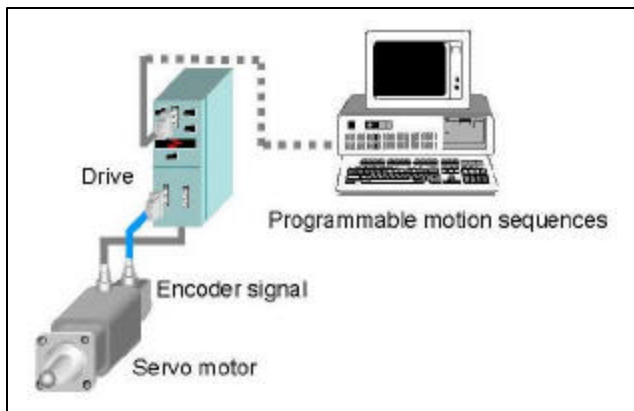


# Packaged Brushless servo motor systems

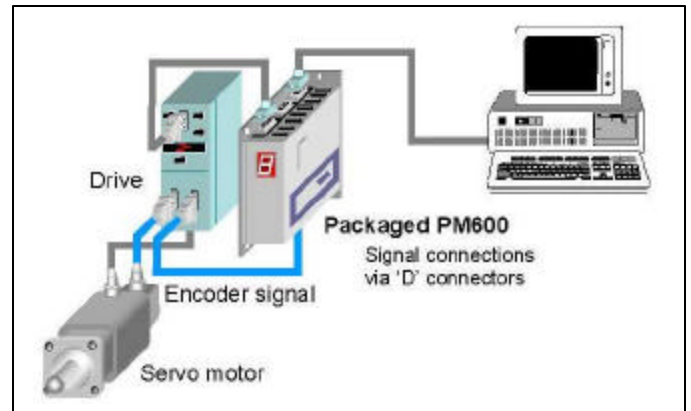
Brushless servo motor systems are based on 'in-service proven' drives & controls that offer an ideal solution to a wide range of industrial, scientific & general mechanisation applications. Single & multi-axis systems can be constructed to meet customers needs providing output powers from 0.03 to 5 kWatts per axis



Many of the drives have integral motion controllers that provide an optimum performance – cost ratio in industrial applications that require repetitive positioning cycles or multi-axis synchronisation. For more complex tasks, or where direct-on line communication is required, the powerful PM600 motion controller provides additional control features



