MITSUBISHI ELECTRIC

Changes for the Better

PROGRAMMABLE LOGIC CONTROLLERS

FX PLC & GOT1000

Pure Control

Compact PLC Applications

FX GRAPHIC OPERATION TERMINAL GOT1000

Mitsubishi Electric Corporation Himeji Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001(standards for quality assurance management systems)

ISO 14001 JACO EC97J1234 UKAS ENVIRONMENTAL MANAGEMENT 051

Certified ISO 9001 by BVQI UKAS QUALITY MANAGEMENT 008

Empowering Industries

A World of

Wood cutting

Baking

Water Industry

Material Handling

Shipping

Understanding

A PLC is essentially at the center of control for every application, therefore it is vital that the chosen PLC meets the needs and requirements of the system - ultimately giving satisfaction to the end user.

The FX Family is designed so that the PLC CPU acts as a platform to which you can add and customize to your needs, allowing customers to create solutions that fit perfectly within their systems.

With a wide range of PLC base units that form the FX Family range, customers can select products that answer their applications and cost requirements with few compromises. The FX family contains several independent yet compatible series, four of which are the FX1S, FX1N, FX2N and FX3U - all of which have been designed with 4 key principles in mind:

- ***Speed with Precision***
- ***Flexible Design***
- ***Backward & Forward Compatibility***
- ***Low cost***

Visualization

Efficient data management is a key component to achieving successful human machine interaction. The GOT1000 range of HMIs has been specifically built to enable customers to design interface screens that visualize the application in the easiest way possible. The intuitive GOT software and setup utilities allow customers to create easy-to-use screens and reduce setup time.

Applications

Customer Confidence

The FX Family is the PLC of choice across the world's industries and applications. At Mitsubishi Electric we pride ourselves on our close working relationship with our customers. By listening to customer needs Mitsubishi Electric has learnt to understand the requirements of modern applications and has developed PLC solutions that offer quality, reliability and a product that customers want. The success of this approach has been reflected in the sales of our products – now surpassing the 8 million milestone.

Furthermore with RoHS compliance as standard for the complete product range, customers are assured that the purchasing of FX and GOT products falls in line with the directives placed within the market, providing a more environmentally friendly control system.

International Recognition and Reliability

Mitsubishi Electric has a reputation for producing high quality products. This comes in part from our commitment to understanding and meeting the requirements of international standards and directives.

In today's world of manufacturing, customers require durable products that can cope with the day in day out tasks of the application they control. To ensure our high levels of product reliability, Mitsubishi Electric's quality control program leaves nothing to chance, resulting in an undisputable quality that customers can rely on.

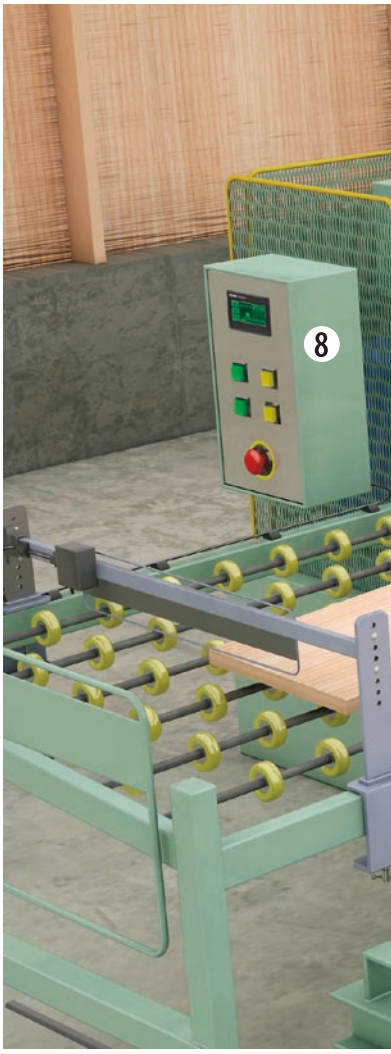
INJECTION MOLDING

LABEL PRINTING

PACKAGING

CONTENTS -

Wood Cutting Industry
– Plank Cutting Application



Features:

- *FX1S – A robust Micro-PLC*
- *Simple Connection Analog Expansion Boards*
- *GT1020 touch screen Micro-HMI with Multi-connection functionality*

Application Overview:

Wood is a commodity that is being used every day around the globe. To handle the different types of needs for this material, the applications are many and range in complexity. For the smaller applications where customers require an affordable robust PLC, the FX1S often is the controller of choice.

FX1S – A Robust Micro-PLC

For effective woodcutting of different sized planks within the application, the FX1S PLC is equipped with two inverters. Control of the first inverter is responsible for positioning the plank so that smaller plank sizes can be created and the second inverter is used to drive the spinning saw across the plank.

The method used to control both the position of the plank and the saw blade axis is known as the Limit Switch Method. To provide control of movements within the system two switches are provided in places where a moving part passes. For example, when considering drive control of the plank there are two points where these switches are located:

- At the backboard, which determines the length of the plank to be cut. (To change the length of the plank being cut, the backboard can be manually adjusted to the user's requirement)
- At the loading position where new planks are placed on to the application.

Once the first limit switch has been activated, the motor speed is reduced. On activation of the second limit switch, the motor turns off and the brake turns on to stop the movement of the plank. For requirements where greater precision is required the user can reduce the operation speed of the inverters to reduce overshoot of the second limit switch.

Although this method does not provide the accuracy as associated with servo control, using inverters and the limit switch method, the application control system can be realized at a much lower cost.

Analog Expansion Boards

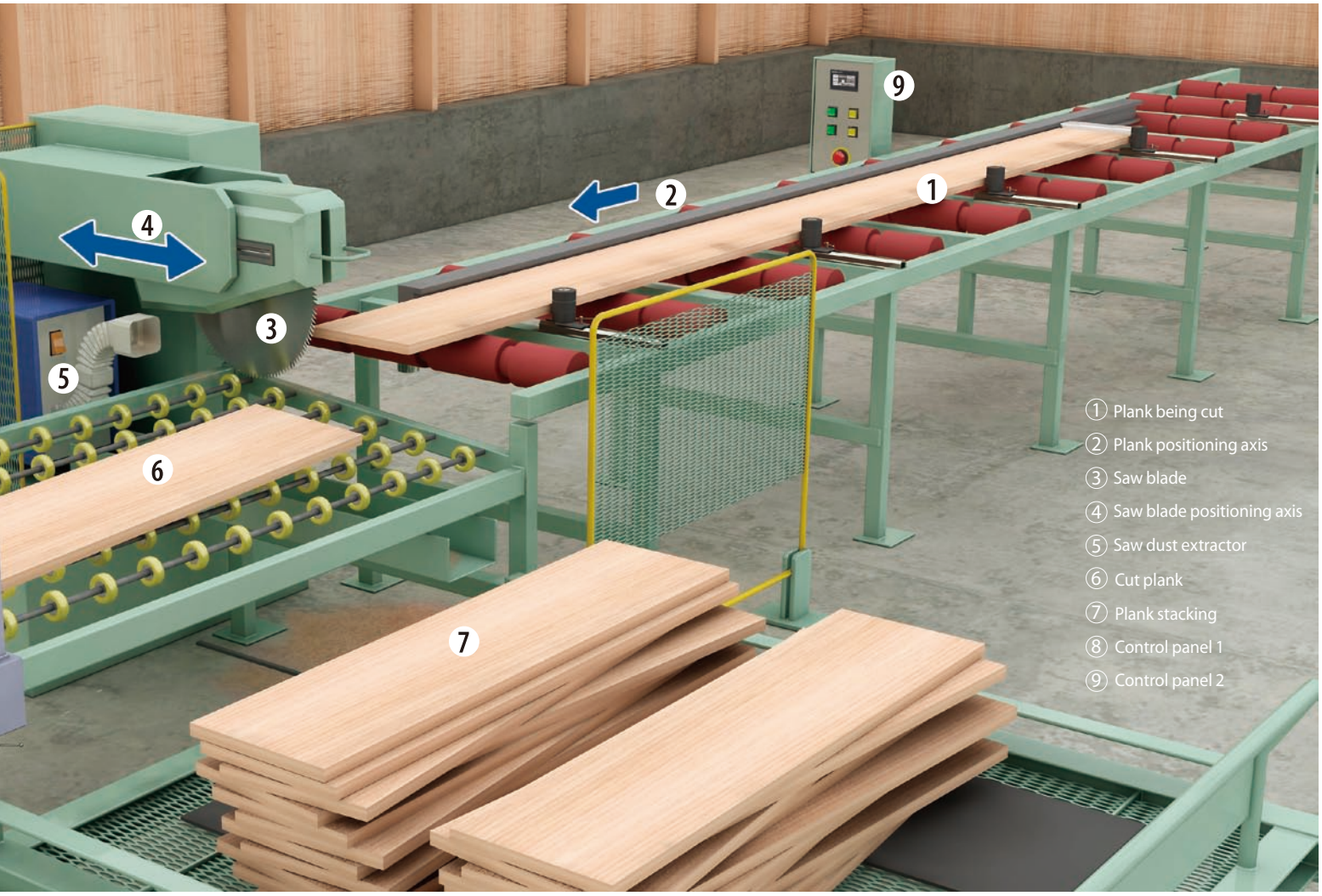
The FX1S can be fitted with an Analog to Digital or Digital to Analog expansion board on the front panel of the PLC. By using the FX1N-1DA-BD, the user has one analog output that can be used to control the speed of the cutting saw. Using a variable sinusoidal output into an inverter, the saw speed can easily be varied according to the size of the plank being cut.

Alternatively, for applications that require analog inputs, the FX1N-2AD-BD is available. This product permits 2 analog inputs to be integrated to the PLC which is particularly useful for when acquiring data such as speed or pressure that is to be used internally within the application.

GT1020 - Just Right!

Using the small but high resolution screen the GT1020 provides clear visualization of application data, as well as a touch screen interface. The 3-color LED screen (available in green, orange and red or white, pink, red) can be used to provide clear and easy to understand signals regarding the status of the machine, maximizing the potential of this micro-HMI.

For high performance cost ratio, the GT10 series also features multi-unit connection. This feature allows the applications to be enhanced with two HMIs, enabling the user to access application data from more than one place on the application. Thus when preparing the plank for cutting, the user benefits from a more ergonomically friendly application.



Lastly, through the use of alternative start-up screens during start-up of the GOT, machine builders can feature their own brand logos when the customer starts the application, giving a more personal touch to the end customer.

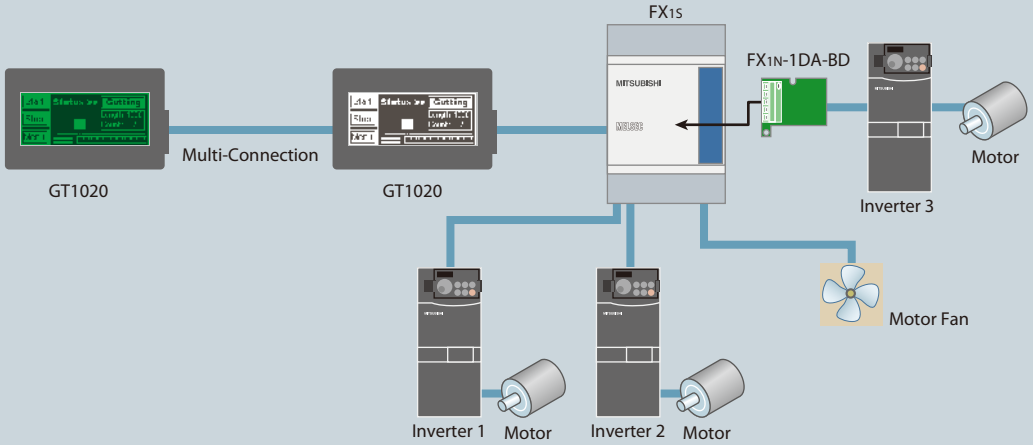
Furthermore with removable logos the customer can provide a more customized feel to their application.

