

# Group3 Control



*Fiber Optically Linked*

**Distributed  
Control  
System**

# Group3 Control

Group3 Control is designed for scientific and industrial applications, and in particular for high voltage particle accelerator control.

A card plugged into the control computer communicates by fiber optic cables with a series of small modules which house the I/O boards. Each module is populated with the I/O boards required at that point, and placed close to the controlled apparatus. The fiber optic cable traverses any voltage and distance, providing noise free, high speed communications.

Very high channel density per computer slot can be achieved with 3 I/O boards per module, and 16 modules per fiber loop.

## Fiber Optics

- High voltage isolation
- Fast data rate - 1.152 Mbaud
- Immunity to transients
- Easy routing and installation

## Small Size

- Easy mounting
- Locate close to control points to keep signal wires short, minimizing EMI.

## Modular Design

- Easily reconfigured
- Easily expanded as needs grow
- Quick field replacement

## High Resolution

- 16 bit inputs and outputs

## High Update Rate

- Scan rates up to 32,000 channels per second.

## High Channel Density

- Several thousand channels per computer slot.

## Rugged Reliable Operation

- Fault tolerant and self correcting software in the modules.

## Easy Set Up Using Diagnostic Port

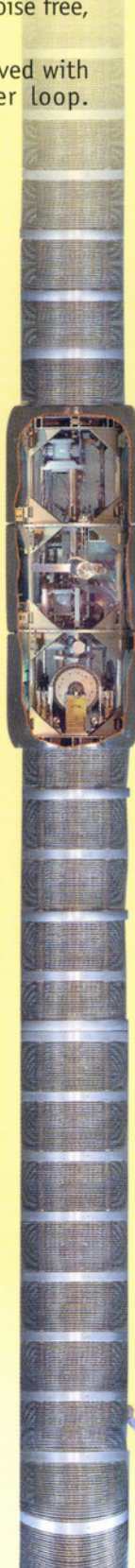
- Configure each I/O channel
- Local control and monitoring
- Excellent system debugging tool

## Choice of Control Software

- Easily configured by non experts

## Cost Effective

- High performance system at a budget price.



# Modules

## CN3

CN3 modules house a processor card and any combination of three I/O boards.



Group3 modules are distributed throughout the machine to be controlled. I/O signals are converted into data on the fiber optic loop.

A single fiber loop can include both CNAs and CN3s, with a maximum of 16 modules per loop.

The all-metal cases and many innovative hardware & software features ensure continued performance in harsh conditions.

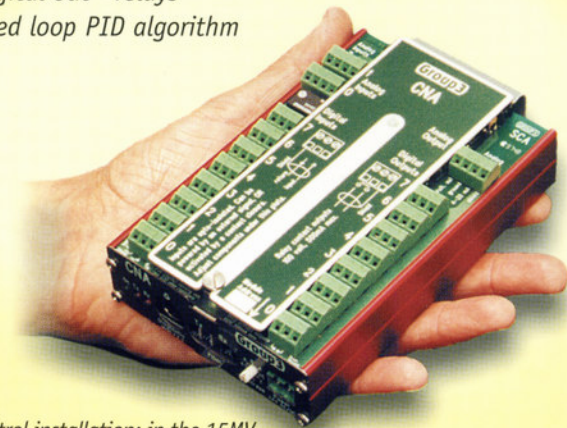
Installation is simplified by DIN rail mounting and small size.

A unique feature of all Group3 modules is the Diagnostic Port, allowing channel by channel configuration, inspection, and manual override of data - an essential feature when debugging a complex machine.

The CNA is a multi-function module combining communications processor, analog & digital I/O and signal conditioning in one compact module.

- 2 analog inputs - 16 bit
- 1 analog output - 16 bit
- 8 digital in - optocoupled
- 8 digital out - relays
- Closed loop PID algorithm

## CNA



Group3 Control installation; in the 15MV terminal of the heavy ion accelerator at the Department of Nuclear Physics, RSPHysSE, ANU, Canberra. Photo courtesy of Tim Thompson.

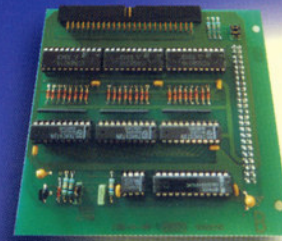
# I/O Boards



## Analog/Digital

Two 16 bit analog inputs,  
(see C board.)  
One 14 bit analog output,  
(see D board.)  
Eight digital I/O channels.

A



## 24 Digitals

24 digital channels,  
input and output,  
Outputs: open collector,  
180 mA, 40V  
Inputs: TTL levels.  
40V max.

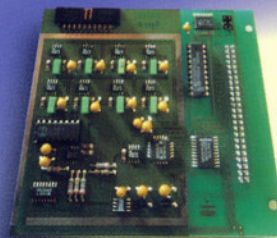
B



## 8 Analog Inputs

8 analog input channels,  
differential inputs,  
16 bit resolution,  
Ranges: 50mV to 10V.  
Unipolar and bipolar.

C



## 8 Analog Outputs

8 analog outputs of  
14 bit resolution,  
5V and 10V ranges.  
Unipolar and bipolar.

D



## 4 DC Motor Drivers

Drives 4 DC motors,  
Pulse density modulated.  
Independently programmable  
speed and acceleration.  
Motors up to 30V, 1A.

E



## Serial Communications

2 independent serial ports.  
Fiber optic transmit/receive.  
Programmable communication  
parameters.  
Interfaces to instrumentation.

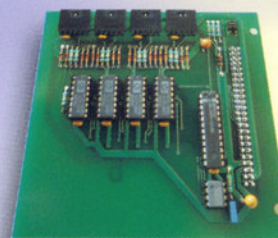
F



## 4 Steppers

Generates logic levels to  
drive 4 stepper motors.  
Automatic positioning, with  
independently programmable  
accelerations and speeds.  
Eight limit switch inputs.  
Four 8 bit  
analog inputs.