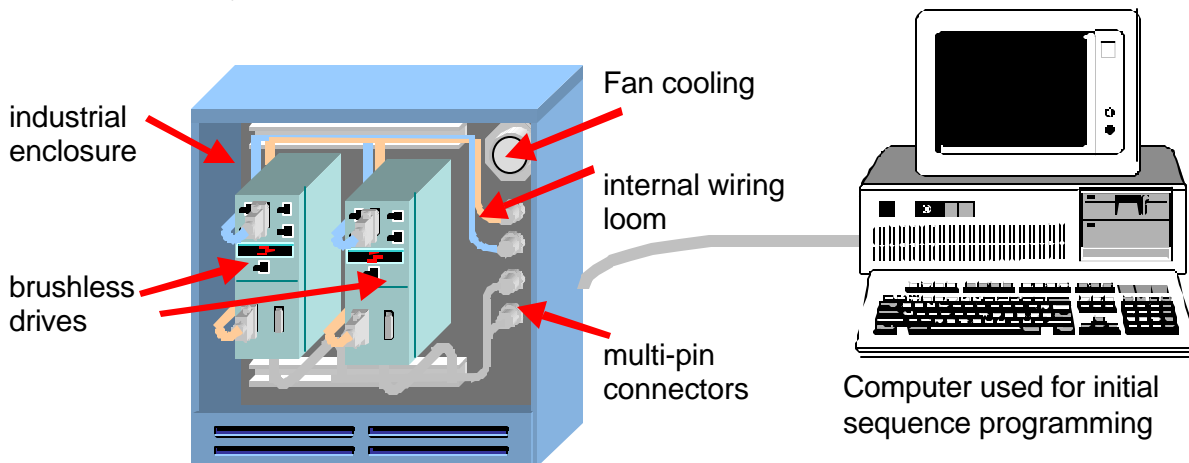
Using integrated motion controller



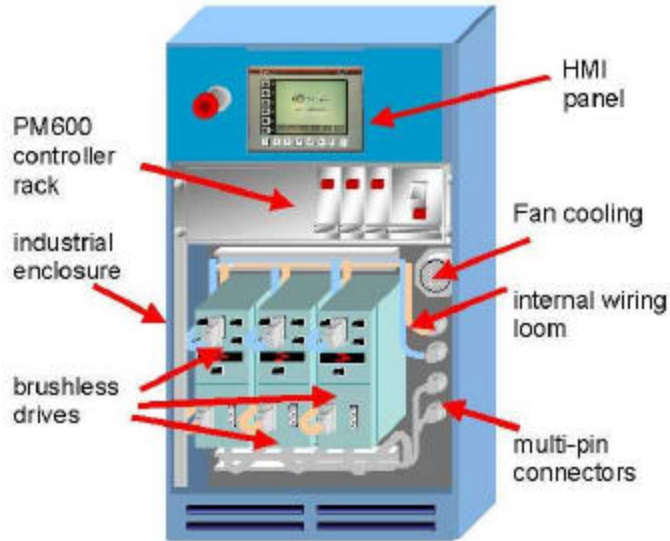
Using PM600 motion controller

## System packaging

The required combination of drives, controls & power supplies are mounted in high grade industrial enclosures & interconnected ready for use:



# Systems with integrated human –machine interface

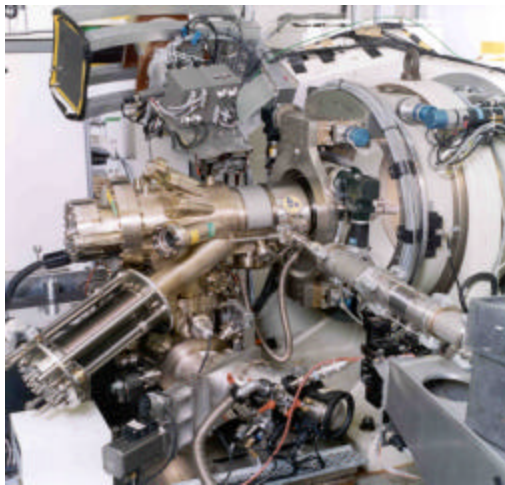


Systems, utilising an operators interface ( HMI panel ) are developed to provide customised control functions.

The HMI motion control software is developed around the PM600 controller for maximum flexibility.

The number of axes controlled in this way is not limited by the HMI processor power since the motion control algorithm is resident within the PM600 axis controller

## Typical applications



### Precision scientific apparatus

Mclennan has established a world-wide reputation for high accuracy positioning drives in scientific applications with positioning repeatability better than 0.2 arc seconds



### Robotic industrial pick & place

Brushless motor systems are ideally suited to industrial mechanisation due to their combination of high dynamic performance, accuracy and long life.

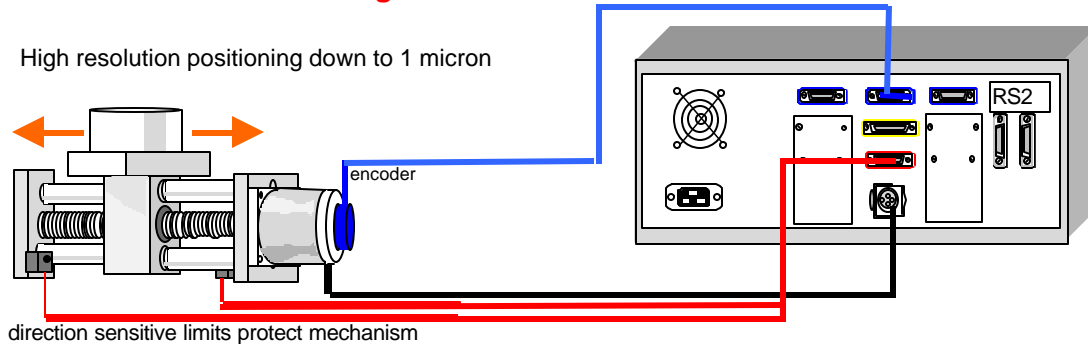
# Typical Applications: High accuracy Absolute positioning

Brushless drives are either provided with integral motion controllers or may be used with an external controller such as the PM600. The motors are equipped with either a resolver, incremental or absolute encoder that provide a resolution up to 16384 counts per revolution

## Typical single axis positioning

Brushless drives are ideal high speed positioners for use with modern mechanisation systems. They enable very high accuracy combined with fast response & long life to be obtained. Standard system features include datum signal inputs and directional sensitive limits to protect the driven mechanism against an over-travel condition.