System Configuration:

Controlled inputs

- User control panel 1
- User control panel 2
- Limit switches (Drive control of plank)
- Limit switches (Drive control of saw)
- General input handling

Hardware



Controlled outputs

- User control panel 1
- User control panel 2
- Plank positioning (Inverter 1)
- Saw blade positioning (Inverter 2)
- Saw speed (Inverter 3)
- General output handling

Food Industry
– Heating Conveyor Application

Features:

- FX1N PLC – An Entry Level Expandable Controller

- High precision Analog Special Function Blocks

- FX1N-BAT for trouble free export

- Clear data representation via GT1030's 4.5 inch display

Application Overview:

Food is a necessary part of our every day lives. To cope with the multitude of products that we take for granted, applications are continuously being modified and improved to sustain their competitive edge within the market.

The FX1N – An entry level expandable controller

A heating conveyor is an application that can be typically seen within the food processing industries, however other connotations of the application are also applicable to industries such as the automotive, pharmaceutical and ceramic industries. The application is principally based on both analog controls with secondary requirements for positioning. To meet this demand, the FX1N steps to the forefront providing respectable processing speeds, control of up to 128 I/O as well as a range of other attributes that make effective control possible.

Effective Analog Control

Within the conveyor oven, the challenge of providing optimized heater control is of the utmost importance. To achieve this successfully, the control system relies on both analog to digital control and digital to analog control. Using Mitsubishi Electric's range of Special Function Blocks the heating of the chamber can be tailored to the needs of the specified industry.

To provide the analog to digital control required for monitoring the temperature of the furnace, the FX2N-4AD-PT uses a 3-wire platinum resistance thermometer sensor (PT100) and a compensated range of -100 to + 600 °C (-148 to 1112 °F). With a resolution between 0.2 to 0.3°C (0.36 to 0.54 °F), the module can be setup to acquire precise data from even the most temperature sensitive applications.

To provide output control to the heaters, the system is fitted with an FX2N-4DA, which allows more than one heater to be controlled using the 4 outputs, permitting larger applications to feature different temperature zones. For plastic industry applications, different temperature zones may be useful for such processes as curing. The accuracy of the unit provides a resolution of either 5mV or 20µA as well as an adequate conversion time of 2.1ms for 4 channels.

Through the use of the Analog Special Function Blocks, the customer can set up a PID closed-loop control system that meets even the toughest application requirements.

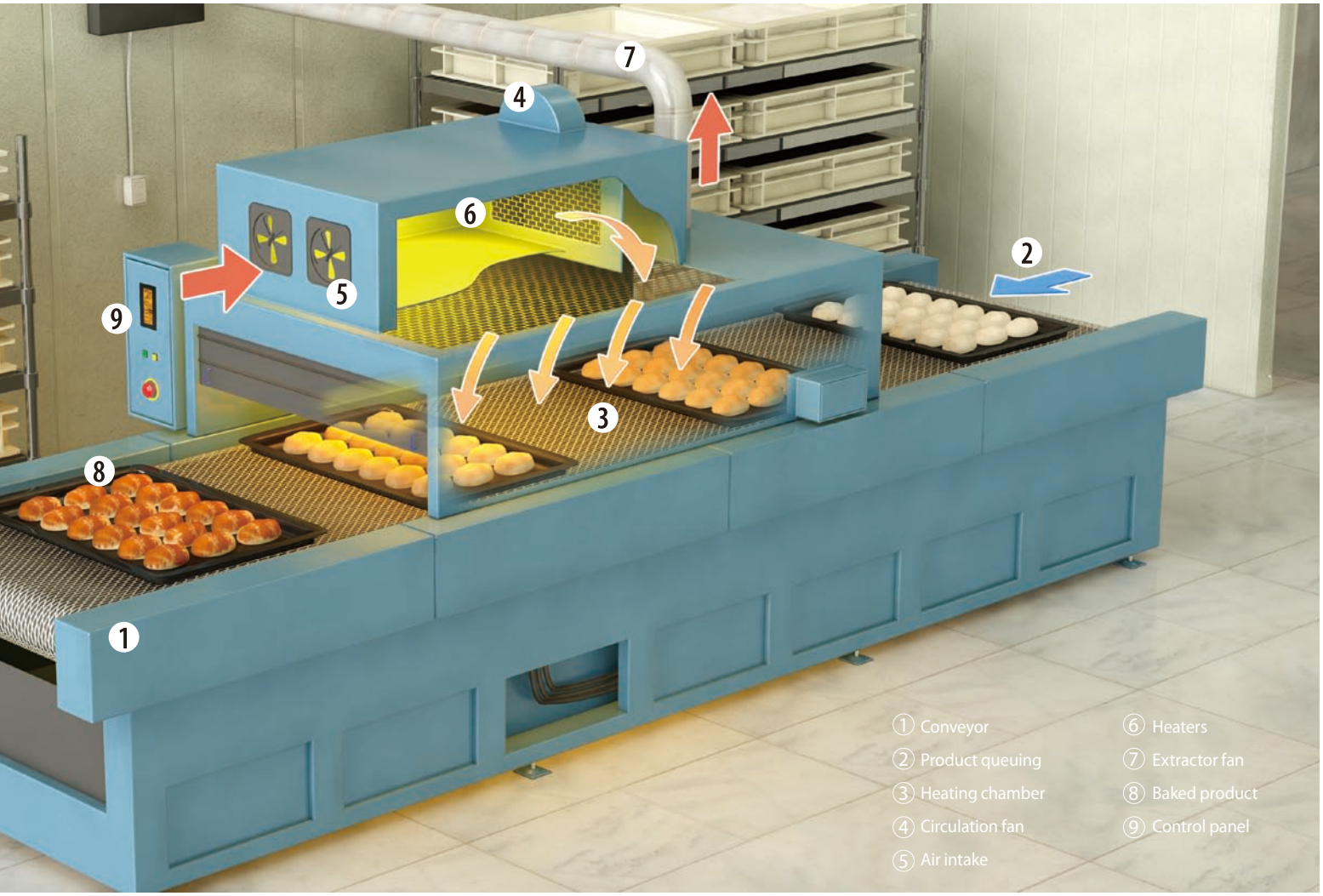
The control system also makes use of an inverter connection that allows the product being processed to be passed through the oven at various speeds via control of the conveyor belt.

Trouble Free Export - FX1N-BAT

The FX1N-BAT has been designed for long-term data retention (up to 1 year), to avoid the loss of capacitor-backed data in the FX1N main unit. This allows machine builders to export their products world wide, assuring that the PLC will be in an operable state when first turned on by the end-customer. This reduces complications for the end-customers on receiving of the application.

GT1030 - Bright

In today's food processing environment, it may not be acceptable to have applications that are dedicated to processing only one product. Applications need to be able to handle a range of products, while setup for changes should be kept to a minimum. To achieve this, the GOT1000 features recipe handling, which allows the user to completely reconfigure the system's settings at a touch of a button.



The GT1030 is also equipped with a number of features that enhance the end-users interaction with the application. Using a 4.5 inch wide screen digital touch panel display, users are able to press two buttons simultaneously to activate critical tasks, reducing the chance of the wrong button being accidentally pressed. The GT1030 also features a real time clock, enabling the end user to automate oven on and off times from within the HMI.

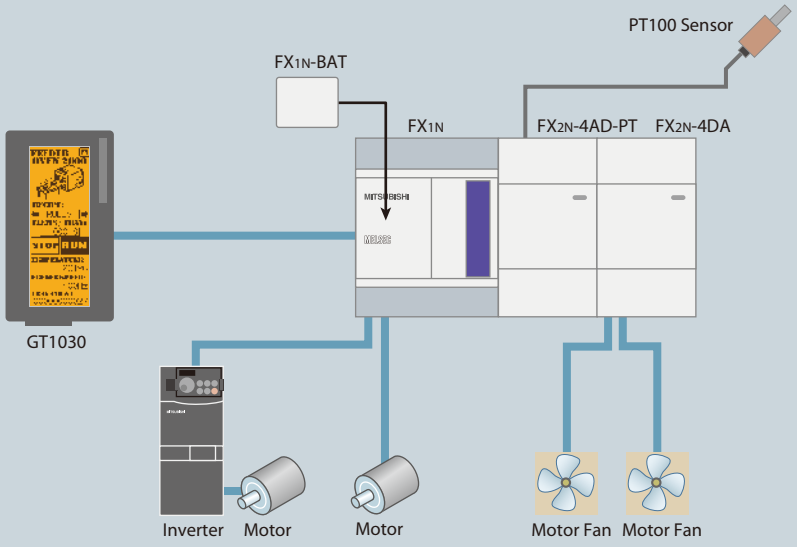
The physical layout of the GT1030 is also versatile, allowing the user to vertically or horizontally mount the HMI to the application. This enables the optimal screen layout with respect to the application and versatility for space critical applications.

System Configuration:

Controlled inputs

- User control panel
- Oven temperature
- Valve status
- General input handling

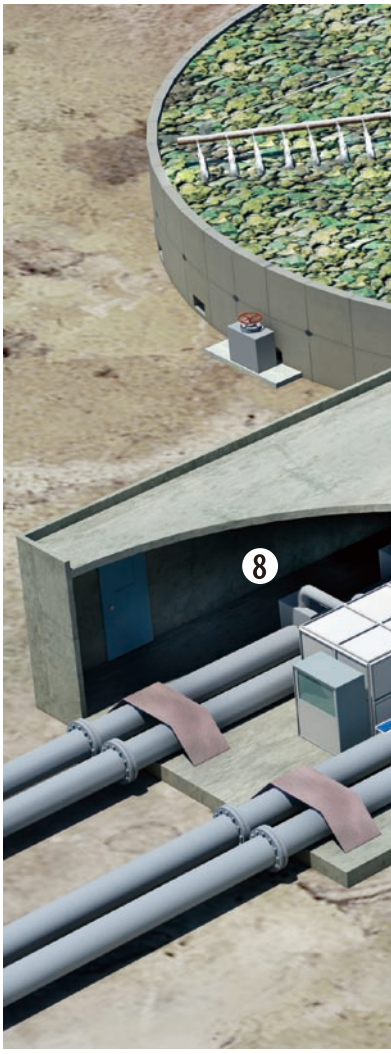
Hardware



Controlled outputs

- User control panel
- Conveyor (Inverter)
- Circulation fan
- Extractor fan
- Oven heater
- Air intake valve open
- General output handling

Water Industry
– Trickle Filter Application



Features:

- Remote monitoring and maintenance via Ethernet communication

- FREQROL protocol for simple setup of inverters

- Energy saving inverters

- Handy HMI

Application Overview:

To sustain the health of the community, a crucial factor is to ensure that water treatment is correctly managed. To do this, a range of applications exist for large treatment plants that range from 1000s of I/O to compact PLC applications, like the trickle filter.

The trickle filter is a wastewater treatment system that biodegrades organic matter and can also be used to achieve nitrification. To do this a rotating distributor evenly distributes the wastewater from above the bed, where the wastewater trickles through a circular bed of coarse stones. The microorganisms in the wastewater attach themselves to the bed, which is covered with bacteria. This bacteria breaks down the organic waste and removes pollutants from the wastewater.

Mitsubishi Electric Inverters

A key element to this application is providing a continuous flow of water through the tanks. For this task, Mitsubishi Electrics Inverters are the answer. A key advantage to using inverters is that they allow for energy saving via their variable torque load, enabling the system to increase power to the motors when increased pumping is required. For ease of setup, the inverters can easily be connected to the FX3U PLC using the FREQROL protocol. This protocol allows connection of an FX PLC and up to eight inverters communications in accordance with RS-485, and permits inverter monitoring as well as parameter reading/writing – all of which enables the customer to keep a sharp eye on events happening within the system.

