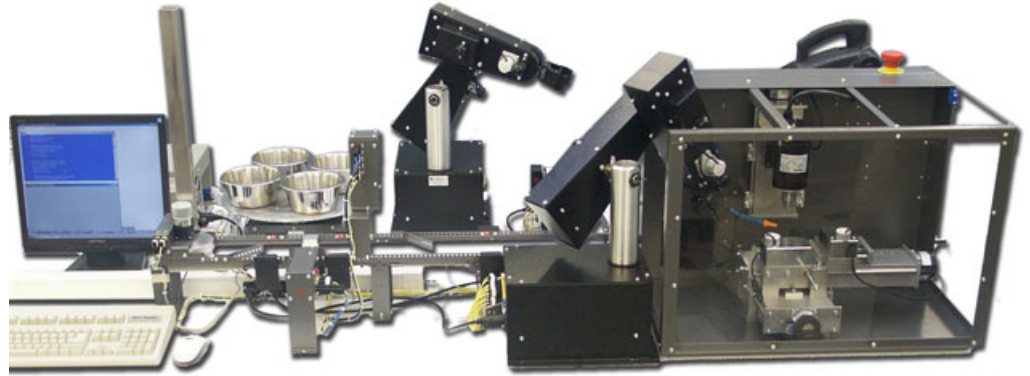


## Flexible Manufacturing System W1 35-011

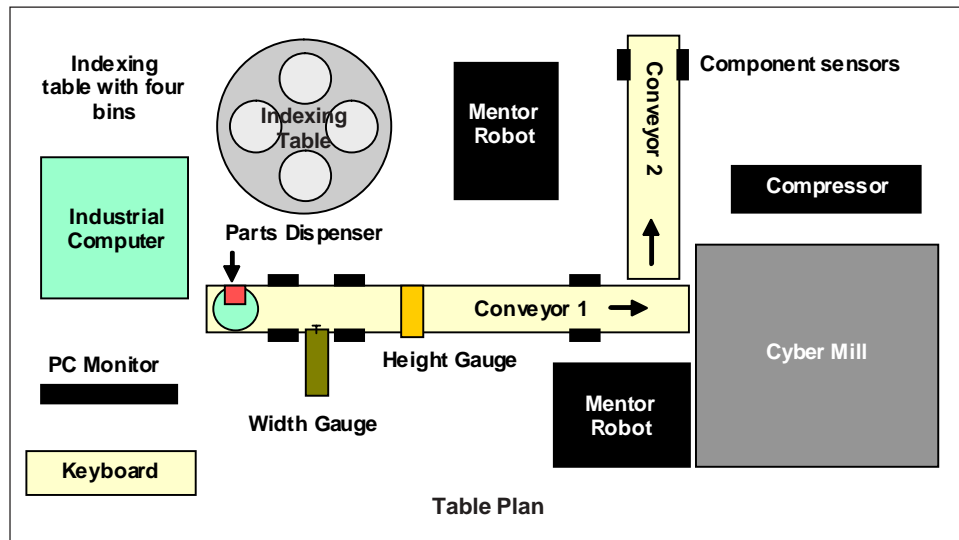
### Features

- Fully operational FMS
- Stages of manufacture can be examined from raw material to finished part
- Uses WALLI Software specifically designed for ease of programming
- Demonstration programming routines provided
- Mobile Bench top mounted system



### System Benefits

- Pre-tested workcell
- Simplified programming using WALLI software
- Software supports ISO format programming - G and M codes
- Includes industrial computer pre-loaded with WALLI Software
- Produces machined components