### Conventional control using motor's encoder



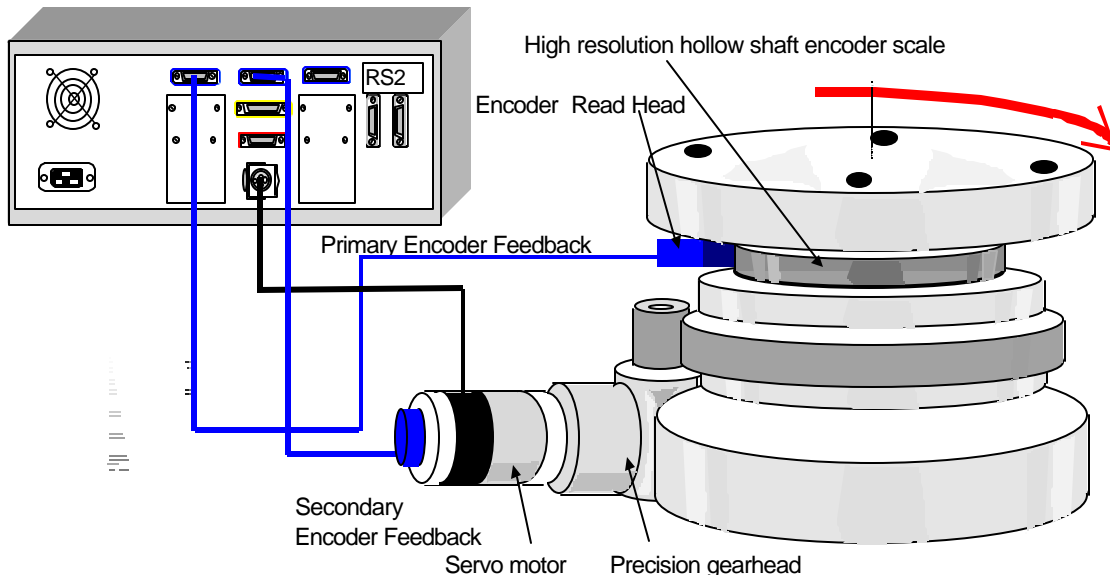
### Optional dual encoder input for each axis

## Dual Encoder feedback for use with encoders mounted remotely from the motor

When high accuracy positioning is required a high resolution encoder can be mounted directly on the output of the driven mechanism. However, compliance and backlash in the transmission system can lead to instability which may require a deadband and reduced positioning velocity in order to maintain stable operation. The dual encoder system available in the PM600 controller damps instability, enables the deadband to be eliminated and increased positioning velocity to be achieved.

Using this technique a positioning accuracy of 1 arc second and repeatability of better than 0.18 arc seconds have been achieved.

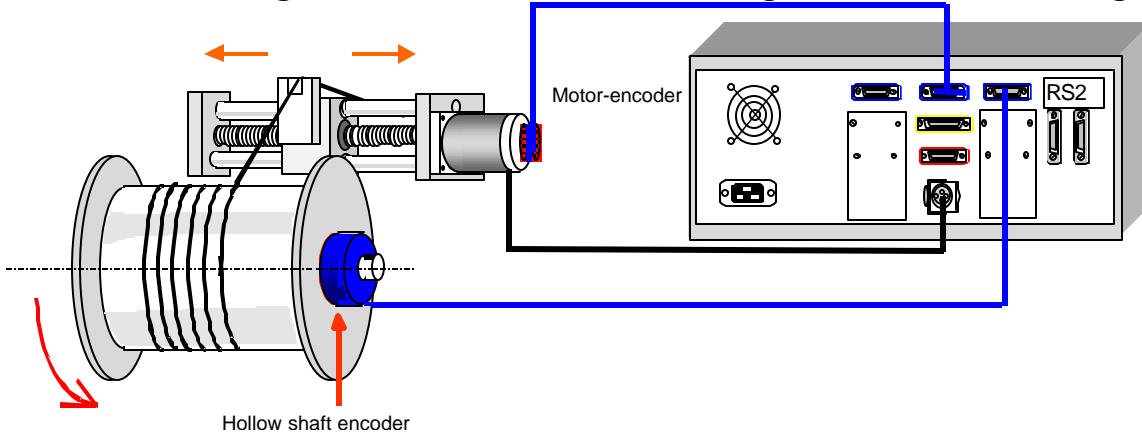
### Precision rotary table drive using dual encoder feedback