Ethernet - Remote Connection

With these types of applications often being located at remote sites, it is no longer cost effective to have service personal frequently visiting the application just to perform routine checks. To overcome this problem, the control system features an Ethernet connection to enable remote monitoring and maintenance of the application. Remote access allows the user to setup control rooms where a number of different stations can be monitored from one location, all of which reduces labor costs and in-turn reduces the overhead costs of running the application.

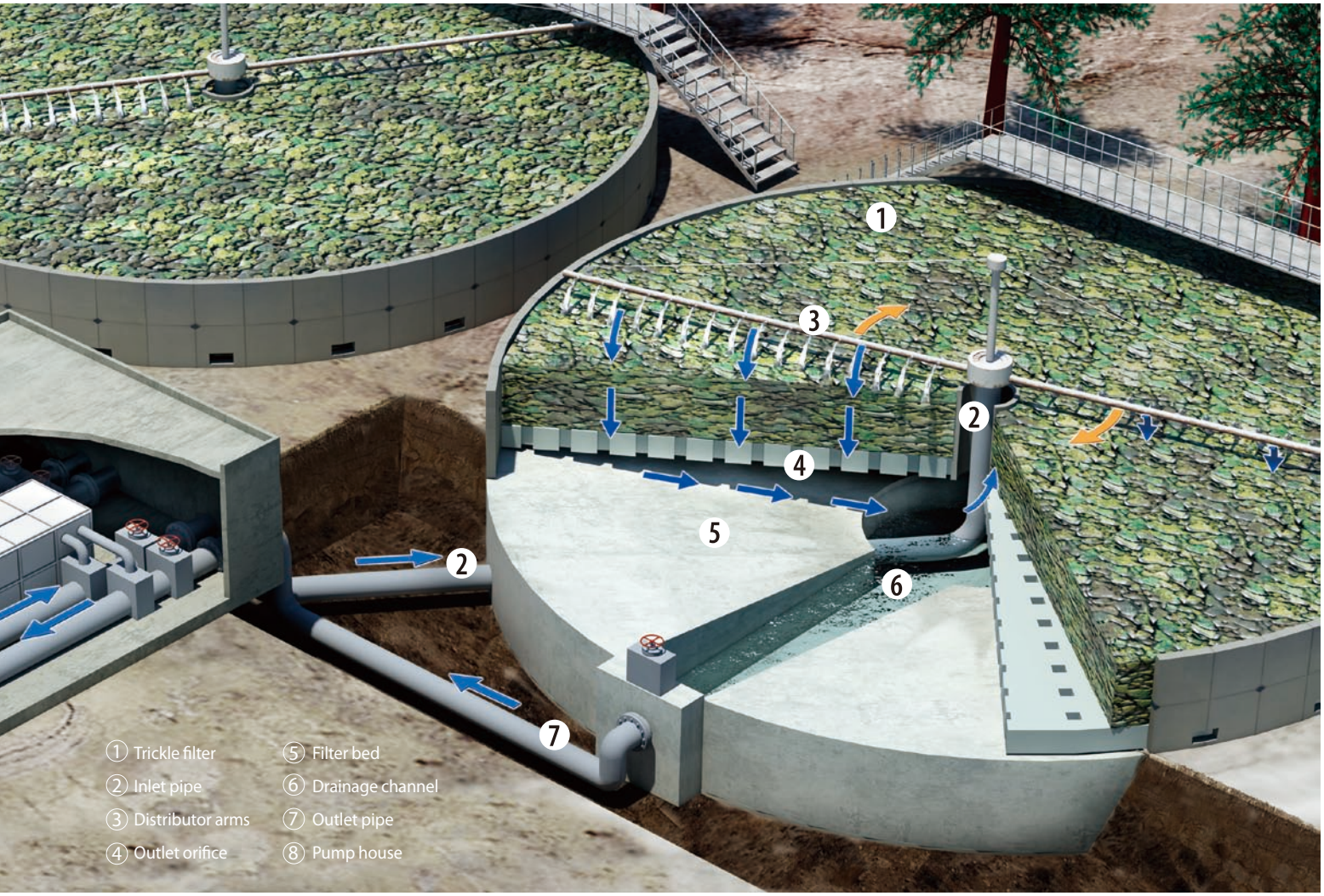
To enhance remote monitoring, the FX3U-ENET connection also features E-mail, allowing the FX3U PLC to actively contact the user with status information and notify the operator in the event of an alarm within the application.
The user is also able to communicate to the PLC via E-mail, permitting setting of parameters within the PLC code.

A Mobile HMI for Mobile Users

For the occasional times when personnel visit the application in person, the cost of the control system can be reduced by removing the need for fixed HMI displays. The use of the GOT-Handy type terminal allows service personal to directly plug their mobile HMI into the system, providing a user interface that has been created especially for servicing the application, and helping maintenance staff to perform service in the most efficient manner possible.

Although technically based on the GT11 series, the GOT-Handy terminal also features a number of functions that ease operation in a mobile environment:

Push-button switches - these six buttons with LEDs for operation status are provided as inputs to control external equipment.



Emergency stop switch - This switch immediately stops the unit in an emergency. A Normally closed contact is adopted to assure safety. In addition, the switch guard is offered as an optional add-on to prevent additional operation.

Selector key switch - Operation of the GOT can be adjusted according to the key switch status. Manual vs. Automatic operation or Visible vs. Hidden objects are among the possibilities.

Three-position grip switch - The three-position (OFF-ON-OFF) type 'dead-man' switch is adopted for preventing operation mistakes and prohibiting operation of a machine. The switch can also directly control external equipment to give immediate stop commands to a machine.

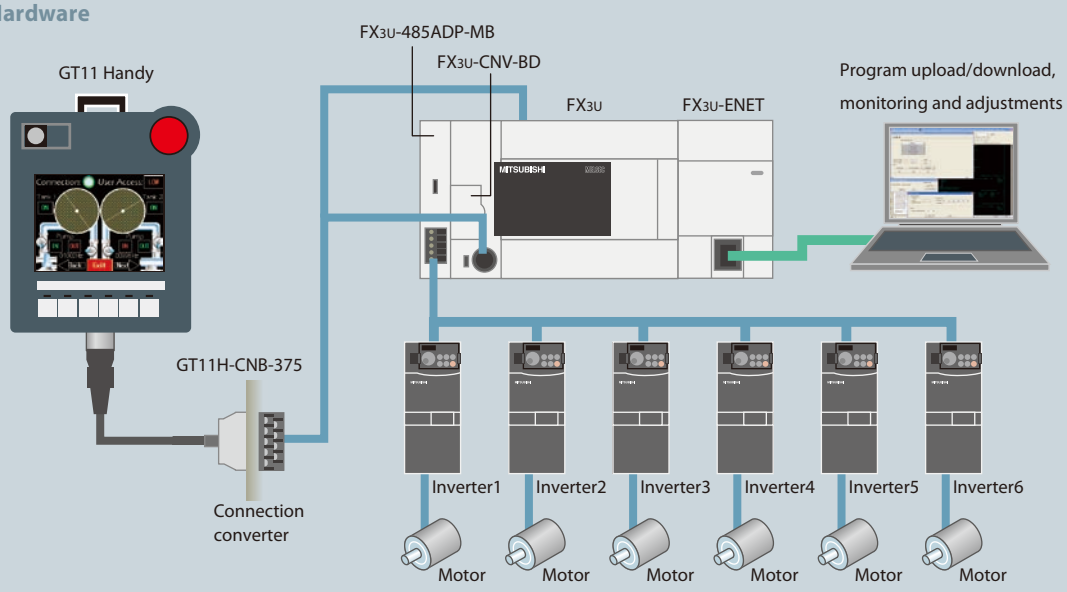
Note: Direct disconnection of the handy unit will cause the emergency stop switch to activate unless a design such as configuring an external parallel circuit is implemented. Refer to the GOT Handy manual for details.

System Configuration:

Controlled inputs

- Water pressure
- Valve status
- Distributor arm encoder pulse input (x2)
- Water flow rate
- Distributor rotation speed
- General input handling

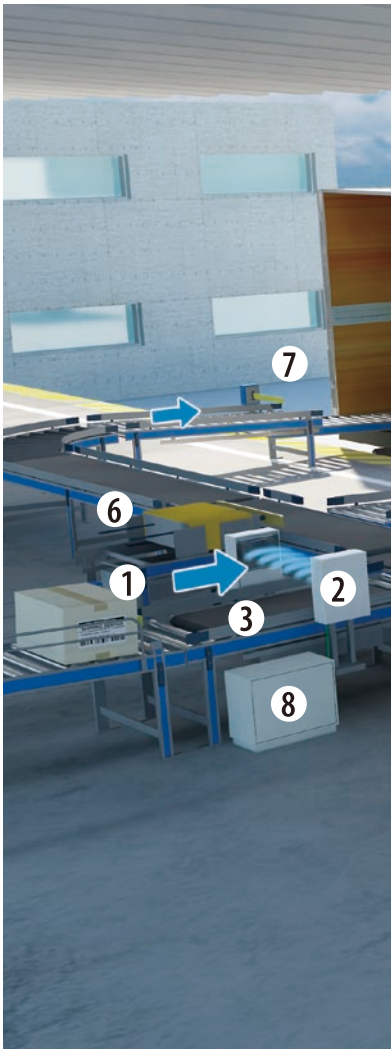
Hardware



Controlled outputs

- Water pump in (Inverter 1 & 2)
- Water pump out (Inverter 3 & 4)
- Distributor arm control (Inverter 5 & 6)
- Output data (GT11 handy)
- General output handling

Material Handling Industry
– Package Distribution Application



Features:

- Multi-network connection

- FX3U ADP Expansion Bus

- Easily expandable system

- Third-Party device Connection

Application Overview:

Reliable communication with a PLC is a necessity for every application – whether it is to provide a connection between actuators and switches, FX series products, or other third party devices. When communication types are appropriately selected they increase the effectiveness and efficiency with which the application completes its tasks.

Effective Data Management

Material handling is an industry area that defines its existence on effective data management. It is of the utmost importance that accurate information is continuously and reliably passed through the system, enabling database-updates and allowing the user to access information at any given moment. To meet these demands, the FX3U steps to the fore front, offering a range of serial and network communication options for flexible easy to use communication functionality.

Straightforward Communication

Today package tracking is something that is vital within the material handling industry, allowing system users to see exactly where a specified package is at all times. To do this, the PLC is situated in the application as a handling device, passing information received from the RFID scanner up to the computer. An RFID scanner, a third party device, is also connected to the FX3U via an FX3U-232-BD board mounted on the front of the PLC. Using Non-Protocol communication, package location data from the RFID scanner can be quickly passed to the FX3U PLC.

Once data has arrived in the PLC, two processes are then initiated. The first is for the PLC to determine the destination target. This is carried out by using outputs of the FX3U PLC to provide control signals to the conveyor system, thus creating a destination path for the package.

The second process is to update the main database with package data received by the PLC to set up this communication path the Computer link protocol is used. This allows all information received and sent by the FX3U to be recorded within the computer. Once in the computer, data can be easily managed and manipulated using third party software, allowing users with little experience to successfully interact with the activities of the application.