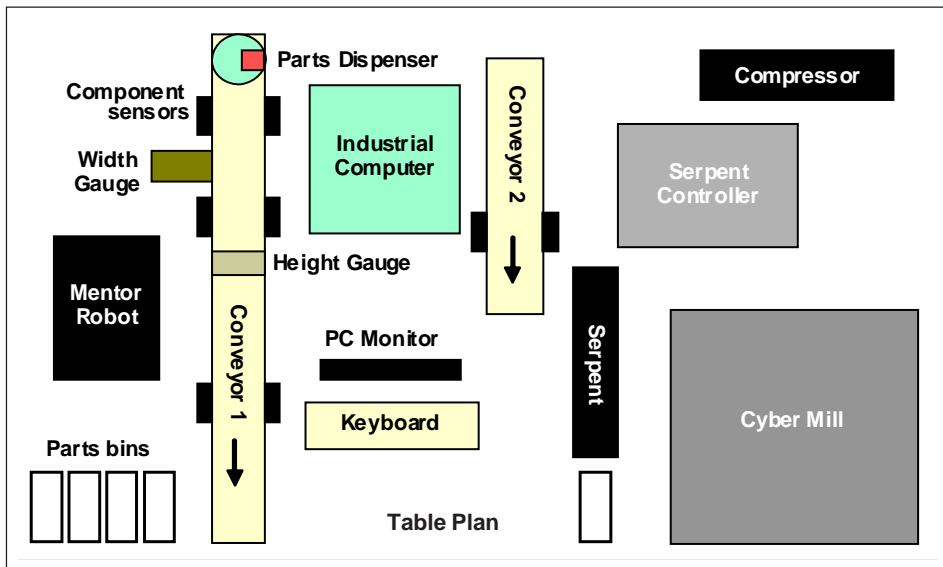


There are three manufacturing systems available, each one is designed to demonstrate the special requirements of equipment that is needed to perform a specific manufacturing process. The geographic layout of the equipment involved is an important aspect of the planning of an efficient manufacturing system and can be examined in detail using this range of FMS products.

The 35-011 is a complete system that comprises of a mobile table and a fixed layout of equipment for the study of a small manufacturing system. The layout has been chosen to form a compact workcell which involves the dispensing of unfinished parts, material detection, material sizing, parts positioning, milling, and finally, the loading of the part into an appropriate completion bin. Two conveyors with material sensors, one fitted with width and height gauging, and two Mentor robots are used to move the part around the manufacturing system. The overall control of the process sequence is performed by an industrial PC running WALLI software programmed with the individual routines of the robots and the mill, which are then triggered by the part detection sensors at the relevant stages of the process.

The overall size of the table surface is 2,404 x 1,201mm with a height from the floor to the working surface of 710mm.

## Flexible Manufacturing System W4 35-014



This versatile system offers the opportunity to study the complexities of setting-up and programming two simultaneously operating workcells.

The first system involves a handling and sorting process using a Mentor Robot and Conveyor 1. This system performs the process of gauging a part for tolerance on width and height as it travels down the conveyor towards the final set of part sensors. Once a part has reached this position the robot takes the part and places it into the appropriate bin positioned at the end of the conveyor. The choice of bin is determined by the dimensions recorded previously by the computer from the height and width gauges.

The second process utilises a Serpent Robot, Conveyor 2 and a Cyber Mill. The Serpent is a SCARA device which moves the workpiece from the Conveyor to the Mill. The part is then machined. Finally, the Serpent is used to remove the finished part from the Mill and to place it in the parts bin.

The part used is a plastic disc that has three layers, the central layer is a different colour to the outsides. Several discs are placed on Conveyor 2, they are moved until one is detected at the end of the conveyor. The Serpent Robot then picks up the part with a vacuum gripper and places it into the vice on the Cyber Mill. It can then be cut to the appropriate design. Once the milling process is complete the Serpent Robot picks-up the finished part and places it in a storage bin.

The overall size of the table surface is 2,404 x 1,201mm with a height from the floor to the working surface of 710mm.

### Features

- Two independent processes
- Fully operational FMS
- Two Robots - SCARA and Arthropomorphic types
- ISO format programming of milling machine
- Supplied on a mobile table
- Complete working system

### System Benefits

- Provides CNC Mill training
- Easy to use WALLI programming software
- Programming examples provided
- Software supports ISO G & M codes
- Produces complete components
- Comprehensive instruction manual including exercises

