

FANUC Robot series

R-30iA CONTROLLER

iPendant CUSTOMIZATION GUIDE

Version 7.70

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This manual can be used with controllers labeled R-30iA or R-J3iC. If you have a controller labeled R-J3iC, you should read R-30iA as R-J3iC throughout this manual.

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Patents

One or more of the following U.S. patents might be related to the FANUC Robotics products described in this manual.

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Conventions

WARNING

Information appearing under the "WARNING" caption concerns the protection of personnel. It is boxed and bolded to set it apart from the surrounding text.

CAUTION

Information appearing under the "CAUTION" caption concerns the protection of equipment, software, and data. It is boxed and bolded to set it apart from the surrounding text.

Note Information appearing next to NOTE concerns related information or useful hints.

Safety

FANUC Robotics is not and does not represent itself as an expert in safety systems, safety equipment, or the specific safety aspects of your company and/or its work force. It is the responsibility of the owner, employer, or user to take all necessary steps to guarantee the safety of all personnel in the workplace.

The appropriate level of safety for your application and installation can be best determined by safety system professionals. FANUC Robotics therefore, recommends that each customer consult with such professionals in order to provide a workplace that allows for the safe application, use, and operation of FANUC Robotics systems.

According to the industry standard ANSI/RIA R15-06, the owner or user is advised to consult the standards to ensure compliance with its requests for Robotics System design, usability, operation, maintenance, and service. Additionally, as the owner, employer, or user of a robotic system, it is your responsibility to arrange for the training of the operator of a robot system to recognize and respond to known hazards associated with your robotic system and to be aware of the recommended operating procedures for your particular application and robot installation.

Ensure that the robot being used is appropriate for the application. Robots used in classified (hazardous) locations must be certified for this use.

FANUC Robotics therefore, recommends that all personnel who intend to operate, program, repair, or otherwise use the robotics system be trained in an approved FANUC Robotics training course and become familiar with the proper operation of the system. Persons responsible for programming the system—including the design, implementation, and debugging of application programs—must be familiar with the recommended programming procedures for your application and robot installation.

The following guidelines are provided to emphasize the importance of safety in the workplace.

CONSIDERING SAFETY FOR YOUR ROBOT INSTALLATION

Safety is essential whenever robots are used. Keep in mind the following factors with regard to safety:

- The safety of people and equipment
- Use of safety enhancing devices
- Techniques for safe teaching and manual operation of the robot(s)
- Techniques for safe automatic operation of the robot(s)
- Regular scheduled inspection of the robot and workcell
- Proper maintenance of the robot

Keeping People and Equipment Safe

The safety of people is always of primary importance in any situation. However, equipment must be kept safe, too. When prioritizing how to apply safety to your robotic system, consider the following:

- People
- External devices
- Robot(s)
- Tooling
- Workpiece

Using Safety Enhancing Devices

Always give appropriate attention to the work area that surrounds the robot. The safety of the work area can be enhanced by the installation of some or all of the following devices:

- Safety fences, barriers, or chains
- Light curtains
- Interlocks
- Pressure mats
- Floor markings
- Warning lights
- Mechanical stops
- EMERGENCY STOP buttons
- DEADMAN switches

Setting Up a Safe Workcell

A safe workcell is essential to protect people and equipment. Observe the following guidelines to ensure that the workcell is set up safely. These suggestions are intended to supplement and not replace existing federal, state, and local laws, regulations, and guidelines that pertain to safety.

- Sponsor your personnel for training in approved FANUC Robotics training course(s) related to your application. Never permit untrained personnel to operate the robots.
- Install a lockout device that uses an access code to prevent unauthorized persons from operating the robot.
- Use anti-tie-down logic to prevent the operator from bypassing safety measures.
- Arrange the workcell so the operator faces the workcell and can see what is going on inside the cell.

- Clearly identify the work envelope of each robot in the system with floor markings, signs, and special barriers. The work envelope is the area defined by the maximum motion range of the robot, including any tooling attached to the wrist flange that extend this range.
- Position all controllers outside the robot work envelope.
- Never rely on software or firmware based controllers as the primary safety element unless they comply with applicable current robot safety standards.
- Mount an adequate number of EMERGENCY STOP buttons or switches within easy reach of the operator and at critical points inside and around the outside of the workcell.
- Install flashing lights and/or audible warning devices that activate whenever the robot is operating, that is, whenever power is applied to the servo drive system. Audible warning devices shall exceed the ambient noise level at the end-use application.
- Wherever possible, install safety fences to protect against unauthorized entry by personnel into the work envelope.
- Install special guarding that prevents the operator from reaching into restricted areas of the work envelope.
- Use interlocks.
- Use presence or proximity sensing devices such as light curtains, mats, and capacitance and vision systems to enhance safety.
- Periodically check the safety joints or safety clutches that can be optionally installed between the robot wrist flange and tooling. If the tooling strikes an object, these devices dislodge, remove power from the system, and help to minimize damage to the tooling and robot.
- Make sure all external devices are properly filtered, grounded, shielded, and suppressed to prevent hazardous motion due to the effects of electro-magnetic interference (EMI), radio frequency interference (RFI), and electro-static discharge (ESD).
- Make provisions for power lockout/tagout at the controller.
- Eliminate *pinch points*. Pinch points are areas where personnel could get trapped between a moving robot and other equipment.
- Provide enough room inside the workcell to permit personnel to teach the robot and perform maintenance safely.
- Program the robot to load and unload material safely.
- If high voltage electrostatics are present, be sure to provide appropriate interlocks, warning, and beacons.
- If materials are being applied at dangerously high pressure, provide electrical interlocks for lockout of material flow and pressure.

Staying Safe While Teaching or Manually Operating the Robot

Advise all personnel who must teach the robot or otherwise manually operate the robot to observe the following rules:

- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.
- Know whether or not you are using an intrinsically safe teach pendant if you are working in a hazardous environment.
- Before teaching, visually inspect the robot and work envelope to make sure that no potentially hazardous conditions exist. The work envelope is the area defined by the maximum motion range of the robot. These include tooling attached to the wrist flange that extends this range.
- The area near the robot must be clean and free of oil, water, or debris. Immediately report unsafe working conditions to the supervisor or safety department.
- FANUC Robotics recommends that no one enter the work envelope of a robot that is on, except for robot teaching operations. However, if you must enter the work envelope, be sure all safeguards are in place, check the teach pendant DEADMAN switch for proper operation, and place the robot in teach mode. Take the teach pendant with you, turn it on, and be prepared to release the DEADMAN switch. Only the person with the teach pendant should be in the work envelope.

WARNING

Never bypass, strap, or otherwise deactivate a safety device, such as a limit switch, for any operational convenience. Deactivating a safety device is known to have resulted in serious injury and death.

- Know the path that can be used to escape from a moving robot; make sure the escape path is never blocked.
- Isolate the robot from all remote control signals that can cause motion while data is being taught.
- Test any program being run for the first time in the following manner:

WARNING

Stay outside the robot work envelope whenever a program is being run. Failure to do so can result in injury.

- Using a low motion speed, single step the program for at least one full cycle.

- Using a low motion speed, test run the program continuously for at least one full cycle.
- Using the programmed speed, test run the program continuously for at least one full cycle.
- Make sure all personnel are outside the work envelope before running production.

Staying Safe During Automatic Operation

Advise all personnel who operate the robot during production to observe the following rules:

- Make sure all safety provisions are present and active.
- Know the entire workcell area. The workcell includes the robot and its work envelope, plus the area occupied by all external devices and other equipment with which the robot interacts.
- Understand the complete task the robot is programmed to perform before initiating automatic operation.
- Make sure all personnel are outside the work envelope before operating the robot.
- Never enter or allow others to enter the work envelope during automatic operation of the robot.
- Know the location and status of all switches, sensors, and control signals that could cause the robot to move.
- Know where the EMERGENCY STOP buttons are located on both the robot control and external control devices. Be prepared to press these buttons in an emergency.
- Never assume that a program is complete if the robot is not moving. The robot could be waiting for an input signal that will permit it to continue its activity.
- If the robot is running in a pattern, do not assume it will continue to run in the same pattern.
- Never try to stop the robot, or break its motion, with your body. The only way to stop robot motion immediately is to press an EMERGENCY STOP button located on the controller panel, teach pendant, or emergency stop stations around the workcell.

Staying Safe During Inspection

When inspecting the robot, be sure to

- Turn off power at the controller.
- Lock out and tag out the power source at the controller according to the policies of your plant.
- Turn off the compressed air source and relieve the air pressure.
- If robot motion is not needed for inspecting the electrical circuits, press the EMERGENCY STOP button on the operator panel.
- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.

- If power is needed to check the robot motion or electrical circuits, be prepared to press the EMERGENCY STOP button, in an emergency.
- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.

Staying Safe During Maintenance

When performing maintenance on your robot system, observe the following rules:

- Never enter the work envelope while the robot or a program is in operation.
- Before entering the work envelope, visually inspect the workcell to make sure no potentially hazardous conditions exist.
- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.
- Consider all or any overlapping work envelopes of adjoining robots when standing in a work envelope.
- Test the teach pendant for proper operation before entering the work envelope.
- If it is necessary for you to enter the robot work envelope while power is turned on, you must be sure that you are in control of the robot. Be sure to take the teach pendant with you, press the DEADMAN switch, and turn the teach pendant on. Be prepared to release the DEADMAN switch to turn off servo power to the robot immediately.
- Whenever possible, perform maintenance with the power turned off. Before you open the controller front panel or enter the work envelope, turn off and lock out the 3-phase power source at the controller.
- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.
- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.

WARNING

Lethal voltage is present in the controller WHENEVER IT IS CONNECTED to a power source. Be extremely careful to avoid electrical shock. HIGH VOLTAGE IS PRESENT at the input side whenever the controller is connected to a power source. Turning the disconnect or circuit breaker to the OFF position removes power from the output side of the device only.

- Release or block all stored energy. Before working on the pneumatic system, shut off the system air supply and purge the air lines.

- Isolate the robot from all remote control signals. If maintenance must be done when the power is on, make sure the person inside the work envelope has sole control of the robot. The teach pendant must be held by this person.
- Make sure personnel cannot get trapped between the moving robot and other equipment. Know the path that can be used to escape from a moving robot. Make sure the escape route is never blocked.
- Use blocks, mechanical stops, and pins to prevent hazardous movement by the robot. Make sure that such devices do not create pinch points that could trap personnel.

 WARNING

Do not try to remove any mechanical component from the robot before thoroughly reading and understanding the procedures in the appropriate manual. Doing so can result in serious personal injury and component destruction.

- Be aware that when you remove a servomotor or brake, the associated robot arm will fall if it is not supported or resting on a hard stop. Support the arm on a solid support before you release the brake.
- When replacing or installing components, make sure dirt and debris do not enter the system.
- Use only specified parts for replacement. To avoid fires and damage to parts in the controller, never use nonspecified fuses.
- Before restarting a robot, make sure no one is inside the work envelope; be sure that the robot and all external devices are operating normally.

KEEPING MACHINE TOOLS AND EXTERNAL DEVICES SAFE

Certain programming and mechanical measures are useful in keeping the machine tools and other external devices safe. Some of these measures are outlined below. Make sure you know all associated measures for safe use of such devices.

Programming Safety Precautions

Implement the following programming safety measures to prevent damage to machine tools and other external devices.

- Back-check limit switches in the workcell to make sure they do not fail.
- Implement “failure routines” in programs that will provide appropriate robot actions if an external device or another robot in the workcell fails.
- Use *handshaking* protocol to synchronize robot and external device operations.
- Program the robot to check the condition of all external devices during an operating cycle.

Mechanical Safety Precautions

Implement the following mechanical safety measures to prevent damage to machine tools and other external devices.

- Make sure the workcell is clean and free of oil, water, and debris.
- Use software limits, limit switches, and mechanical hardstops to prevent undesired movement of the robot into the work area of machine tools and external devices.

KEEPING THE ROBOT SAFE

Observe the following operating and programming guidelines to prevent damage to the robot.

Operating Safety Precautions

The following measures are designed to prevent damage to the robot during operation.

- Use a low override speed to increase your control over the robot when jogging the robot.
- Visualize the movement the robot will make before you press the jog keys on the teach pendant.
- Make sure the work envelope is clean and free of oil, water, or debris.
- Use circuit breakers to guard against electrical overload.

Programming Safety Precautions

The following safety measures are designed to prevent damage to the robot during programming:

- Establish *interference zones* to prevent collisions when two or more robots share a work area.
- Make sure that the program ends with the robot near or at the home position.
- Be aware of signals or other operations that could trigger operation of tooling resulting in personal injury or equipment damage.
- In dispensing applications, be aware of all safety guidelines with respect to the dispensing materials.

NOTE: Any deviation from the methods and safety practices described in this manual must conform to the approved standards of your company. If you have questions, see your supervisor.

ADDITIONAL SAFETY CONSIDERATIONS FOR PAINT ROBOT INSTALLATIONS

Process technicians are sometimes required to enter the paint booth, for example, during daily or routine calibration or while teaching new paths to a robot. Maintenance personnel also must work inside the paint booth periodically.

Whenever personnel are working inside the paint booth, ventilation equipment must be used. Instruction on the proper use of ventilating equipment usually is provided by the paint shop supervisor.

Although paint booth hazards have been minimized, potential dangers still exist. Therefore, today's highly automated paint booth requires that process and maintenance personnel have full awareness of the system and its capabilities. They must understand the interaction that occurs between the vehicle moving along the conveyor and the robot(s), hood/deck and door opening devices, and high-voltage electrostatic tools.



CAUTION

Ensure that all ground cables remain connected. Never operate the paint robot with ground provisions disconnected. Otherwise, you could injure personnel or damage equipment.

Paint robots are operated in three modes:

- Teach or manual mode
- Automatic mode, including automatic and exercise operation
- Diagnostic mode

During both teach and automatic modes, the robots in the paint booth will follow a predetermined pattern of movements. In teach mode, the process technician teaches (programs) paint paths using the teach pendant.

In automatic mode, robot operation is initiated at the System Operator Console (SOC) or Manual Control Panel (MCP), if available, and can be monitored from outside the paint booth. All personnel must remain outside of the booth or in a designated safe area within the booth whenever automatic mode is initiated at the SOC or MCP.

In automatic mode, the robots will execute the path movements they were taught during teach mode, but generally at production speeds.

When process and maintenance personnel run diagnostic routines that require them to remain in the paint booth, they must stay in a designated safe area.

Paint System Safety Features

Process technicians and maintenance personnel must become totally familiar with the equipment and its capabilities. To minimize the risk of injury when working near robots

and related equipment, personnel must comply strictly with the procedures in the manuals.

This section provides information about the safety features that are included in the paint system and also explains the way the robot interacts with other equipment in the system.

The paint system includes the following safety features:

- Most paint booths have red warning beacons that illuminate when the robots are armed and ready to paint. Your booth might have other kinds of indicators. Learn what these are.
- Some paint booths have a blue beacon that, when illuminated, indicates that the electrostatic devices are enabled. Your booth might have other kinds of indicators. Learn what these are.
- EMERGENCY STOP buttons are located on the robot controller and teach pendant. Become familiar with the locations of all E–STOP buttons.
- An intrinsically safe teach pendant is used when teaching in hazardous paint atmospheres.
- A DEADMAN switch is located on each teach pendant. When this switch is held in, and the teach pendant is on, power is applied to the robot servo system. If the engaged DEADMAN switch is released or pressed harder during robot operation, power is removed from the servo system, all axis brakes are applied, and the robot comes to an EMERGENCY STOP. Safety interlocks within the system might also E–STOP other robots.

WARNING

An EMERGENCY STOP will occur if the DEADMAN switch is released on a bypassed robot.

- Overtravel by robot axes is prevented by software limits. All of the major and minor axes are governed by software limits. Limit switches and hardstops also limit travel by the major axes.
- EMERGENCY STOP limit switches and photoelectric eyes might be part of your system. Limit switches, located on the entrance/exit doors of each booth, will EMERGENCY STOP all equipment in the booth if a door is opened while the system is operating in automatic or manual mode. For some systems, signals to these switches are inactive when the switch on the SOC is in teach mode.
- When present, photoelectric eyes are sometimes used to monitor unauthorized intrusion through the entrance/exit silhouette openings.
- System status is monitored by computer. Severe conditions result in automatic system shutdown.

Staying Safe While Operating the Paint Robot

When you work in or near the paint booth, observe the following rules, in addition to all rules for safe operation that apply to all robot systems.

WARNING

Observe all safety rules and guidelines to avoid injury.

WARNING

Never bypass, strap, or otherwise deactivate a safety device, such as a limit switch, for any operational convenience. Deactivating a safety device is known to have resulted in serious injury and death.

WARNING

Enclosures shall not be opened unless the area is known to be nonhazardous or all power has been removed from devices within the enclosure. Power shall not be restored after the enclosure has been opened until all combustible dusts have been removed from the interior of the enclosure and the enclosure purged. Refer to the Purge chapter for the required purge time.

- Know the work area of the entire paint station (workcell).
- Know the work envelope of the robot and hood/deck and door opening devices.
- Be aware of overlapping work envelopes of adjacent robots.
- Know where all red, mushroom-shaped EMERGENCY STOP buttons are located.
- Know the location and status of all switches, sensors, and/or control signals that might cause the robot, conveyor, and opening devices to move.
- Make sure that the work area near the robot is clean and free of water, oil, and debris. Report unsafe conditions to your supervisor.
- Become familiar with the complete task the robot will perform BEFORE starting automatic mode.
- Make sure all personnel are outside the paint booth before you turn on power to the robot servo system.
- Never enter the work envelope or paint booth before you turn off power to the robot servo system.
- Never enter the work envelope during automatic operation unless a safe area has been designated.

- Never wear watches, rings, neckties, scarves, or loose clothing that could get caught in moving machinery.
- Remove all metallic objects, such as rings, watches, and belts, before entering a booth when the electrostatic devices are enabled.
- Stay out of areas where you might get trapped between a moving robot, conveyor, or opening device and another object.
- Be aware of signals and/or operations that could result in the triggering of guns or bells.
- Be aware of all safety precautions when dispensing of paint is required.
- Follow the procedures described in this manual.

Special Precautions for Combustible Dusts (Powder Paint)

When the robot is used in a location where combustible dusts are found, such as the application of powder paint, the following special precautions are required to insure that there are no combustible dusts inside the robot.

- Purge maintenance air should be maintained at all times, even when the robot power is off. This will insure that dust can not enter the robot.
- A purge cycle will not remove accumulated dusts. Therefore, if the robot is exposed to dust when maintenance air is not present, it will be necessary to remove the covers and clean out any accumulated dust. Do not energize the robot until you have performed the following steps.
 1. Before covers are removed, the exterior of the robot should be cleaned to remove accumulated dust.
 2. When cleaning and removing accumulated dust, either on the outside or inside of the robot, be sure to use methods appropriate for the type of dust that exists. Usually lint free rags dampened with water are acceptable. Do not use a vacuum cleaner to remove dust as it can generate static electricity and cause an explosion unless special precautions are taken.
 3. Thoroughly clean the interior of the robot with a lint free rag to remove any accumulated dust.
 4. When the dust has been removed, the covers must be replaced immediately.
 5. Immediately after the covers are replaced, run a complete purge cycle. The robot can now be energized.

Staying Safe While Operating Paint Application Equipment

When you work with paint application equipment, observe the following rules, in addition to all rules for safe operation that apply to all robot systems.

**WARNING**

When working with electrostatic paint equipment, follow all national and local codes as well as all safety guidelines within your organization. Also reference the following standards: NFPA 33 Standards for Spray Application Using Flammable or Combustible Materials, and NFPA 70 National Electrical Code.

- **Grounding:** All electrically conductive objects in the spray area must be grounded. This includes the spray booth, robots, conveyors, workstations, part carriers, hooks, paint pressure pots, as well as solvent containers. Grounding is defined as the object or objects shall be electrically connected to ground with a resistance of not more than 1 megohms.
- **High Voltage:** High voltage should only be on during actual spray operations. Voltage should be off when the painting process is completed. Never leave high voltage on during a cap cleaning process.
- Avoid any accumulation of combustible vapors or coating matter.
- Follow all manufacturer recommended cleaning procedures.
- Make sure all interlocks are operational.
- No smoking.
- Post all warning signs regarding the electrostatic equipment and operation of electrostatic equipment according to NFPA 33 Standard for Spray Application Using Flammable or Combustible Material.
- Disable all air and paint pressure to bell.
- Verify that the lines are not under pressure.

Staying Safe During Maintenance

When you perform maintenance on the painter system, observe the following rules, and all other maintenance safety rules that apply to all robot installations. Only qualified, trained service or maintenance personnel should perform repair work on a robot.

- Paint robots operate in a potentially explosive environment. Use caution when working with electric tools.
- When a maintenance technician is repairing or adjusting a robot, the work area is under the control of that technician. All personnel not participating in the maintenance must stay out of the area.
- For some maintenance procedures, station a second person at the control panel within reach of the EMERGENCY STOP button. This person must understand the robot and associated potential hazards.
- Be sure all covers and inspection plates are in good repair and in place.
- Always return the robot to the “home” position before you disarm it.
- Never use machine power to aid in removing any component from the robot.

- During robot operations, be aware of the robot's movements. Excess vibration, unusual sounds, and so forth, can alert you to potential problems.
- Whenever possible, turn off the main electrical disconnect before you clean the robot.
- When using vinyl resin observe the following:
 - Wear eye protection and protective gloves during application and removal.
 - Adequate ventilation is required. Overexposure could cause drowsiness or skin and eye irritation.
 - If there is contact with the skin, wash with water.
 - Follow the Original Equipment Manufacturer's Material Safety Data Sheets.
- When using paint remover observe the following:
 - Eye protection, protective rubber gloves, boots, and apron are required during booth cleaning.
 - Adequate ventilation is required. Overexposure could cause drowsiness.
 - If there is contact with the skin or eyes, rinse with water for at least 15 minutes. Then seek medical attention as soon as possible.
 - Follow the Original Equipment Manufacturer's Material Safety Data Sheets

* NF Browser by ACCESS Co. Ltd. is adopted for the Internet browser used in this product.



* NF Browser is registered trademark of Access Co. Ltd. in Japan.

* Part of the software in this product includes modules developed by Independent JPEG Group.

* This product uses technology included in LZW patent of Unisys Co. Ltd. And is subject to the following restrictions.

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1 INTRODUCTION

This document describes how to customize the FANUC Robotics iPendant. Please refer to the FANUC Robotics SYSTEM R-30iA Controller Setup and Operations Manual for information relating to iPendant screen navigation and iPendant-specific functions.

The FANUC Robotics iPendant provides the capability for the user to easily develop custom screens using the EasyPanel development environment and the custom iPendant components supplied by FANUC Robotics North America, Inc. This document is meant to provide detailed information on how to create, and use these custom screens on an iPendant.

2 IPENDANT WEB BROWSER

2.1 Overview

The iPendant uses NetFront Browser v2.6, a web browser developed by ACCESS CO., LTD. ®. The web site can be found at <http://www.access.co.jp/english/products/nf.html>.

NetFront Browser is registered trademark of ACCESS CO., LTD. ®

Some of the major features of NetFront Browser are:

- HTML 3.2 + Frames with partial support for HTML 4.0
- JavaScript 1.1 equivalent
- Cookies
- Browser 16Kbyte Cache Support
- GIF, JPEG (progressive JPEG)

2.2 Browser Menus

The iPendant BROWSER is available from the BROWSER entry on the main menu. (Typically the second page of the Main Menu)

The iPendant BROWSER screen allows you to access web pages on the robot or web pages on any device on the network with the robot. Please refer to the FANUC Robotics SYSTEM R-30iA Controller Internet Options Setup and Operations Manual for information on using the robot's web server.

You can add your own links to the BROWSER [TYPE] menu, which is displayed by the F1 key. Ten links are available in this [TYPE] menu. They are defined in the system variable \$TX_SCREEN[n] where:

\$TX_SCREEN[n].\$DESTINATION specifies the browser link/URL.

\$TX_SCREEN[n].\$SCREEN_NAME specifies the screen name to display in the menu.

Where n is 1 to 10

The screen name must be provided or the entry will not be shown.

Some example links are shown below:

Link	Description
"http://pderob011"	Default web page for robot pderob011
"http://pderob011/fr/example.htm"	fr:example.htm on robot pderob011
"fr/example.htm"	example.htm which is on fr: device, uses relative address based on connection
"http://172.22.200.202:9001"	Default web page for a Virtual Robot on a PC
"http:// www.fanucrobotics.com/CRC.asp "	Customer Resource Center

For links other than the connected robot (/fr/example.htm), the "Internet Connectivity Option" must be loaded and the Proxy Server properly configured. Please refer to the FANUC Robotics SYSTEM R-30iA Controller Internet Options Setup and Operations Manual for more information.

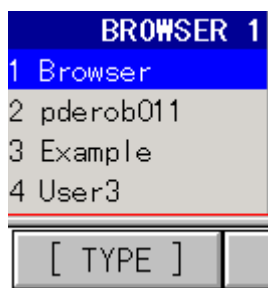
For example, if you set the following:

```
$TX_SCREEN[1].$DESTINATION = 'http://pderob011'
$TX_SCREEN[1].$SCREEN_NAME = 'pderob011'
```

```
$TX_SCREEN[2].$DESTINATION = '/fr/example.htm'
$TX_SCREEN[2].$SCREEN_NAME = 'Example'
```

```
$TX_SCREEN[3].$DESTINATION = '/fr/status.htm'
$TX_SCREEN[3].$SCREEN_NAME = 'User3'
```

The BROWSER [TYPE] menu would appear as follows:



2.3 Help for Browser Menus

You can use the integrated Help system to provide Help for your specific BROWSER screen when the user presses the HELP/DIAG key while in your screen. The help system will try to find the specific file indicated in the table below, based on which \$TX_SCREEN[n] variable corresponds to that entry. To provide HELP, simply copy your help file to the file indicated on the FR: device. Note: File names are case insensitive.

\$TX_SCREEN[1]	FR:\H17D0A.HTM
\$TX_SCREEN[2]	FR:\H17D0B.HTM
\$TX_SCREEN[3]	FR:\H17D0C.HTM
\$TX_SCREEN[4]	FR:\H17D0D.HTM
\$TX_SCREEN[5]	FR:\H17D0E.HTM
\$TX_SCREEN[6]	FR:\H17D0F.HTM
\$TX_SCREEN[7]	FR:\H17D10.HTM
\$TX_SCREEN[8]	FR:\H17D11.HTM
\$TX_SCREEN[9]	FR:\H17D12.HTM
\$TX_SCREEN[10]	FR:\H17D13.HTM

2.4 Extended Status Window

The iPendant allows you to add your own links to the Extended Status window, which is on the left side of the Status/Single Display. 255 links are available in the Extended Status window.

A series of .STM files will be used to make up the Extended Status window. The system will create the table of links based on the files it finds. The files will be ordered by ascending number. The numbers do not have to be sequential. If the same number is already used, the file will be inserted after the one already found.

To create a new link, follow these steps:

- 1 Create a web page based on the template in Appendix C.
- 2 Copy your file using the following convention. File names are case insensitive.

FR:EXTn.STM

Where n is 1 to 255

- 3 Restart the controller to CONTROLLED START and select FCTN> COLD.

Your new Extended status link should now be available on the Extended Status Page.

3 USING FANUC IPENDANT CONTROLS

The FANUC iPendant Controls are Microsoft ActiveX controls that allow you to create operator panel context for the iPendant.

Microsoft is registered trademark of Microsoft Corporation.
ActiveX is registered trademark of Microsoft Corporation.

Note: Other Microsoft ActiveX controls cannot be used with the iPendant.

3.1 IPendant Controls Summary

The iPendant Controls main functions are as follows:

- Permit the dynamic display and input of Register, System and KAREL Variables, and I/O values.
- Change between web pages (Manually and Automatically).

3.2 Recommended Environment

The recommended developer environment is:

- Windows XP/XP Pro
- Microsoft® FrontPage® 2003 (All references to FrontPage and FrontPage screens in this document are for FrontPage 2003)

FrontPage 2003 is the recommended application for development because it interacts with ActiveX controls by displaying custom property pages and showing more information at design time. At this time it is no longer available from Microsoft but is available from several software resellers. Other web authoring tools, such as Dreamweaver, can also be used; however you may have to enter all the ActiveX control parameters manually. A file named ipctrls.stm is provided with the iPendant controls setup. This file contains samples of each control that can be used to cut and paste controls into your custom pages if desired.

3.3 Installation

To install the FANUC iPendant Controls on your PC for use with FrontPage in the development of custom screens, run the Easy Panel setup available from the FANUC Robotics cRC Download site.