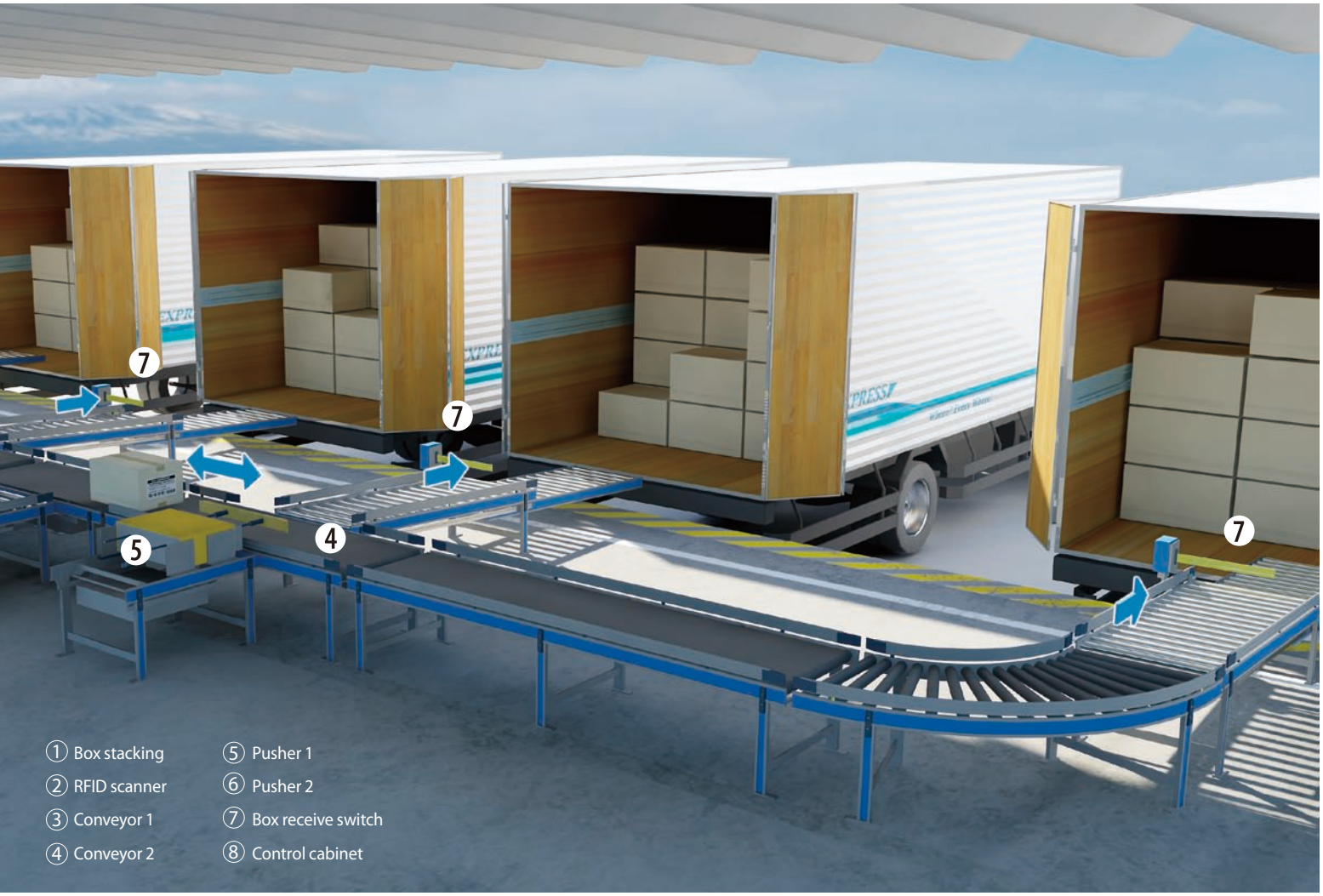
FX3U ADP Expansion Bus

A design feature of the FX3U is the new adapter expansion bus on the left hand side of base unit. Through this bus users can add additional analog and temperature units as well as multiple communications and positioning blocks. All control is carried out through direct access data registers and setting bits within the base unit - allowing quicker set-up, easier use, and above all much higher processing speeds.

Expandability

Using the FX3U-485ADP-MB hardware connection, the Computer Link Protocol network is easily expanded, permitting up to 16 FX PLCs to be placed on the network up to 500m away from the computer. This flexibility offered by the FX3U allows users to expand their applications easily giving them the flexibility to operate within modern day businesses where change is constantly present.

The FX series also features a range of other serial networks that enable better realization of the application depending on the given requirements. These serial networks include N:N networking, Parallel Link and Modbus.



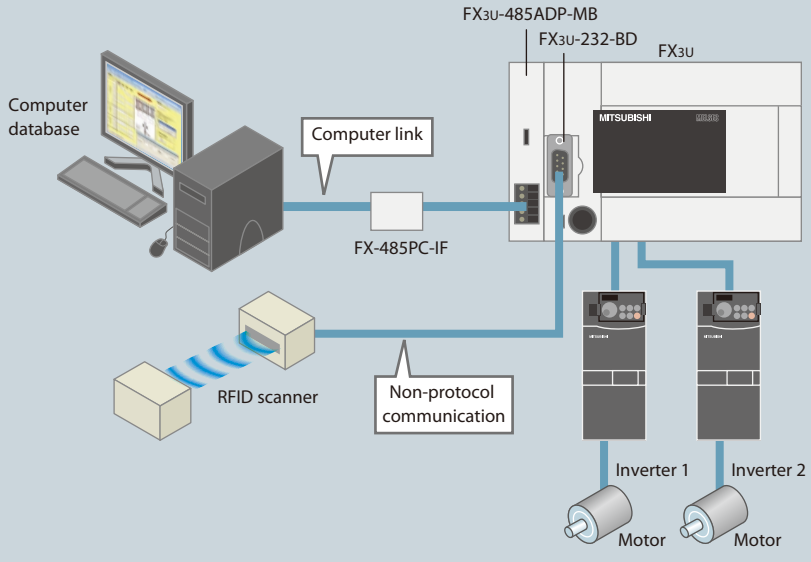
To enhance serial network setup, Mitsubishi Electric's own PLC programming software, GX Developer, also features parameter windows that facilitate the setting up of networks. Through simple drop down menus, users can quickly and easily select the communication channel, the network type, communication speeds and time out periods, thus reducing the coding time for the programmer.

System Configuration:

Controlled inputs

- Box send switch
- Box receive switch
- Operator control panel
- RFID scanner (Non-protocol communication)
- General input handling

Hardware



Controlled outputs

- Operator control panel
- Conveyor 1 (Inverter 1)
- Conveyor 2 (Inverter 2)
- Package pushers
- General output handling

Shipping Industry
– Dehumidification Application

Features:

- Shipping approvals

- Easy program change via EEPROM cassette

- High accuracy Analog Special Function Blocks

- Intuitive programming environment

Application Overview:

Due to the nature of today's business, applications are produced for a variety of purposes and installed in a number of different environments. To create control systems for these applications, customers require products that are flexible as well as robust, so that they can operate in a variety of different environments without fear of stoppage.

International Approvals

Shipping is a large industry area that has evolved to handle one part of the transportation process. Within modern ships, be them cargo ships or cruise ships, there are a range of different applications where PLC control plays a vital part. However, before a PLC can be fitted to a ship certain legislative requirements must be first met. The FX series base unit range along with a range of SFBs, ADPs and other accessory products are compliant with a number of key shipping approval organizations, including: Lloyds, German Lloyds, American Bureau of shipping, Registro Italiano Navale, DET Norse Veritas and Bureau Veritas. These approvals give the user confidence that the FX control system will operate safely within the bounds of this strict operating environment.

Adapting to the Application

To care for the condition of the ship and the products being transported, it is imperative that the ship interior is kept as dry as possible. Therefore, moist air, a catalyst for rusting and causing mildew, must be removed. This process of handling moist air within the ship is carried out by a dehumidifier application. The application itself is simple, taking air from the ship holds, passing it over a cooling filament, condensing the moisture from the air before then passing the dry air back into the ship hold.

To enable control of the application, the PLC is equipped with two analog units. The first unit, the FX2N-4AD, takes humidity measurements from the sensors located in the various hull compartments of the ship. These humidity measurements are used to alter the temperature of the cooling fins. The greater the humidity in the air the cooler the fins become. To provide accurate temperature output data, the fins are controlled by the second analog unit, the FX2N-4DA.

Direct Motor Connection

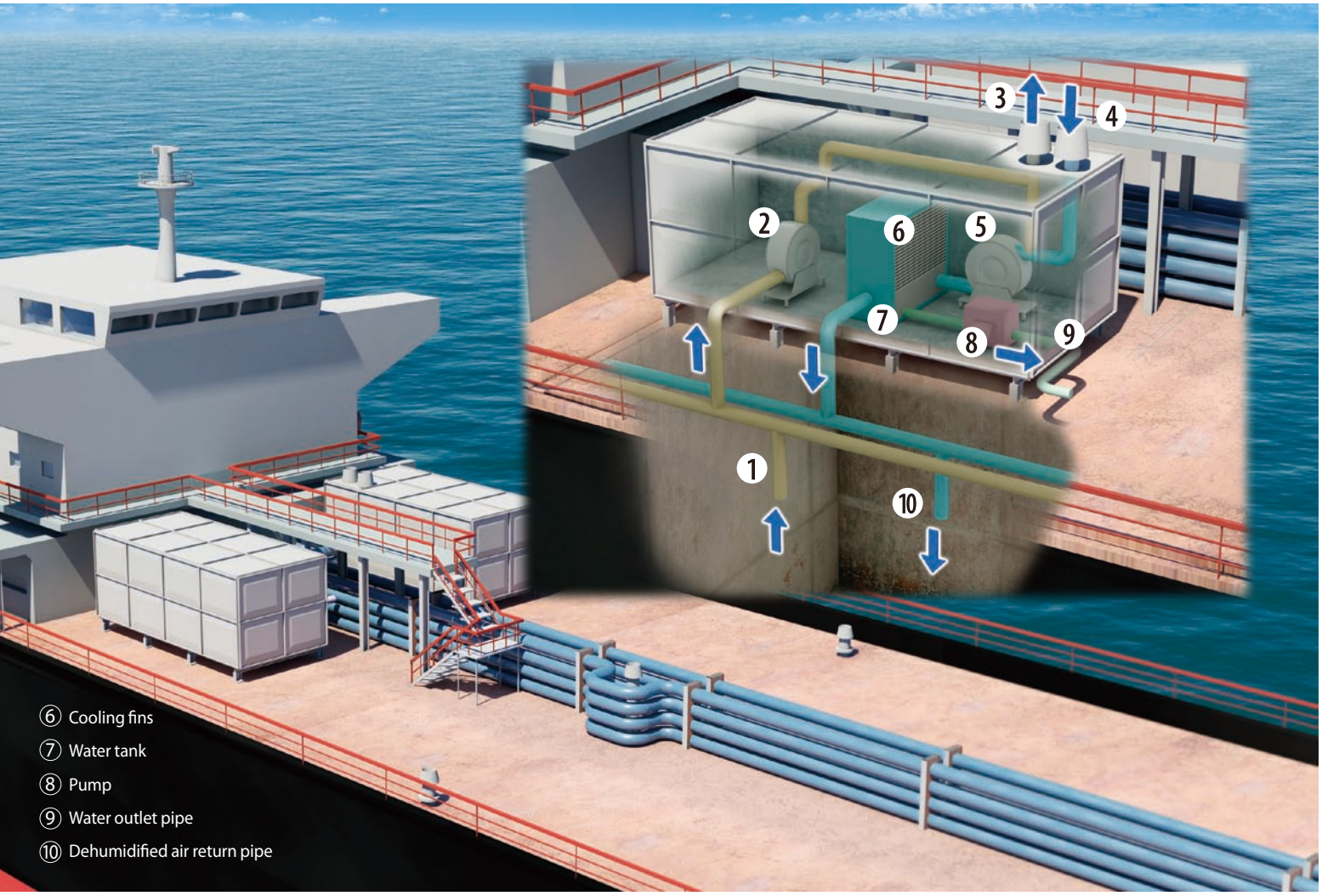
To remove condensed water from the system, the control system takes readings of the water levels from the condensed water collection tank. Once the threshold value is reached within the tank, the PLC turns on an output which is connected to a motor, and water is pumped from the collection tank until emptied. Once empty, the motor is shut down until next required.