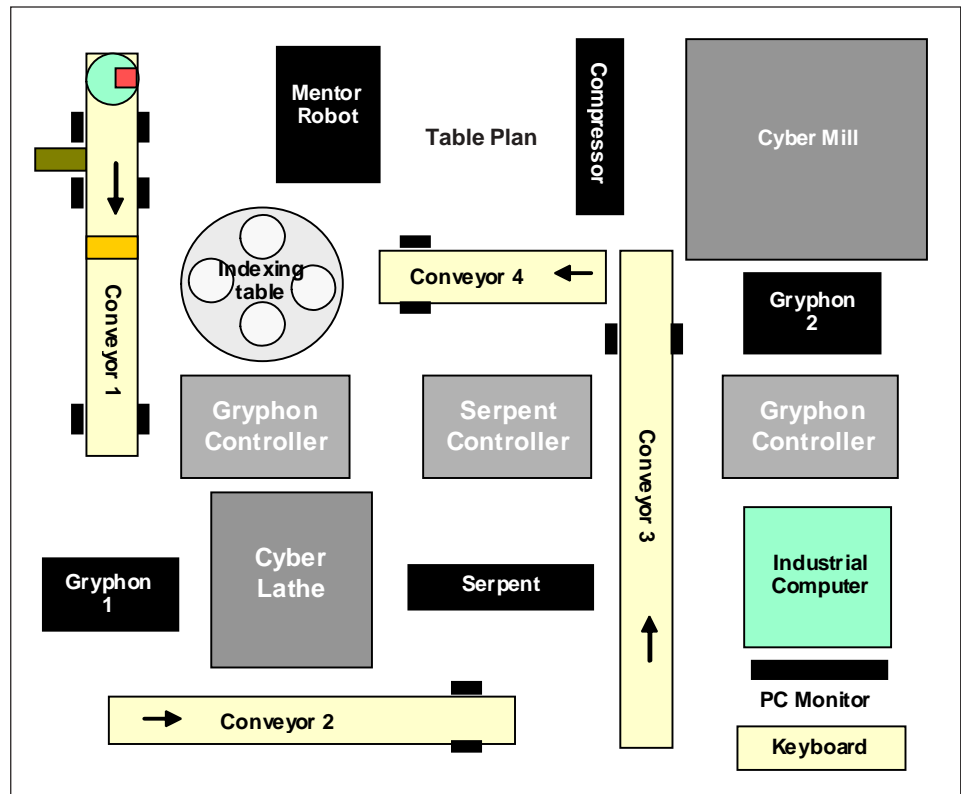
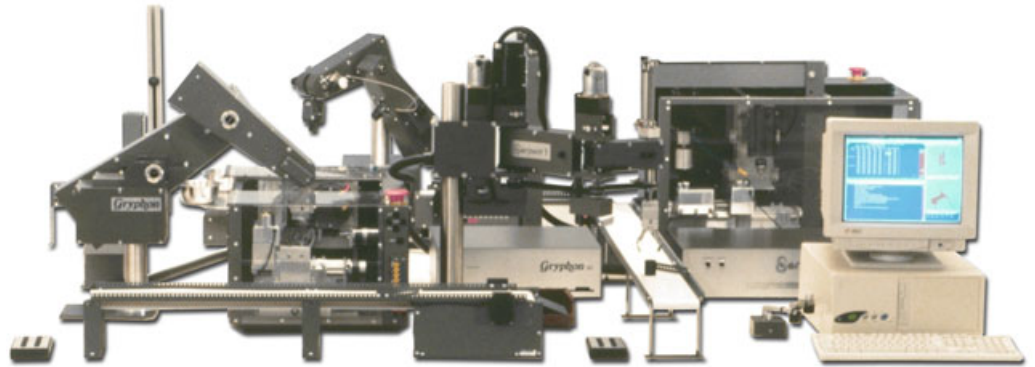
## Flexible Manufacturing System W7 35-017

### Features

- Four Robot System
- CNC Mill and Lathe
- Four conveyors
- Stages of manufacture can be examined from raw material to finished part
- Fully operational FMS
- Uses WALLI Software specifically designed for ease of programming
- Demonstration programming routines provided
- Mobile Bench-top mounted system

### System Benefits

- Pre-tested workcell
- Simplified programming using WALLI software
- Software supports ISO format programming - G and M codes
- Includes industrial computer pre-loaded with WALLI Software
- Extensive programming opportunities
- Produces machined components



This comprehensive FMS system provides many opportunities to implement various system programming scenarios and to study the individual operations of each stage of the manufacturing process. The four robots, (2 Gryphon, a Mentor and a Serpent), each perform tasks that are suited to their design. The individual robot activity within the workcell can therefore be investigated. The system demonstrates a fully automated production process for the manufacture of small machined components utilising independently controlled conveyors, two CNC machines and four robots.

The industrial computer is supplied with WALLI software pre-loaded and includes routines for the individual robots and CNC machines to perform the operations necessary to carry-out the full process performed by the workcell. These routines and the full workcell operation are tested prior to the system leaving the factory. Although the workcell program is pre-determined, (the main program being a fixed statement of the workcell function), the subroutines that control the Lathe and Mill may be edited so that a new part is produced through their action. Any change in the shape or size of the billet of material used in the manufacturing process will affect the operations performed by the robot handling the material. Therefore the parameters will need to be adjusted accordingly.