3.3.1 Installation Conditions

- You must have V6.21-1 iPendant firmware or greater and V6.21-1 R-30iA Controller software or greater. The latest iPendant firmware is available on the load media for the controller. See the Software Installation manual for instructions on updating your iPendant firmware.
- Microsoft® FrontPage 2000™ or greater loaded on your PC (Microsoft® FrontPage 2003™ is recommended)
- You are using a PC that is connected to the Internet
- You have obtained a FANUC Robotics Username and Password for the FANUC Robotics Customer Resource Center (cRC).

1-800-47-ROBOT (1-800-477-6268) in the United States or Canada
or
1-248-377-7159 for International Calls.
or
go to <https://crc.frc.com> and register.

3.3.2 Installation Procedure

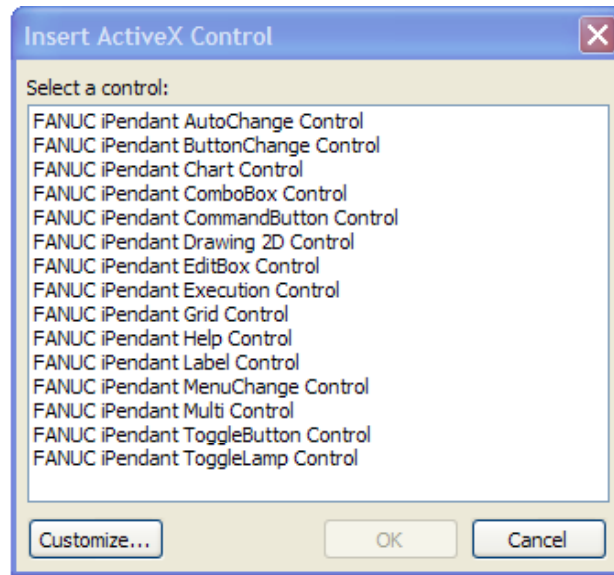
Note: If you have already downloaded the iPendant Controls setup, skip to step 7 to install.

1. Use Microsoft® Internet Explorer on your PC to connect to <https://crc.frc.com> (FANUC Robotics File Transfer Center) and log in using your cRC Username and Password.
2. Select **Software Downloads** from the **Support/Downloads** tab
3. Select **Download PC Software** on the Download Center
4. Click on [iPendant Controls VX.XX](#) to download the file. (where X.XX is the version you need) This file contains the setup files necessary to install the iPendant controls on your PC, some sample image files for indicator lamps, buttons, and switches, and some example web pages.
5. Select Save at the prompt and select the temporary directory to which you want to save this file on your PC.
6. Log off of the FANUC Robotics cRC Site.
7. On your PC, navigate to the temporary directory where you saved the file iPendant_controls_vxxx.exe and double click to unzip the file.
8. Select a temporary directory to unzip the file to and click UNZIP
9. After the files are unzipped, go to the temporary directory that you unzipped them in.
10. Double-click on setup.exe to start the installation.
11. Follow the instructions to Install the FANUC Robotics iPendant Controls
12. The iPendant Controls are now installed on your PC and can be used to create custom screens or for remote iPendant operation or monitoring.

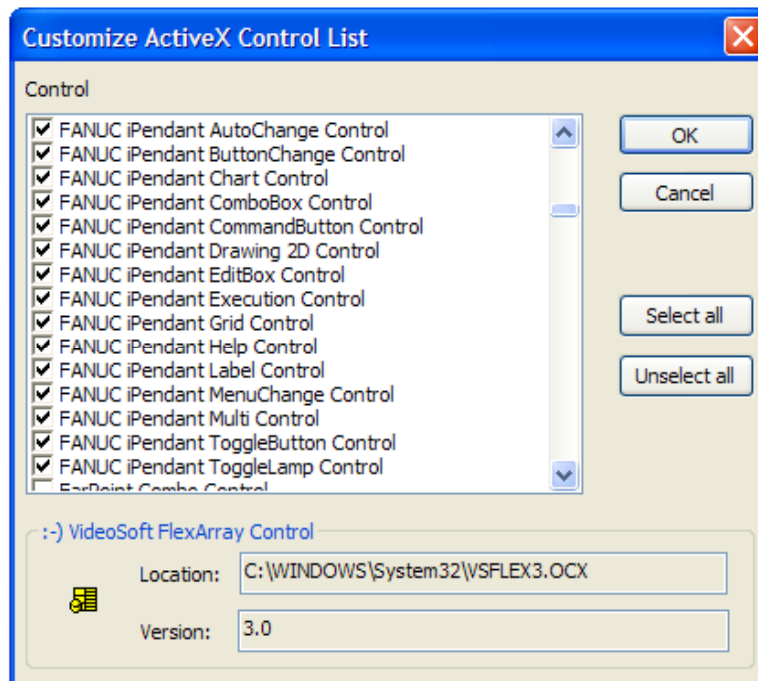
To verify correct installation:

1. Start Microsoft FrontPage and open a new blank page. Refer to your FrontPage documentation for more information.

2. Select Insert | Advanced | ActiveX Control from the menu bar. This brings up the Insert ActiveX Control dialog box.



3. If FANUC iPendant Controls do not appear, select Customize button. If they were installed properly, you will see a screen where you can select all the FANUC iPendant Controls.



4. If you insert an ActiveX component, and it shows up with the following image in FrontPage:



You most likely installed the .ocx on a drive that is currently no longer available. (i.e. a networked drive)

3.4 Control Features Summary

The following is a brief description of each control that is included with the FANUC Robotics iPendant Controls:

- **Label**
Used to display the value of Register, Variable and I/O. Also used to display fixed strings and the combination of fixed strings and digits.
- **EditBox**
Used to change the value of a Register, a Variable or an I/O point. Popup keyboard and iPendant numeric keypad are supported.
- **ToggleLamp**
Used to change the color or image displayed by the control if the value of a Register, a Variable or an I/O point, fulfills the specified single condition. Three types of lamps are available: panel, circle, or an image. This control can also be used to display a fixed image.
- **CommandButton**
Used to write the specified value to a Register, a Variable or an I/O point. Two types of buttons are available: rectangular pushbutton and image.
- **ToggleButton**
Used to write one of two specified values to a Register, a Variable or an I/O point based on the state of the button. Three types of buttons are available: rectangular pushbutton, checkbox and image.
- **Multi**
Used to display up to 10 different images or strings based on the value of a Register, a Variable or an I/O point. It can be used to create simple animations like a progress bar.
- **AutoChange**
Used to change a page being displayed automatically based on the value of a Register, a Variable or an I/O point. This can be used to change the displayed page from a TP or KAREL program.
- **MenuChange**
Used to select a page to be displayed from a popup menu. The pages are displayed when the button is pressed. Two types of buttons are available: rectangular pushbutton and image.
- **ButtonChange**
Used to display the specified page. Two types of buttons are available: rectangular pushbutton and image.
- **ComboBox**
Used to change the value of a Register, a Variable or an I/O point using a popup menu selection.
- **Help**
Used to display the specified help page when the HELP key is pressed.
- **Execution**
Used to run the specified KAREL program when the page is loaded.
- **Chart**
Used to graphically display data from the controller as a bar or line chart.
- **Drawing 2D**
Used to draw Text, Lines, Paths, Circles, Rectangles, Diamonds or images on the iPendant
- **GRID**
Used to render Text, Lines, Circles, Rectangles, and Images registered to a grid.

Each control has several settable properties, which will be described later, but in general each control allows you to set:

- Which numeric register, System variable, KAREL variable, or I/O type to use.
- The border of the control, which can be 3D (thin and bold border), straight (black and forecolor) and none.
- The size, color, and font used by the control.

Section 5 describes how to use these controls to make an Operator Panel.

4 FRONTPAGE 2003

This chapter gives tips on using FrontPage 2003 to develop web pages for the iPendant. Refer to the FrontPage documentation for complete details.

4.1 Working with Webs

FrontPage works with what is called a web to create and manage your site development. A web is all the pages contained in your website. Whenever you work within FrontPage, you want to make sure you are working within a web. If you are working with RoboGuide, use the Open Web commands under File, and point to the MC directory of your virtual robot as your web. FrontPage will insert several files that it needs which will not affect the operation of the virtual robot.

If you are not working in RoboGuide, then create a new web (from the File menu) somewhere on your PC to store your files. Later you can "Publish" these files directly to the controller.

Note

You should put all your web files into one directory without any subdirectories. Subdirectories are not fully supported on the R-30iA Controller.

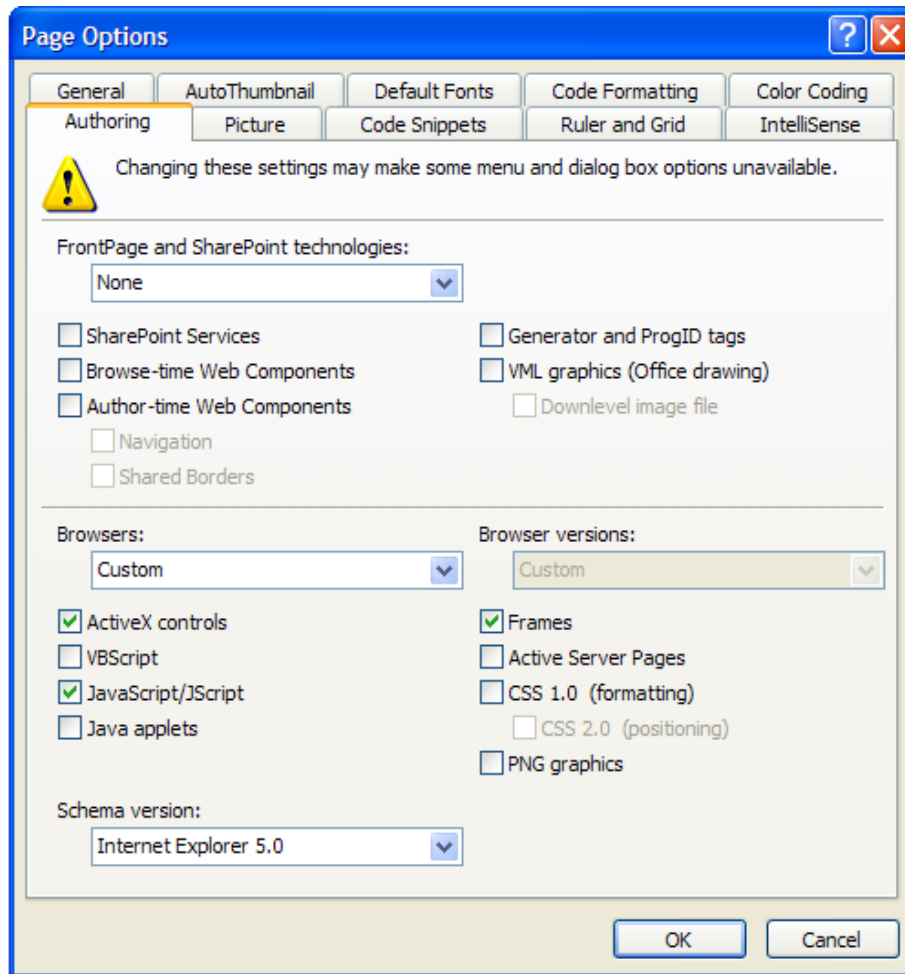
4.2 Working with Pages

When FrontPage is used, you can create content by inserting iPendant controls on a web page. Many HTML tags and forms are also available for use. See Appendix A for details. FrontPage gives you the option of viewing web pages as a normal WYSIWYG document or as HTML code, or previewing them in the integrated browser.

Note

When viewing your page in the integrated browser the FANUC Robotics iPendant Controls will appear static, since they are not connected to the robot controller.

The dialog box available from Tools | Page Options | Authoring Tab allows you to set up your compatibility options specifically for iPendant:



Microsoft FrontPage and SharePoint Technologies, VBScript, Java applets, Cascading style sheets (CSS), Active Server Pages, and PNG graphics are not supported by iPendant and should be disabled.

4.2.1 File Names

Any web page that contains FANUC Robotics iPendant Controls must be saved with an .stm file extension or iPendant will not recognize the FANUC Robotics iPendant controls. The file name must follow the robot's 8.3 naming convention with no spaces.

Files that are specific to a particular language should end in a suffix. However, the links should not include the suffixes. The web server will automatically find the correct file based on the current language setting of the robot. For instance, if you link to arc.stm and the robot language is set to English, the web server will find arc.stm if it exists. If it does not exist the Web Server will look for arceg.stm.

Language	Suffix
English	eg
Japanese	jp
Kanji	kn
French	fr
German	gr
Spanish	sp

4.2.2 Meta Tags

Meta tags are used to instruct the browser about the page. One common use is to instruct the browser to always refresh a page when the page is loaded. Unfortunately, not all browsers follow the same conventions so the following 3 tags need to be specified on any page that you do not want cached by the browser:

```
<meta http-equiv="Cache-Control" content="no-cache">
<meta http-equiv="Cache-Control" content="no-store">
<meta http-equiv="Pragma" content="no-cache">
```

Note

If FANUC Robotics iPendant Controls are used on a page, the page does not need to be refreshed and the above Meta tags should not be included since they will slow the display of the page.

4.2.3 Page Properties

In the Design View, right-click the page, and then click **Page Properties** on the shortcut menu. This allows you to change the background color and text color of a page. The page TITLE specified will be shown in the Title bar on the iPendant when this page is displayed.

4.2.4 Window Size

To avoid scroll bars on your web pages, the size of the page should be the same as the size of the iPendant screen:

Window	Width	Height
Single	628	365
Double	307	365
Triple Left	307	365
Triple Right	307	187
Status/Single Right	407	365

A table with 1 row and column can be inserted on a blank web page as a guideline with the width and height set (in pixels) to the appropriate values from the table above.

An alternative is to set the table height and width to 95% instead of specifying a pixel value. You may still need to adjust your page once it is complete to eliminate scroll bars.

Use additional tables inside of this table for positioning of iPendant Controls as discussed in the next section. An example for whole mode is contained in Appendix D.

Note

Both the Horizontal and Vertical Scroll bars are 16 pixels wide, so if you design pages that exceed the above sizes, you will need to take this into account.

4.2.5 Positioning

FrontPage has the ability to design web pages with pixel-precise positioning. This feature uses cascading style sheets (CSS), which are not supported on iPendant.

The best way to position controls, text and images on an iPendant screen is through the use of tables embedded inside of other tables. Use the Cell and Table Properties dialog boxes to get pixel-perfect adjustments by right clicking on the table or cell and adjusting the necessary parameters. A Table toolbar is also available. See Using Table examples in Appendix D.

4.2.6 HTML Editing

Inserting code into your web page is done in the “Code” view of FrontPage. To select this view, select either the Split or Code view from the view bar at the bottom of the page.



To quickly select a section of code in the code window, use the Quick Tag Selector at the top of the page. To enable the Quick Tag Selector go to View | Quick Tag Selector from the menu bar. You can select the beginning tag in a tag set and FrontPage will highlight all the information that falls between the beginning tag and the ending tag for that set. Or you can select View | Reveal Tags to have the tags displayed in the Design View.

4.2.7 Fonts

The HTML tag is supported on the iPendant. The following are the font sizes that correspond to the HTML Font settings:

Tag	Size on iPendant
Font size=1	12 (hard to read)
Font size=2	14
Font size=3	14
Font size=4	16
Font size=5	18
Font size=6	24
Font size=7	24

Bold, blink, and underline are supported by the iPendant. Italic font will always display as bold.

4.2.8 Images

The iPendant supports GIF and JPG formats. Generally, GIF images are best used to display small graphics, such as buttons, icons, and banners, or images that contain large blocks of solid colors and little detail. Use the JPG format for images that contain a high level of detail or colors. The Picture Properties dialog box can be used to set the attributes for the image.

4.2.9 Links

For navigation purposes, the iPendant MenuChange and ButtonChange controls can be used to select new pages. The anchor (<a>) tag can also be used. The href attribute defines a source hyperlink. The value of the attribute is the URL of the destination. Typically, the URL should be a relative address, but it is sometimes difficult to know the base address.

A URL can be any file or web page accessible from the robot, a KAREL program or KCL command. Please refer to the FANUC Robotics SYSTEM R-30iA Controller Internet Options Setup and Operations Manual for information on using KAREL or KCL.

Note

The KCL option must be loaded on the robot in order to use KCL or KCLDO in a URL.

Here are some examples for using URLs.

```
<a href="/KCL/show%20var%20$version">KCL show var $version</a>
```

```
<a href="/KCLDO/reset">KCLDO reset</a>
<a href="/KCLDO/set%20port%20tpout[1]=1">KCLDO set port tpout[1]=1</a>
<a href="/mc/demo.stm">Demo</a>
<a href="/KAREL/webtp?tpkey=50"
<a href="/KARELCMD/progname?name1=value1&name2=value2">KAREL Command</a>
```

Using JavaScript:

```
window.location.href = "/KAREL/webtp?tpkey=50"
window.location.href = "/KCLDO/reset";
```

KCL will show a response page. KCLDO will perform the command without a response. Typically a KAREL program must return a response page. If a KAREL program defines a static variable, return_code, and sets it to 204, then the command will be performed without a response.

The Browser menu has BACK and FORWARD function keys. It keeps a history of URLs and can replay them. If you use /KARELCMD/ or /KCLDO/, then the Browser will not keep a history of the URL so it cannot be accidentally replayed by the BACK and FORWARD keys. In fact, the only difference between using /KAREL/ and /KARELCMD/ is that /KAREL/ will store the URL in the history and /KARELCMD/ will not.

4.2.10 Forms

Forms are very useful when you don't need to monitor data from the controller. JavaScript can be used with form elements making them very powerful. The iPendant does not support form elements outside of the form tag. For instance, some browsers such as IE, allow you to remove the form tags and keep just the buttons and text boxes. You can remove the Submit and Reset buttons from the form if they are not required.

You can create a web page that can pass parameters from a form in the browser to a KAREL program. The KAREL program is invoked based on the "submit" action in the form and parameters included in the form are passed with the URL. The FANUC Robotics web server complies with standards found in the HTTP 1.0 Specification. Note that only the HTTP "GET" method is supported at this time. The KAREL program must declare string variables whose names match any parameter names being passed from the form in order to access it. An additional string variable called "URL" should be declared to see the complete URL request sent from the browser to the KAREL Program(for debugging). For example:

```
<FORM ACTION="/KAREL/pnlsvr" METHOD="GET">
  <INPUT TYPE="hidden" NAME="object" VALUE="dout">
  <INPUT TYPE="hidden" NAME="operate" VALUE="set">
  <INPUT TYPE="hidden" NAME="index" VALUE="1">
  <INPUT TYPE="hidden" NAME="value" VALUE="on">
  <INPUT TYPE="submit" VALUE="SET DOUT[1]=ON"></FORM>
```

See Form example in Appendix D

4.2.11 Frames

Frames should be avoided if possible. The iPendant supports frames but only 5 frames are available for use. Reserved target names of **_blank** and **_top** should never be used since they will force the iPendant to log off the controller. (See below for more information) Floating frames (IFRAME tag) are not supported.

If the iPendant inadvertently browses to a web page that contains a target name of **_top**, then it will cause the iPendant to "logout" of the robot. For instance, browsing to this web page and pressing ENTER on the link would cause a logout.

```
<html>
<body>
<center>
<a href="dologout.htm" target="_top">Press ENTER to Logout</a>
</center>
</body>
</html>
```

Once a logout occurs, you can continue to browse web pages using the keys listed in the table below. The Status LED's, Status Window, Override Display, and Function keys will no longer be available. Most Keys on the iPendant will be disabled. HOLD, Teach Pendant Enable, E-STOP and Deadman switches will continue to function. Pressing the MENUS key will log you back into the robot, however this may take several seconds.

Available Keys	
PREV	Back one Web Page
NEXT	Forward on Web Page
SHIFT-PREV	Back one frame
SHIFT-NEXT	Forward on frame
MENUS	Login to the robot and resume iPendant Operation
ENTER	Select Link
CURSOR KEYS	Navigate Web Page Links

4.2.12 Themes and Styles

FrontPage Themes and Styles are not supported in iPendant and should not be used.

4.2.13 Dynamic HTML

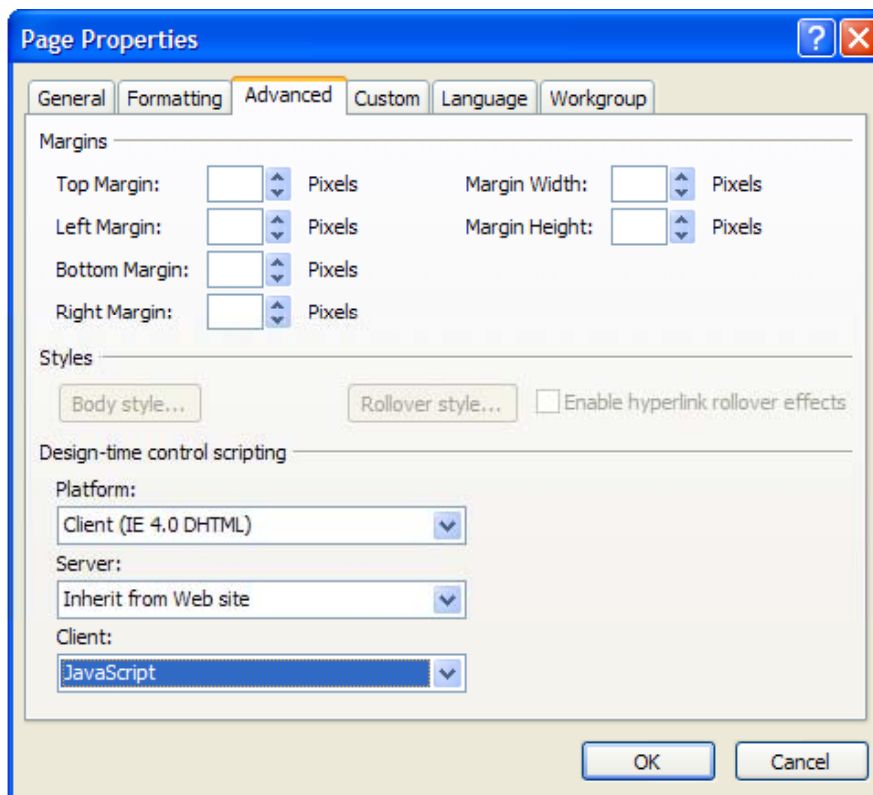
DHTML is an integration of various scripts that allow your pages to have dynamic content. The following elements are key to the development of dynamic pages through the use of HTML:

Scripting – Client-side scripting allows for the layouts and content within the page to be altered without the need for reloading pages. (See Section 4.2.14 for additional information on using scripts with the iPendant)

Style sheets – which are not supported by the iPendant.

Document Object Model (DOM) – The DOM allows for the incorporation of the scripts that make DHTML work.(See section 4.2.15 for additional information on DOM support on the iPendant)

4.2.14 Scripting Elements



FrontPage 2003 uses the Microsoft Script Editor available from Tools | Macros menu to add scripts directly into your pages. Only JavaScript is supported on iPendant. See Appendix B for JavaScript elements supported by the iPendant. If you choose not to uncheck VBScript in the Compatibility dialog box, then Select File | Properties | Advanced and set the default Client scripting language to JavaScript. Client-side scripts are supported. Server-side scripts are not. JavaScript functions should be placed within the header of your Web page. JavaScript placed within the body will be processed top to bottom. Sometimes it is necessary to perform different scripts based on the browser. To determine if the browser is iPendant use the following:

```
var _nf = (navigator.userAgent.indexOf("AveFront") >= 0);
if (_nf == true) {
    // iPendant browser
}
else {
    // Other browsers
}
```

The FANUC Robotics Server Side Include (SSI) directives are supported on iPendant. This provides dynamic information only when the page is loaded. Such information can include the current value of a program variable (part count, for example), current status of an I/O point, or the current error listing. Please refer to the FANUC Robotics SYSTEM R-30iA Controller Internet Options Setup and Operations Manual for information on using SSI.

4.2.14.1 Adding Script

The Microsoft Script editor includes features that help you create scripts. You can create event handlers for elements on the page, which are scripts that run in response to actions such as when a user chooses a

button, when a document first loads, or other events. You can also use editor features to create standalone script blocks to contain any script, not only event handlers.

The Script Outline window displays a tree view containing the object hierarchy for the client. Each script on the page appears as a node on the tree. Beneath each object, the hierarchy also contains a list of events supported by that object. If a handler exists for that event, the name of the event is displayed in bold. To create a new handler, double-click the name of the event. To jump to an existing script, click its node in the tree.

When you double click the event name, the editor performs the following actions:

- Creates or moves to one of the following script blocks at the top of the document, depending on where the script will run and what language it will be in:
- Inserts a new, blank event-handling procedure for the element and event you specified.
- If the script will be in JavaScript, adds an event attribute (for example, onclick=) to the element.
- Positions the insertion point at the second line of the new script, ready for you to enter commands.

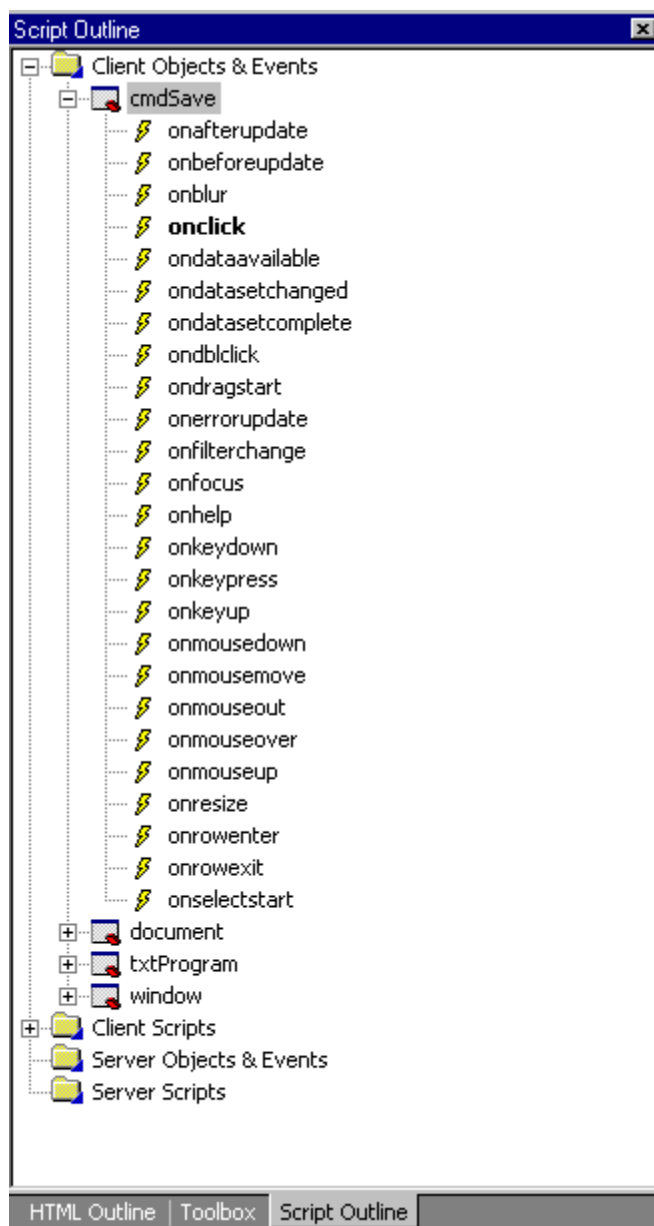
For JavaScript functions, the format is:

```
function elementID_event() {  
  
}
```

When creating JavaScript event handlers, the editor also adds the following attributes to the HTML element itself:

```
event="return elementID_event()"
```

If you are writing script, the HTML editor uses IntelliSense[®] — it displays options that help you complete statements. When you type in the name of an object available on your page followed by a period (.), the editor displays all members of that object's class.



4.2.14.2 Debugging in Source View



Source view enables you to execute debugger commands, such as setting breakpoints, by choosing commands from the Debug menu or the Debug toolbar. The left margin of the edit window displays glyphs indicating breakpoints.

When the debugger is running, the current page is displayed in Source view so you can see individual lines of script. The current line is indicated in the margin with an arrow indicator.

4.2.14.3 Scripting iPendant Controls

IE views the iPendant ActiveX controls as objects and allows you to get and set the properties using JavaScript. **This will not work on the actual iPendant.** iPendant does not view the iPendant ActiveX

controls as objects. Therefore, do not try to use the objects in JavaScript. You may create objects using JavaScript but then you cannot use the WYSIWYG editing capabilities in FrontPage.