Simple Program Change

In applications such as those fitted to ships, when a program change is required, often the personnel around the device are not familiar with the internal workings of the application and cannot program the desired change. To overcome this problem, an EEPROM cassette can be used by the application builder to store a modified program, after which it can then be sent to the end user. Upon receiving the EEPROM cassette, the end-user simply plugs the cassette into the PLC, where the EEPROM program will automatically run. This process minimizes complications and avoids the need for costly on-site visits for program changes.

Intuitive Programming Environment

For the machine builder who creates the PLC program for the application, the FX Family of controllers has a simple programming structure. Using



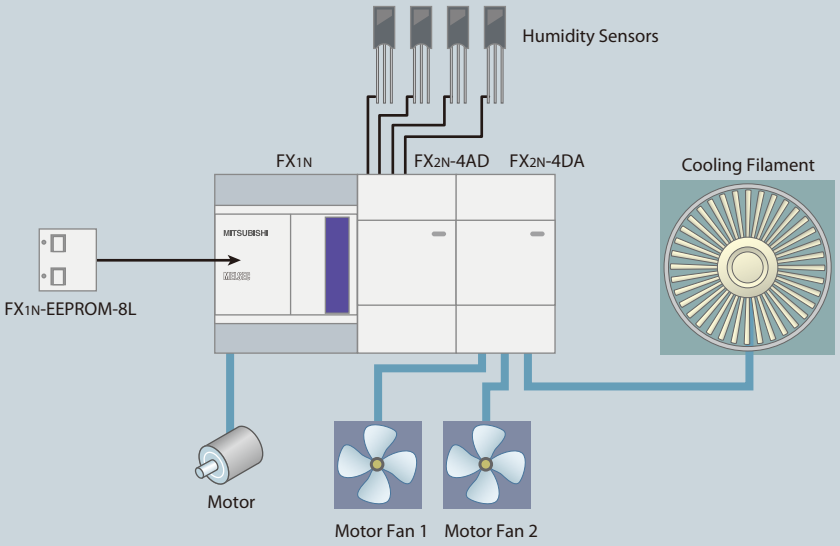
GX Developer's straightforward programming environment, easy to use help functions, and advanced PC to PLC communication, machine builders can quickly develop programs that meet the demands of the application.

System Configuration:

Controlled inputs

- Temperature of cooling fins
- Humidity monitoring
- Fresh air inlet
- Fresh air outlet
- User control panel
- General input handling

Hardware



Controlled outputs

- Valve control
- Non-treated air fan (Fan 1)
- Non-treated air fan (Fan 2)
- Cooling fins temperature
- Water pump
- User control panel
- General output handling

Plastics Industry
- Injection Molding Application

Features:

- New FX3U ADP bus for high-speed precision control

- Third party device connection via Modbus

- High speed input/output ADPs with differential line drivers

- HMI with CF card interface and List Editor

Application Overview:

In modern society plastics are something that most of us take for granted. The process of producing bottles, jars, toys etc. has become a refined process where speed and accuracy are two qualities that distinguish the good applications from the rest.

With injection molding applications, the process involves turning raw plastic granules into usable commodities. Although a straightforward process, the control system must handle analog and positioning procedures with high processing speed. To set a new benchmark within the compact PLC market, the FX3U was developed with a new high-speed Special Adapter (ADP) bus that implements control via direct access to data registers and bits within the PLC, capable of higher processing speeds for the customer's application.

High speed I/O Control

High speed I/O control is an integral part to the application. The application relies on control of the worm screw that drives the plastic granules down the heating chamber, control of the reciprocal injection mechanism that drives the melted plastic into the mold, and, once the plastic is set in the mold, control of the mechanism that opens the mold, ejects the plastic and re-closes the mold again. The high-speed input and output ADPs provide simple control of up to 4 axes that can process signals at up to 200kHz. Both the FX3U-4HSX-ADP and the FX3U-2HSY-ADP use differential line drivers which improve positioning accuracy and reduce the effect of noise within the system.

Explore the Possibilities - Modbus

A Modbus connection provides a simple connection for the temperature controllers which monitor the temperature of the heating chamber and provide control to the heaters. Modbus allows a simple connection of both FX3U PLCs and third party devices compatible with the protocol. This opens the customer to a range of new opportunities, ensuring that the optimum sensory devices and output devices are fitted to the control system. The FX3U-485ADP-MB hardware connection allows communication with up to 16 slaves with a transmission speed of up to 19.2 kbps.

Data Visualization and Storage

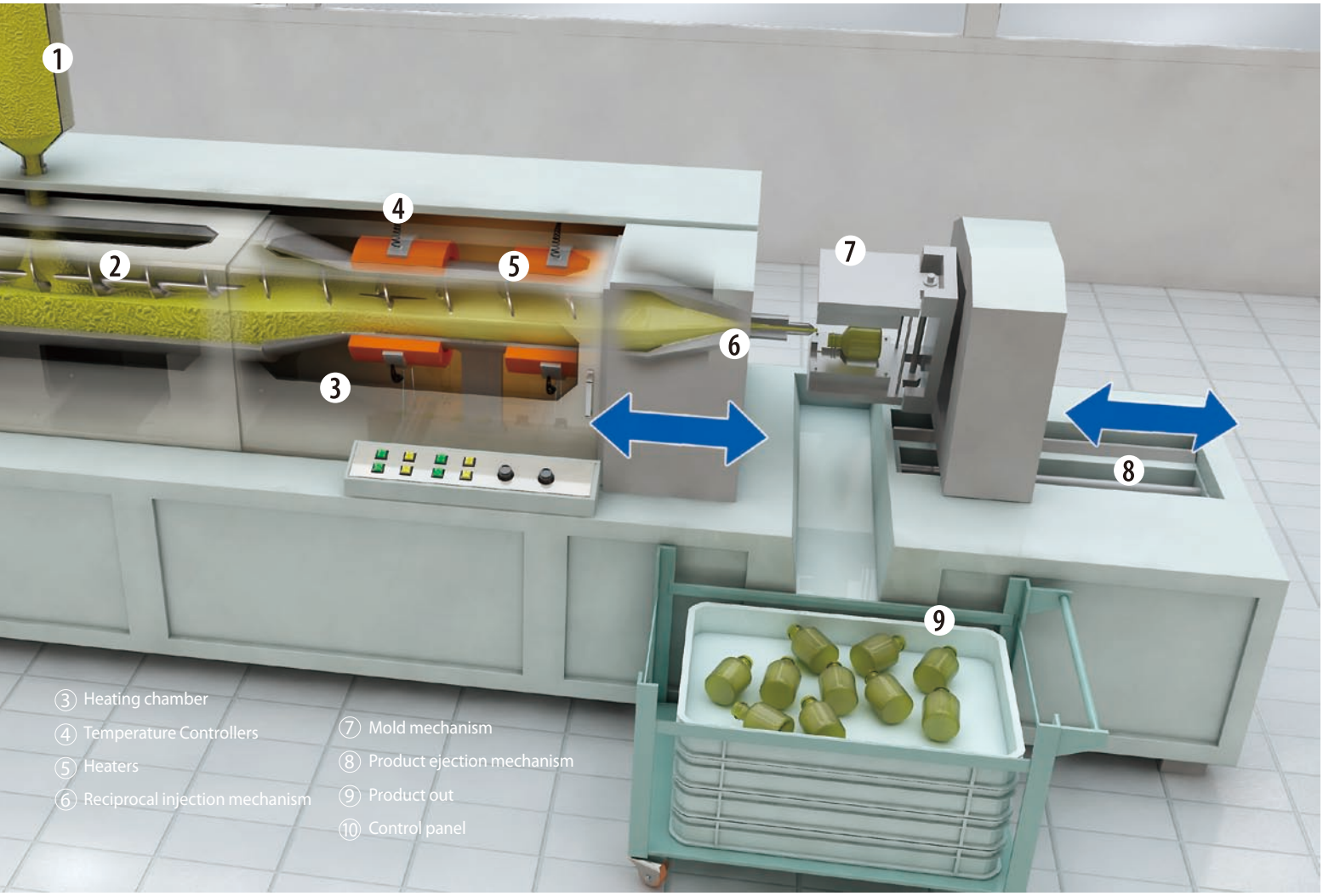
To enable the operator to successfully interact with the application, the control system is equipped with a GT1155 that provides sharp data representation via the 256-color display and 3MB storage space for screen designs. Among the many functions available, the GOT is equipped with extensive alarm handling as well as graph functionality that gives the user a range of options to select the best method to present application data. Screens can be tailored to the end user's needs so that high-level control is always one touch away.

CF cards are a useful accessory for transferring screen projects quickly, particularly when a large number of terminals need to be simultaneously updated. The CF cards can also be used to store alarm related information as well as other specified data, allowing service engineers to complete application analysis away from the application itself.

Mitsubishi Electric's data transfer tool also allows users to upload/download GOT project data from/to the HMI, without the expense of purchasing GT Designer 2.

Direct Program Change & System Monitor

Furthermore, included with the GT11 is a List Editor that provides a convenient



method for minor on-site program changes in Mitsubishi Electric PLCs. Changes are carried out in instruction list format, removing the need for additional peripheral devices.

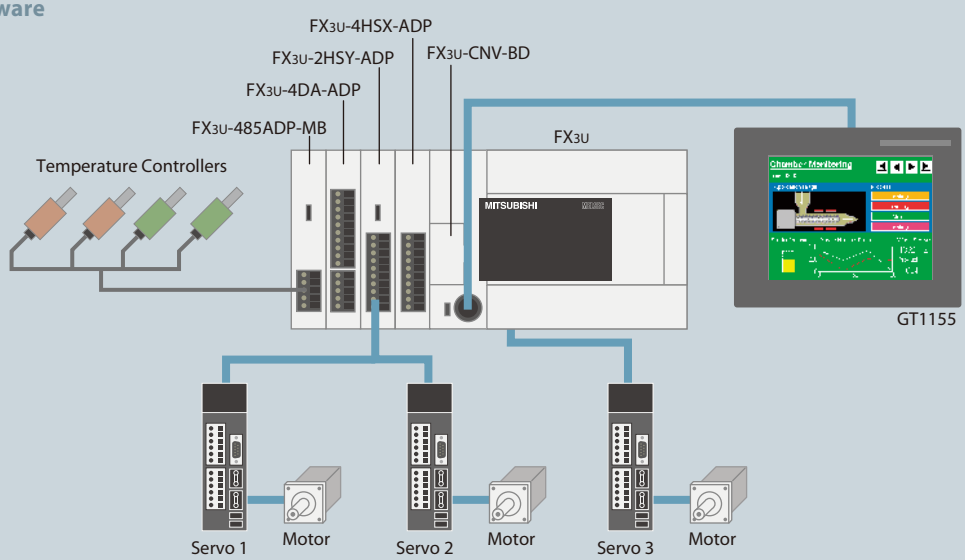
Using the System Monitor within the GT11, Mitsubishi Electric PLC devices can be monitored and changed. Monitoring can be performed by selecting individual devices to be monitored, or by specifying the first device in a range. Current values and set values of timer and counter devices can also be changed, along with the buffer memory of attached special function blocks.