# Dual encoder feedback & variable ratios for slaving drives

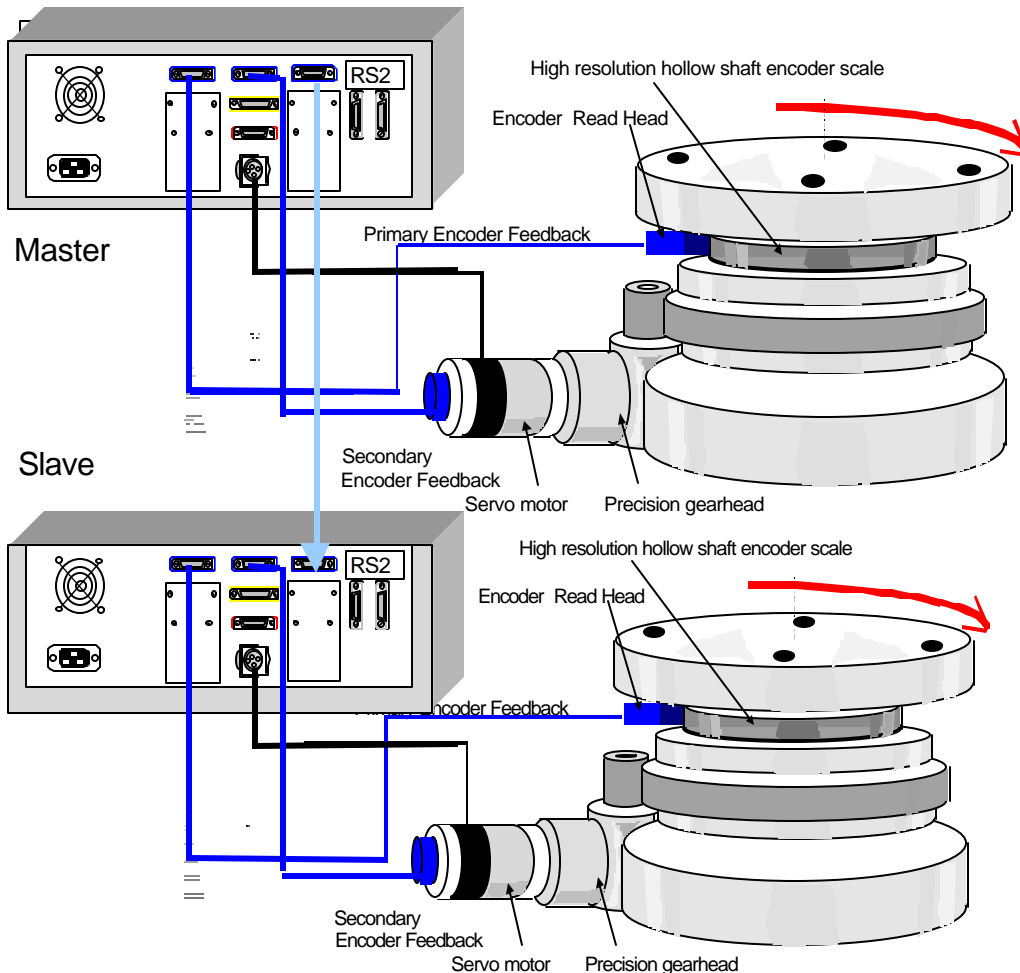
The use of 'electronic gearbox' is so called because it enables the controlled axis to be slaved to another axis of motion with a variable ratio. The ratio is entered as a nominator and denominator value, each being selectable from 1 to 32,000. This enables a different number of encoder counts on the master and slave axes to be accommodated and synchronised motion to be realised.

## SM9000 series using dual encoders with electronic gearbox for coil winding



## Triple encoder feedback for slaving drives using remote encoders

A unique feature of the latest PM600 based Mclennan Servo controller is the ability to combine master slave operation with the dual encoder feedback technique as shown on the diagram below. In this example the Primary encoder signal from the encoder input/output connector to that of the slave axis controller.