Here is an example of creating an object using JavaScript so the DataIndex can be calculated at run-time:

```
<SCRIPT LANGUAGE="JavaScript"><!--
var _reqvar = <!--#echo var = $BBSTART_DI.$PORT_NUM -->
_reqvar = _reqvar + 2
req = '<object classid="clsid:7106066C-0E45-11D3-81B6-0000E206D65E"
id="FRIPToggleButton1" width="87" height="50">\n'
req += '  <param name="_Version" value="65536">\n'
req += '  <param name="_ExtentX" value="2302">\n'
req += '  <param name="_ExtentY" value="1323">\n'
req += '  <param name="_StockProps" value="15">\n'
req += '  <param name="Caption" value="+X">\n'
req += '  <param name="ForeColor" value="0">\n'
req += '  <param name="BackColor" value="16776960">\n'
req += '  <param name="DataType" value="1">\n'
req += '  <param name="DataIndex" value="' + _reqvar + '">\n'
req += '  <param name="Border" value="4">\n'
req += '  <param name="Type" value="0">\n'
req += '  <param name="ViewType" value="0">\n'
req += '  <param name="TrueColor" value="12632256">\n'
req += '  <param name="FalseColor" value="16776960">\n'
req += '  <param name="TrueStrColor" value="0">\n'
req += '  <param name="FalseStrColor" value="0">\n'
req += '  <param name="TrueValue" value="0">\n'
req += '  <param name="FalseValue" value="0">\n'
req += '  <param name="TrueImage" value>\n'
req += '  <param name="FalseImage" value>\n'
req += '  <param name="OtherPhase" value="-1">\n'
req += '</object>'
document.write(req);
//--></SCRIPT>
```

4.2.15 DOM Elements

The iPendant supports the Document Object Model for standard HTML elements. Here are some examples:

Element	JavaScript
URL	window.location.href
Button in Form	Document.form1.button1.value
Text in Form	Document.form1.text1.value
Selected Option in Form	document.form1.list1.options[document.form1.list1.selectedIndex].text
Button in Frame "User1" as seen from Frame "User2"	window.parent.user1.document.form1.button1.value

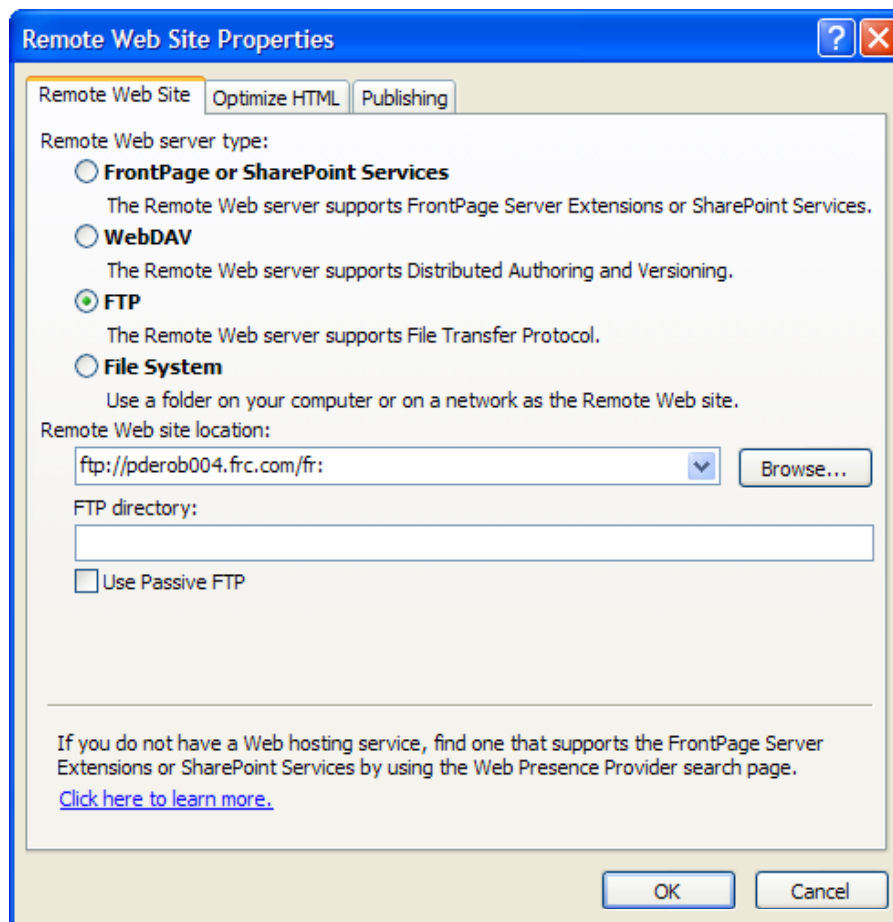
4.2.16 Page Load Time

The FrontPage status bar, found at the bottom of the screen, tells you how long the page will take to load with modems of different speeds. Right-click on the modem speed and select 56.6. Divide the time shown in half (the iPendant uses 115.2 Kbps) then add 300 ms for each iPendant control on the page to determine the approximate time to load the page on the iPendant.

4.3 Publishing your Web

FrontPage allows you to publish your web to the robot. File | Publish Site brings up a dialog box. The Publish Site dialog box allows you to FTP your files to the robot. Your robot must have an FTP server running. Please refer to the FANUC Robotics SYSTEM R-30iA Controller Internet Options Setup and Operations Manual for information on using FTP.

Select FTP as the server type and use ftp://robot_ip_addr/fr: to publish files on the FR: device as shown

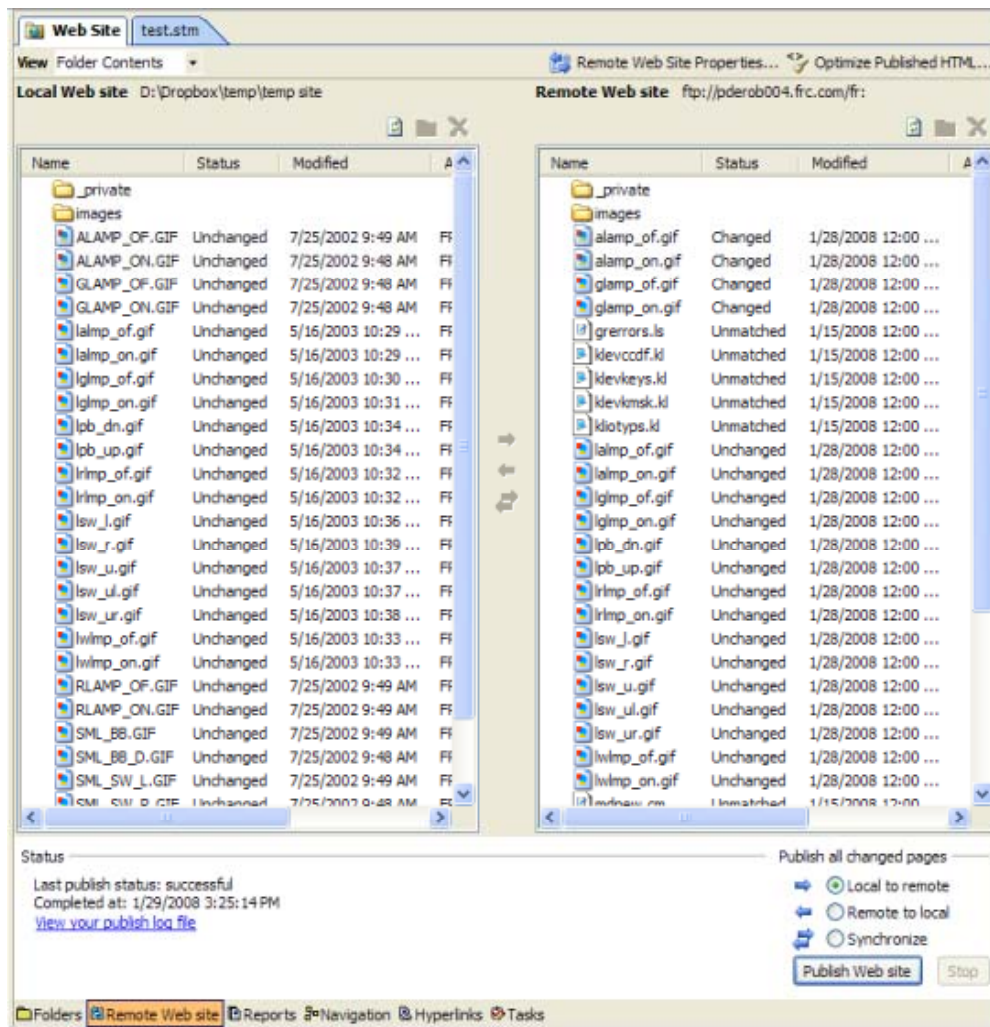


below:

Note

The robot does not support subdirectory creation from FTP so you should only publish files in the web's current folder. If FrontPage is trying to publish files created in another subdirectory such as _derived, you will need to remove these files.

Once you click OK the Web Site tab will be displayed and FrontPage will attempt to connect to your robot. After a successful connection is established you can choose which files to download to the robot.



See the FrontPage Help for additional information on transferring and synchronizing files.

5 MAKING A CUSTOM IPENDANT SCREEN USING THE IPENDANT CONTROLS

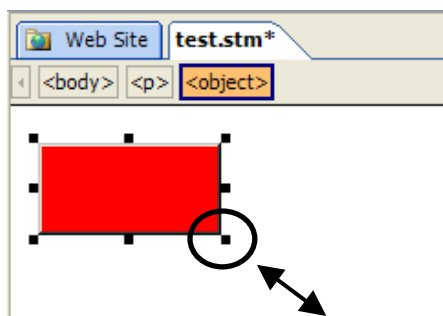
The easiest way to create an easy operator panel or custom screen for the iPendant is by putting the iPendant controls on the web page and by setting their properties.

5.1 Control Arrangement

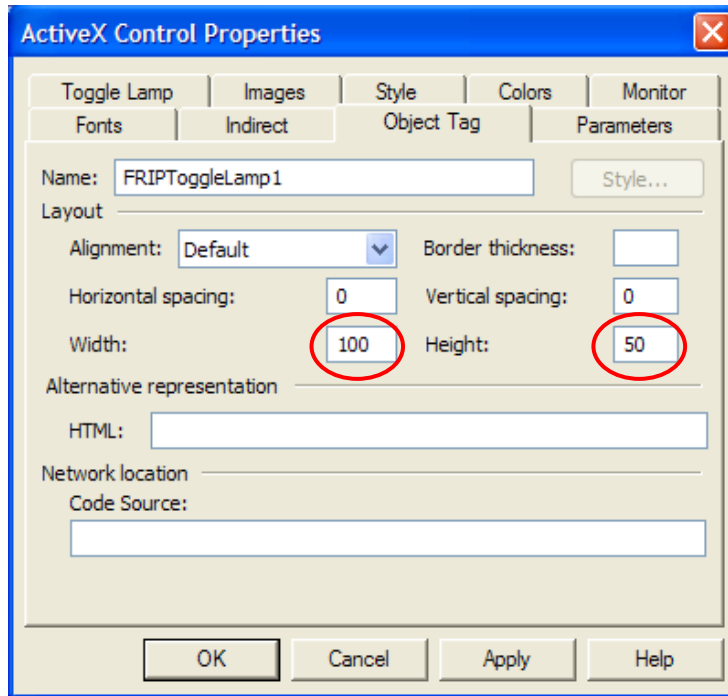
To add an iPendant Control to your web in FrontPage, follow these steps:

1. Position your cursor where you want the control to appear.
2. Select Insert | Advanced | ActiveX Control from the menu bar.
3. Choose the control you want to insert from the list of available FANUC iPendant controls, and click OK. The selected control is now inserted into your page.
4. Configure its properties by double-clicking on the control. The property dialog box that appears will depend on the control you have inserted.

Note: FrontPage will not insert the Height and Width into the control parameters unless you actually modify them. This will result in the control being the wrong size (very small) on the iPendant. To solve the problem resize the control (by grabbing one of the handles and moving it). This will put the current size into the parameters for the control.



Then on the Object Tag property page for the control you can reset the size to exactly what you want.



5.2 Common Control Properties

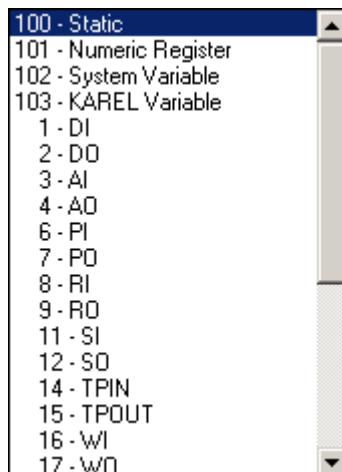
Most of the controls have the following common properties.

5.2.1 Object Tag

The Object Tag dialog allows you to specify some standard attributes associated with your control. The Name is used when an error occurs. The Width and Height can be specified in pixels. Of course, you can resize the control by dragging the control's handles with the mouse.

5.2.2 DataType and DataIndex

DataType Specifies the type of the data to be monitored or modified depending on the type of control.



The allowable types can be selected from a dropdown box similar to the one below:

Where:

100 – Static	Displays the strings specified in Caption.
101 – Numeric Register	Displays the value of the numeric register specified in DataIndex.
102 – System Variable	Displays the value of the System Variable specified in DataIndex.
103 – KAREL Variable	Displays the value of the KAREL Variable specified in DataIndex.
104 – Dictionary Element	Displays the dictionary element specified in DataIndex.
112 – String Register	Displays the value of the string register specified in DataIndex.
1 – DI	Displays the value of DI specified in DataIndex.
2 – DO	Displays the value of DO specified in DataIndex.
...	Displays the value of the I/O type specified in DataType and DataIndex.

DataIndex Specifies the number or the variable name associated with the DataType.

For numeric and string registers, this is the register number. For example,

2

For System Variables, the type must be Integer, Real, Boolean, Short, Byte, or String. For example,

\$MNUTOOLNUM[1]

For KAREL Variables, enclose the program name inside [...]. The type must be Integer, Real, Boolean, Short, Byte, or String. For example,

[USEREXT]STR_VAR
[USEREXT]STRUC_VAR.FIELD1

For Dictionary Elements, specify the dictionary name and enclose the dictionary element inside [...]. For example,

TPAR[5]

For I/O, specify the port number. For example,

5

5.2.3 Images

The Images dialog allows you to select the images to display when the ViewType is Image.

- The display size is automatically adjusted to the size of the image which is specified by FalseImage or DataDefault for the Multi Control. Therefore the size of any other images specified should be the same size as FalseImage. It is not possible to change the size using the mouse.
- It is necessary to copy all the image files which are specified to the directory on the iPendant where the web page is located.
- If iPendant cannot find an image file, "No Image File" is displayed on the control.
- FrontPage may not be able to find the Image files after the page is closed and reopened. You can specify the directory containing the image files by setting a Registry String. An example is shown below.

```
[HKEY_LOCAL_MACHINE\SOFTWARE\FANUC\FANUC Robotics iPendant Controls]  
"CurrentDirectory"="v:\qa\ipendant\cgop\"
```

Or you can reselect one of the images from the Property Page dialog box. The ActiveX Controls will set this registry key for you. You may need to select View | Refresh to refresh the web page.

- Transparent gif images are supported. The color that shows behind the image must be specified as follows:

For CommandButton, ButtonChange, MenuChange, ToggleButton, and ToggleLamp:

FalseColor is used when the image is not pressed.

TrueColor is used when the image is pressed.

BackColor should be set to the background color of the web page.

For Multi Control:

BackColor is used.

5.2.4 Border

Border Select the border design of the control out of the types shown below.



Where:

0 - Thin3D

Create a thin 3D line.

1 - None

No border line.

2 - Black

Create a thin black line.

3 - ForeColor

Create a thin line whose color is the equal to the foreground color (color used for displaying characters).

4 - Bold3D

Create a bold 3D line.

5.2.5 Colors

The Colors dialog allows you to specify the color of certain elements. The iPendant supports 256 colors. All controls have the following Colors associated with them:

ForeColor

Specify the color of characters.

BackColor

Specify the background color.

Some controls will have additional choices such as TrueColor and BackColor. (See the individual controls for additional details)

5.2.6 Fonts

The Fonts dialog allows you to specify the font used with the control. The iPendant supports a subset of the Fonts available in FrontPage. If you want the fonts to appear similar to how it will appear on iPendant, then use the following font settings:

Tag	Value
Font:	Courier New
Font Style:	Regular or Bold
Size:	14, 16, 18, or 24
Strikeout	Do not check
Underline	Do not check

The EasyPanel controls may convert 16 down to 15.75. If this happens, use 16.5.

5.2.7 Alignment

HAlign Selects the horizontal alignment of characters out of the types shown below.

0 - Left	Left align the text.
1 - Center	Center the text.
2 - Right	Right align the text.

VAlign Selects the vertical alignment of characters out of the types shown below.

0 - Top	Top align the text.
1 - Center	Center the text.
2 - Bottom	Bottom align the text.

5.2.8 Monitor

The Monitor dialog allows you to specify whether the item specified in the DataType field is Monitored or Updated Periodically and the time interval in milliseconds used to monitor or update the data. If the Periodic checkbox is not checked (FALSE) the data will be monitored at the specified rate and the current value will only be sent to the iPendant if the value has changed since the last period. If the Periodic checkbox is checked (TRUE) the value of the item specified in the DataType field will be sent to the iPendant at the interval rate regardless of whether or not it has changed since the last update. Monitoring the data is more efficient because the data is only sent from the robot to the iPendant when the data has changed.

The interval time will default to 250 ms. The minimum interval time is 100 ms. The periodic switch will default to unchecked (FALSE).

Identical monitors for the iPendant are shared, even across multiple pages. The lowest interval time is used. For instance, if the page in the left window is monitoring DI[1] at 250 ms and the page in the right window starts monitoring DI[1] at 100 ms, then the left page will also monitor at 100 ms. If the right page is changed to another page, the left page will continue to monitor at 100 ms until the page is changed.

The Monitor dialog allows you to specify FastLoad:

Checked Specifies that properties that are set to their corresponding “default” values are not included in the web page. This effectively saves load time.

Unchecked: Specifies that all parameters are included in the web page, whether they have “default” values or not.

5.2.9 Function Key ViewType

The following EasyPanel Controls will support the Function Key ViewType:

- EditBox Control
- CommandButton Control
- ToggleButton Control
- ButtonChange Control
- MenuChange Control
- ComboBox Control

The ViewType will display a dropdown box with F2 – F5 and F7 – F10 as selections. F1 and F6 are not available because the controller reserves them for the [TYPE] function key. If a function key is selected, then the EasyPanel control will be invisible, but it will register itself with the FunctionKey control. The EasyPanel control can reside anywhere on the visible portion of the web page. If it is not on the visible portion (scroll bars are necessary to see it) then it may not be created. It is only operational if it has been created. The control can be any size as long as it is big enough to be created. The size doesn't matter since it is invisible.

To avoid cursoring to the invisible control, use `tabindex="-1"` in the object tag.
Example:

```
<object classid="clsid:71060660-0E45-11D3-81B6-0000E206D650" id="FRIPEditBox1" width="116"
height="50" tabindex="-1">
  <param name="Caption" value="F2">
  <param name="ViewType" value="1">
  ...
</object>
```

The button caption and/or button images will be used by the FunctionKey control. Both TrueImage and FalseImage are used. The Image, if specified, is displayed first; and the Caption, if specified, is displayed next. Properties that are ignored include most of the display properties:

- Font
- Halign
- VAlign
- Border

All FunctionKey controls will use their color properties, such as ForeColor and BackColor.

5.2.10 Caption

If the DataType value is other than 100 – Static, the string in the caption is managed as a format string. The “%v” in the string is converted as the value of the specified variable. When the format string is NULL, only the value of the specified variable is displayed. Any C Style Format specifier may also be used instead of “%v”. In the example below, the left side shows the result and the “fmt:” shows the format string that was specified in the Caption.

FORMAT SPECIFIERS	
R[1] : 0 ms	fmt: R[1] : %v ms
DO[1] : OFF	fmt: DO[1] : %v
GO[1] : 0	fmt: GO[1] : %u
1. 8000E+000	fmt: %20. 4E, value: [userext]real_var
1. 8000e+000	fmt: %−20. 4e, value: [userext]real_var
Percent % CGOP1	fmt: Percent %% %s, value: \$TP_DEFPROG
CGOP1	fmt: %−20s, value: \$TP_DEFPROG
CGOP1	fmt: %20s, value: \$TP_DEFPROG

If the Caption contains multiple words and it doesn't fit into the available columns, it is automatically split into multiple rows. If the automatic split is not appropriate, the Caption can be manually split into multiple rows by adding \n where appropriate. You may use %n anywhere in the Caption to suppress the value and show only the Caption.

5.2.11 Pulse DO

The feature allows the user to pulse a digital output port for a specified number of milliseconds. In FrontPage, if the user selects DataType = DO for CommandButton or ToggleButton, then the Pulse Checkbox will be enabled. Once the Pulse checkbox is clicked, the ms textbox is enabled.

☐ Pulse Time: ms

If Time is zero, no pulse will occur. A pulse always writes the value in SetValue and then after the time has expired, writes the reverse. So if the port is “normally off”, SetValue can be set to True to pulse it on. If the port is “normally on”, SetValue can be set to False to pulse it off.

The maximum pulse value is 32767 ms. The default is 100 ms.

5.2.12 Port Simulation

This feature allows the user to display and modify the port simulation status for an I/O signal. In FrontPage, if the user selects an I/O type for DataType that supports simulation, then the Simulation Checkbox will be enabled.



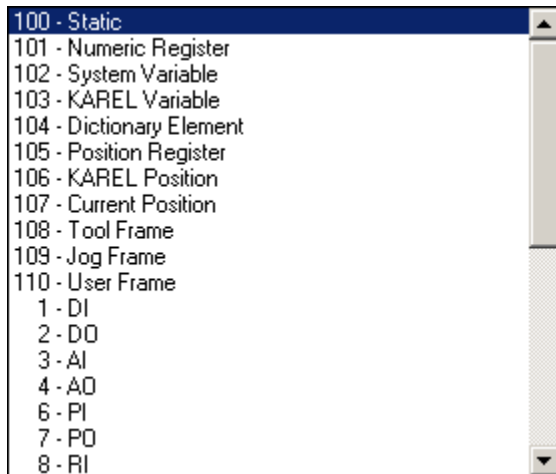
The Port Simulation Type will be similar to the Boolean type. It automatically displays SIMULATE, UNSIMULATE but you can specify the string precision in the Caption field. So if Caption = "%.1S" (note precision is after the period), then only "S" or "U" will be displayed.

If "SIM" or "UNSIM" is desired, then the ComboBox Control or Multi Control can be used instead. These controls allow you to specify whatever strings you want displayed. ComboBox is used to both monitor and modify the simulation status while Multi is used to only monitor the simulation status.

5.2.13 Positions

The Label Control allows positions to be displayed.

DataType Specifies the type of the position data to be monitored:



The allowable types can be selected from a dropdown box similar to the one above:

Where:

105 – Position Register	Displays the value of the Position Register specified in DataIndex.
106 – KAREL Position	Displays the value of the KAREL Position specified in DataIndex.
107 – Current Position	Displays the value of the Current Position in the representation specified in DataIndex.
108 – Tool Frame	Displays the value of the Tool Frame, MNUTool[GroupNum, PosId], whose PosId is specified in DataIndex.
109 – Jog Frame	Displays the value of the Jog Frame, [TPFDEF]JOGFRAMES[GroupNum, PosId], whose PosId is specified in DataIndex.
110 – User Frame	Displays the value of the User Frame, \$MNUFRAME[GroupNum, PosId], whose PosId is specified in DataIndex.

DataIndex Specifies the number or the variable name associated with the DataType.

For Position Registers, Tool, Jog, and User Frames, the position id is specified.

For KAREL Positions, enclose the program name inside [...].

[USEREXT]POSN

[USEREXT]XYZEXT

[*SYSTEM*]\$GROUP[1].\$UFRAME

For Current Position, the representation is specified. JOINT is the default.

JOINT

WORLD

USER

GroupNum Specifies the group number associated with the DataType/DataIndex if more than one group is available on the robot controller. Not used for KAREL Positions which are inherently defined for a single group.

PosAlign Selects the position alignment from the types shown below.

0 - Default

Align the position similar to Position Menu.

1 - Subwindow

Align the position similar to TPP and Position Register subwindows.

2 - Vertical

Align the position vertically.

The other properties of the label control are also used, such as Fonts, Border, Halign, Valign, and Colors.

Here are some examples of the current position with different alignments:

Default - Left/Top

```
JOINT          GP1          UT:1

J1:   31.138 J2:   16.253 J3:   15.989
J4:   23.306 J5:   20.498 J6:   28.325
E1:    8.280 E2:   44.064 E3:    6.653
```

Subwindow - Centered

```
WORLD GP1          UT:1  CONF:UT 0

X 1110.000 mm W 180.000 deg
Y  0.000 mm P  0.000 mm
Z 620.000 mm R  0.000 deg
E1  3.758 mm E2 59.616 mm
E3  2.110 mm
```

```

Vertical- Right/Bottom
USER GP1 UF:1 UT:1
CONF: F U T, 0, 0, 0
X: 1055.540 mm
Y: -994.081 mm
Z: 4176.247 mm
W: -7.671 deg
P: -38.192 deg
R: 42.969 deg
E1: 0.769 deg
E2: 474.408 mm
E3: 6.653 mm

```

All position types have a default title. However, you can override the default title by specifying the **Caption** parameter. Each **PosAlign** is different:

Default	Truncates the caption to 19 characters
Subwindow	Truncates the caption to 5 characters
Vertical	Uses the entire caption. You can split the caption using \n or the caption will automatically split to fit in the available space.

The comment for Position Registers and Frame Positions is shown on a separate line.

```

PR[1] GP1
[Perch Position]
CONF: F U T, 0, 0, 0
X: 2277.512 Y: 270.391 Z: 3913.003
W: -6.627 P: -5.219 R: 36.404
E1: 12.960 E2: 3.211 E3: 4.694

```

The default title for a KAREL position is its name. It will be shown on the comment line instead of the top line.

```

GP1
[tscvar]xyz
CONF: F U T, 0, 0, 0
X: 1874.370 Y: 480.508 Z: 1401.627
W: -59.703 P: -56.915 R: -98.003

```

5.2.14 Indirect DataType and DataIndex

Five different Indirect DataType/DataIndex keywords can be used in any EasyPanel parameter that defines a String. The special keywords !INDIRECT1, !INDIRECT2, ... !INDIRECT5 will be used to specify indirection. The indirect value is read as a string and substituted into the parameter.

- Multiple keywords can be used in a parameter.
DataIndex: \$MCR_GRP[!INDIRECT1].!INDIRECT2
- Multiple parameters can contain keywords.
DataIndex: \$MCR_GRP[!INDIRECT1].\$DRY_JOG_OVR
Caption: !INDIRECT2
- A keyword can be used multiple times.
DataType: 101 – Numeric Register
DataIndex: !INDIRECT1
Caption: !INDIRECT1
- Indirect keyword is allowed when specifying Indirect DataType/DataIndex.
Indirect2DataType: 101 – Numeric Register
Indirect2DataIndex: !INDIRECT1

In FrontPage, the Indirect Property tab can be used to set up the Indirect DataType/DataIndex properties. The indirection is evaluated each time the page is loaded. New for V7.10, the Indirect DataType/DataIndex properties are monitored so they will change dynamically.

An example of indirection in the EditBox Control:

The KAREL program, indirect.kl, contains a variable, regno: INTEGER, which is used to determine the register number to display.

```
<param name="Caption" value="R[!Indirect1] : %v">
<param name="DataType" value="101">
<param name="DataIndex" value="!Indirect1">
<param name="Indirect1DataType" value="103">
<param name="Indirect1DataIndex" value="[indirect]regno">
```

5.2.15 PANEID

The special keyword !PANEID can be used in any EasyPanel parameter that defines a String. The proper value is substituted into the parameter according to the table below:

!PANEID	Description
1	Primary iPendant pane
2	Dual iPendant pane
3	Third iPendant pane
4 – 9	Panes for Internet Explorer connections

An example of indirection in the EditBox Control:

The KAREL program, indirect.kl, contains an array variable, regno: ARRAY[9] OF INTEGER, which is used to determine the register number to display for each pane.

```
<param name="Caption" value="Pane Id: !paneid, R[!Indirect1] : %v">
<param name="DataType" value="101">
<param name="DataIndex" value="!Indirect1">
<param name="Indirect1DataType" value="103">
<param name="Indirect1DataIndex" value="[indirect]regno[!paneid]">
```

5.2.16 Pipe

Properly configured iPendant controls will actively monitor and modify controller information and processes without you having to write code on the controller. There are times, however, where you might require additional flexibility and control. The Pipe mechanism provides this ability.