System Configuration:

Controlled inputs

- User control panel
- Temperature input (Modbus)
- High speed counters
- General input handling

Hardware



Controlled outputs

- Worm screw motor (Servo 1)
- Worm screw reciprocal injection mechanism (Servo 2)
- Mold mechanism (Servo 3)
- Heater control (Modbus)
- User control panel
- General output handling

Printing Industry
– Label Printing Application

Features:

- FX2N-10PG with up to 1MHz pulse output string

- Non-protocol communication for third party device connection

- GOT1000 Series HMI with language switching

- FX3U - Speed with Precision

Application Overview:

Printing is an industry where the FX range has always proven successful. Whether the customer seeks reliability, accuracy or speed, the FX range offers the correct attributes to give the customer's application a leading edge within the market.

Single-Axis Positioning Module

For the majority of applications the FX3U's built in high speed inputs and outputs offer sufficient control for the customer's application. However, in certain circumstances the user may wish to increase the positioning control performance. This can be carried out by simply connecting a FX2N-10PG Special Function Block, which provides a pulse train output of up to 1MHz. This highly accurate pulse output can be used to drive a single-axis stepping or servo motor enabling advanced control within the application. To limit the affect of noise within the system, the FX2N-10PG is also equipped with a differential line driver. The differential line driver cancels out any white noise that may be present within the system, providing more precise positioning data to the drive train and thus more accurate printing results.

With special functions that include the selection of absolute or relative positioning and 7 different operation functions, such as jog mode, zeroing and speed increase or decrease functionality, the FX2N-10PG provides an array of options with which to control the application.

Control of third party devices

For control of third party devices, the FX range can also communicate via non-protocol communication, connecting to devices such as printers, barcode readers, etc. Using non-protocol communication, up to 4,096 data points can be sent and up to 4,096 data points can be received. And, with a total extension distance of up to 15m via the FX1N-232-BD, this setup has potential for use with larger applications.

Speed with Precision

The FX3U has the fastest processing speeds within the FX range, allowing basic instructions to be processed at 0.065µsec. For users this means faster program response and more accurate process performance as inputs, outputs and actions are processed and monitored more times per second.

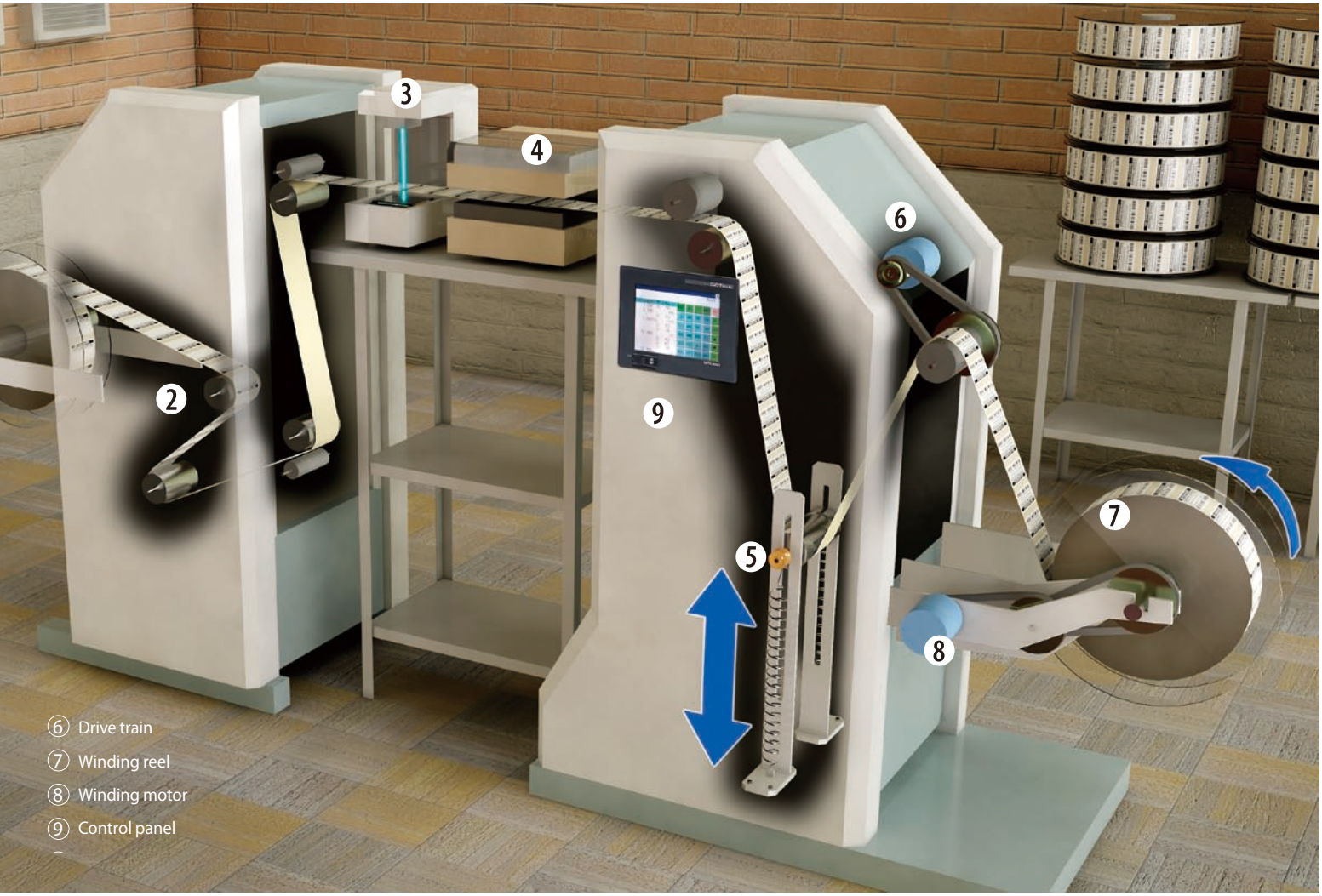
Furthermore the FX3U comes with a large standard internal memory of 64k steps. Larger memory allows the user to write larger and more complex programs as well as store more data in the file registers.

Overcoming the Language Barrier

For applications that are exported to different parts of the world, it is essential that the HMI language can be reconfigured to end-users' native tongue. To do this, the GOT1000 series features easy language switching which allows a variety of spreadsheet based dialogs to be loaded within the user's program, permitting the user to switch the user language at a touch of a button. The GOT1000 series is compatible with Unicode 2.1 enabling a host of character sets to be chosen, whatever the language.

Using the GOT's ASCII input feature, new dialogs can be written within the HMI and sent to the PLC. This feature allows the user to modify the alphanumeric strings that are printed to the labels without complications of additional hardware or software.

With a range of fonts, graphical charts and alternative startup screens, the GOT1000 range allows the user to create a personalized interface to display in-depth information about the application. Also by using the available



graphical tools, machine builders have a range of options from which to choose the most efficient method of representing data thus utilizing the maximum amount of available screen space.

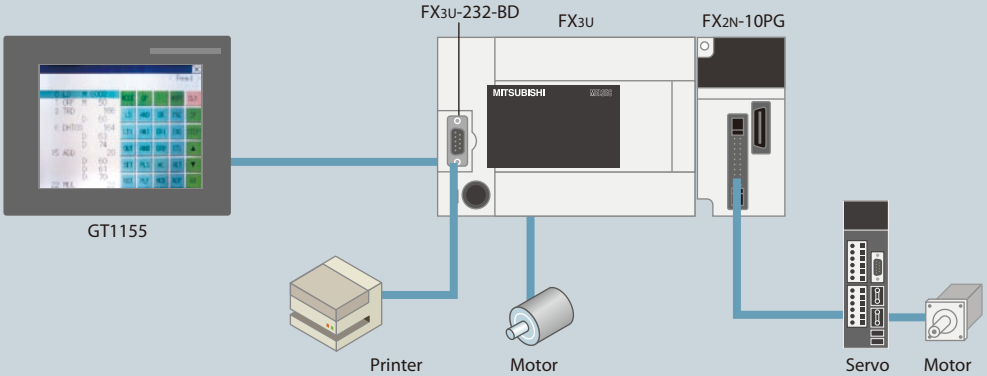
Finally, with the front mounted USB port, service staff can quickly enter the PLC program, allowing the ladder code to be quickly monitored and changed as necessary. The USB "transparent mode" simplifies the connection setup, thus reducing down time of the application.

System Configuration:

Controlled inputs

- User control panel (label test input)
- Start stop sensor
- General input handling

Hardware



Controlled outputs

- User control panel
- Drive train (Servo)
- Printing device
- Winding motor
- General output handling

Packaging Industry
– Interconnected Applications

Features:

- FX - Servo System Controller Network Advanced positioning control

- CC-Link connection - Effective data communication

- Backwards and Forwards Compatibility

Application Overview:

Whether the product comes from the food industry, pharmaceutical industry or consumer goods industry, it is highly likely that the product undergoes some form of packaging during the production process. With a variety of packaging applications available, the PLC system must be flexible so that it can mold to the requirements of each solution. Whether it is filling, capping, sleeve placing, heat shrinking, or product placement, the PLC system must provide multifaceted control for every stage of the packaging process.

Sustaining Pace with Technology

To sustain pace with the technological improvements within the market and for customer's business' to stay competitive, it is important that control systems can be upgraded as the need arises. As new products feature in the market, it is unreasonable for customers to bear the cost of upgrading their entire control system to accommodate new technologies. It is for this reason that the FX family of base units have been developed with backward - forward compatibility, allowing users to upgrade their base unit without the case of upgrading extension modules.

SSCNET III
- Servo System Controller Network

Mitsubishi Electric's SSCNET fiber optic network provides new opportunities that were only previously available with advanced PLC platforms. The network is connected to the PLC via the FX3U-20SSC-H block that permits a host of new functionality at the compact PLC range. Features include torque control, that ensures the maximum torque is not exceeded when placing caps on jars, manual pulsar connection, enabling customers to quickly set up the position of the sleeve rolls, and dual axis control, realizing both linear and circulation interpolation for quicker transition between points while reducing force loading on the product during positioning movements.