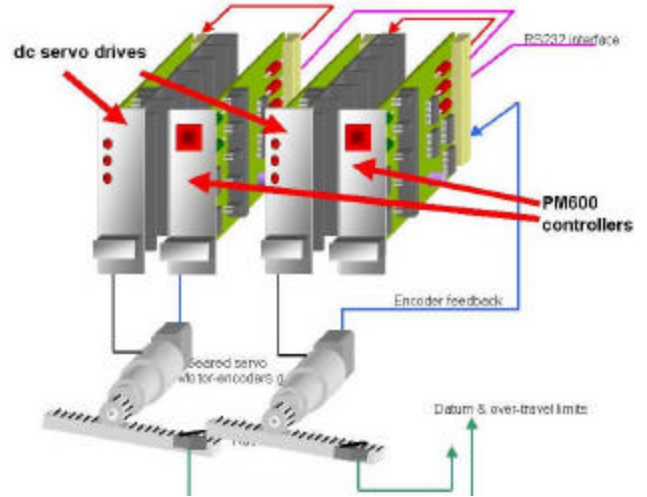


# Hybrid systems using Mclennan motion technology

An advantage of Mclennan motion systems based on PM600 controllers is that the unit is equally suitable for use with digital & analogue brushless servo motors, dc servo motors & stepper systems. This leaves our engineers free to select the optimum drive technology to meet the requirements of each axis.

## Typical example of a 19 axis Hybrid system

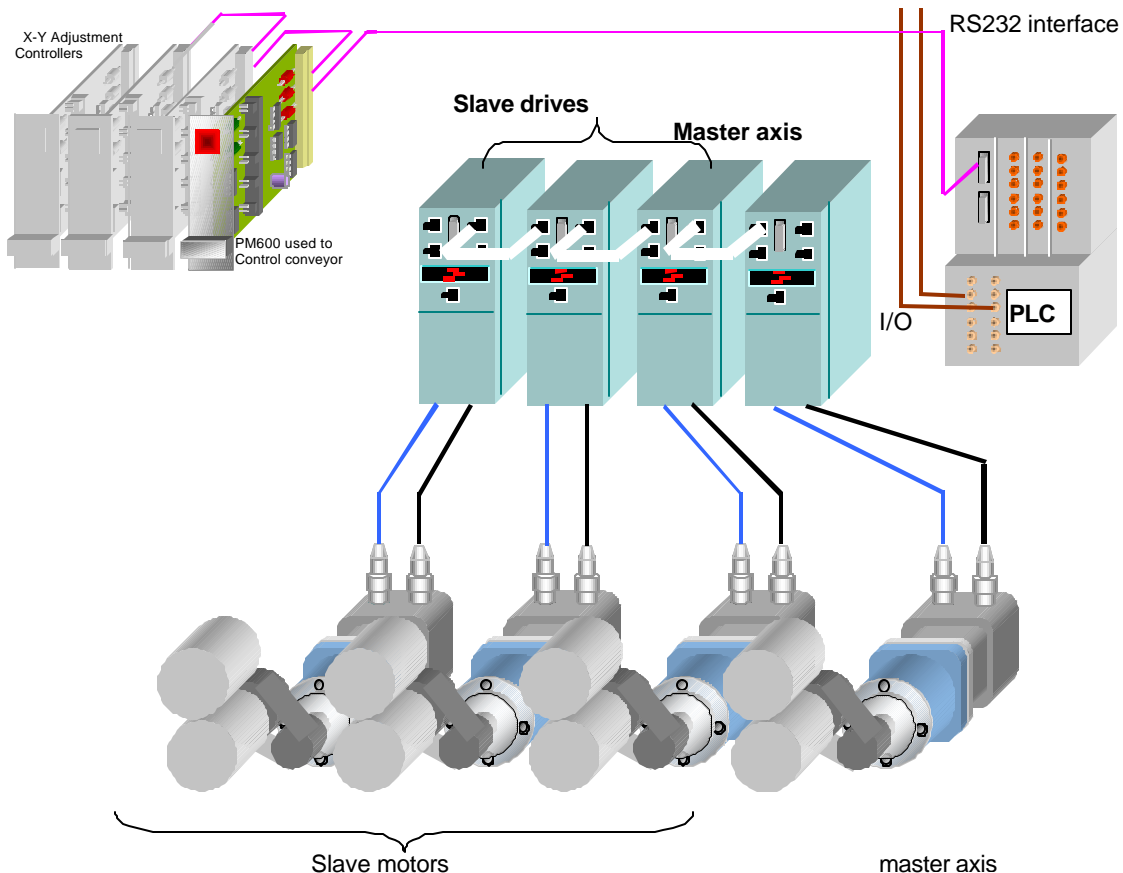
In a carton manufacturing machine eighteen low power ( 20 watts ) small servo motors were required to position the guillotine, & slotting mechanisms in X7Y axes. Once set they remain in position during the manufacture of a given carton so operating duty cycles are quite low. For these axes geared dc servo motors equipped with encoders were selected  
A typical block diagram showing two of the axis is shown below:



The carton material is fed through rollers that are synchronised, one acting as a master. The use of the PM600 to control the master axis results in a common control language throughout the system. Due to the high duty cycle brushless motors equipped with heavy duty planetary gearheads were selected.

