal power supply is operational.

Digital I/O Card   Card Power LED   Card Fault LED   Bank Status LED's   Line Status LED's

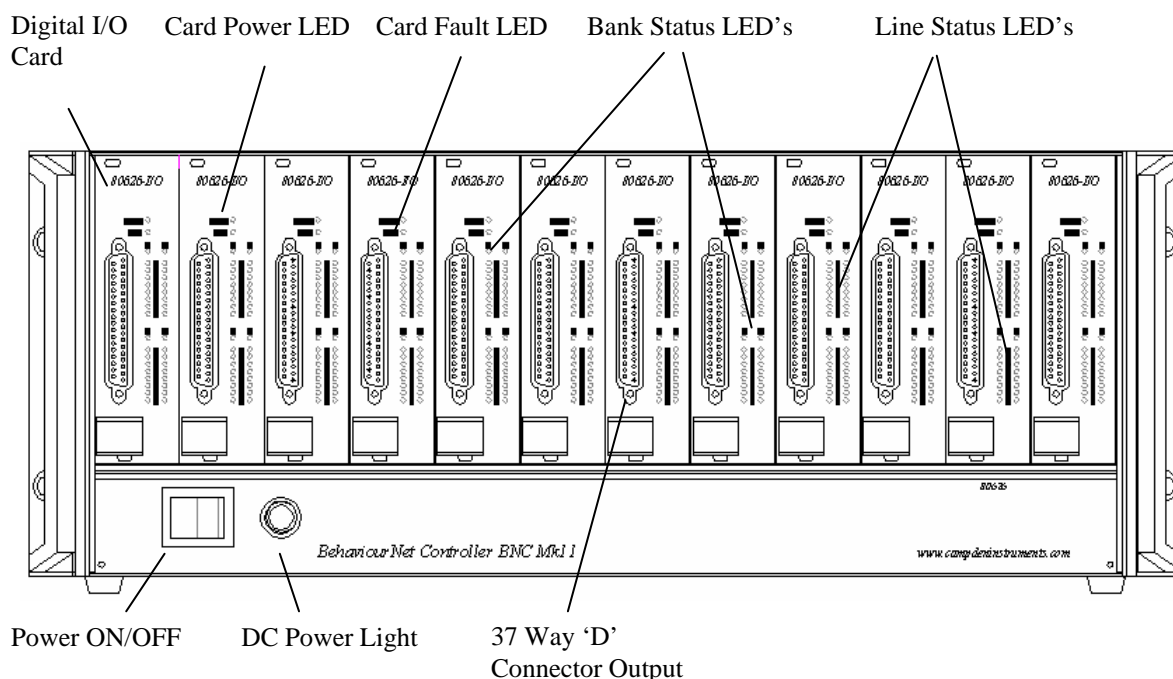Power ON/OFF   DC Power Light   37 Way 'D' Connector Output

Figure 3. BNC2 Controller front panel

10. Check the fault LED on each I/O card. Green indicates the card is ok, RED indicates a fault. Check the Bank LED lights on the front of each I/O card. The LED for each I/O bank will light RED if the bank is configured for outputs and GREEN if the bank is configured for inputs. The banks can be reconfigured in hardware to be either output lines or input lines. For instruction on configuring card inputs and outputs, refer to data sheet 80626-D003 at the rear of this manual.
11. Switch on the PC.
12. Open the whisker server software.
13. In whisker server click *configure hardware – BNC controllers and Advantec I/O hardware.* Check card zero is selected and the *Use board with BNC controller* box is ticked. See figure 4.
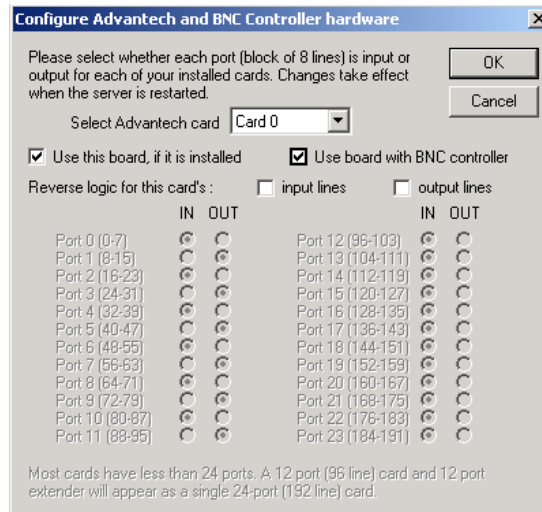
Figure 4. Configure Advantec and BNC controller hardware.