If you configure an iPendant control's Pipe parameter to have a value of a filename,

```
<param name="Pipe" value="mypipe!paneid.dat">
```

you will be able to send the control commands while it is active. Open the file using the string "PIP:" as its device prefix. Then write string commands to the file in the format:

```
id="control_id" param_name="new_value"
```

where:

control_id is the string you provided in the Object tag Name field

param_name is the name of the parameter you wish to modify.

new_value is the new value you want to assign to the parameter

A KAREL example to change the caption of the label control named Label_1 follows.

```
OPEN FILE f1 ('AP', 'PIP:mypipe1.dat')  
WRITE f1 (' id="Label_1" caption="This is my new caption"')
```

Remember, Label_1 must have been configured to listen to pipe "mypipe!paneid.dat" at design time.

5.2.17 SetFocus

Use the SetFocus parameter to tell the browser to give focus to or remove it from the control. This only applies to the following controls that can accept focus.

- EditBox Control
- CommandButton Control
- ToggleButton Control
- ButtonChange Control
- MenuChange Control
- ComboBox Control

SetFocus must be issued through the pipe mechanism.

```
<param name="SetFocus" value="1">
```

Sending a value of "1" directs the browser to give focus to the identified control. Sending a value of "0" sets the focus to the parent HTML page, essentially removing focus from the identified control.

5.2.18 ClickMe

Use the ClickMe parameter to tell the browser to send the action event to the control. This looks to the control exactly as if the user had clicked on it. This only applies to the following controls that can be clicked.

- EditBox Control
- CommandButton Control
- ToggleButton Control
- ButtonChange Control
- MenuChange Control
- ComboBox Control

ClickMe must be issued through the pipe mechanism.

```
<param name="ClickMe" value="1">
```

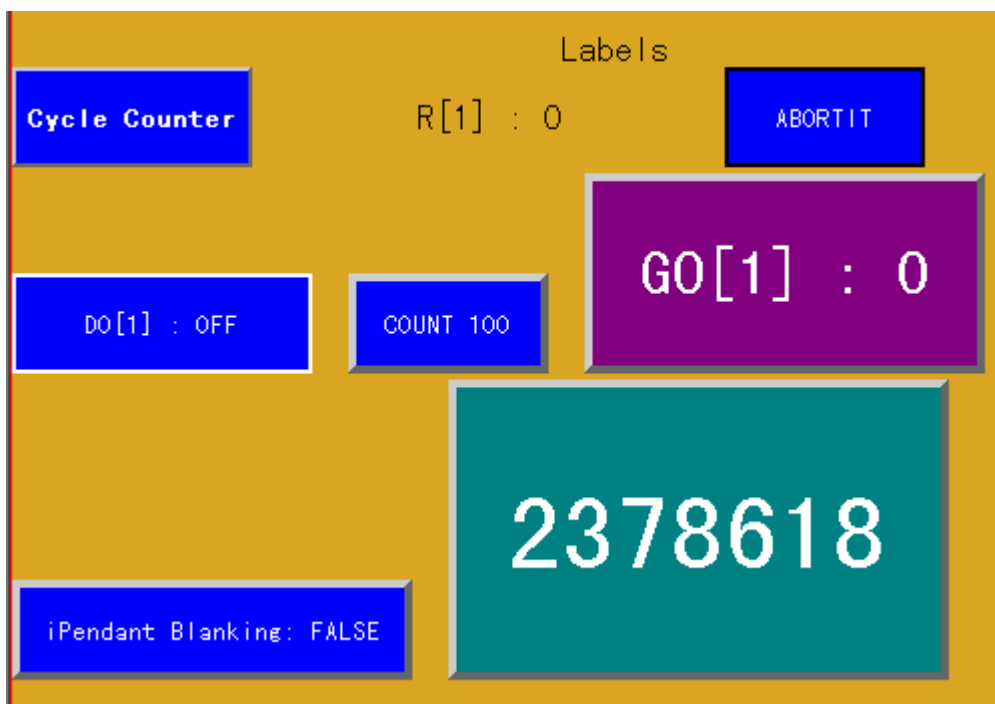
This feature can be especially useful with the ComboBox in that it will cause the control to display the choices. It will save you from having to write duplicate code to generate the choices under program control that the ComboBox is ready to display.

The value sent has no meaning at this time, but we suggest sending a 1 as other values may have significance in the future.

5.3 Control Description

This section describes the controls that can be used on iPendant, in order.

5.3.1 Label Control



Explanation

The value of a Register, String Register, System or KAREL Variable or I/O is displayed as shown in the figure above. Fixed strings can also be displayed.

Note

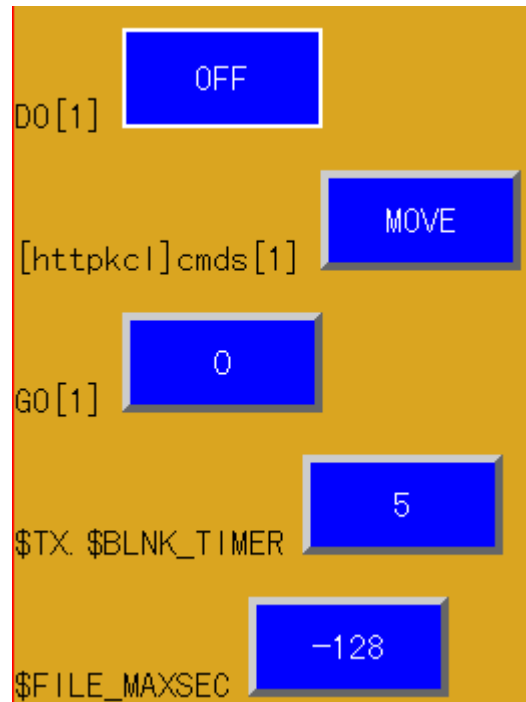
- 1 If the read value is Boolean I/O type, ON/OFF string is displayed.
- 2 If the read value is Boolean var type, TRUE/FALSE string is displayed.
- 3 If the DataType value is 100 – Static, the string in Caption is displayed as a fixed string.
- 4 If the DataType value is other than 100 – Static, the string in caption is managed as a format string.

Property

Property can be divided into the groups shown below.
 Related data for read : DataType, DataIndex
 Related display : ForeColor, BackColor, Caption, Font,
 Border

Caption	Specify the fixed String or format string. (Refer to Note) (The maximum is 128 characters.)
ForeColor	Specify the color of characters.
BackColor	Specify the background color.
Font	Specify the font name, font style and size.
HAlign	Specify the horizontal alignment of characters.
VAlign	Specify the vertical alignment of characters.
DataType	Specify the type of the data for display.
DataIndex	Specify the number or the variable name.
IOSim	Used only for I/O types. When TRUE, the port simulation status is displayed instead of the actual point.
Interval	Specify the interval time in ms.
Periodic	Specify whether to monitor the data or send periodically.
Border	Select the border design of the control.
PosAlign	Used only for position types. Selects the position alignment from the types shown below.
0 - Default	Align the position similar to Position Menu.
1 - Subwindow	Align the position similar to TPP and Position Register subwindows.
2 - Vertical	Align the position vertically.
GroupNum	Used only for position types. Specifies the group number associated with the DataType/DataIndex if more than one group is available on the robot controller. Not used for KAREL Positions which are inherently defined for a single group.

5.3.2 EditBox Control



Explanation

This is used to change the value of a Register, String Register, System or KAREL Variable (except XYZWPR type) or I/O.

The specified data value can also be monitored and displayed.

When you select this control on the page, the virtual keyboard is displayed and it accepts input.

Two kinds of virtual keyboards are supported, NumericKey and FullKey.

Note

If the written variable is Boolean type, you can use TRUE/FALSE string, ON/OFF string, or 0/1 value.

Property

Properties can be divided into the groups shown below:

Related data for read : DataType, DataIndex

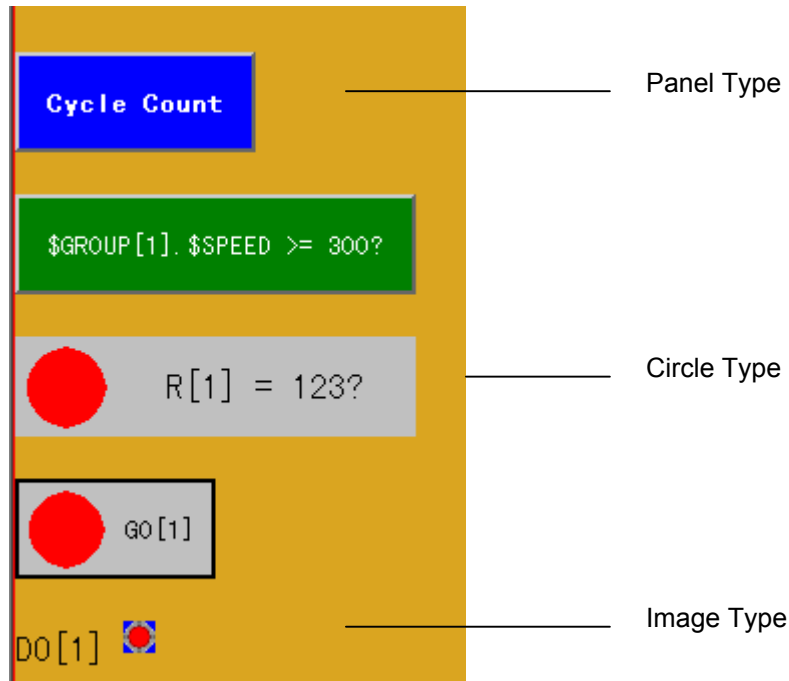
Related display : ForeColor, BackColor, Caption, Font, Border

Related virtual keyboard : Type

Caption	Specify the fixed String. (The maximum is 128 characters.)
ForeColor	Specify the color of characters.
BackColor	Specify the background color.
Font	Specify the font name, font style and size.
HAlign	Specify the horizontal alignment of characters.
VAlign	Specify the vertical alignment of characters.
DataType	Specify the type of the data for display and change.
DataIndex	Specify the number or the variable name.
IOSim	Used only for I/O types. When TRUE, the port simulation status is displayed and changed instead of the actual point.
Interval	Specify the interval time in ms.

Periodic	Specify whether to monitor the data or send periodically.
Border	Select the border design of the control.
Type	Select the type of virtual keyboard (not supported yet).
0 - NumericKey	Display the virtual keyboard for numeric input.
1 - FullKey	Display the virtual keyboard for alpha and numeric input.
ValueMin	Specify the minimum value. Available only when NumericKey is selected.
ValueMax	Specify the maximum value. Available only when NumericKey is selected.

5.3.3 ToggleLamp Control



Explanation

This is used to change the color of the control if the value of a Register, String Register, System or KAREL Variable (except XYZWPR type) or I/O fulfills the specified condition with the specified value or not.

The six kinds of condition operators, EQ, NE, LT, LE, GT and GE are supported. Three kinds of lamps are available. They are the panel, the circle, and the image.

In case of the image type, by exchanging the two kinds of images, a toggle lamp can be created. It is also possible to display a fixed image.

Note

CmpOperator:

[read value] [condition expression] [standard value for compare]

(e.g. X LT Y means X < Y)

The expression is valued like this.

(read value : DataType, DataIndex)

(condition expression : CmpOperator)

(standard value for compare : CmpValue or ValueStr)

Property

Property can be divided into the groups shown below:

Related data for read : DataType, DataIndex

Related display : ForeColor, BackColor, Caption, Font,
Border, ViewType

Related specifying display color : TrueColor, FalseColor

Related displayed image : TrueImage, FalseImage

Related specifying operation : CmpOperator, CmpValue or ValueStr

Caption Specify the fixed String.

ForeColor Specify the color of characters.

BackColor Specify the background color.

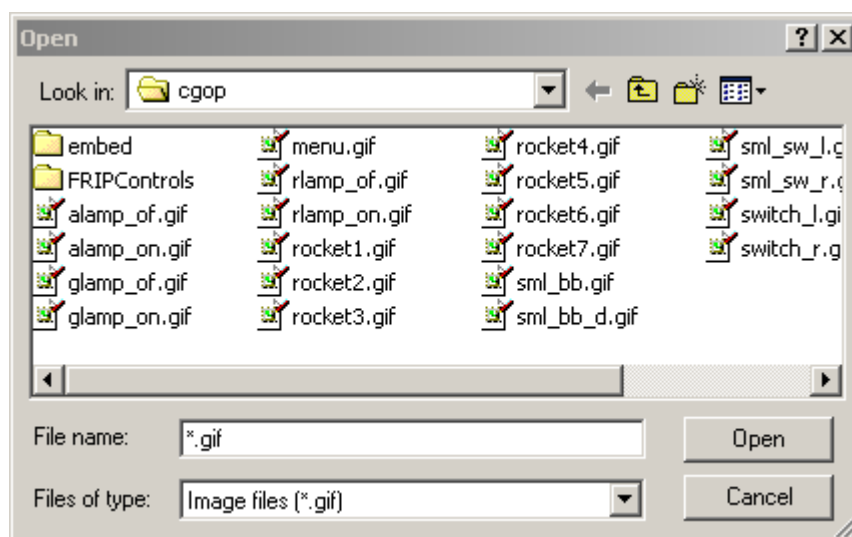
Font	Specify the font name, font style and size.
HAlign	Specify the horizontal alignment of characters.
VAlign	Specify the vertical alignment of characters.
DataType	Specify the type of the data to display. The following data types are supported:
100 - Static	Not used usually. If ViewType is image type, the image specified in FalselImage is displayed as fixed.
101 - Numeric Register	Compare the value of register specified in DataIndex with CompareValue.
102 - System Variable	Compare the value of the System Variable specified in DataIndex with CompareValue.
103 - KAREL Variable	Compare the value of the KAREL Variable specified in DataIndex with CompareValue.
112 - String Register	Compare the value of the string register specified in DataIndex with ValueStr.
I/O	Compare the value of I/O specified in DataType and DataIndex with CmpValue.
DataIndex	Specify the number or the variable name.
IOSim	Used only for I/O types. When TRUE, the port simulation status is displayed instead of the actual point.
Interval	Specify the interval time in ms.
Periodic	Specify whether to monitor the data or send periodically.
Border	Select the border design of the control.
ViewType	Select the type of the button to display.
0 - Panel	Specify the panel type.
1 - Circle	Specify the circle type.
3 - Image	Specify the image type.
Type	Select the data type to transact.
0 - Logical	Data is transacted as Boolean type. The setting of CmpOperator and the value of CmpValue are ignored.
1 - Numerical	Data is transacted as numerical type. The setting of CmpOperator and the value of CmpValue is applied.
2 - String	Data is transacted as string type. The setting of CmpOperator and the value of ValueStr is applied.
CmpOperator	Select the condition expression evaluated as TRUE.(Refer to Note 1) This value is effective when Type is numerical or string.
0 - EQ	Specify the equal case (=).
1 - NE	Specify the not equal case (<>).
2 - LT	Specify the less than case (<).
3 - LE	Specify the less than or equal case (<=).
4 - GT	Specify the greater than case (>).
5 - GE	Specify the greater than or equal case (>=).
CmpValue	Specify the standard value for comparison. If the result of comparison between read value and this value is TRUE, TrueColor or TrueImage is displayed, otherwise FalseColor or FalseImage is displayed. This value is effective when Type is numerical.
ValueStr	Specify the string value for comparison. If the result of comparison between read value and this value is TRUE, TrueColor or TrueImage is displayed, otherwise FalseColor or FalseImage is displayed. This value is effective when Type is string.
TrueColor	Specify the color to be displayed when the read value fulfill the condition expression.

FalseColor	Specify the color to be displayed when the read value does not fulfill the condition expression.
TrueImage	Specify the image to be displayed when the read value fulfill the condition expression. Used only in case that ViewType is Image type.
FalseImage	Specify the image to be displayed when the read value does not fulfill the condition expression. Used only in case that ViewType is Image type.

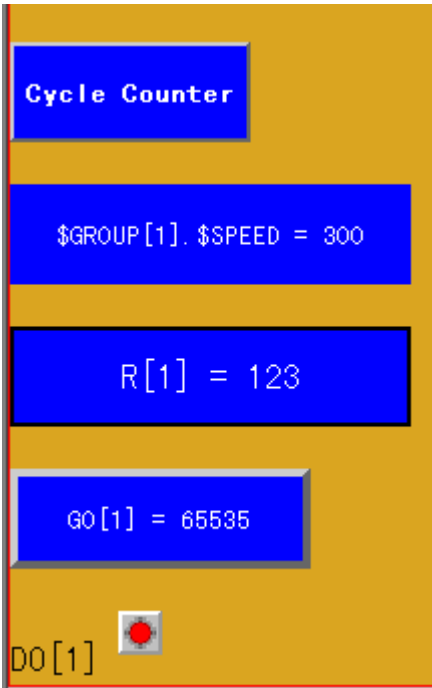
When ViewType is image type, General2 property page is available.



When ... is clicked, it is possible to specify the property using the file dialog. See the following screen for an example.



5.3.4 CommandButton Control



Explanation

Used to write the specified value to a Register, String Register, System, or KAREL Variable (except XYZWPR type) or I/O whenever the button is pushed.
 The image button is also available.
 The monitor function for the written data is not supported.

Property

Property can be divided into the below groups:
 Related data for read : DataType, DataIndex
 Related display : ForeColor, BackColor, Caption, Font, Border, ViewType
 Related specifying image : TrueImage, FalseImage
 Related specifying written value : SetValue or ValueStr

- Caption** Specify the fixed String.
- ForeColor** Specify the color of characters.
- BackColor** Specify the background color.
- Font** Specify the font name, font style and size.
- HAlign** Specify the horizontal alignment of characters.
- VAlign** Specify the vertical alignment of characters.
- DataType** Specify the type of the data to change.
 The following data types are supported:
 - 100 - Static** Not used usually.
 - 101 - Numeric Register** Change the value of register specified in DataIndex.
 - 102 - System Variable** Change the value of the System Variable specified in DataIndex.
 - 103 - KAREL Variable** Change the value of the KAREL Variable specified in DataIndex.

112 – String Register	Change the value of string register specified in DataIndex.
I/O	Change the value of I/O specified in DataType and DataIndex.
DataIndex	Specify the number or the variable name.
IOSim	Used only for I/O types. When TRUE, the port simulation status is displayed and changed instead of the actual point.
Border	Select the border design of the control.
ViewType	Select the type of the button to display.
0 - Normal	Specify the normal button.
1- Image	Specify the image button.
Type	Select the data type to transact.
0 - Logical	Data is transacted as Boolean type. (SetValue is TRUE/FALSE)
1 - Numerical	Data is transacted as numerical type. The value of SetValue is applied.
2 – String	Data is transacted as String type. The value of ValueStr is applied.
SetValue	Specify the value written when the button is pushed for Logical or Numerical types.
ValueStr	Specify the string value written when the button is pushed for String type.
TrueImage	Specify the image to be displayed when the button is pushed. Used only in case that ViewType is Image type.
FalseImage	Specify the image to be displayed when the button is not pushed. Used only in case that ViewType is Image type.
TrueColor	Specify the background color to be used when a transparent image is pressed. Used only in case that ViewType is Image type.
FalseColor	Specify the background color to be used when the transparent image is not pressed. Used only in case that ViewType is Image type.

5.3.5 ToggleButton Control



Explanation

Used to change the value of a Register, String Register, System or KAREL Variable (except XYZWPR type) or I/O to the specified value following the ON(Pushed)/OFF(Popped) status of the button. The monitor function for the written data is also supported. The image button is also available.

Note

- The specified variable is rewritten with the specified value just after this button is operated. However the function to hold the specified value is not supported.
- In case of numeric type, the value set by On/Off of button is TrueValue/FalseValue.
- In case of string type, the value set by On/Off of button is TrueValueStr/ValueStr.
- In case of logical type, the value set by On/OFF of button is fixed value (TRUE/FALSE) and it is not possible to change this value except to Invert it.
- In case of numeric type, if the value of the specified Register, System/KAREL Variable and I/O is changed neither TrueValue nor FalseValue, the status of the button will follow the setting of the OtherPhase.
- In case of string type, if the value of the specified String Register is changed neither TrueValueStr nor ValueStr, the status of the button will follow the setting of the OtherPhase.

Property

Property can be divided into the below groups:

Related data for read: DataType, DataIndex

Related display: ForeColor, BackColor, Caption, Font, Border, ViewType

Related specifying display color : TrueColor, FalseColor, TrueStrColor,
FalseStrColor

Related specifying image: TrueImage, FalseImage

Related specifying standard value:

Type, TrueValue, FalseValue, TrueValueStr, ValueStr

Caption Specify the fixed String.

TrueCaption Specify the fixed String when the value is TRUE.
If not specified, Caption is used.

ForeColor Specify the color of characters.

BackColor Specify the background color.

Font Specify the font name, font style and size.

HAlign Specify the horizontal alignment of characters.

VAlign Specify the vertical alignment of characters.

DataType Specify the type of the data to change.
The following data types are supported:

100 - Static Not used usually.

101 - Numeric Register Change the value of register specified in
DataIndex.

102 - System Variable Change the value of the System Variable
specified in DataIndex.

103 - KAREL Variable Change the value of the KAREL Variable
specified in DataIndex.

112 - String Register Change the value of string register
specified in DataIndex.

I/O Change the value of I/O specified in
DataType and DataIndex.

DataIndex Specify the number or the variable name.

IOSim Used only for I/O types. When TRUE, the port simulation
status is displayed and changed instead of the actual point.

Momentary When TRUE, the button status is changed to ON when
pressed and OFF when released. This only works when
the button is pressed with the Touch Panel or if the mouse
is pressed in Internet Explorer.

Interval Specify the interval time in ms.

Periodic Specify whether to monitor the data or send periodically.

Border Select the border design of the control.

ViewType Select the type of the button to display.

0 - Normal Specify the normal button.

1 - CheckBox Specify the checkbox button.

2 - Image Specify the image button.

Type Select the data type to transact.

0 - Logical Data is transacted as Boolean type. The value of
TrueValue and FalseValue is ignored.

1 - Numerical Data is transacted as numerical type. The value of
TrueValue and FalseValue is applied.

2 - String Data is transacted as string type. The value of
TrueValueStr and ValueStr is applied.

Invert Specifies the value should be inverted. This value is
effective when Type is Logical. When button status
is ON, value written is OFF (FALSE). When button
status is OFF, value written is ON (TRUE).

TrueValue Specify the value written when the button status is
changed to ON (TRUE). This value is effective
when Type is numerical.

FalseValue Specify the value written when the button status is
changed to OFF (FALSE). This value is effective
when Type is numerical.

TrueValueStr	Specify the string value written when the button status is changed to ON (TRUE). This value is effective when Type is string.
ValueStr	Specify the string value written when the button status is changed to OFF (FALSE). This value is effective when Type is string.
OtherPhase	Specify the status (TRUE/FALSE) in case that the value is equal to neither TrueValue nor FalseValue. This value is effective when Type is numerical.
TrueColor	Specify the color displayed when the read value is equal to TrueValue or not equal to FalseValue.
FalseColor	Specify the color displayed when the read value is equal to FalseValue or not equal to TrueValue.
TrueStrColor	Specify the color of characters displayed when the read value is equal to TrueValue or not equal to FalseValue. Used when the ViewType is not the image type.
FalseStrColor	Specify the color of characters displayed when the read value is equal to FalseValue or not equal to TrueValue. Used when the ViewType is not the image type.
TrueImage	Specify the image to be displayed when the button status is ON. Used only in case that ViewType is Image type.
FalseImage	Specify the image to be displayed when the button status is OFF. Used only in case that ViewType is Image type.
Confirm	Specify a confirmation popup should be displayed before setting the button status to ON. This parameter must be typed into the HTML. <param name="Confirm" value="-1">

5.3.6 Multi Control



Explanation

Used to change a maximum of 10 kinds of images or strings if the value of Register, System or KAREL Variable (except XYZWPR type) and I/O is within specified range or not. It is the multi version of ToggleLamp and can be used to create animations, such as progress bars.

For example:

If the read value is within ValueMin01 through ValueMax01, therefore $\text{ValueMin01} \leq (\text{read value}) \leq \text{ValueMax01}$ is fulfilled, the strings or image specified in Data01 is displayed.

Note

- If the read value is within the multi specified range, the smallest number condition is applied.
- If the read value is out of all specified ranges, the default image or string (specified in DataDefault) is displayed.

Property

Property can be divided into the groups below:

Related data for read: DataType, DataIndex

Related display: ForeColor, BackColor, Font, Border, Type

Related specifying standard value: DataDefault

Data01 - Data10

ValueMin01 - ValueMin10

ValueMax01 - ValueMax10

ForeColor Specify the color of characters.
This is effective when Type is label.

BackColor Specify the background color.

Font Specify the font name, font style and size.

	This is effective when Type is label.
HAlign	Specify the horizontal alignment of characters. This is effective when Type is label.
VAlign	Specify the vertical alignment of characters. This is effective when Type is label.
DataType	Specify the type of the data to display. The following data types are supported:
100 - Static	Not used usually. If Type is label, the strings specified in DataDefault are displayed. If Type is image, the image specified in DataDefault is displayed.
101 - Numeric Register	Compare the value of register specified in DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.
102 - System Variable	Compare the value of the System Variable specified in DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.
103 - KAREL Variable	Compare the value of the KAREL Variable specified in DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.
I/O	Compare the value of I/O specified in DataType and DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.
DataIndex	Specify the number or the variable name.
IOSim	Used only for I/O types. When TRUE, the port simulation status is displayed instead of the actual point.
Interval	Specify the interval time in ms.
Periodic	Specify whether to monitor the data or send periodically.
Border	Select the border design of the control.
ViewType	Select the type of the button to display.
0 - Label	Display strings. DataDefault, Data01 - Data10 are treated as the strings for display.
1 - Image	Display image. DataDefault, Data01 - Data10 are treated as the image file name.
DataDefault	Specify the strings or the image file name if the read value does not fulfill any condition.
Data01 - Data10	Specify the strings or the image file name if the read value fulfills the condition. These data correspond to the same ordinal condition.
ValueMin01 - ValueMin10	Specify the start value of the condition range. It is possible to set 10 conditions from 01 to 10.
ValueMax01 - ValueMax10	Specify the end value of the condition range. It is possible to set 10 conditions from 01 to 10.

5.3.7 AutoChange Control



Explanation

An invisible control that is used to change the web page automatically if the value of Register, System or KAREL Variable (except XYZWPR type) or I/O is within specified range or not. Used to change the web page from the teach pendant program.

For example:

If the read value is within ValueMin01 through ValueMax01, therefore $\text{ValueMin01} \leq (\text{read value}) \leq \text{ValueMax01}$ is fulfilled, the web page specified in PageName01 is displayed.

Note

- If the read value is within the multi specified range, the smallest number condition is applied.
- If the read value is out of all specified ranges, the change of web page is not done.
- The condition is ignored during screen initialization.
- This control is invisible at run-time.
- For logical variable set 0 for FALSE, and 1 for TRUE

Property

Property can be divided into the below groups.

Related data for read: DataType, DataIndex

Related specifying standard value:

PageName01 - PageName10

ValueMin01 - ValueMin10

ValueMax01 - ValueMax10

DataType Specify the type of the data to monitor.

The following data types are supported:

100 - Static Not used usually.

101 - Numeric Register Compare the value of register specified in DataIndex is within ValueMinXX through 1 ValueMaxXX and XX is 01 through 10 in order.

102 - System Variable Compare the value of the System Variable specified in DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.

103 - KAREL Variable Compare the value of the KAREL Variable specified in DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.

I/O Compare the value of I/O specified in DataType and DataIndex is within ValueMinXX through ValueMaxXX, and XX is 01 through 10 in order.

DataIndex Specify the number or the variable name.

IOSim Used only for I/O types. When TRUE, the port simulation status is monitored instead of the actual point.

Interval Specify the interval time in ms.

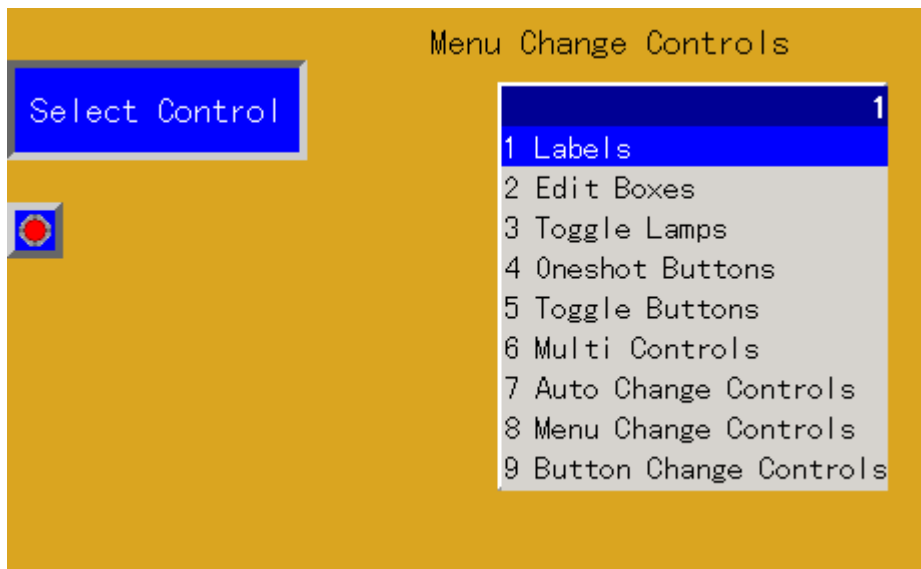
Periodic Specify whether to monitor the data or send periodically.