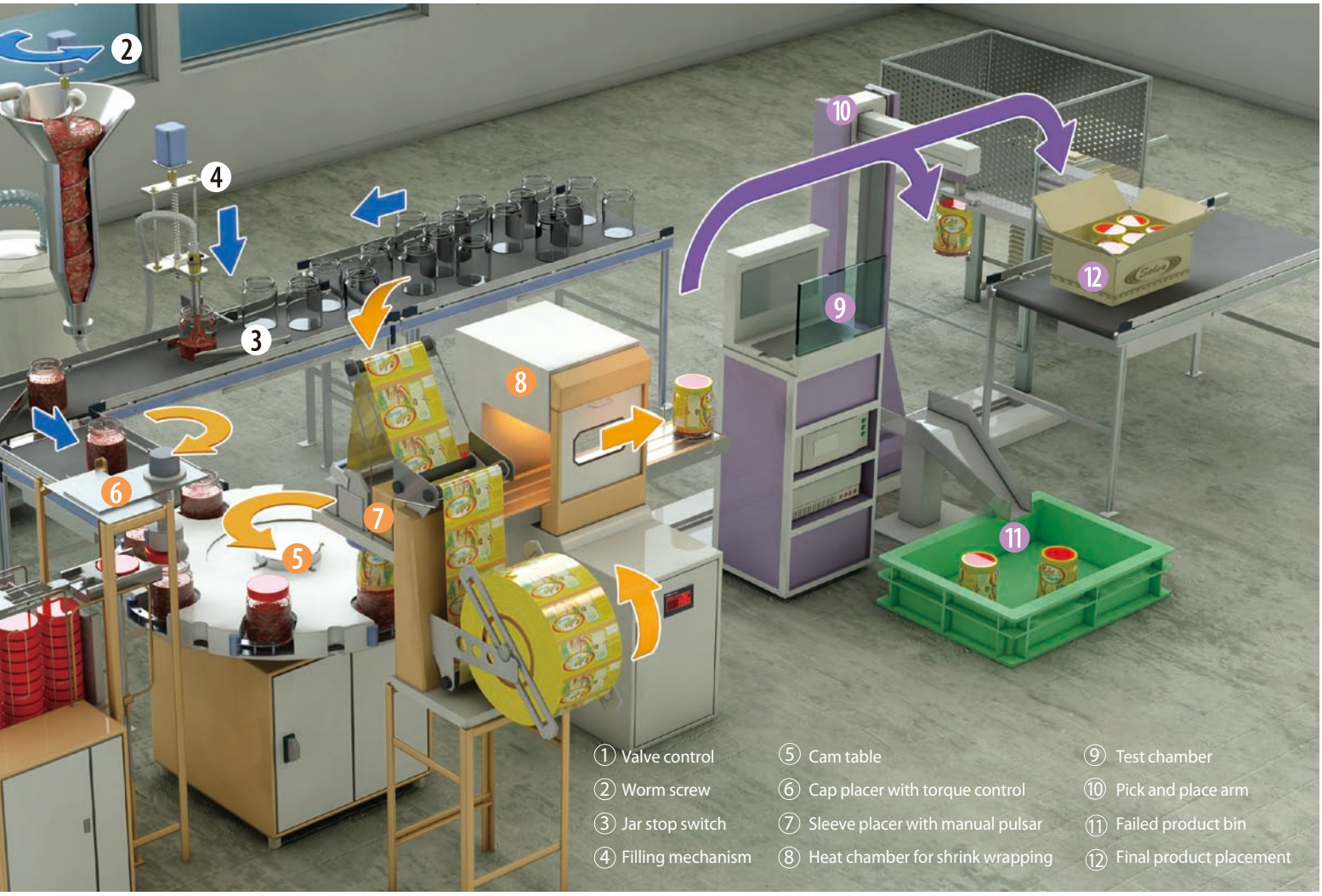
Another useful SSCNET feature is the Target Address Change function. Once the product is tested the PLC checks whether the jar is marked with a pass or fail status which can trigger the jar to be moved to a new target location. Using SSCNET, this process happens in one fluid movement – once the product status is identified the SSCNET module will automatically map the new path of the product without stopping, increasing the speed and efficiency of the process.

To enable flexibility when designing the application, SSCNET is equipped with fiber optic cables to convey control signals between the servo motors and the PLC unit. Fiber optic cabling means the servos can be placed up to 50m from each node on the network whilst providing a communication speed of 50Mbps.

To simplify the setup procedure, the FX3U-20SSC-H also features its own programming software FX Configurator-FP. This software integrates with GX Developer and allows the users to set up positioning instructions in a table format enabling simple to advanced positioning control patterns to be quickly and easily created.

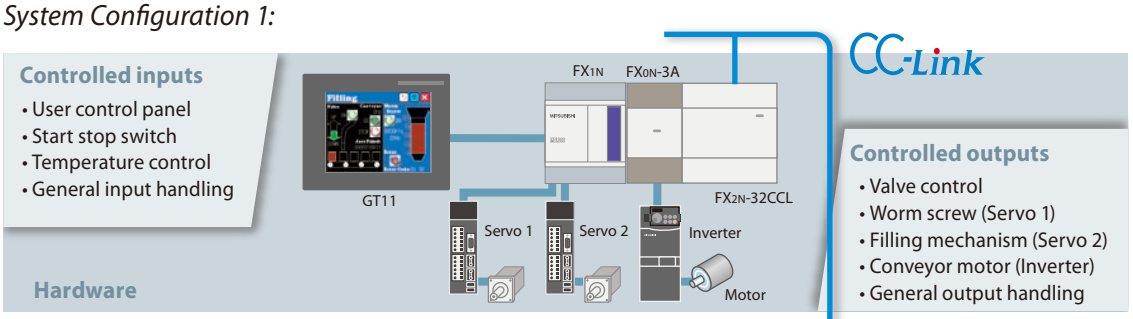
CC-Link
– Effective Data Communication

FX applications often feature as part of a bigger application. In factory environments there may be many other processes happening simultaneously. To maintain synchronization and efficiency, application processes must be able to communicate with each other continuously. To do this, CC-Link has evolved, providing an open field bus and control network for

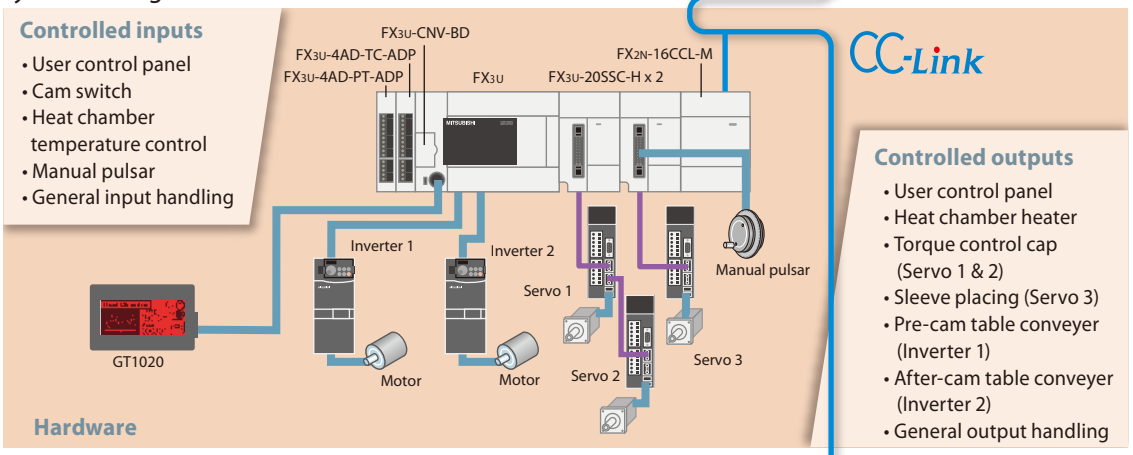


communication with intelligent devices such as display devices, bar code readers, and PLCs. With data communication via standardized twisted-pair cable, a maximum bus segmentation extension of 1,200m (at 156 kbit/s max.) and transfer rates of up to 10 Mbit/s (for reduced extensions), CC-Link provides a cost effective and versatile network for a range of applications. CC-Link is also connectable to a PC, allowing a Master station to be setup on the network and permitting the user to monitor and control the system away from the factory floor.

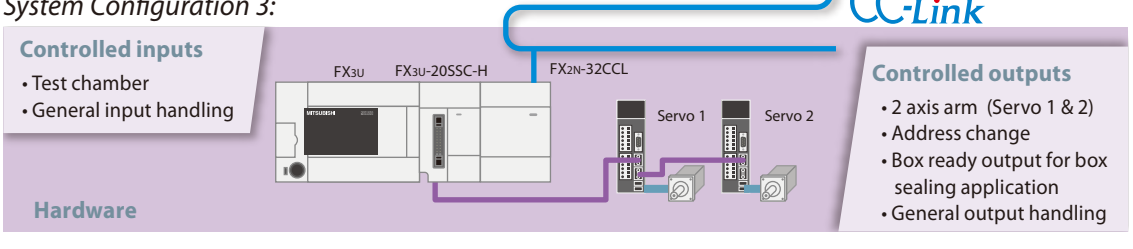
System Configuration 1:



System Configuration 2:



System Configuration 3:



Hardware

Hardware
The setup of an FX system can range from a standalone base unit to more advanced systems with increased I/O handling, as well as analog and digital control. When creating FX control systems, the FX products fall into a set of defined categories.

Base units
The unique range of base units makes FX PLCs suitable for a variety of applications. The range allows the customer to select the power supply, AC or DC, as well as the type and number of system inputs and outputs used on-board the system. All base units can be programmed with GX Developer programming software, allowing flexibility to transfer programs between different PLC types.*1

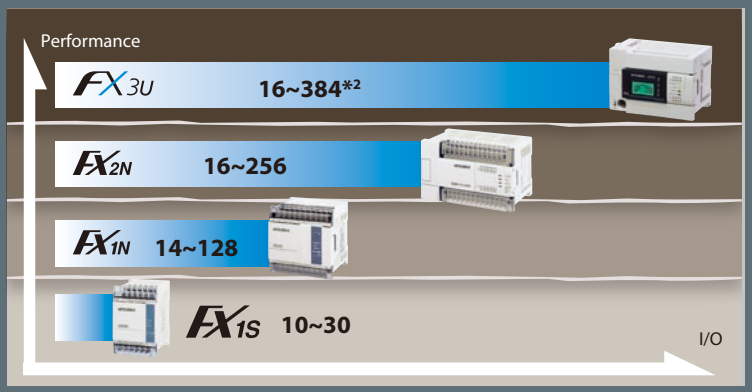
*1 Some instructions may not be supported in certain base units.

Expansion boards
For small numbers of additional I/O (2 to 4), the extension adapter boards can be installed directly into the FX1S or FX1N controller. Interface adapter boards can also provide other communication interfaces for FX PLCs.

Expansion I/O Blocks and Units
Both un-powered and powered expansion I/O can be added to the FX series PLCs. This allows customers to create systems that control the optimum amount of I/O to operate their application effectively.

Special Function Blocks and Special Adapters
A wide variety of special function modules are available for the FX series PLCs, providing networking functionality, digital to analog control, analog to digital control, positioning control and temperature monitoring.

Accessories
To enhance the FX System performance, the product range also features various memory casettes, display modules and cables. This attention to detail allows customers to configure a system that can be fine tuned to meet the end customer's needs.



FX1S
A micro controller for simple applications, supported by strong communication capabilities.

FX1N
This powerful micro brings the flexibility of the modular PLC design concept but, with the ease of use typical of FX series PLCs.

FX2N
Advanced control, multiple communication possibilities and a wide range of options still make this PLC an industry leader.

FX3U
Ultra high speed, maximum performance and a simplified design concept make this the ultimate micro PLC.

The right PLC for you
The FX family of PLCs is highly flexible, enabling fast and efficient configuration for the application at hand. It is the ideal choice regardless of whether you need a simple control system requiring up to 34 I/O (FX1S), or a more complex system with up to 384*2 I/Os (FX3U). Each PLC within the FX family has been created with a different application profile in mind.

Model	*FX1S*	*FX1N*	*FX2N*	*FX3U*
Power supply	100-240V AC, 24V DC	100-240V AC, 12-24V DC	100-240V AC, 24V DC	100-240V AC 24V DC
Maximum I/O	30	128	256	384*2
Digital I/O	Relay/Transistor	Relay/Transistor	Relay/Transistor /Triac	Relay/Transistor
Cycle period/ logical instruction	0.55 µs	0.55 µs	0.08 µs	0.065 µs
PLC program memory	2k steps	8k steps	8k expandable to 16k steps	64k steps

*2 When networked with CC-Link or AS-Interface (Discrete I/O maximum = 256)

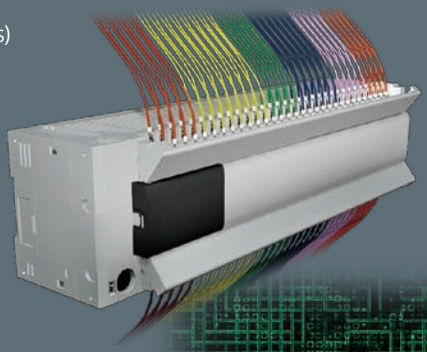
Your System

I/O Processing

Flexibility, speed, efficient configuration and ease of programming are often key features why customers choose FX products for their applications. The FX range is equipped with powerful processors that enable quick responses and accurate processing of tasks.