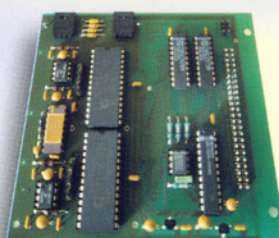
G



## 4 Encoder Channels

4 independent encoder  
inputs.  
Decodes 4 sets of  
quadrature pulse trains  
increment/decrement at  
up to 120 kHz.

H



## 2 Precision Outputs

2 precision analog outputs  
of 16 bit resolution.  
5V and 10V ranges.  
Unipolar and bipolar.

J



## GPIB/IEEE488

Controller, Talker,  
Listener. To interface to  
instrumentation and  
other devices on an  
IEEE488 bus.

K

# LC - Loop Controller

All communication on the fibers is handled by a Group3 Loop Controller, installed in the control computer. High speed is maintained even on large systems because all the computer has to do is read and write to memory on the loop controller.

There is no inherent limit to the size a Group3 Control system can attain because several LCs can be installed in a computer, and computers can be networked together.

## Loop Controllers for a PC:

- LC1 1 loop from an ISA slot
- LC3 3 loops from an ISA slot
- LC1PCI 1 loop from a PCI slot

## Loop Controllers for other platforms:

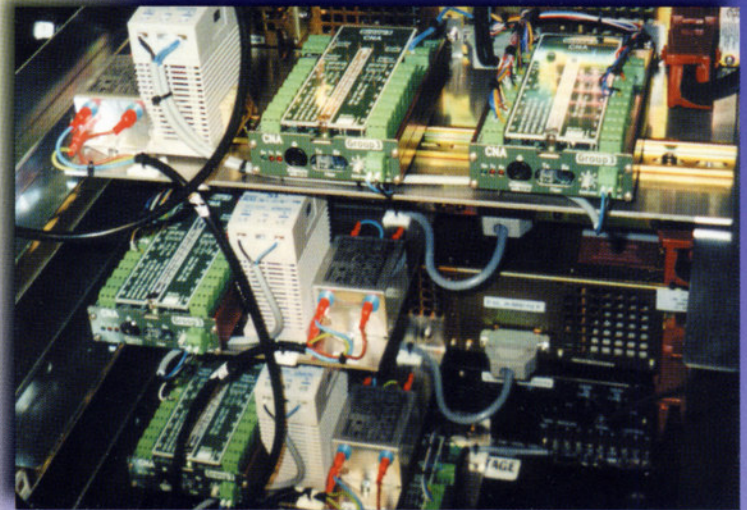
- LC2VME 2 loops from a VME slot
- LCSTD 1 loop from an STD crate
- LC2CAM 2 loops from a CAMAC crate

# Accessories

## Signal Conditioners

- Suppress transients.
- Allow alteration of signal levels.
- Provide screw terminals for field wiring.

**FTR** Fiber Optic to RS-232 serial data converter



Typical installation of a Group3 control system

# Operating Software

Specialist software personnel are not required to set up the system if one of the easy-to-use commercial control packages is chosen. LabVIEW by National Instruments, and InTouch by WonderWare are highly recommended. Drivers and DDE servers are available for many control programs.

Alternatively, all the information required to write custom programs is in a detailed programmer's manual. There is also a well documented C++ library containing all the low level code for driving the hardware. It greatly speeds up the development of a C++ application, and is valuable as example code for other languages.

# The Group3 Team

With over 14 years of design experience on successful accelerator control systems, the Group3 team have become world leaders in their field. Ongoing research & development ensure Group3 systems offer unrivalled performance under difficult conditions.

The simple set-up, ease of modification, and cost effective performance of the Group3 equipment has led to its widespread use on research accelerators around the world. Group3 has also been supplying control modules to US manufacturers of ion beam implanters for over a decade.

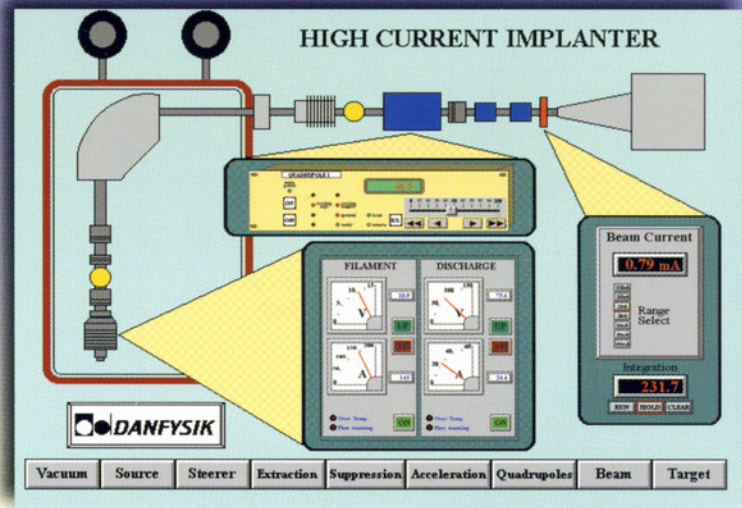
Group3 also produce a range of magnetic field sensors and measuring instruments - these can be integrated into a Group3 Control system to enable closed loop control.

## Manufactured by:

Group3 Technology Ltd.  
P.O. Box 71-111 Rosebank,  
Auckland, New Zealand.  
Ph. +64 9 828 3358  
Fax +64 9 828 3357



e-mail: [info@group3technology.com](mailto:info@group3technology.com)  
web: <http://www.group3technology.com>



Operator screen for an implanter