PageName01 - PageName10 Specify the web page to display when the read value fulfills the condition. These data correspond to the same ordinal condition.

ValueMin01 - ValueMin10 Specify the start value of the condition range. It is possible to set 10 conditions from 01 to 10.

ValueMax01 - ValueMax10 Specify the end value of the condition range. It is possible to set 10 conditions from 01 to 10.

5.3.8 MenuChange Control



Explanation

Used to select the web page from the popup menu. The menu is displayed when the MenuChange button is clicked and can have a maximum of 10 items. The image button is also available.

Note

- It is necessary to set menu item without a break. When there is a null data in PageCaptionXX, the rest of data after the null data is not displayed, even if there is effective data after the null data.

Property

Property can be divided into the following groups.

Related display: Caption, ForeColor, BackColor, Font, Border

Related changing content: PageCaption01 - PageCaption10,
PageName01 - PageName10

Related specifying image: TrueImage, FalseImage

Caption Specify the fixed String.

ForeColor Specify the color of characters.

BackColor Specify the background color.

Font Specify the font name, font style and size.

HAlign Specify the horizontal alignment of characters.

VAlign Specify the vertical alignment of characters.

Border Select the border design of the control.

ViewType Select the type of the button to display.

0 - Normal Specify the normal button.

1 - Image Specify the image button.

PageCaption01 - PageCaption10

Specify the strings displayed on popup menu for selecting menus. These data correspond to the same ordinal PageNameXX.

PageName01 - PageName10

	Specify the page name displayed after popup menu is selected. These data correspond to the same ordinal PageCaptionXX.
TrueImage	Specify the image to be displayed when the button is pushed. Used only in case that ViewType is Image type.
FalseImage	Specify the image to be displayed when the button is not pushed. Used only in case that ViewType is Image type.
TrueColor	Specify the background color to be used when a transparent image is pressed. Used only in case that ViewType is Image type.
FalseColor	Specify the background color to be used when the transparent image is not pressed. Used only in case that ViewType is Image type.

5.3.9 ButtonChange Control



Explanation

Used to display the specified web page. Can also be used to perform a command using a URL. (KCL and KCLDO Commands)
The image button is also available.

Property

Property can be divided into the below groups.

Related display: Caption, ForeColor, BackColor, Font, Border

Related specifying image: TrueImage, FalseImage

Related changing content: PageName

Caption	Specify the fixed String.
ForeColor	Specify the color of characters.
BackColor	Specify the background color.
Font	Specify the font name, font style and size.
HAlign	Specify the horizontal alignment of characters.
VAlign	Specify the vertical alignment of characters.
Border	Select the border design of the control.
ViewType	Select the type of the button to display.
0 - Normal	Specify the normal button.
1 - Image	Specify the image button.
PageName	Specify the page name displayed after button is pushed or specify a command to perform using a URL.
TrueImage	Specify the image to be displayed when the button is pushed. Used only in case that ViewType is Image type.
FalseImage	Specify the image to be displayed when the button is not pushed. Used only in case that ViewType is Image type.
TrueColor	Specify the background color to be used when a transparent image is pressed. Used only in case that ViewType is Image type.
FalseColor	Specify the background color to be used when the transparent image is not pressed. Used only in case that ViewType is Image type.

5.3.10 Help Control



Explanation

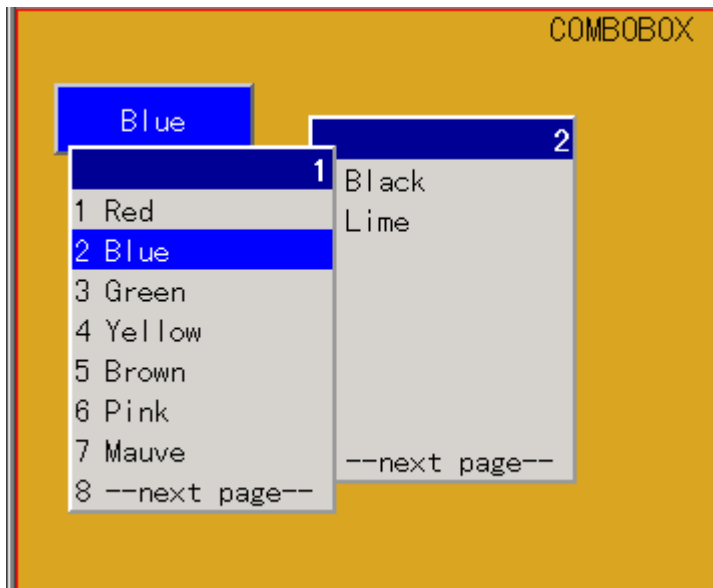
The Help Control will be used to specify a single help page. The help page is displayed when the HELP key is pressed. The Help Control will be invisible on the page. It can reside anywhere on the visible portion of the web page. If it is not on the visible portion then it may not be created. It is only operational if it has been created. Only one Help Control should be used per web page. It is undefined which help page will be used if multiple Help controls exist.

The rules for displaying the help page are exactly the same as the current iPendant help system. You cannot specify how it operates. You can only specify the web page to display when help is activated

Property

PageName	Specify the page name displayed when HELP is selected. This can be any valid URL.
-----------------	---

5.3.11 ComboBox Control



Explanation

The ComboBox Control allows the selection of an item from a popup menu. The control displays the currently selected item. When the button is clicked (enter key), a popup list is displayed. When an item is selected, the selected value and selected text is written to the specified data on the controller. The selected value is monitored so can be dynamically changed. In the case of string registers, the string register value is also monitored so can be dynamically changed.

The selection list can be populated by various data fields:

- List of programs with program type filter.
- Contents of KAREL string array.
- Dictionary elements.
- List of file names.
- List of string registers.

Property

Related display of button:

Caption	Specify the format string.
ForeColor	Specify the color of characters.
BackColor	Specify the background color.
Font	Specify the font name, font style and size.
HAlign	Specify the horizontal alignment of characters.
VAlign	Specify the vertical alignment of characters.
Border	Select the border design of the control.
ViewType	Select the type of the button to display.
0 - Normal	Specify the normal button.
1-8	Specify the function key.

Related selection of list:

DataType	Specify the type of the data for the selected value of the list.
DataIndex	Specify the number or the variable name of the data for the selected value of the list.
IOSim	Used only for I/O types. When TRUE, the port simulation status is displayed and changed instead of the actual point.
Interval	Specify the interval time in ms.
Periodic	Specify whether to monitor the data or send periodically.
TextType	Specify the type of the data to set for the selected text of the list. Not valid if the Type property is set to ProgramType or FileType.
TextIndex	Specify the number or the variable name to set for the selected text of the list. Not valid if the Type property is set to ProgramType or FileType.

Related list:

Type	Specify the type of the ComboBox.
0 - ListType	Not available in this release.
1 - ProgramType	Similar to %pk in the Form Manger. The list is populated by the loaded programs on the robot. The ProgType property is used to further classify which types of programs are included in the list. The list is updated every time the list is displayed. Upon selection of the list, the program name is copied to the data specified by DataType/DataIndex.
2- VariableType	Similar to %v in the Form Manger. The list is populated by a KAREL string array. The DataSource property is used to specify the KAREL string array. The list is updated every time the list is displayed. Upon selection of the list, the value is copied to the data specified by DataType/DataIndex. The string is copied to the data specified by TextType/TextIndex.
3- DictionaryType	Similar to %w in the Form Manager. The list is populated by a dictionary element. The DataSource property is used to specify the starting dictionary element. The list is updated every time the list is displayed. Upon selection of the list, the value is copied to the data specified by DataType/DataIndex. The string is copied to the data specified by TextType/TextIndex.
4- FileType	The list is populated by the file names. The DataSource property is used to specify the directory. The list is updated every time the list is displayed. Upon selection of the list, the file name is copied to the string specified by DataType/DataIndex.
5- StringRegisterType	The list is populated by the string register comments. The DataSource property is

not used. The list is updated every time the list is displayed. Upon selection of the list, the string register index is copied to the data specified by `DataType/DataIndex`. The string register value is copied to the data specified by `TextType/TextIndex`. The string register value is displayed in the caption and is dynamically updated.

ProgType Specify the program type if the Type property is set to `ProgramType`.

- 1 – TP programs** The list is populated by only TP programs (default).
- 2 – KAREL programs** The list is populated by only KAREL programs.
- 6 – All** The list is populated by TP, KAREL, and VR programs.
- 16 – TP & KAREL** The list is populated by TP and KAREL programs.

DataSource Specify the source used to populate the list when the Type property is set to `VariableType`, `DictionaryType`, or `FileType`.

When Type property is set to **VariableType**, `DataSource` should specify a KAREL string array. Each element of the array should define a choice in the list. The first element in the array is related to the value 0 and is never used. The second element is related to the value 1 and is the first item in the list. This is defined for compatibility with the Form Manager. The last item is either the end of the array or the first uninitialized value. For example, `DataSource = "[RUNFORM]CHOICES"`

```
[RUNFORM] CHOICES:ARRAY[6] OF STRING[12] =
[1] *uninit*
[2] 'Red'    <= value 1
[3] 'Blue'   <= value 2
[4] 'Green'  <= value 3
[5] 'Yellow' <= value 4
[6] *uninit*
```

Example for Boolean type:

```
[RUNFORM] IOSIM:ARRAY[3] OF STRING[12] =
[1] *uninit*
[2] 'UNSIM'  <= value 0 for Boolean types
[3] 'SIM'    <= value 1 for Boolean types
```

When Type property is set to **DictionaryType**, `DataSource` should specify the starting dictionary element. This first element is related to the value 1. One dictionary element is needed to define each entry in the list. The last entry should be followed by a dictionary element that contains `"\a"`. For example, `DataSource = "FORM[9]"`

```
$9
"Red"      * value will be set to 1
$-
"Blue"     * value will be set to 2
```

\$-
"Green" * value will be set to 3
\$-
"Yellow" * value will be set to 4
\$-
"a" * specifies end of list

Example for Boolean type, DataSource = "FORM[9]"

\$9
"UNSIM" * value 0 for Boolean types
\$-
"SIM" * value 1 for Boolean types
\$-
"a" * specifies end of list

When Type property is set to **FileType**, DataSource should specify a File Specification. If no DataSource is specified, all files on the default device of the robot are shown.

Some examples of DataSource:

MF: *.DT
*.DT (uses default device)
FR: *.DT
MC:\WEB*.TM

5.3.12 Execution Control



Explanation

The Execution Control can be used to specify a KAREL program to run or a C SOFTPART to call. The Execution Control will be invisible on the page. It can reside anywhere on the visible portion of the web page. If it is not on the visible portion then it may not be created. It is only operational if it has been created. Only one Execution Control should be used per web page.

After the page is completely loaded, the KAREL program is run. If the KAREL program is not loaded, it will not be run. The KAREL program will already be running if another pane has the same web page loaded. A static variable, `ref_cnt`, is created and maintained. The KAREL program is aborted when no panes are left to process. The KAREL program can increment the reference count if you wish it to remain running: `ref_cnt = ref_cnt + 1`

Property

Name	Specify the name of the KAREL program or the name of the C SOFTPART.
Type	Select the type of execution.
0 - KAREL	Run a KAREL program.
1 - SOFTPART	Call a C SOFTPART, see Appendix E.
Parameter1 – Parameter8	Specify the string parameter to set in \$UI_PANEDATA[PANEID].PARAMETER1 through \$UI_PANEDATA[PANEID].PARAMETER8. For more information on \$UI_PANEDATA, see Appendix F.
ClickEvents	Send button click events to the KAREL program or the C SOFTPART.
ChangeEvents	Send value change events to the KAREL program or the C SOFTPART.
FocusEvents	Send focus events to the KAREL program or the C SOFTPART.

Note

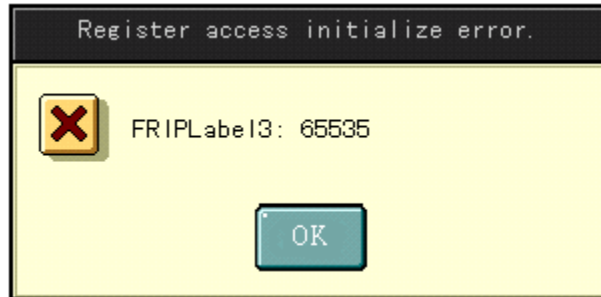
Currently, ClickEvents, ChangeEvents, and FocusEvents are only available while using DISCTRL_FORM; Otherwise, they should remain unchecked for efficiency reasons. See Appendix E for details on DISCTRL_FORM.

5.4 Control Design Advice

The process speed shows a tendency to be slow as the number of controls on the page increases. Using Image files, the process speed shows a tendency to be slow as the number of colors increase.

5.4.1 Error Code Dialog

When an error occurs, a dialog appears, such as



The error title contains the error. The object name and error content is displayed in the dialog box. See “Section 5.2.1 Object Tag” for details on changing the object name.

5.4.2 Error Code Messages

Error content

Access initialize error.

Content: Error occurred trying to access the specified data type.

Cause: Specified DataType and/or DataIndex were not valid.

Remedy: Specify a valid type in DataType and valid index in DataIndex.

To access a dictionary element use
dict_name[element_number], such as TPAR[5]

Register access initialize error.

Content : Error occurred trying to access the specified Register.

Cause: Specified register number doesn't exist on the robot.

Remedy: Specify the register number in DataIndex which exists on the robot.

System Variable access initialize error.

Content : Error occurred trying to access the specified System Variable.

Cause : Specified System Variable doesn't exist on the robot.

Remedy : Specify the System Variable name in DataIndex which exists on the robot, such as \$MNUTOOLNUM[1]. The System Variable type must be Integer, Real, Boolean, Short, Byte, or String.

KAREL Variable access initialize error.

Content : Error occurred trying to access the specified KAREL Variable.
Cause : Specified KAREL Variable doesn't exist on the robot.
Remedy : Specify the KAREL Variable name in DataIndex which exists on the robot, such as [KRLPRG]KRLARY[1]
The KAREL variable type must be Integer, Real, Boolean, Short, Byte, or String.

I/O access initialize error.

Content : Error occurred trying to access the specified I/O port.
Cause : Specified I/O type or port number doesn't exist on the robot.
Remedy : Specify the I/O type in DataType and the port number in DataIndex which exists on the robot.

Measure : Specify the I/O which exist in this system.

Write error.

Content : Error occurred trying to write the data.
Cause : Data may be out of valid range.
Remedy : Check the new value is within a valid range. Check the DataType and DataIndex are specified correctly.

No write access to data.

Content : Error occurred trying to write the data.
Cause : Tried to write data which is write protected.
Remedy : Try to set at control start.

Value out of range.

Content : Error occurred trying to write the data. The valid ranges should be shown in the dialog box.
Cause : Value is out of range.
Remedy : Enter new value within specified ranges.

Unable to connect to controller.

Content : Error occurred trying to connect to the robot controller to access the data. The RPC_MAIN port number that the iPendant is trying to connect to should be shown in the dialog box.
Cause : Controller may not be loaded correctly. The RPC server on the controller must be loaded and running.
Remedy : Verify controller is loaded properly. Version V6.21 or later is required. Verify RPC_MAIN port number in \$SERVENT system variable is valid on the controller.

No Image File.

Content : No Image File is shown instead of the specified image.
Cause : Specified image file could not be loaded from the robot.
Remedy : Verify the image file is specified correctly as a control parameter. Verify the image file is copied to the correct device and directory on the robot.

HTTP/1.0 404 File Not Found

Content : HTTP/1.0 404 File Not Found is shown instead of the specified web page.

Cause : Specified web page could not be found on the robot.

Measure : Verify the web page is specified correctly as a control parameter. Verify the web page is copied to the correct device and directory on the robot.

6 USING THE CHART CONTROL

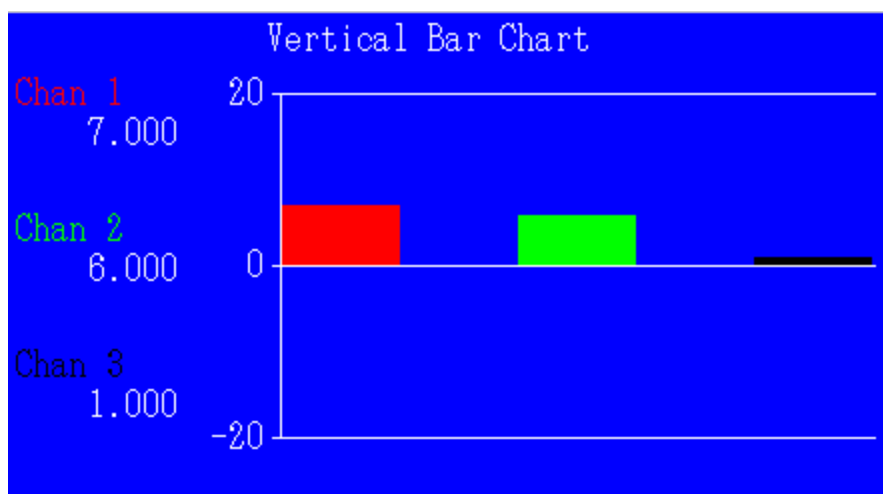
The Chart control is a means to graphically render data on the iPendant or an externally connected browser such as Internet Explorer.

The Chart control is configured through properties within the web page to control the display and configure the data sources. A Chart has one or more channels or data sources. These sources are supplied from the robot controller, and specified by name and monitor rate.

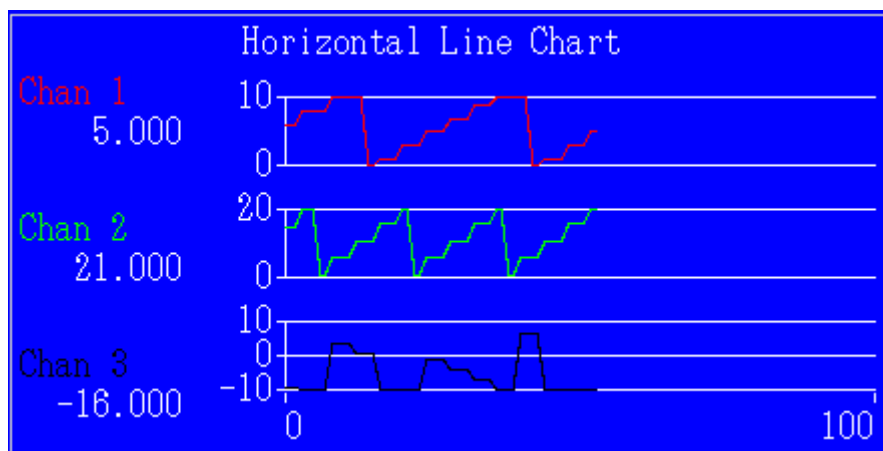
Properties of the control also determine the scaling, format, colorization and layout of many of the Chart's characteristics.

A Chart may be specified as either a Bar or Line chart.

1) Bar chart:



2) Line chart:



These charts can be oriented horizontally or vertically.

A maximum of 8 channels per Chart can be configured and active at one time.

Conventions:

Usually axes are referred to as X-axis and Y-axis for 2-dimensional charting. This gets confusing when horizontal or vertical orientation requires translation to the browser or plug-in native coordinate system. Instead we will use the following nomenclature regardless of the orientation:

SampleAxis or **SampleScale** – refers to the sample index.

For a Bar Chart this is the base axis of the bars.

For a Line Chart this is the common axis among multiple channels. It may be time, or just a running sample increment but it is common and relates the individual channels.

DataAxis or **DataScale** – refers to the data value of the channel.

For a Bar Chart this is common to all channels.

For a Line Chart this is independent among all channels since its scaling will dictate the visibility of small or large changes in the channels data value.

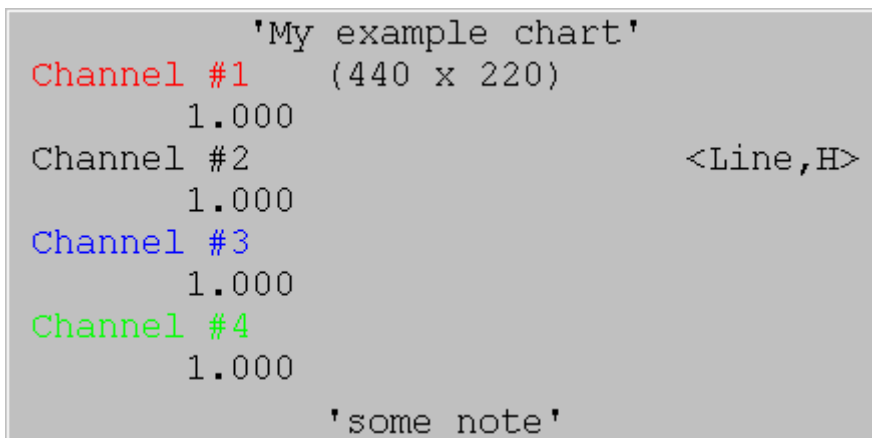
The easiest way to create chart on the screen for the iPendant is by putting the Chart controls on the web page and by setting its properties.

The characteristics controlling items such as chart layout, orientation, data source, labels, colors, etc. can be controlled by the user setting the appropriate properties of the Chart control.

Initially when a drawing control is first inserted on the web page, by Microsoft FrontPage, it is displayed with the default light gray background in 200 by 160 pixel size. The two text items in the control reflect the Caption and size (width and height). These are dynamically updated when the size or Caption is changed.



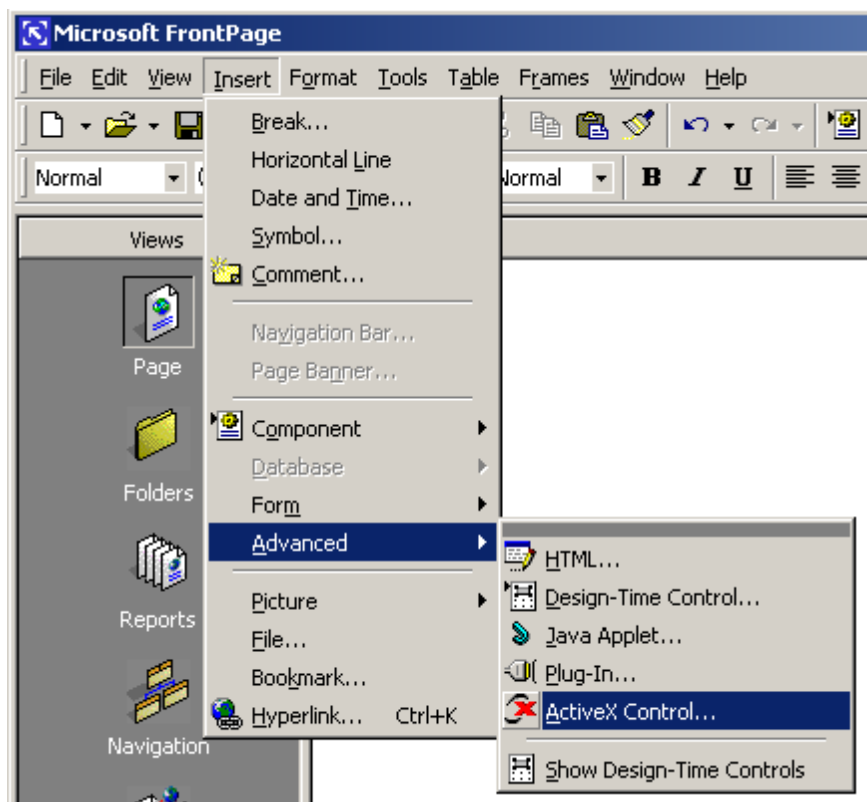
As the chart is resized and channels are enabled, the display changes dynamically to give a general feel for the overall layout...



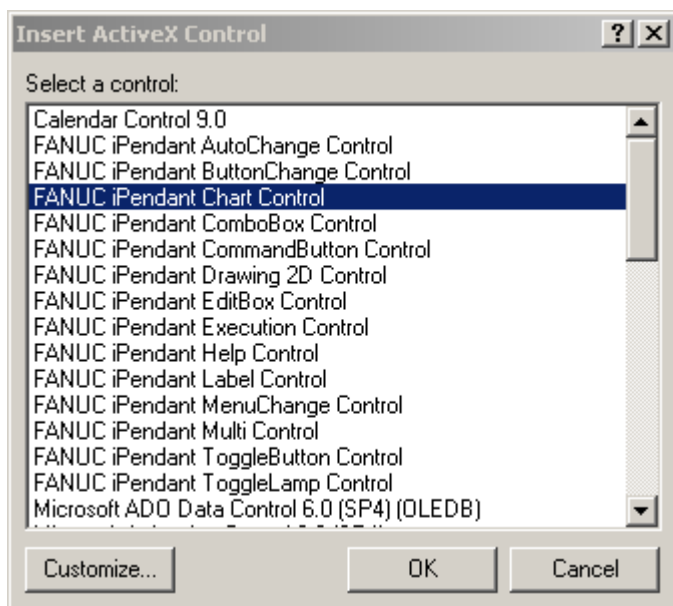
6.1 Control Arrangement

To add a Chart Control to your web in FrontPage, follow these steps:

- 1) Position your cursor where you want the control to appear.
- 2) Select **Insert | Advanced | ActiveX Control** from the menu bar.



- 3) Choose the **FANUC iPendant Chart Control** from the list of available FANUC iPendant controls, and click OK. The Chart control is now inserted into your page.



Note: If the **FANUC iPendant Chart Control** is not an option in the list, use the **Customize...** button to enable it. If the option is not available under the **Customize...** setup, then the proper software for the FANUC controls has not been installed.

- 4) The particular properties can be configured from the ActiveX property pages. Either double click on the control or right click and select **ActiveX Control Properties**.

6.2 Common Chart Control Properties

A Charting control has the following properties.

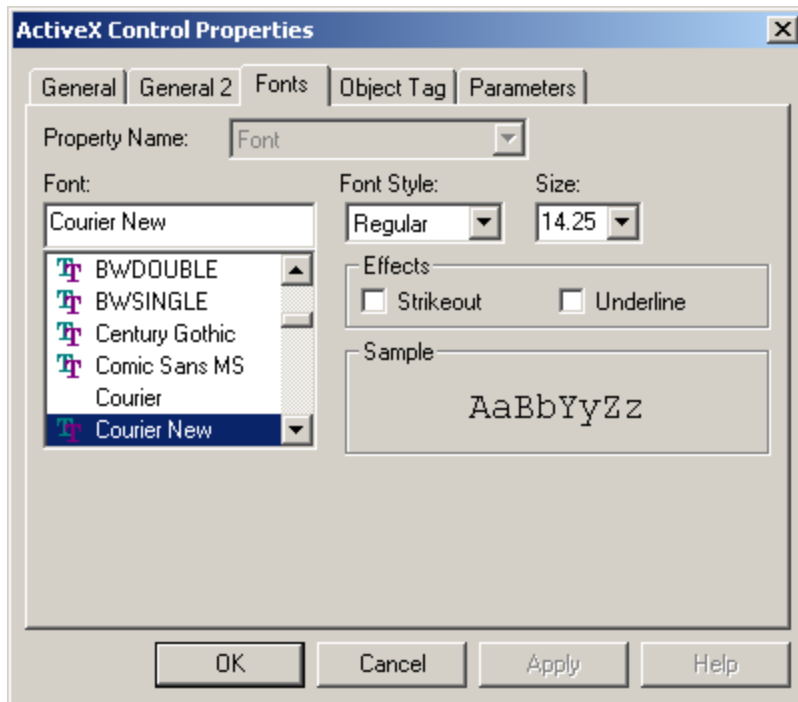
6.2.1 Object Tag

The Object Tag dialog allows you to specify some standard attributes associated with your control. The Name is used when an error occurs. The **width** and **height** can be specified in pixels or percentage (%). Of course, you can resize the control in FrontPage by dragging the control's handles with the mouse.

The remaining properties are grouped by their property page tab.