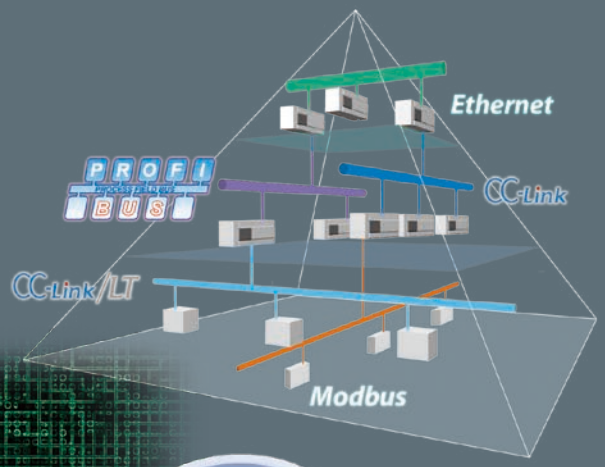
The use of instructions within the FX PLC range is designed with one common concept: to make the building of applications and program writing easier and quicker, whilst reducing the chance of errors.

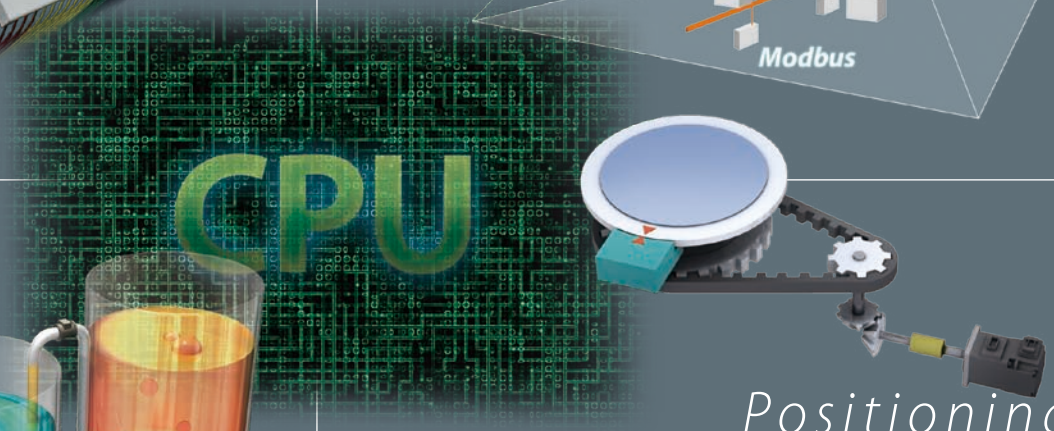
The FX base units' memory size range from 2K steps (FX1S) to 64K steps (FX3U). Larger memory means customers can write larger and more complex programs and store more data in data registers and extension registers.

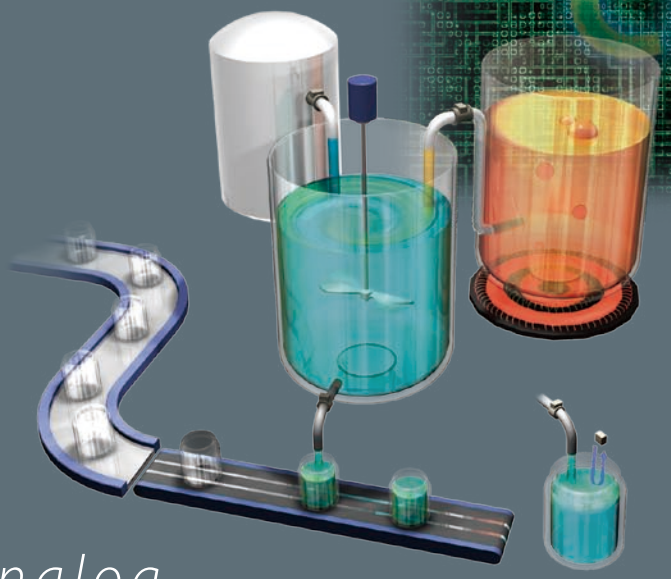


Communication

The FX Family of PLCs are equipped to share a basic communication concept where additional RS-232, RS-422 or RS-485 communication boards can be added to the main base unit without increasing the required cabinet space. These can then be used for communication to various third party devices like bar code readers, printers and modems. FX Family PLCs, such as the FX1N, FX2N and FX3U, also have a wider range of communications modules. These include options for connection to open and closed networks such as CC-Link, Profibus, Modbus and Ethernet.







Analog

The FX Family offers a wide range of analog solutions from 1 and 2 channel BD boards for FX1S and FX1N to the 4 high resolution independently configurable inputs and 1 output provided by the FX2N-5A. FX analog blocks come in a range of resolutions from 8 bit up to 16 bit signal processing. Through use of the FX1S analog range of products, control can be implemented for a wide range of devices be it speed control for an inverter, pressure levels in a pipe or temperature control.

Positioning

Simple

FX PLCs come with high speed counters and pulse train outputs on-board. The high speed counters can be configured for single or two phase inputs whereas the high speed outputs can be configured as single phase pulse train outputs.

There are also Special Function Blocks and Adapters available for the FX range that offer improved positioning performance to meet the needs of the customer.

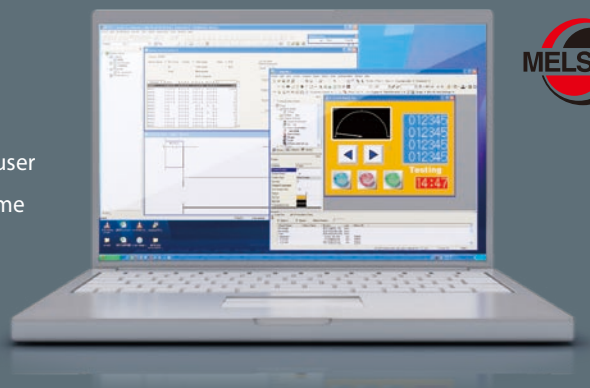
Advanced Solutions

Mitsubishi Electric's own Servo System Controller Network, SSCNET III, now includes an FX range connection via the FX3U-20SSC-H, bringing Modular platform technologies to the Micro PLC level.

Simple plug and play with dedicated cables reduces setup time and creates an error free wiring scenario. Optical communication technology delivers high noise immunity and extended transmission distances enabling unconstrained servo placement.

Software

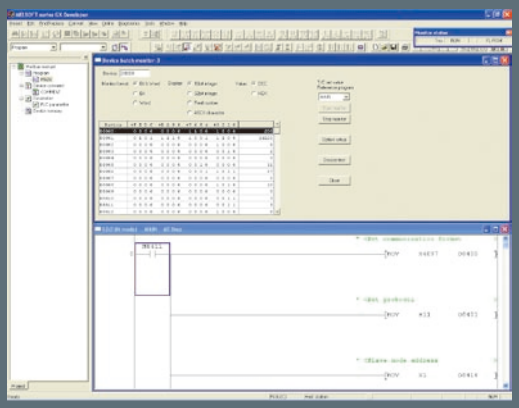
In today's world, programming software for PLCs is a forever evolving process. Customers place more focus on reusable program code and user friendly software. This helps to reduce errors, reduce programming time and helps manage the programming process.



GX Developer

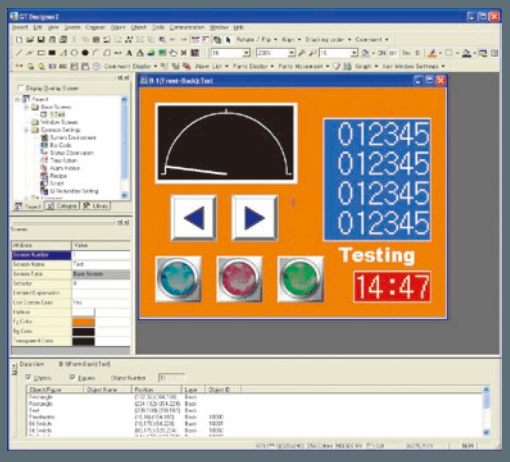
The key to any good software is that it is simple to use and intuitive. The GX Developer PLC programming package has achieved this by using a design that is simple to understand yet has access to powerful functions and tools. It also features help functions and an advanced communications setup utility, ensuring safe reliable data transfer to and from the target PLC.

GX Developer has also been designed so that it can interface directly with other FX programming packages, such as FX Configurator-FP and FX Configurator-EN, allowing customers to access different programs in a straightforward manner.



GT Designer 2

GT Designer 2 is a screen design program used to create HMI screens for the GOT series HMIs. A user-friendly Windows® environment provides the customer with a simple and recognizable interface, facilitating a fast learning curve for new users. GT Designer 2 is equipped with a parts library, a range of touch-switches and lamps, screen preview functionality, a GOT communication settings utility and a project consistency check function. Together these features combine to make GT Designer 2 a platform that produces screens that simplify the control interface between the user and the machine.

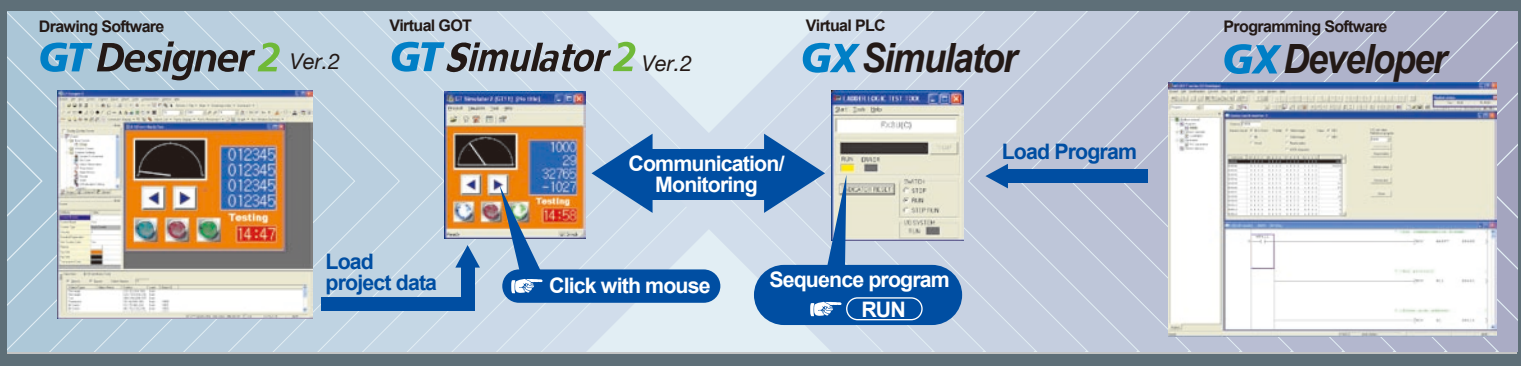


Simulation packages

GT Simulator 2 & GX Simulator

In today's high pressured world, application designers are often pressurized to reduce program development time. In order to meet this challenge, Mitsubishi Electric has created simulation packages to help designers increase development efficient and ease.

GX Simulator and GT Simulator 2 allow users to create a virtual PLC or GOT respectively on their PC. PLC code and GOT programs can be tested and any errors debugged without the need of hardware. GT Simulator 2 and GX Simulator have been developed so they can operate simultaneously, allowing full application environments to be created within the user's PC.



The Beauty of Functionality

GRAPHIC OPERATION TERMINAL

GOT1000 Series

Performance and functionality

3.7-inch	4.5-inch	5.7-inch	8.4-inch to 15-inch

GT10

An HMI range that offers
vivid data visualization on a micro-display

GT1020 GT1030

GT11

An entry-level HMI range that provides an array
of easy-to-use functions for stand alone use

GT15

A progressive HMI range for a wide range of
stand alone and networked applications

Panel size

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⚠ Safety Warning

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

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