## Flexible Manufacturing System W7 35-017 (continued)

In this system the process performed is as follows-

The part is dispensed onto Conveyor 1 where it has the width and height measured as it moves down to the sensor at the end of the conveyor. Gryphon 1 picks up the part from Conveyor 1 and places it in the chuck of the Cyber Lathe for machining. Once the machining process is complete the Gryphon removes the part from the Lathe and places it onto Conveyor 2, where it is moved to the end of the conveyor. The Serpent robot picks-up the part from Conveyor 2 and places it onto Conveyor 3, where it moves to the end of the conveyor. Gryphon 2 picks-up the part and places it into the vice of the Cyber Mill to perform the milling process. When the part has been milled the Gryphon picks-up the part from the vice and places it on Conveyor 4. It is then moved to the conveyor 'end' sensor. The Mentor Robot picks-up the part and, depending on the component design, places it into the appropriate bin on the indexing table. The movement of parts is continuous with several parts in the system at the same time, but all at different stages in the manufacturing process.

This product is supplied as two mobile tables of overall size 2,404 x 1,201mm with a height from the floor to the working surface of 710mm. When in use, the two tables are bolted together to form one large mobile unit.

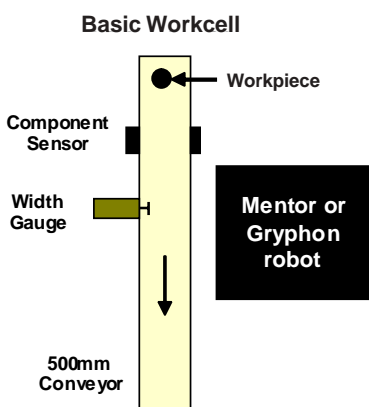
Cell Definition	
GRYPHON	RJ45 Board - Device 1
CYBER LATHE	RJ45 Board - Device 2
SERPENT I/EC	RJ45 Board - Device 3
GRYPHON 2	RJ45 Board - Device 4
CYBER MILL	RJ45 Board - Device 5
MENTOR	RJ45 Board - Device 6
Conveyor 1	Serial From MENTOR Latched Output 1
Conveyor 2	Serial From CYBER LATHE Latched Output 8
Conveyor 3	Serial From GRYPHON 2 Latched Output 7
Conveyor 4	Serial From GRYPHON 2 Latched Output 8
Index Table 1	Serial From MENTOR Latched Output 7
Dispenser 1	Zero Sensor To MENTOR Input 7 Start From MENTOR Output 2 Free To MENTOR Digital Input 1 Mounted on Conveyor 1
Width Gauge 1	Start From MENTOR Output 5 Read From MENTOR Output 6 Out to MENTOR Digital Input 3
Height Gauge 1	Start From MENTOR Output 3 Read From MENTOR Output 4 Out to MENTOR Digital Input 2
Digital Sensor 1	Output to MENTOR Digital Input 4
Digital Sensor 2	Output to MENTOR Digital Input 5
Digital Sensor 3	Output to MENTOR Digital Input 6
Digital Sensor 4	Output to CYBER LATHE Digital Input 8
Digital Sensor 5	Output to GRYPHON 2 Digital Input 7
Digital Sensor 6	Output to GRYPHON 2 Digital Input 8

*WALLI software screen showing the interconnection of components in the W7 system*

## Basic Workcell 35-119

The Basic Workcell is intended for use with the Mentor and Gryphon robots to extend their activity beyond understanding the principles of robotics to a working application.

The cell components consist of a 500mm conveyor, horizontal gauging unit, infra-red component sensor and assorted workpieces. These components can be configured to form a basic workcell which then performs the function of parts movement, component sizing and component detection within the parts movement process. Programming of the workcell is performed using WALLI software which provides an uncomplicated approach to writing a control program for the relevant workcell operation.



A typical layout of the workcell components is shown opposite complete with a robot but without the controlling PC.

The cell operation is not defined in a WALLI program as the intention is for the student to configure the components and to write a program that performs the intended process. One possible process sequence would be to use the robot to pick the workpiece from a storage bin and to place it on the conveyor. The conveyor is run so that the workpiece passes the component sensor which detects it after a predetermined distance the workpiece is stopped in front of the width gauge to be measured.

This value is stored by the computer. The component is moved on and then stopped after a pre-determined distance, the robot then removes the part and places it in a storage bin.

A variation on this process would be to use different sizes of workpieces so that the final activity is one of part selection.

### Features

- Individual components
- Configurable system layout
- Requires programs to be developed
- Programming using easy to use WALLI software