6.2.2 Fonts

The font properties associated with the chart as the “defaults” are modified from the **Fonts** property page. Text strings use these “default” settings when no other font attributes are specified.



- Font: specifies the name of the font passed in the **Font** property.

Note: For the iPendant this has no effect.

- Font Style: can specify regular, bold, italic and italic bold. This affects whether the properties **FontBold** and **FontItalic** are optionally passed.

Note: For the iPendant only regular and bold have an effect, italic and bold italic are ignored.

- Size: specifies the size is the font. It is passed in the **FontSize** property.

The iPendant has built-in fonts for 12, 14, 16, 18 and 24-point fonts. Other fonts are interpolated in size and may render with dithering around the edges. Valid ranges of font sizes are 8 through 24.

Suggested values are:

- 12** Specifies 12 point font.
- 14** Specifies 14 point font.
- 16** Specifies 16 point font.
- 18** Specifies 18 point font.
- 24** Specifies 24 point font.

Note: on the iPendant, 8-point font is about the smallest that is readable.

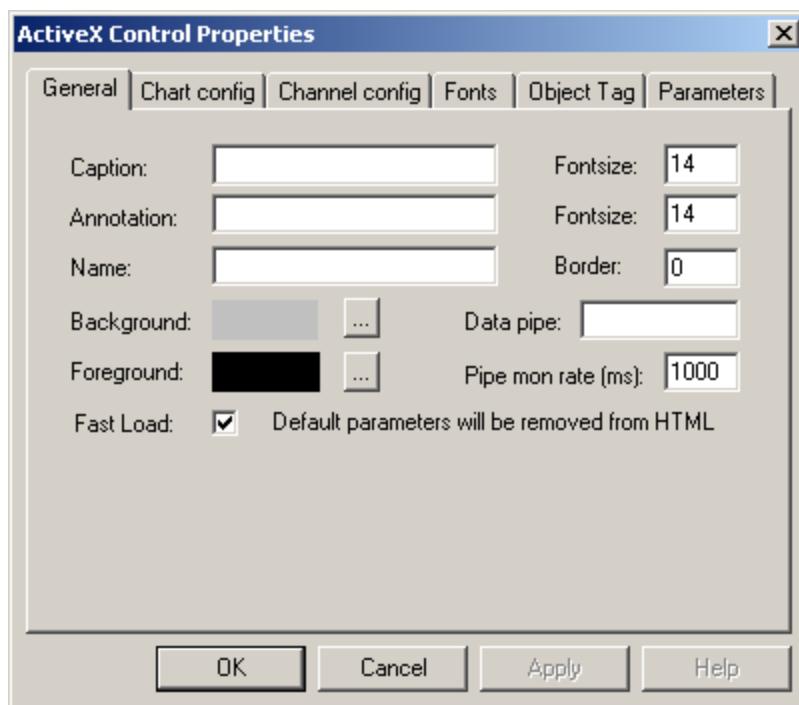
- Strikeout: specifies whether the **FontStrikethrough** property is passed.

Note: For the iPendant this has no effect.

- Underline: specifies whether the **FontUnderline** property is passed.

Note: For the iPendant this has no effect.

6.2.3 General Chart Properties



6.2.3.1 Caption & CaptionFontSize

Caption Specifies a text string to be displayed as a general label for the chart.

This string is centered at the top of the Chart control, in the control's foreground color and font properties.

CaptionFontSize is used to override the "default" font size specified from the Fonts property tab.

6.2.3.2 Annotation & AnnotateFontSize

Annotation Specifies a text string to be displayed as a note for the chart.

This string is centered at the bottom of the Chart control, in the control's foreground color and font properties.

AnnotateFontSize is used to override the “default” font size specified from the Fonts property tab.

6.2.3.3 Name

Name Is a text string that specifies an association to a KAREL program on the controller.

Currently, when the Drawing control is instantiated, the control checks for the existence of two program variables on the controller. This variable can be used to pass text commands in the format and with the content of other properties to dynamically affect the Drawing control’s operation.

[name] cmdstr If the variable exists and is of type STRING the control creates a monitor for this variable. Strings of commands can be written (set) to this variable and are delivered to the Drawing control to affect ‘dynamic’ actions such as data updates or changes in some chart properties.

[name]cmdack If the variable exists and is of type BOOLEAN or INTEGER, the Drawing control uses this variable to acknowledge that commands have been accepted via the **command** variable and acted on. The **cmdack** variable is set TRUE or 1 when that command is accepted by the plug-in.

Note: The **Name** parameter can utilize **!PanelID**.

6.2.3.4 Border

Border Select the border surrounding the Chart control.

Allowable values are:

>0 A 3 dimensional raised border, that number of pixels thick.

=0 No border line.

<0 A 3 dimensional depressed border, that number of pixels thick..

6.2.3.5 Foreground & Background Colors

The Colors dialog allows you to specify the color of certain elements. The iPendant supports 256 colors. Colors associated with the Chart control are:

ForeColor Specify the “default” color of any entity that does not have an explicit color defined.

BackColor Specify the “default” background color.

Note: Colors are specified as a decimal value represent bbgrr (blue green red) format, where as hexadecimal value preceded by the # sign are in rrggbb (red green blue) format.

For example; ForeColor = 10531008 (decimal) is the same as ForeColor = #C0B0A0 (hex).

6.2.3.6 Pipe

Pipe Is a text string that specifies a named data file created on the controller and only associated with the PIP: device.

This file is used to dynamically deliver data to the drawing control on the iPendant. The name can be any 8.3-formatted name, for example: drawing1.dat.

The name of this file is sent to the controller when the chart control is instantiated on the iPendant. The file name is concatenated to PIP: and the file opened. If the file does not exist then the file is created and opened for read. If the file does exist prior to this, the file is opened for read access and a seek to the end of file done to eliminate the possibility of stale data.

When the last chart control using this file is gone, the file is deleted.

Note: The **Pipe** parameter can utilize **!PanelID**.

6.2.3.7 PipeMonRate

PipeMonRate Specifies the time in milliseconds at which the Pipe file data is sampled.

Note: This value should be specified at a rate that give reasonable performance and display update. The controller will enforce a minimum of 100ms.

6.2.3.8 FastLoad

FastLoad is selected by the checkbox.

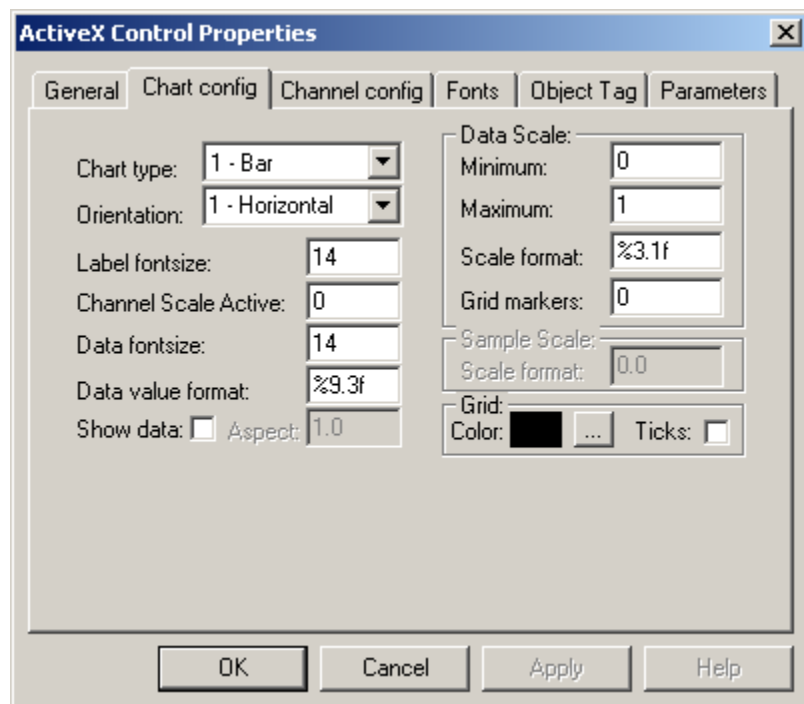
Checked Specifies that properties that are set to their corresponding “default” values are not included in the web page. This effectively saves load time.

Unchecked Specifies that all parameters are included in the web page, whether they have “default” values or not.

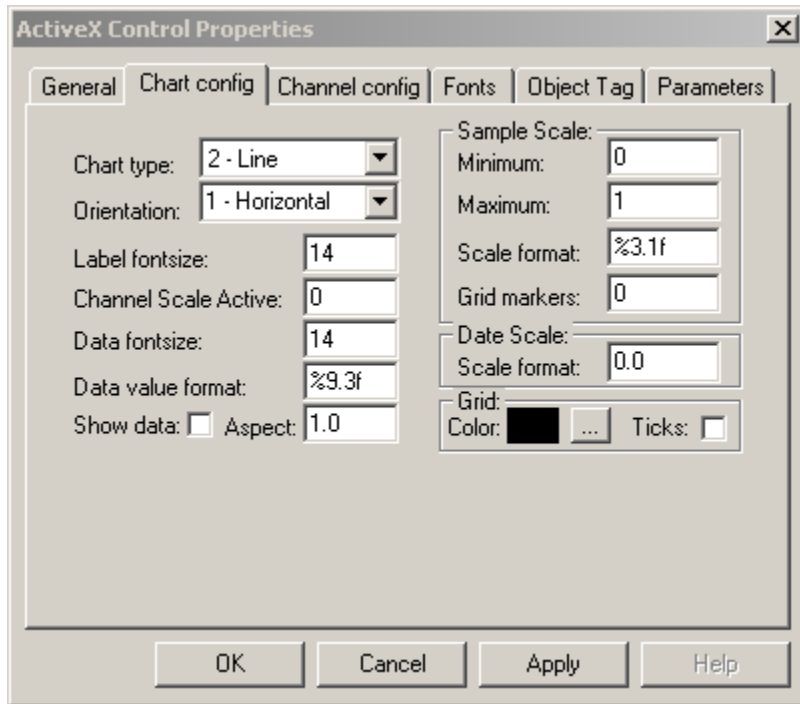
6.2.4 Chart config tab

Chart config properties differ slightly between a Bar chart and Line chart.

For the Bar chart the **Chart config** tab is as follows:



And for a Line chart the Chart config tab is as follows:



Note: The Data Scale and Sample Scale properties have different meanings between the two types of charts (Bar or Line).

6.2.4.1 ChartType

ChartType Specifies the type of chart as a numeric value.

Allowable values are:

- 1 Displays a bar chart
- 2 Displays a line chart

6.2.4.2 Orientation

Orientation Specifies the chart's orientation on the iPendant as a numeric value.

Allowable values are:

- 1 Displays a horizontal chart
- 2 Displays a vertical chart

6.2.4.3 LabelFontSize

LabelFontSize Specifies the font size of the channels data labels.

The iPendant has built-in fonts for 12, 14, 16, 18 and 24-point fonts. Other fonts are interpolated in size and may render with dithering around the edges. Valid ranges of font sizes are 8 through 24.

Suggested values are:

- 12** Specifies 12 point font.
- 14** Specifies 14 point font.
- 16** Specifies 16 point font.
- 18** Specifies 18 point font.
- 24** Specifies 24 point font.

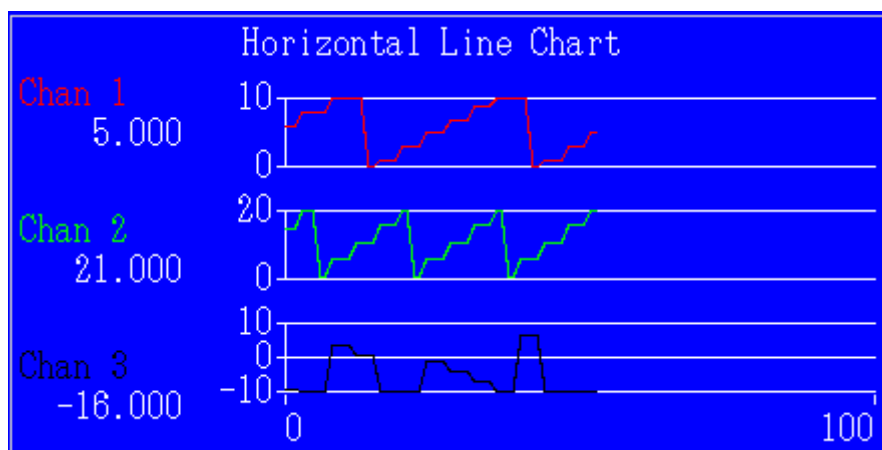
Note: on the iPendant, 8-point font is about the smallest that is readable.

6.2.4.4 LineScaleActive

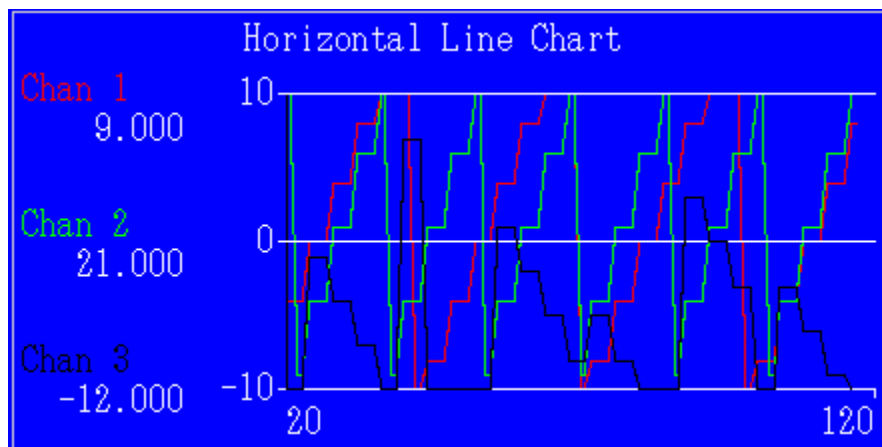
LineScaleActive is set from the "Channel Scale Active: box. It controls which data scale(s) are selected for display on a line chart.

When multiple channels are configured and active a chart may display in two ways.

- 1) A multiple 'stacked' charts each with their individual data scales.



- 2) A single chart, with one channel selected for the data scale. In this case the data scale edge will be in the color of the corresponding channel (in the following example it is channel 3, or black). When channels are overlaid in this manner the non-selected channels are still scaled to their own data scale.



Allowable values are:

- 0** Channels are independently displayed in a 'stacked' fashion
- 1 to 8** Channels are overlaid. The value selects the channel to

display the data scale for. All other channels are still called along the data scale by their own data scale.

6.2.4.5 DataFontSize

DataFontSize Specifies the font size of the channels data value fields.

The iPendant has built-in fonts for 12, 14, 16, 18 and 24-point fonts. Other fonts are interpolated in size and may render with dithering around the edges. Valid ranges of font sizes are 8 through 24.

Suggested values are:

12	Specifies 12 point font.
14	Specifies 14 point font.
16	Specifies 16 point font.
18	Specifies 18 point font.
24	Specifies 24 point font.

Note: on the iPendant, 8-point font is about the smallest that is readable.

6.2.4.6 DataFormat

DataFormat Specifies the format in which the channel's data value will be displayed. The display appears in the legend, near the channel's label, if DataShowValues = 1.

The format is in 'C' printf format for a single precision floating point number. For example; %9.3f

Default if not specified is %9.3f.

Note: Currently %f is the only allowed format.

6.2.4.7 DataShowValues

DataShowValues Specifies whether or not the values of each channel is displayed in a table near the channels label and in the DataFormat.

Allowable values are:

0	Do not display values
1	Display the values.

Default if not specified is 0.

6.2.4.8 SampleScaleAspect

The Aspect box sets SampleScaleAspect. It specifies a SAMPLE SCALE multiplier value.

This is a simple multiplier value applied to the sample scale after the SampleScale Minimum and Maximum values.

A Typical use might be to equate samples to time.

For example;

- 1 sample every 32ms.

- Sample scale range is initially set to 0 to 200 samples.
- SampleScaleAspect=0.010
- The result is that the sample scale minimum and maximums are multiplied by this factor, resulting in a displayed sample scale of 0 to 2 (seconds).

Note: There are no explicit checks on the bounds of this value. It is simply used as a multiplier, so it could also be a value > 1.

6.2.4.9 SampleScale

SampleScale Specifies the sample scale's minimum and maximum extent, since all LINE CHART channels have one common sample scale.

This property only pertains to a Line chart.

The extents can be specified as a pair of comma separated numbers (min,max), or a single value.

Allowable values are:

min	If value < 0, max is assumed 0.
min,max	Min and max as specified.
max	If value > 0, min is assumed 0.

For a horizontal Line chart; **min** is the left value and **max** is the right value.

For a vertical line chart; **min** is the bottom value and **max** is the top value.

Note: for a Bar Chart this property is ignored.

6.2.4.10 SampleScaleFormat

SampleScaleFormat Specifies the format of the sample scale labels.

This property only pertains to a Line chart.

The format is in 'C' printf format for a single precision floating point number. For example; %3.1f

Default if not specified is %3.1f

Note: currently %f is the only allowed format.

6.2.4.11 SampleGrid

SampleGrid Is controlled by the **Grid Markers** box. It specifies the interval of a grid to be displayed along the **SampleScale**.

This property only pertains to a Line chart.

Allowable values are:

0	No grid is displayed.
>0	Display grid in increment of this along the axis.

6.2.4.12 DataScaleFormat

DataScaleFormat Specifies the format of the DataScale labels.

This property only pertains to a Line chart.

The format is in 'C' printf format for a single precision floating point number. For example; %3.1f

Default if not specified is %3.1f.

Note: currently %f is the only allowed format.

6.2.4.13 DataScale

DataScale Specifies the data scale's minimum and maximum extent, since all BAR CHART channels have one common data scale.

This property only pertains to a Bar chart.

The extents can be specified as a pair of comma separated numbers (min,max), or a single value.

Allowable values are:

min	If value < 0, max is assumed 0.
min,max	Min and max as specified.
max	If value > 0, min is assumed 0.

For a horizontal Bar chart; **min** is the left value and **max** is the right value.

For a vertical Bar chart; **min** is the bottom value and **max** is the top value.

Note: for a Line Chart this property is ignored.

6.2.4.14 DataScaleFormat

DataScaleFormat Specifies the format of the data scale labels.

This property only pertains to a Bar chart.

The format is in 'C' printf format for a single precision floating point number. For example; %3.1f

Default if not specified is %3.1f

Note: currently %f is the only allowed format.

6.2.4.15 DataGrid

DataGrid Is controlled by the **Grid Markers** box. It specifies the interval of a grid to be displayed along the **DataScale**.

This property only pertains to a Bar chart.

Allowable values are:

0	No grid is displayed.
>0	Display grid in increment of this along the axis.

6.2.4.16 GridColor

GridColor Specifies the color for the Grid lines.

Note: There is only one color for both Sample and Data scale grids.

Default if not specified is the same color as the data and sample scales.

6.2.4.17 GridType

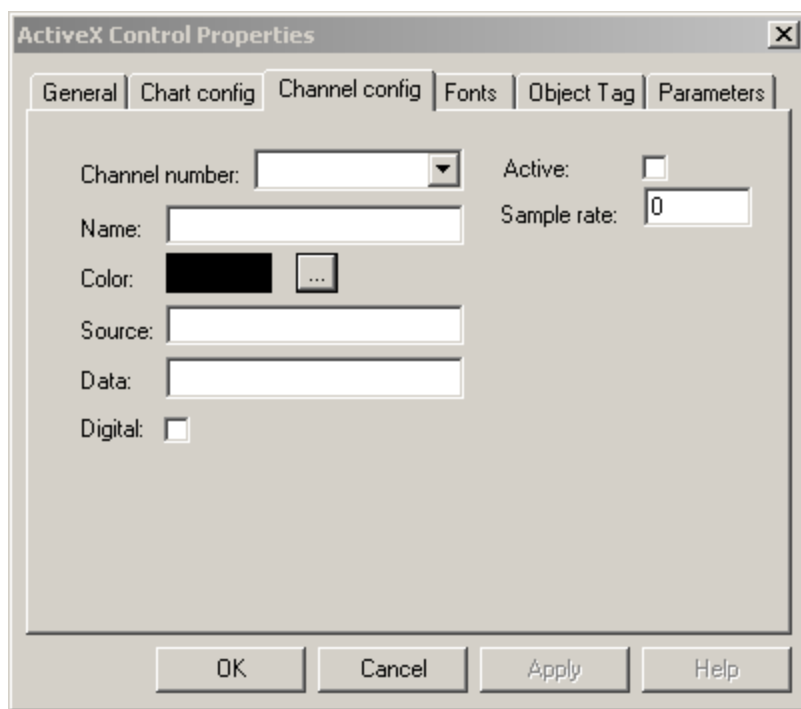
GridType Is controlled by the Ticks checkbox. It specifies how the Grid lines are displayed.

Allowable values are:

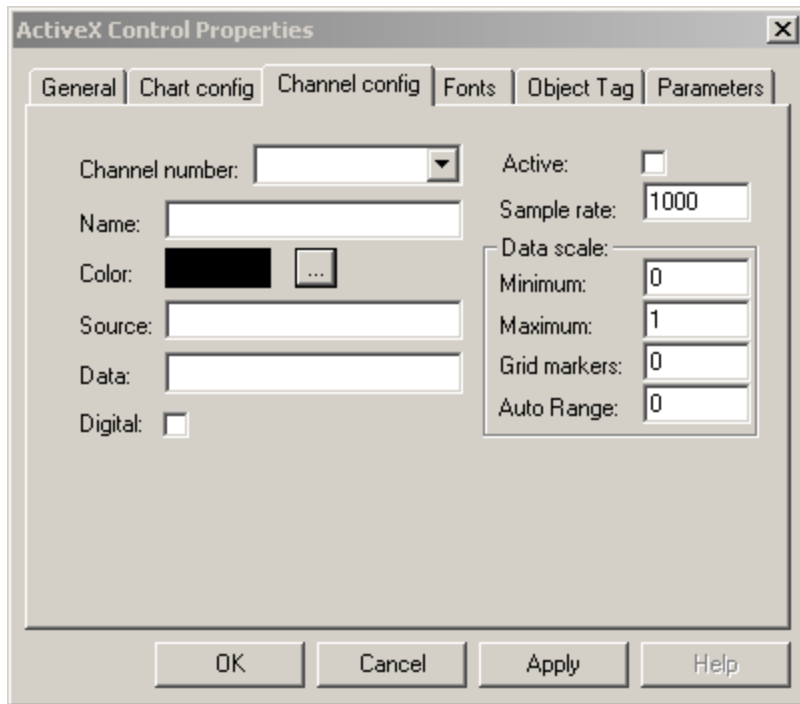
- 0 Grid lines are displayed all the way across the chart.
- 1 Grid lines are displayed as “tick” marks along the axis scale(s).

6.2.5 Channel config tab

Channel config properties of a Bar Chart control are:



Or for a Line Chart control are:



The only significant difference is that for a Line Chart the Data Scale properties can be set on a per channel basis.

The **Channel number** selects the channel number (**N**) that the remainder of the properties on this tab affects. Allowable numbers are 1 through 8.

6.2.5.1 ChN_Name

ChN_Name Specifies a text string to be used as name for the channel.

This is displayed on the chart as the Channel label in the channel's color (specified by **chN_Color**).

Default if not specified is "chN_Name", where the numeric channel number replaces N.

Note: If the name is specified with a leading \$, it is interpreted as a system variable which should be of type KSTRING. In this case, the contents of the string variable will be used as the name.

6.2.5.2 ChN_Color

ChN_Color Specifies the color for the channel.

The color value can be specified in the hexadecimal or decimal format that the ForeColor and BackColor use.

Default if not specified is the chart's foreground color (specified by **ForeColor**).

6.2.5.3 ChN_Source

ChN_Source Specifies the source of data monitored from the controller.

The source can specify any of the following. Note that where indexes are appropriate, they are specified enclosed by [].

Allowable values are:

numreg[n]	Numeric register n.
\$sysvar	System variable.
[prog]var	KAREL variable.
DIN[n]	Digital in n.
DOUT[n]	Digital out n.
ANIN[n]	Analog in n.
ANOUT[n]	Analog out n.
PLCIN[n]	PLC in n.
PLCOUT[n]	PLC out n.
RDI[n]	Robot digital in n.
RDO[n]	Robot digital out n.
SOPIN[n]	Standard Operator Panel in n.
SOPOUT[n]	Standard Operator Panel out n.
TPIN[n]	Teach Pendant in n.
TPOUT[n]	Teach Pendant out n.
WELDIN[n]	Weld in n.
WELDOUT[n]	Weld out n.
GPIN[n]	Group in n.
GPOUT[n]	Group out n.
LDIN[n]	Laser Digital in n.
LDOUT[n]	Laser Digital out n.
LAIN[n]	Laser Analog in n.
LAOUT[n]	Laser Analog out n.
WSIN[n]	Weld stick in n.
WSOUT[n]	Weld stick out n.

6.2.5.4 ChN_Data

ChN_Data Specifies data for a single channel as a single or sequence of data points.

Values are specified as a comma separated series of data values:

data	Data is one channel data point.
data, data,...	Data is a sequence channel data points.

This can be used to create a 'static' chart where all data is supplied as web page content.

6.2.5.5 ChN_Digital

ChN_Digital Specifies whether this channel should be represented as an analog or digital signal with square transitions.

This property only pertains to a Line chart.

Allowable values are:

0	Channel is analog representation.
1	Channel is digital representation.

As a digital representation, the transition is made at the next sample that changes.

6.2.5.6 ChN_State

ChN_State Specifies whether the specified channel is on or off from the Active: checkbox.

Allowable values are:

0	Channel is off (inactive).
1	Channel is on (active).

6.2.5.7 ChN_Rate

ChN_Rate Specifies the rate in milliseconds that the channel source is monitored at from the Sample rate: input.

Note: When multiple channels are active the fastest rate among all channels is used as the monitor rate for all channels.

6.2.5.8 ChN_DataScale

ChN_DataScale Specifies the data scale minimum and maximum extents for a Line Chart.

This property only pertains to a Line chart.

The extents can be specified as a pair of comma separated numbers (min,max), or a single value.

Allowable values are:

min	Assumed if value < 0, max is then 0.
min,max	Min and max specified.
max	Assumed if value > 0, min is then 0.

6.2.5.9 ChN_DataGrid

ChNDataGrid Specifies the interval of a grid to be displayed along the DataScale.

This property only pertains to a Line chart.

Allowable values are:

0	No grid is displayed.
>0	Display grid in increment of this along the axis.

6.2.5.10 ChN_AutoRange

ChN_AutoRange Species that a channel can auto range or peak detect.

To avoid a false peaks, the number of points that must exceed the min or max data scale can be specified.

The value is a comma-separated pair of numbers representing state and number of consecutive points (**state,npoints**).

state is a numeric flag that turns auto range on or off. Allowable values are:

0	Do not autorange
----------	------------------

!=0 Auto range after n consecutive points fall outside the data scale.

npoints specifies the number of consecutive points that must be outside the data scale, on either extreme, before autoscale takes effect.

6.2.6 Miscellaneous

6.2.6.1 SampleMarkerN

SampleMarkerN Specifies one of four markers that appear as lines parallel to the sample axis on a line chart in the color specified by the **SampleMarkerColor**. (**N** = marker #)

This property only pertains to a Line chart.

Values are specified as a comma separated pair:

0 sample marker is off
state, value state is 1 or 0 for on or off, value is along the sample axis.

6.2.6.2 SampleMarkerColor

SampleMarkerColor Specifies the color of the sample markers.

This property only pertains to a Line chart.

This is in the decimal or hexadecimal format that the **ForeColor** and **BackColor** use.

6.2.6.3 ChN_DataMarkerN

ChN_DataMarkerN Specifies one of four markers PER CHANNEL that appear as lines parallel to the data axis on the chart in the channels color. (**N** = marker #)

Values are specified as a comma separated pair:

0 data marker is off
state, value state is 1 or 0 for on or off, value is along the data axis.

6.2.6.4 Ch_Data_N

Ch_Data_N Specifies data for ALL channels.

Note: This is not to be confused with **ChN_Data**.

Values are specified as a comma separated series of data:

Data_ch1,...,data_chN Data is the actual sequence of data points.

This sequence may be a repeating sequence on data points that are distributed among N channels. For example: Ch_Data_3=1,2,3,4,5,6,7,8,9,10 causes:

1,4,7,10 Sent to channel 1.
2,5,8 Sent to channel 2.
3,6,9 Sent to channel 3.

This can be used to create a 'static' chart where all data is supplied as web page content.

Note: No accounting is made to make sure that the number of data points is integral to the number of channels (**N**) specified.

6.2.6.5 ChN_Clear

ChN_Clear Specifies that channel **N** is to be cleared, that is all data is deleted.