14. In whisker server click *configure hardware – set definition file*. Browse to the required definition file (depending on application). See whisker help for editing this or writing custom definition files. The configuration file provided will be to attach the operant boxes provided with your system. You will need to amend this if you had further equipment.
15. Close and re-open whisker server to reconfigure the software for changes.
16. Click *digital line status* in the left hand plane of the screen. This will now display the line information see figure 5. Lines will be configured as either input or output depending on the hardware setting on the controller.
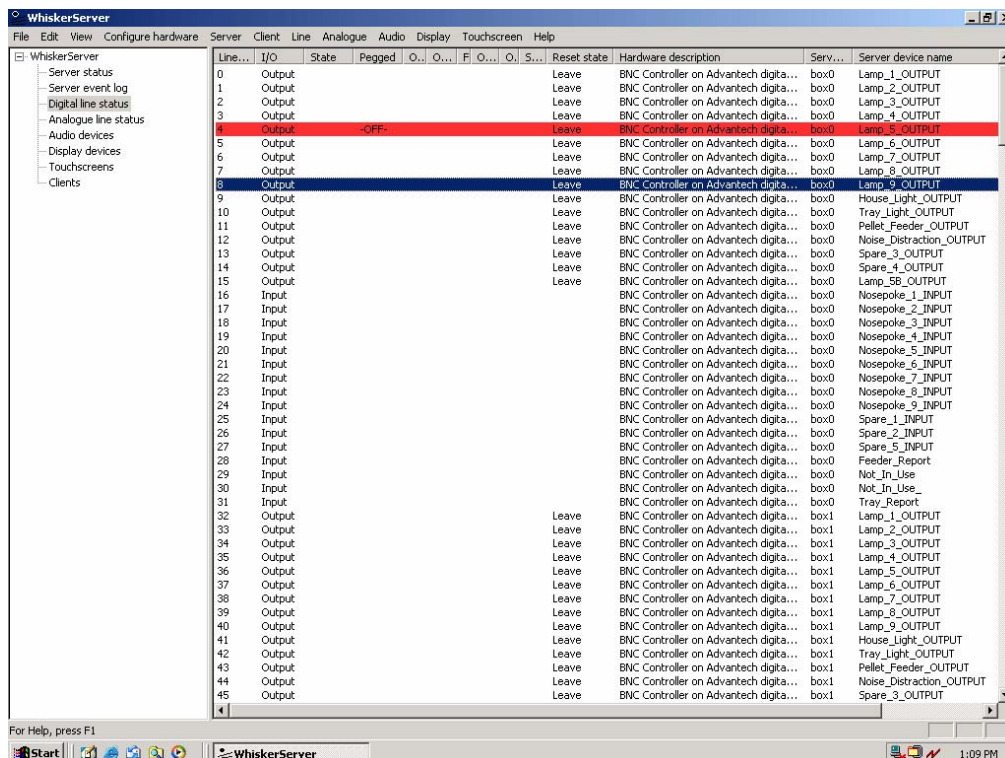

Figure 5. Whisker Digital line status screen.

17. To test the communication link between PC and controller, highlight an output line (left mouse click) and use 1 and 0 to toggle the line on and off. This will light the corresponding orange output LED on the front of the controller.

18. Shut down whisker server and switch off the control unit. Now connect the application devices (e.g. 9hole boxes) to the 37 way output connections on the digital I/O cards. Refer to the instructions supplied with the application device for connection details. For details of the output configuration of the 37 way 'D' connector refer to data sheet 80626-D003 at the rear of this manual.

19. Install any provided schedules (e.g. 5-choice serial reaction time). These are clients, which run on the Whisker Server. Further information on connecting the client schedules and on running the schedules will be found in the Schedule 'Help' (which can also be accessed from 'Start\Programmes\Whisker*Schedule Name*/*Schedule* Help'

Operation

When switching the system on, the power to the BNC2 controller should always be switched on before booting the Whisker server software. All output lines will remain off until communication with Whisker server is established. If during an experiment Whisker server, the PC or the BNC2 hardware crash, then the BNC2 will return to its start up state i.e. all outputs lines off.

Each card is fully protected against overload or short circuit on any output line. If an output line draws more current than the specified 1.5A or all outputs on the card draw more then 8A then whole card will shut down and the fault LED will change from green to red. Once the fault is diagnosed and corrected the card will return to normal operation.

For instruction on configuring card inputs and outputs, refer to data sheet 80626-D003 at the rear of this manual.

Specifications

Mains Inlet
Voltage rating: 100-240V.
Power Rating: 600W.
Inlet Fuse: 10A, 115V
                     5A, 230V

Power Supply
Voltage: 24VDC or 28VDC (factory selected).
Current: 27ADC Max.