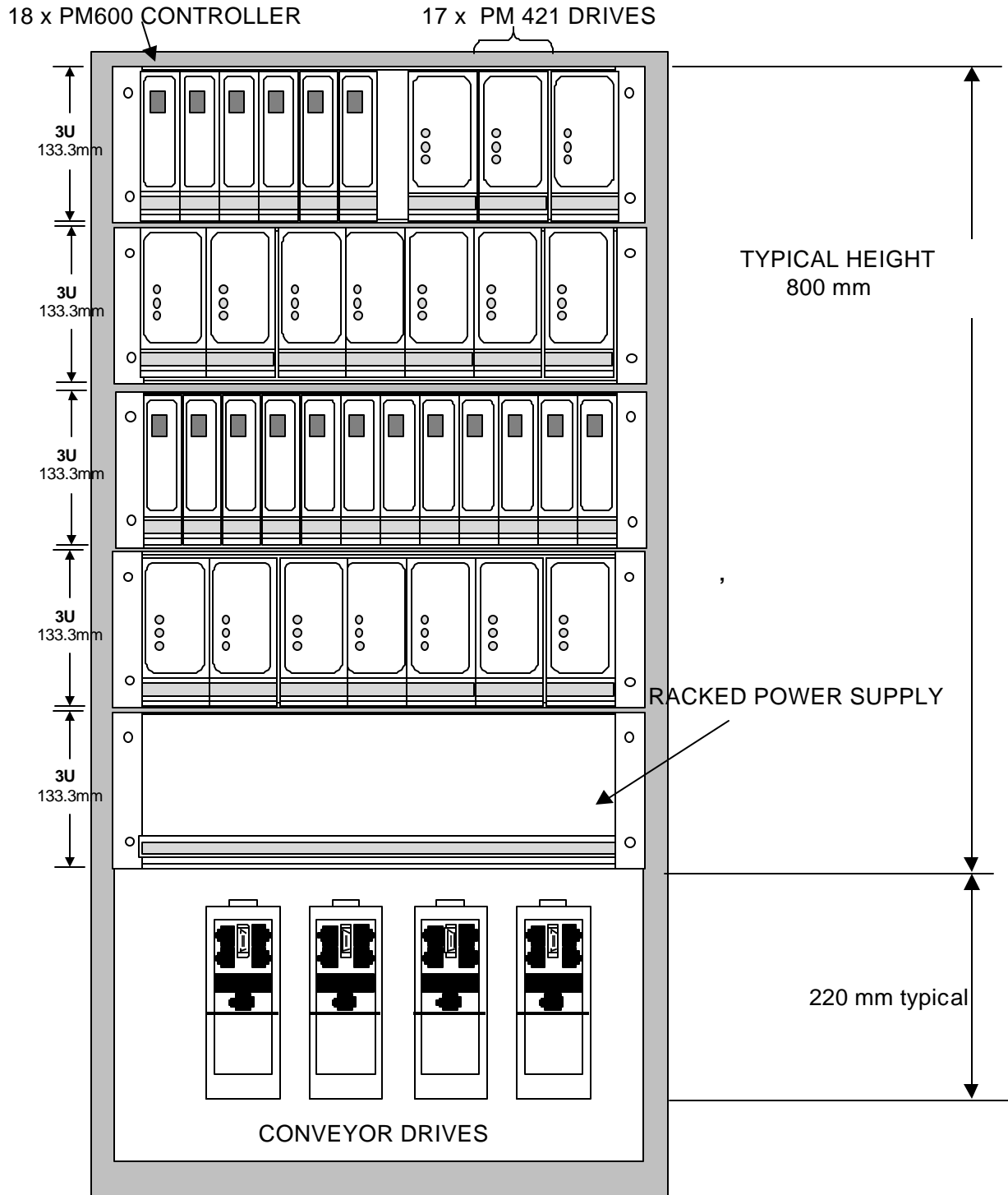
The ability of the PM600 to operate with analogue dc servo drives & digital brushless servo drives offered maximum flexibility in drive selection.

## INTEGRATED DC & BRUSHLESS MULTI-AXIS SYSTEM



# Hybrid system enclosure

In the example given the 18 dc servo amplifiers, 19 controllers, power supplies & brushless drives were supplied in a system enclosure, the layout being as shown below:



The complete system shown above was based on 'in-service proven' Mclennan modular technology that simplified commissioning and offers improved long term serviceability & reliability.