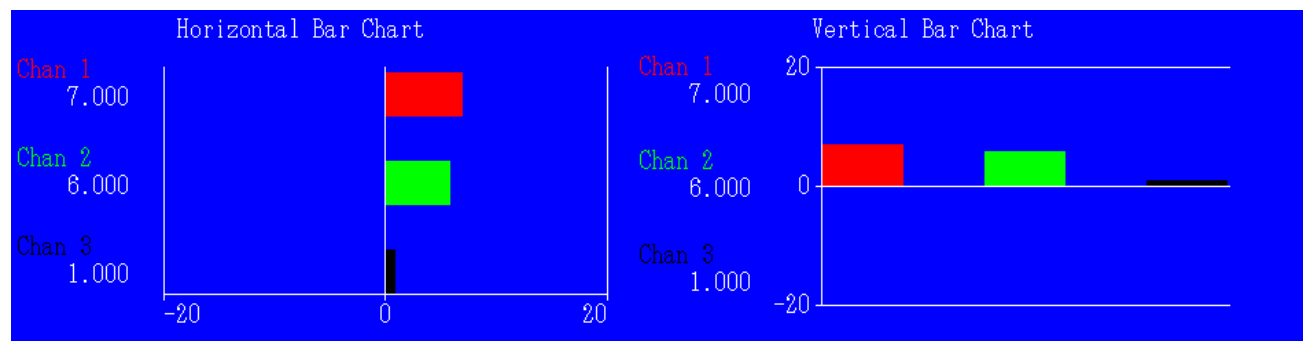
6.2.6.6 ChartClear

ChartClear Specifies that all channels on a chart are to be cleared, that is all data is deleted.

6.3 Chart Control Description

This section describes the charting controls that can be used on iPendant.

6.3.1 Bar Chart Control



Explanation

A Bar Chart control presents data in the familiar format of 2-dimensional bars.

Each bar represents a separate channel with specific characteristics to uniquely identify it.

A legend is supplied to identify the channel by name and optionally show the current value.

The current limitation supports monitoring up to 6 channels simultaneously.

Each bar (channel) is scaled evenly across the sample axis.

DataScaleMarkers can be placed on the chart sample scale. These are independent, 4 for each channel.

Data types that can be monitored are specified by the channel source as native controller data type. These are monitored at set intervals and converted internally from their native data type to floating point.

Property

Property can be divided into the groups shown below.

This first group should be considered static and not changed once the control is created:

id	Specifies an ID string.
height	Specifies the height in pixels or %.
width	Specifies the width in pixels or %.
CtlType	Specifies chart control.
FastLoad	used internally by property editor.
ChartType	Specifies the chart type, Bar or Line
FontSize	Specifies the default font size.
Name	Specifies the name to relate to a KAREL program.
Pipe	Specifies the name of the pipe file.
Orientation	Specifies orientation as horizontal or vertical.
ForeColor	Specifies the default foreground color.

BackColor Specifies the background color.

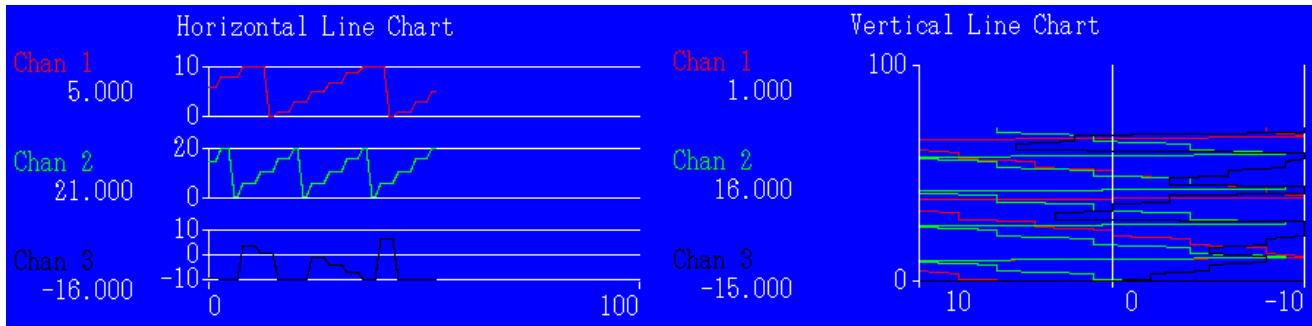
The following may be change dynamically:

Annotate	Specifies the annotation text string to display.
CaptionFontSize	Specifies the font size of the caption text.
LabelFontSize	Specifies the font size of the channel label text.
DataFontSize	Specifies the font size of the channel data value.
AnnotateFontSize	Specifies the font size for the annotate text.
Border	Specifies the border thickness in pixels of the control.
DataScale	Specifies the data scale extents.
GridType	Specifies the grid type, whole lines or ticks.
GridColor	Specifies the default gridline color.
DataGrid	Specifies data scale grid increments.
DataShowValues	Specifies that data value be displayed in the legend.
DataFormat	Specifies the 'C' format for the display of the data values.
DataScaleFormat	Specifies the 'C' format for the DataScale extents and markers.
ChanMonRate	Specifies the default rate for channel monitors in milliseconds.
PipeMonRate	Specifies the pipe file monitor rate in milliseconds.
CmdMonRate	Specifies the CmdStr variable monitor rate in milliseconds. (Currently set the same as PipMonRate).
Verbose	Specifies some verbose text if = 1.
ch_Data_N	Specifies a comma separated data stream, N repeating channels per sample.

The following can occur 1 per channel **N**:

chN_Name	Specifies the text label for the channel legend.
chN_Color	Specifies color of the channel.
chN_Source	Specifies the source to start a monitor on the controller.
chN_Rate	Specifies the monitor rate in milliseconds.
chN_State	Specifies if the channel is active, on or not.
chN_Spread	not implemented.
chN_Data	Specifies a comma separated data stream for the channel.
chN_AutoRange	Specifies that the channel should auto range.
chN_DataMarkerN	Specifies one of 4 markers along the data scale.

6.3.2 Line Chart Control



Explanation

A Line Chart control presents data in the familiar format that is similar to an oscilloscope trace.

A chart can have independent graphs of each channel in a 'stacked' fashion, or can have all channels overlaid on one graph. When the channels are overlaid one channel can be selected to have its DataScale displayed, in this case the data scale is displayed in the color of the active channel. Otherwise, the DataScale is displayed in the Chart control's default ForeColor.

When displayed in stacked mode, the channels are evenly sized and distributed over the display area of the control.

A legend is supplied to identify the channel by name and optionally show the current value.

The current limitation supports monitoring up to 6 channels simultaneously.

All channels share a common sample axis.

DataScaleMarkers can be placed on the chart sample scale. These are independent, 4 for each channel.

Up to 4 Sample Scale markers can be placed on the Chart. These are common to all channels.

Data types that can be monitored are specified by the channel source as native controller data type. These are monitored at set intervals and converted internally from their native data type to floating point.

Property

Property can be divided into the groups shown below.

This first group should be considered static and not changed once the control is created:

id	Specifies an ID string.
height	Specifies the height in pixels or %.
width	Specifies the width in pixels or %.
CtlType	Specifies chart control.
FastLoad	used internally by property editor.
ChartType	Specifies the chart type, Bar or Line
FontSize	Specifies the default font size.
Name	Specifies the name to relate to a KAREL program.

Pipe	Specifies the name of the pipe file.
Orientation	Specifies orientation as horizontal or vertical.
ForeColor	Specifies the default foreground color.
BackColor	Specifies the background color.

The following may be change dynamically:

Annotate	Specifies the annotation text string to display.
CaptionFontSize	Specifies the font size of the caption text.
LabelFontSize	Specifies the font size of the channel label text.
DataFontSize	Specifies the font size of the channel data value.
AnnotateFontSize	Specifies the font size for the annotate text.
Border	Specifies the border thickness in pixels of the control.
LineWeight	Specifies line thickness.
GridType	Specifies the grid type, whole lines or ticks.
GridColor	Specifies the default gridline color.
SampleScale	Specifies the sample scale extents.
SampleGrid	Specifies sample scale grid line increments.
SampleScaleAspect	Specifies a multiplier for the SampleScale.
DataShowValues	Specifies that data value be displayed in the legend.
DataFormat	Specifies the 'C' format for the display of the data values.
SampleScaleFormat	Specifies the 'C' format for the SampleScale extents and markers.
DataScaleFormat	Specifies the 'C' format for the DataScale extents and markers.
LineScaleActive	Specifies if Line chart(s) are overlaid or stacked, and if overlaid which channel is selected as the data scale.
SampleMarkerN	Specifies one of 4 markers along the SampleScale.
SampleMarkerColor	Specifies the default SampleMarker colors.
ChanMonRate	Specifies the default rate for channel monitors in milliseconds.
PipeMonRate	Specifies the pipe file monitor rate in milliseconds.
CmdMonRate	Specifies the CmdStr variable monitor rate in milliseconds. (Currently set the same as PipMonRate).
Verbose	Specifies some verbose text if = 1.
ch_Data_N	Specifies a comma separated data stream, N repeating channels per sample.

The following can occur 1 per channel N:

chN_Name	Specifies the text label for the channel legend.
chN_Color	Specifies color of the channel.
chN_Digital	Specifies the channel is digital if 1.
chN_Source	Specifies the source to start a monitor on the controller.
chN_Rate	Specifies the monitor rate in milliseconds.
chN_DataScale	Specifies the channels data scale extents.
chN_DataGrid	Specifies data scale grid line.
chN_State	Specifies if the channel is active, on or not.
chN_Spread	not implemented.
chN_Data	Specifies a comma separated data stream for the channel.

chN_AutoRange	Specifies that the channel should auto range.
chN_DataMarkerN	Specifies one of 4 markers along the data scale.

6.4 Properties With Additional Optional Values

A few of the properties were extended to add optional values that can be used. This was done for the sake of compactness and backwards portability.

`chN_DataMarkerN="flag,value[,color]"`

color is an optional parameter.

It modifies only this one single marker.

`SampleMarkerN="flag,value[,color]"`

color is an optional parameter.

It modifies only this one single marker.

`ChN_AutoRange="state,npoints[,extendby]"`

extendby is an optional parameter.

Without it, the autorange will extent the maximum or minimum to equal the new value.

With it specified the maximum or minimum is extended by this * the current maximum or minimum.

6.5 Charting Control Design Advice

A completely 'static' chart can be placed on a web page and data completely supplied through it. To do this,

- define the **ChN_Name** and **ChN_Color** for the necessary channels,
- make sure they are active (**ChN_State** = 1)
- if you do not define a source, by **ChN_Source**, for a channel then dynamic updates do not automatically happen,
- use either separate **ChN_Data** properties for each channel, or **Ch_Data_N** for all channels to supply the data.

If a **Name** is designated for a chart, then KAREL variables as described for the **Name** property can be used to deliver dynamic commands to the chart control. For example, a chart with Name = chart1

```
KCL> set def chart1
```

```
KCL> create var command string[127]
```

```
KCL> create var cmdack integer
```

```
Go to the web page that creates chart1
```

```
KCL> set var command = 'ch1_data=1,3,5,7,9,...' Will deliver this data to the chart for channel 1.
```

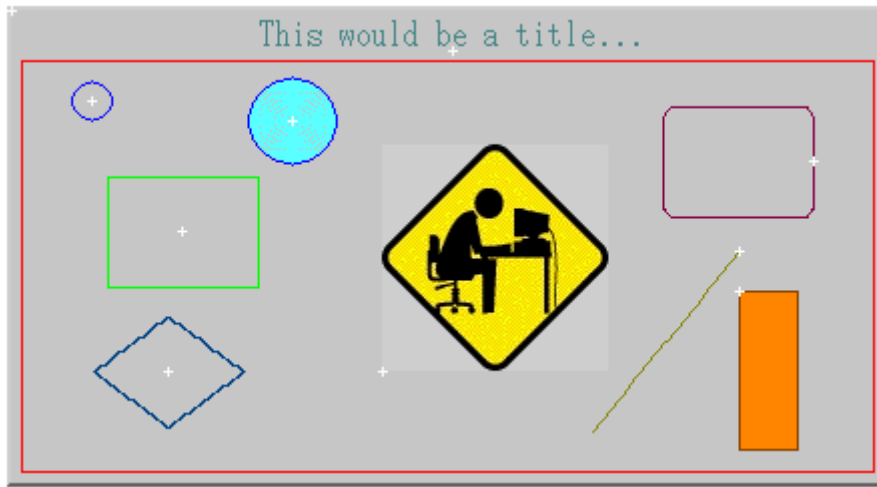
Where formats can be specified please be aware of the possible ranges of these values. For example, the **DataFormat** should account for possible spikes that may appear on a channel.

6.5.1 Error Handling

When an error occurs, either the chart will either not display or will display erroneously.

7 USING THE DRAWING CONTROL

The Drawing control is a means to render line graphics on the iPendant or an externally connected browser such as Internet Explorer. The following example is one with each type of drawing entity rendered.



Properties of the control also determine the scaling, format, colorization and layout of many of the Drawing's characteristics.

Conventions:

The Drawing control is a 'white board' that line art entities are placed on. These entities have characteristics (or properties that are unique to each).

Entities are:

- Text – as in an ASCII string
- Line – a single element drawn from point 1 to point 2
- Path – a sequence of lines
- Circle – a circle empty or filled
- Rectangle – a rectangle empty or filled, square cornered or rounded
- Diamond – a diamond (not filled)
- Image – a picture, source: .jpg, .gif or .png file

Entities have attributes. Some general ones are:

- Name - an ASCII name to identify the entity
- Color - a color
- Fill color – color of the fill
- Height & width, or radius – to determine its size
- Location – to locate its origin (x,y)
- Points – Begin and end locations
- Layer – drawing layer that the entity belongs to.

Each entity belongs to a layer. By default if not specified the entity belongs to layer 0.

- Layer 0 is always (ON) displayed.
- Other layers 1 through 9 can be turned on or off.

The normal coordinate system for the Drawing control on the iPendant (and IE) is:

- Upper left is 0, 0
- Upper right is + max X

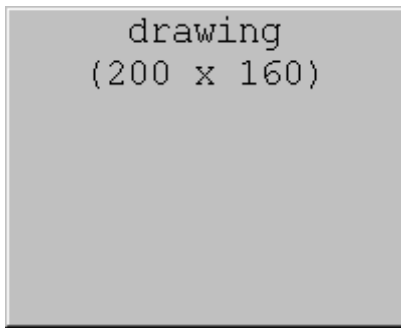
- Lower Left is + max Y

To simplify things an 'InvertY' flag is defined to translate the coordinate system to:

- Upper left is + max Y
- Upper right is + max X
- Lower Left is 0, 0

The easiest way to create drawing on the screen for the iPendant is by putting the Drawing control on the web page and by setting its properties.

Initially when Microsoft FrontPage inserts a drawing control on the web page,, it is displayed with the default light gray background in 200 by 160 pixel size. The two text items in the control reflect the Caption and size (width and height). These are dynamically updated when the size or Caption is changed.

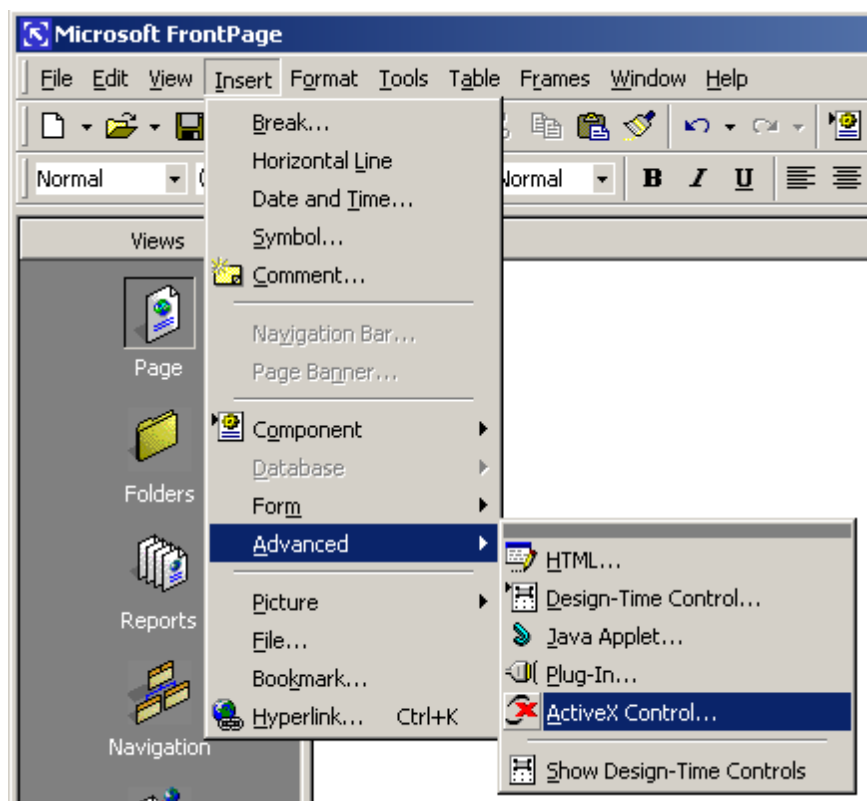


The characteristics controlling items such as orientation, fonts, colors, etc. can be controlled by the user setting the appropriate properties of the Drawing control.

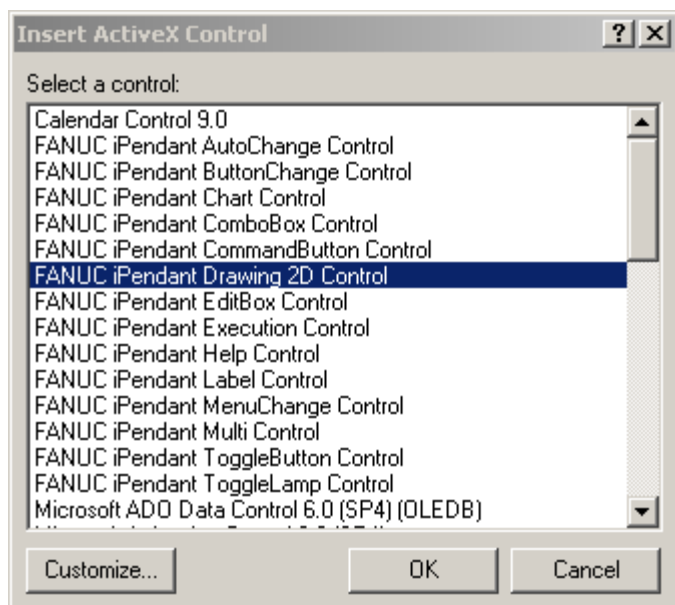
7.1 Control Arrangement

To add a Chart Control to your web in FrontPage, follow these steps:

- 1) Position your cursor where you want the control to appear.
- 2) Select **Insert | Advanced | ActiveX Control** from the menu bar.



- 3) Choose the **FANUC iPendant Drawing 2D Control** from the list of available FANUC iPendant controls, and click OK. The Drawing control is now inserted into your page.



Note: If the **FANUC iPendant Drawing 2D Control** is not an option in the list, use the **Customize...** button to enable it. If the option is not available under the **Customize...** setup, then the proper software for the FANUC controls has not been installed.

- 4) The particular properties can be configured from the ActiveX property pages. Either double click on the control or right click and select **ActiveX Control Properties**.

7.2 Common Drawing Control Properties

A Drawing control has the following properties.

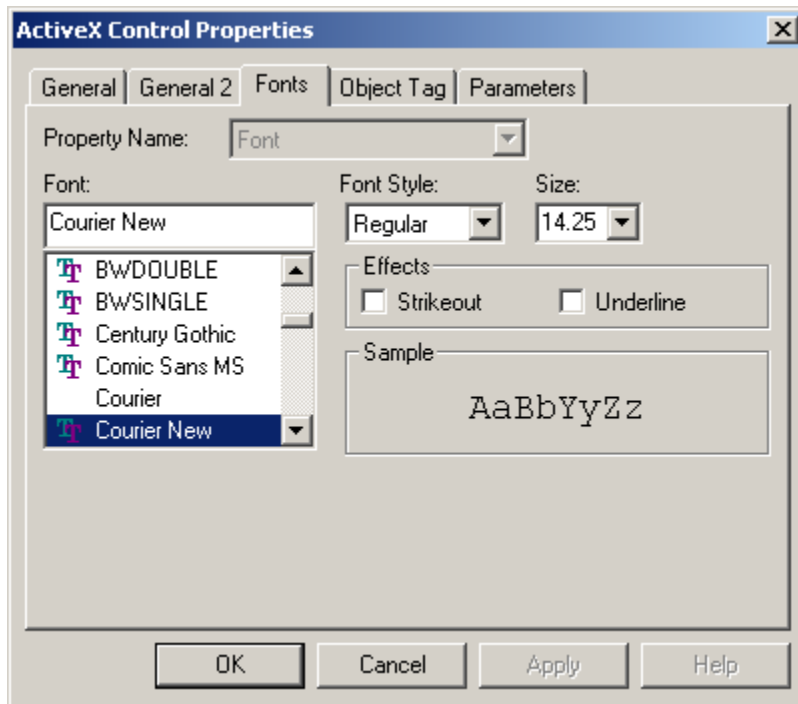
7.2.1 Object Tag

The Object Tag dialog allows you to specify some standard attributes associated with your control. The Name is used when an error occurs. The **width** and **height** can be specified in pixels or percentage (%). Of course, you can resize the control in FrontPage by dragging the control's handles with the mouse.

The remaining properties are grouped by their property page tabs.

7.2.2 Fonts

The font properties associated with the drawing as the “defaults” are modified from the **Fonts** property page. These “default” settings are used by the **Text** string entities when no other font attributes are specified.



- **Font:** specifies the name of the font passed in the **Font** property.

Note: For the iPendant this has no effect.

- **Font Style:** can specify regular, bold, italic and italic bold. This affects whether the properties **FontBold** and **FontItalic** are optionally passed.

Note: For the iPendant only regular and bold have an effect, italic and bold italic are ignored.

- **Size:** specifies the size is the font. It is passed in the **FontSize** property.

The iPendant has built-in fonts for 12, 14, 16, 18 and 24-point fonts. Other fonts are interpolated in size and may render with dithering around the edges. Valid range of font sizes is 8 through 24.

Suggested values are:

12	Specifies 12 point font.
14	Specifies 14 point font.
16	Specifies 16 point font.
18	Specifies 18 point font.

24 Specifies 24 point font.

Note: on the iPendant, 8-point font is about the smallest that is readable.

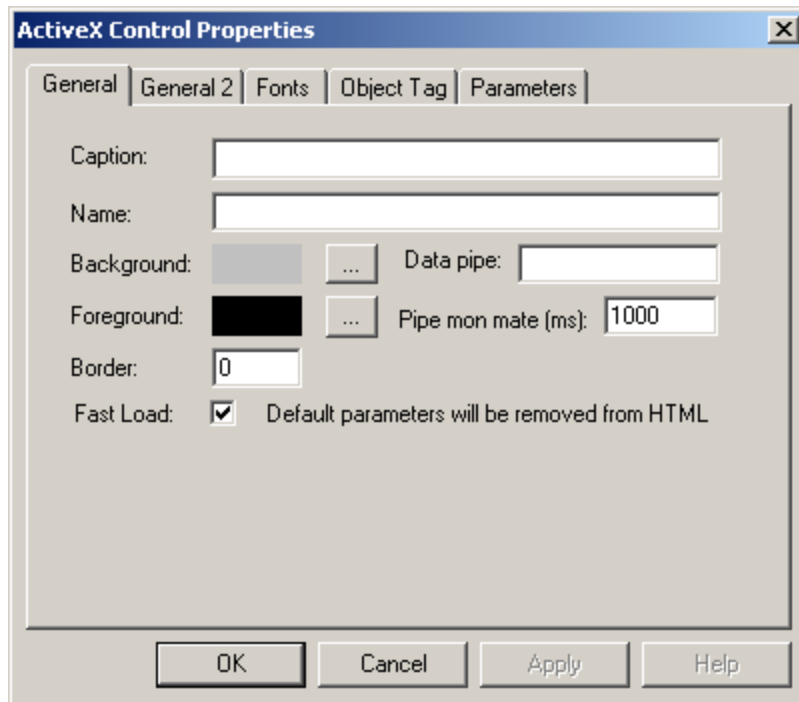
- Strikeout: specifies whether the **FontStrikethrough** property is passed.

Note: For the iPendant this has no effect.

- Underline: specifies whether the **FontUnderline** property is passed.

Note: For the iPendant this has no effect.

7.2.3 General tab



7.2.3.1 Caption

Caption Is a text string that is passed as a property but not used. It is there as an aid to the developer since it is displayed on the FrontPage design and preview views.

7.2.3.2 Name

Name Is a text string that specifies an association to a KAREL program on the controller.

Currently, when the Drawing control is instantiated, the control checks for the existence of two program variables on the controller. These variable can be used to pass text commands in the format and with the content of other properties to dynamically affect the Drawing control's operation.

[name] cmdstr If the variable exists and is of type STRING the control creates a monitor for this variable. Strings of commands can be written (set) to this variable and are delivered to the Drawing control to affect 'dynamic' actions such as data updates or changes in some chart properties.

[name]cmdack If the variable exists and is of type BOOLEAN or INTEGER, the Drawing control uses this variable to acknowledge that commands have been accepted via the **command** variable and acted on. The **cmdack** variable is set TRUE or 1 when that command is accepted by the plug-in.

Note: The **Name** parameter can utilize **!PanelID**.

7.2.3.3 Foreground & Background Colors

The Colors dialog allows you to specify the color of certain elements. The iPendant supports 256 colors. Colors associated with the Drawing control are:

ForeColor Specify the “default” color of any entity that does not have an explicit color defined.

BackColor Specify the background color.

Note: Colors are specified as a decimal value represent bbgrr (blue green red) format, where as hexadecimal value preceded by the # sign are in rrgbb (red green blue) format.

For example; ForeColor = 10531008 (decimal) is the same as ForeColor = #C0B0A0 (hex).

7.2.3.4 Pipe

Pipe Is a text string that specifies a named data file created on the controller and only associated with the PIP: device.

This file is used to dynamically deliver data to the drawing control on the iPendant. The name can be any 8.3-formatted name, for example: drawing1.dat.

The name of this file is sent to the controller when the drawing control is instantiated on the iPendant. The file name is concatenated to PIP: and the file opened. If the file does not exist then the file is created and opened for read. If the file does exist prior to this, the file is opened for read access and a seek to the end of file done to eliminate the possibility of stale data.

When the last drawing control using this file is gone, the file is deleted.

Note: The **Pipe** parameter can utilize **!PanelID**.

7.2.3.5 PipeMonRate

PipeMonRate Specifies the time in milliseconds at which the Pipe file data is sampled.

Note: This value should be specified at a rate that give reasonable performance and display update. The controller will enforce a minimum of 100ms.

7.2.3.6 Border

Border Selects the size of the border surrounding the Drawing control.

Allowable values are:

>0 A 3 dimensional raised border, that number of pixels thick.

=0 No border line.

<0 A 3 dimensional depressed border, that number of pixels thick.

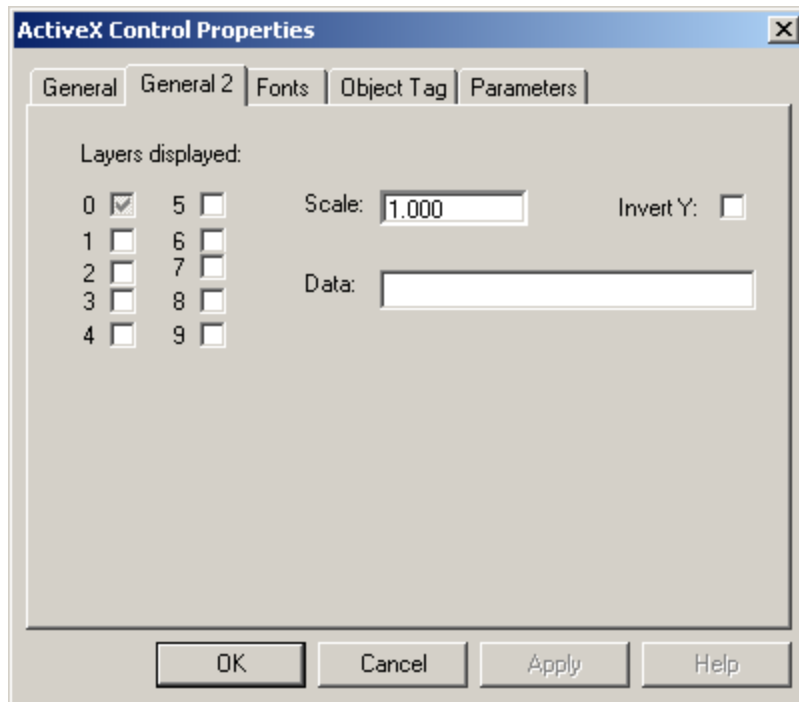
7.2.3.7 FastLoad

FastLoad is selected by the checkbox.