Digital I/O Card
Output lines switch the 0V rail of the connected device.
Output line current: 1.5A max.
Board output current: 8A max.
Input switching threshold: 1.6V

Part numbers:

80626-3	Interface rack
80626-11	Daisy chain cable for two 80626-3
80626-21	Advantech Card and Advantec Card cable
80626-I/O	Digital I/O card
80626-BP	I/O card blanking Plate
80696pro	Whisker Server Software

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Data Sheet No. 80626-D003   **Issue: A**
Title: BNC2 Digital Card Output.   **Date: 02/11/05**
Author: DM   **DCN:**

PLEASE NOTE. When removing the I/O cards from the rack, ensure the rack power is turned off and basic anti static procedures are followed.

The output from the BNC2 digital card is via a 37W 'D' socket. The data lines are configured as shown in Figure 1. Each block of data lines (A,B,C and D) are configurable as blocks of input or output. Dip switches U22 on the bottom right of the card (remove card from rack to access) are used to select this (see figure 2). Switch 1 configures bank D, switch 2 configures bank B, switch 3 configures bank C and switch 4 configures bank A. Setting the switch on (1) selects inputs and off (0) selects outputs. When using the BNC2 controller with Campden Instruments Ltd. 9 hole boxes, the pin assignments are shown in Figure 1. In this case banks A and B should be configured as outputs and banks D and C as inputs.

Pin Ref	Output Ref	9hb Ref	Pin Ref	Output Ref	9hb Ref
1	D0	Nose Poke 9 (I)	20	B7	Lamp 5 B (O)
2	D1	Front Beam (I)	21	B6	Spare 4 (O)
3	D2	Rear Beam (I)	22	B5	Spare 3 (O)
4	D3	IR Tray Report (I)	23	B4	Distraction (O)
5	D4	Spare 2 (I)	24	B3	Reinforcement (O)
6	D5	N/C	25	B2	Tray Light (O)
7	D6	N/C	26	B1	House Light (O)
8	D7	Tray Report (I)	27	B0	Lamp 9 A (O)
9	C0	Nose Poke 1 (I)	28	A7	Lamp 8 A (O)
10	C1	Nose Poke 2 (I)	29	A6	Lamp 7 A (O)
11	C2	Nose Poke 3 (I)	30	A5	Lamp 6 A (O)
12	C3	Nose Poke 4 (I)	31	A4	Lamp 5 A (O)
13	C4	Nose Poke 5 (I)	32	A3	Lamp 4 A (O)
14	C5	Nose Poke 6 (I)	33	A2	Lamp 3 A (O)
15	C6	Nose Poke 7 (I)	34	A1	Lamp 2 A (O)
16	C7	Nose Poke 8 (I)	35	A0	Lamp 1 A (O)
17	24VDC	24V	36	24VDC	
18	24VDC		37	24VDC	
19	0VDC	0V			

Figure 1. BNC2 Digital Output connector.
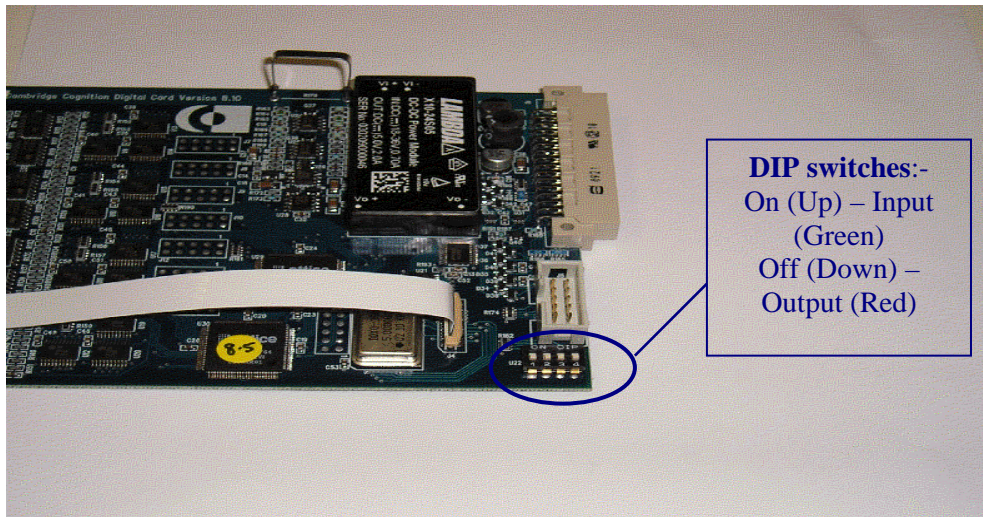
Figure **2.** Dip switches U22