Checked Specifies that properties that are set to their corresponding “default” values are not included in the web page. This effectively saves load time.

Unchecked Specifies that all parameters are included in the web page, whether they have “default” values or not.

7.2.4 General 2 tab



7.2.4.1 Layer control

A Drawing has 10 layers.

Layer 0 is always displayed. By default if an entity does not have a layer attribute, it belongs to layer 0 and is always displayed.

Other layers 1 through 9 can be turned on or off by the check boxes. These check boxes control the value of two parameters **LayerOn** and **LayerOff**.

Both parameters can be a comma separated lists of layers to turn on or off.

LayerOn Specifies a comma separated list of layers to turn on.

LayerOff Specifies a comma separated list of layers to turn off.

Examples are:

LayerOn="n"	Turns on layer n
LayerOff="n,m,o"	Turns off layers n,m and o.

7.2.4.2 Scale

Scale specifies a multiplier applied to both the X and Y scaling.

Note: This is used as a simple multiplier and can result in display peculiarities for each display entity. The default for this setting should be left at 1.0.

7.2.4.3 InvertY

InvertY Specifies than the Y scale is inverted.

Normally the Y scale begins at the top and increases + to the bottom.

When inverted the Y scale begins at the bottom and increases + to the top.

Allowable values are:

0	Y Not inverted. Y scale begins at the top and increases + to the bottom.
1	Y inverted. Y scale begins at the bottom and increases + to the top.

7.2.4.4 Data

Data Specifies a raw data string that the user can type in.

This is supplied to the Drawing control via the Data parameter.

Since the value is a string and should not contain double quotes, a single quote should be used in place of double quotes. During processing all single quotes in the data value will be converted to double quotes.

Note: this implies that single quotes cannot be handled or escaped. They should not be used.

7.2.5 The Entities

7.2.5.1 Text

Text Specifies a text entity on the drawing.

Attributes as follows:

text[=id]	Text entity with optional id
layer=n	Optionally specifies the layer it belongs to. Default is layer 0
font=f	Specifies font size, +/- can be used to increment or decrement from the default font size
locate=x,y	Specifies x, y origin relative to the white board
color=cvalue	Specifies color as hex or decimal value
bold=b	Specifies bold (1=bold, 0=nobold)
italic=i	Specifies italics (1=italic, 0=no italic)

7.2.5.2 Line

Line Specifies a line entity on the drawing.

Attributes as follows:

line [=id]	Line entity with optional id
layer =n	Optionally specifies the layer it belongs to. Default is layer 0
points =x1,y1,x2,y2	Specifies the beginning point x1,y1 and ending point x2,y2
color =cvalue	Specifies color as hex or decimal value

7.2.5.3 Path

Path Specifies a path entity on the drawing. The path entity is a sequence of contiguous lines along a sequence of points.

Attributes as follows:

path [=id]	Path entity with optional id
layer =n	Optionally specifies the layer it belongs to. Default is layer 0
points =x1,y1,x2,y2,...,xn,yn	Specifies the beginning point that a sequence of lines are drawn along
color =cvalue	Specifies color as hex or decimal value

7.2.5.4 Circ

Circ Specifies a circle entity on the drawing.

Attributes as follows:

circ [=id]	Circle entity with optional id
layer =n	Optionally specifies the layer it belongs to. Default is layer 0
locate =x,y	Specifies x, y origin relative to the white board
color =cvalue	Specifies color as hex or decimal value
radius =r	Specifies the circles radius r in pixels.
weight =w	Specifies a thickness w in pixels
fill =fcolor	Optional fill color in hex or decimal
halign =align	Horizontal alignment (left, center, right), Default = left
valign =align	Vertical alignment (top, middle, bottom), Default = bottom

7.2.5.5 Rect

Rect Specifies a rectangle entity on the drawing.

Attributes as follows:

rect [=id]	Rectangle entity with optional id
layer =n	Optionally specifies the layer it belongs to. Default is layer 0
locate =x,y	Specifies x, y origin relative to the white board
color =cvalue	Specifies color as hex or decimal value
height =h	Specifies height as h pixels
width =w	Specifies width as w pixels
fill =color	Optional fill color in hex or decimal
halign =align	Horizontal alignment (left, center, right), Default = left
valign =align	Vertical alignment (top, middle, bottom), Default = bottom
radius =r	Specifies the radius r in pixels of the corners.

7.2.5.6 Diam

Diam Specifies a diamond entity on the drawing.

Attributes as follows:

diam[=id]	Diamond entity with optional id
layer=n	Optionally specifies the layer it belongs to. Default is layer 0
locate=x,y	Specifies x, y origin relative to the white board
color=cvalue	Specifies color as hex or decimal value
height=h	Specifies height as h pixels
width=w	Specifies width as w pixels
halign=align	Horizontal alignment (left, center, right), Default = left
valign=align	Vertical alignment (top, middle, bottom), Default = bottom

7.2.5.7 Imag

Imag Specifies an image entity on the drawing.

Attributes as follows:

imag[=id]	Image entity with optional id
layer=n	Optionally specifies the layer it belongs to. Default is layer 0
locate=x,y	Specifies x, y origin relative to the white board
height=h	Specifies height as h pixels, default is file image height
width=w	Specifies width as w pixels, default is file image height
halign=align	Horizontal alignment (left, center, right), Default = left
valign=align	Vertical alignment (top, middle, bottom), Default = bottom
imagename=path	Specifies the source file name and path of the image

7.2.6 Miscellaneous Properties

The following properties are available but have limited use unless used for dynamic drawing.

If a **Name** is designated for a chart, then KAREL variables as described for the **Name** property can be used to deliver dynamic commands to the drawing control. For example, a drawing with Name = drawing1

```
KCL> set def drawing1
KCL> create var command string[127]
KCL> create var cmdack integer
Go to the web page that creates drawing1
KCL> set var command = '....' Will deliver this data to the drawing.
```

7.2.6.1 Clear

Clear Specifies that the entire drawing be cleared, leaving only the blank white board displayed.

7.2.6.2 Delete

Delete=id Specifies that an entity previously created with id be deleted. It is permanently removed from the drawing.

7.2.6.3 LayerOn

LayerOn Specifies a single layer or comma-separated list of layers that are turned ON. All entities that belong to these layers are then displayed.

7.2.6.4 LayerOff

LayerOff Specifies a single layer or comma-separated list of layers that are turned OFF. All entities that belong to these layers are not displayed. These entities are not deleted they are simply not displayed.

7.2.7 Dynamic Entity modifications

Using the ID to specify an already existing entity, you can modify any of the entities properties without deleting and redrawing it.

For example, assume the following entities are drawn:

**text=t1 layer=1 string='This is the title' font=12 color=8421440 locate=220,20 valign=bottom
halign=center**

path=pth1 color=255 points=5,25;430,25;430,230;5,230;5,25 layer=3

circ=c1 layer=4 color=16711680 locate=40,45 radius=10

Later, by using the ID, properties of those entities can be modified without deleting and redrawing the whole entity:

text=txt1 color=#0000ff

Changes the text txt1 to red

circ=c1 locate=10,10

Makes circle c1's origin 10, 10

path=pth1 points=10,10,20,20
for path pth1.

Adds two more points to whatever points exist

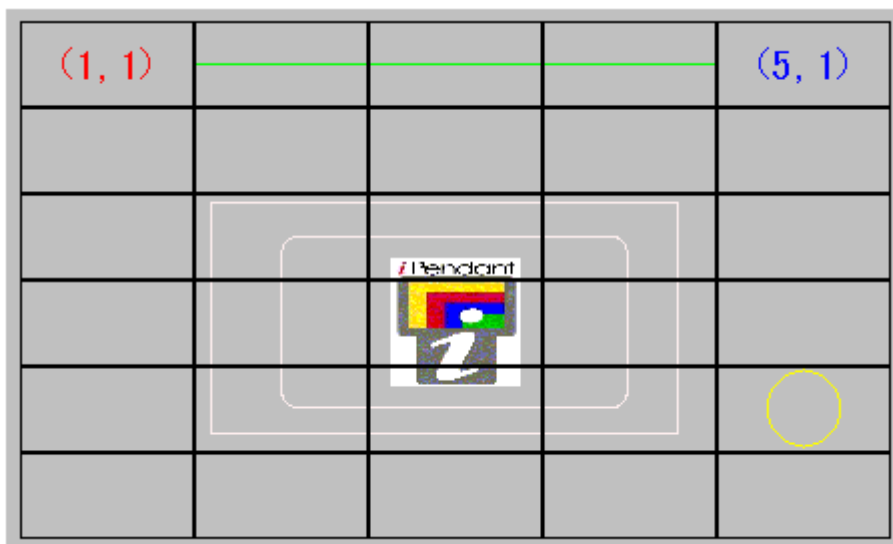
8 USING THE GRID CONTROL

The GRID control is a means to display SHAPE graphics (text, lines, rectangles, circles, images, etc) on a web page aligned in a manner controlled by XML.

The GRID control divides the display real estate into a 2 dimensional array of evenly spaced tiles. SHAPES can then be aligned to the individual tiles for display. The SHAPES are generally located and sized relative to the TILES making it easy to resize the entire display.

The GRID control also makes use of inheritance. The control itself has basic characteristics such as color and font information. The GRID is a child of the control, so characteristics not explicitly declared is inherited from the control. This filters down to the TILE belonging to the GRID and SHAPES belonging to a TILE.

A simple display using the GRID control is the following:



Note: Here tile outlines have been turned on to show where the tiles are located. Normally the outlines would not be turned on.

In this example a grid 5 tiles wide by 6 tiles high is displayed.

- Tile 1,1 (upper left) contains the red text “(1,1)” centered in it.
- Tile 1,1 also has a line from tile 1,1, beginning at 100% of the width and 50% of the height. The length of the line is 300% of the origin tile’s width at 1,1.
- Tile 5,1 (upper right) has the blue text “(5,1)”.
- Tile 3,3 contains a .gif image center in it, height is 150% and width is 75%.
- Tile 3,3 also contains 2 white rectangles. The inner one has rounded corners.
- Tile 5,4 contains a yellow circle. Its diameter is specified as 50% of the width of the tile.

The GRID control itself is specified by the user in html syntax within a .stm file, see Section [8.1](#) Inserting a GRID control on a web page .

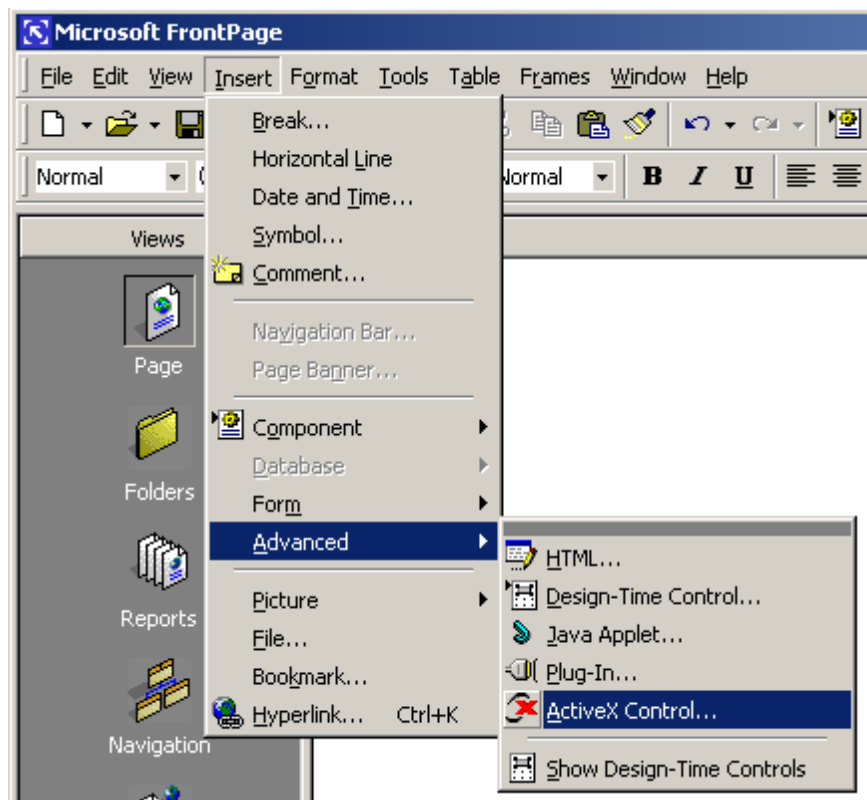
The content of the GRID, TILES and SHAPES are specified in XML (Extensible Markup Language) and is furnished to the Grid control in one of 3 ways:

- most often through a pipe file (This is specified in the control’s “pipe” property),
- through the KAREL variables specified by the “name” property or,
- through the “data” property of the web page itself.

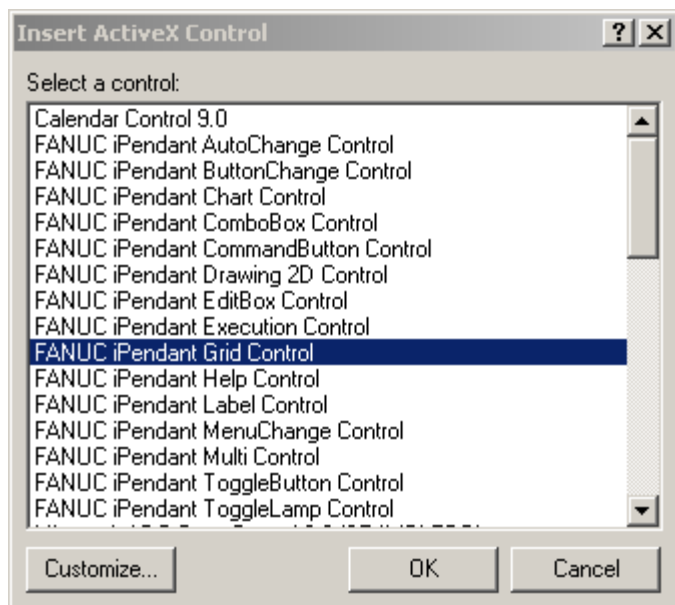
8.1 Inserting a GRID control on a web page

To add a Grid Control to your web in FrontPage, follow these steps:

- 1) Position your cursor where you want the control to appear.
- 2) Select **Insert | Advanced | ActiveX Control** from the menu bar.

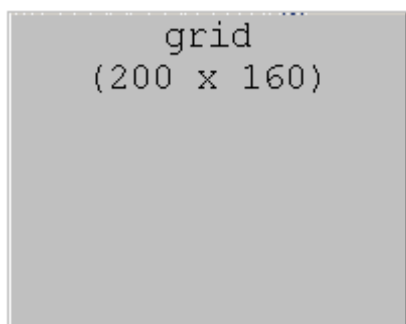


- 3) Choose the **FANUC iPendant Grid Control** from the list of available FANUC iPendant controls, and click OK. The Grid control is now inserted into your page.



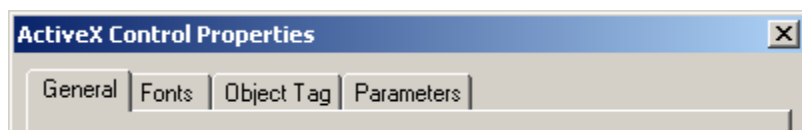
Note: If the **FANUC iPendant GRID Control** is not an option in the list, use the **Customize...** button to enable it. (see [Section 3.3.2 Installation Procedure](#)) If the option is not available under the **Customize...** setup, then the proper software for the FANUC controls has not been installed.

4) Once the control is inserted into your web page you will see a blank control, with the size in pixels as:



Note: You can grab the edges of the Grid control and stretch it to resize.

5) The particular properties can be configured from the ActiveX property pages. Either double click on the control or right click and select **ActiveX Control Properties**.



8.2 Common GRID Control Properties

A Grid control has the following properties.

From here on we'll use the term of attributes, since these can be more closely equated to XML content.

8.2.1 Object Tag

The Object Tag dialog allows you to specify some standard attributes associated with your control.

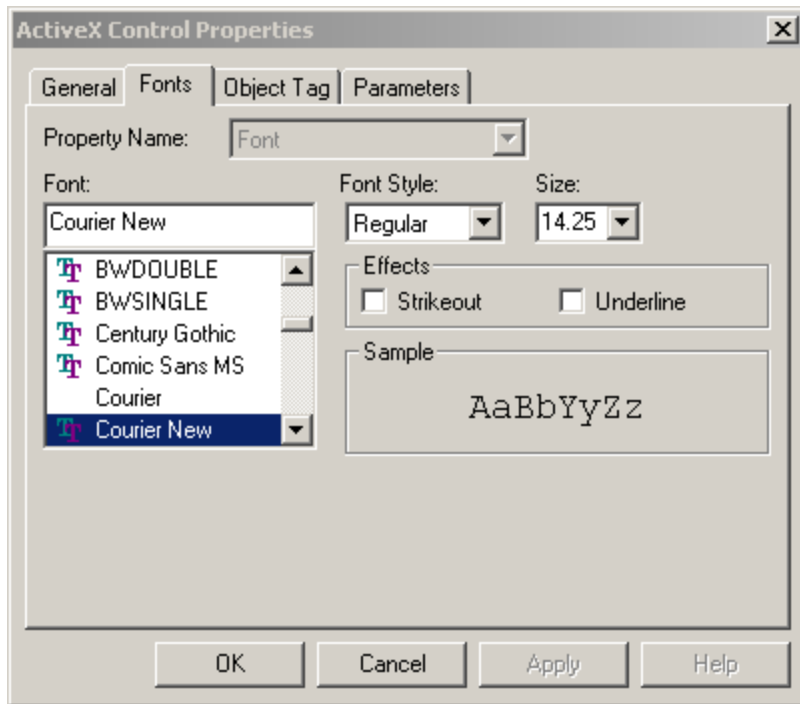
Name is used when an error occurs.

Width and **Height** can be specified in pixels or percentage (%). Of course, you can resize the control in FrontPage by dragging the control's handles with the mouse.

The remaining properties are grouped by their property page tabs.

8.2.2 Fonts

The font properties associated with the GRID as the "defaults" are modified from the **Fonts** property page. These "default" settings are used by the **Text** string entities when no other font attributes are specified.



- **Font:** specifies the name of the font passed in the **Font** property.

Note: For the iPendant this has no effect.

- **Font Style:** can specify regular, bold, italic and italic bold. This affects whether the properties **FontBold** and **FontItalic** are optionally passed.

Note: For the iPendant only regular and bold have an effect, italic and bold italic are ignored.

- **Size:** specifies the size is the font. It is passed in the **FontSize** property.

The iPendant has built-in fonts for 12, 14, 16, 18 and 24-point fonts. Other fonts are interpolated in size and may render with dithering around the edges. Valid range of font sizes is 8 through 24.

Suggested values are:

12	Specifies 12 point font.
14	Specifies 14 point font.
16	Specifies 16 point font.
18	Specifies 18 point font.
24	Specifies 24 point font.

Note: on the iPendant, 8-point font is about the smallest that is readable.

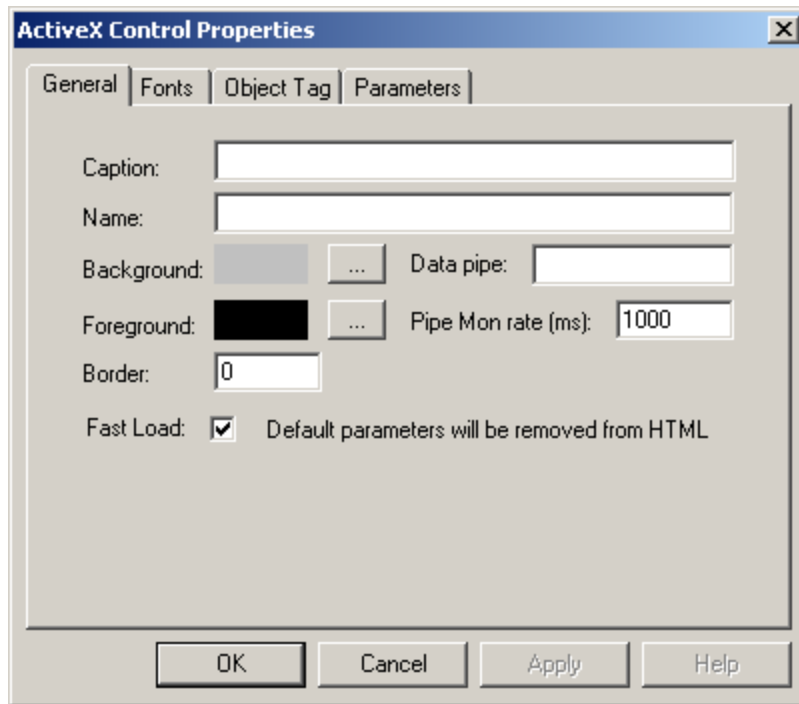
- **Strikeout:** specifies whether the **FontStrikethrough** property is passed.

Note: For the iPendant this has no effect.

- **Underline:** specifies whether the **FontUnderline** property is passed.

Note: For the iPendant this has no effect.

8.2.3 General tab



8.2.3.1 Caption

Caption Is a text string that is passed as a property but not used. It is there as an aid to the developer since it is displayed on the FrontPage design and preview views.

8.2.3.2 Name

Name Is a text string that specifies an association to a KAREL program on the controller.

Currently, when the Grid control is instantiated, the control checks for the existence of two program variables on the controller. These variables can be used to pass text commands in the format and with the content of other properties to dynamically affect the Grid control's operation.

[name]cmdstr If the variable exists and is of type STRING the control creates a monitor for this variable. Strings of commands can be written (set) to this variable and are delivered to the Grid control to affect 'dynamic' actions such as data updates or changes in some chart properties.

[name]cmdack If the variable exists and is of type BOOLEAN or INTEGER, the Grid control uses this variable to acknowledge that commands have been accepted via the **command** variable and acted on. The **cmdack** variable is set TRUE or 1 when that command is accepted by the plug-in.

Note: The **Name** parameter can utilize **!PanelID**. This is recommended for proper functioning in a multi-pane environment.

8.2.3.3 Foreground & Background Colors

The Colors dialog allows you to specify the color of certain elements. The iPendant supports 256 colors. Colors associated with the Grid control are:

ForeColor	Specify the "default" color of any entity that does not have an explicit color defined.
------------------	---

BackColor Specify the background color.

Note: Colors are specified as a decimal value represent bbgrr (blue, green, red) format, where if they are set as hexadecimal value preceded by the # sign, they are in rrggbb (red, green, blue) format.

For example; ForeColor = 10531008 (decimal) is the same as ForeColor = #C0B0A0 (hex).

8.2.3.4 Pipe

Pipe Is a text string that specifies a named data file created on the controller and only associated with the PIP: device.

This file is used to dynamically deliver data to the Grid control on the iPendant. The name can be any 8.3-formatted name, for example: xgrid.dat.

The name of this file is sent to the controller when the Grid control is instantiated on the iPendant. The file name is concatenated to PIP: and the file opened. If the file does not exist then the file is created and opened for read. If the file does exist prior to this, the file is opened for read access and a seek to the end of file done to eliminate the possibility of stale data.

When the last Grid control using this file is gone, the file is deleted.

Note: The **Pipe** parameter can utilize **!PanelID**. Which is recommended for proper functioning in a multi-pane environment? So specifying xgrid!PanelID.dat will allow a unique pipe file to exist on a per pane basis.

8.2.3.5 Pipe Mon Rate

PipeMonRate Is an integer value (>0) that specified the number if millisecond rate at which the controller checks for data in the pipe file.

The controller will enforce a maximum rate (most likely 100ms) as the lower end of the range.

Note: when multiple controls specify the same pipe file the fastest monitoring rate will take effect for all the controls monitoring this file.

8.2.3.6 Border

Border Selects the size of the border surrounding the Grid control.

Allowable values are:

>0	A 3 dimensional raised border, that number of pixels thick.
=0	No border line.
<0	A 3 dimensional depressed border, that number of pixels thick.

8.2.3.7 FastLoad

FastLoad is selected by the checkbox.

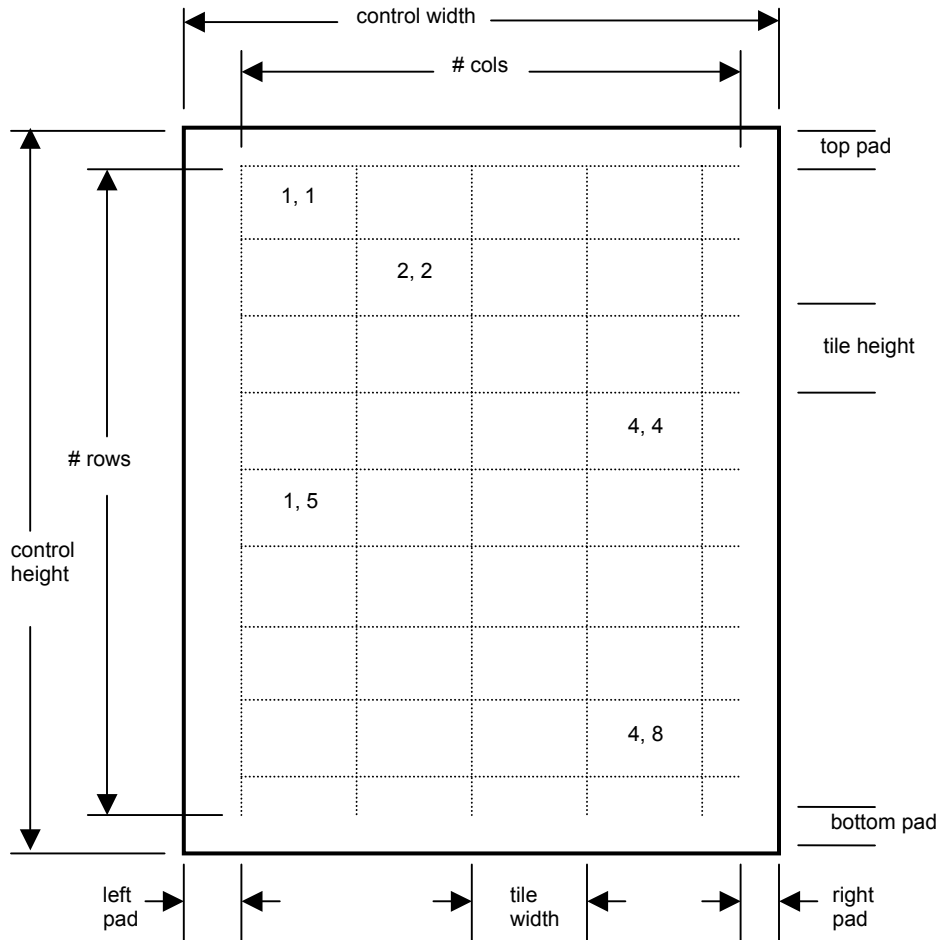
Checked	Specifies that properties that are set to their corresponding “default” values are not included in the web page. This effectively saves load time.
Unchecked	Specifies that all parameters are included in the web page, whether they have “default” values or not.

8.3 Display Concepts

The GRID control is simply a container within a web page to display graphics. It is placed on a web page specified in a .stm file. The .stm file is required so that the OBJECT syntax is properly translated to the EMBEDDED syntax when used with the iPendant.

8.3.1 Conventions

The grid is laid out and referenced as follows:



The user can specify separate and/or optional padding each of the 4 sides independently. This padding is specified in # of pixels.

The GRID is then broken up into TILES, with attributes of:

- # columns wide in the horizontal direction. The origin TILE (1) being at the left,
- # rows high in the vertical direction. The origin TILE (1) being at the top,
- default foreground and or background color, otherwise the colors are inherited from those specified in the Grid Control,
- padding in # of pixels,
- touchable flag,
- version.

Each TILE has attribute(s):

- an assigned id string,
- row location within the grid,
- column location within the grid,

- default foreground and or background color, otherwise the colors are inherited from those specified in the GRID,
- each tile can contain SHAPES: images, text, lines, circles, rectangles, etc.
- each TILE can specify the layer that is currently displayed,.

Each SHAPE within a tile has attributes of:

- an assigned id string,
- location, relative to the tile. Negative offsets are allowed! Location is a % of the TILE dimension,
- size, IMAGES can be sized by width and height, if not specified the corresponding height and width are defaulted to the tile height or width,
- color, which if not specified is inherited from the TILE,
- and optionally, the SHAPE can belong to a TILE's layer 0 through 9. Layer 0 is the default and is always displayed.

Note: .png files should not be used for images due to deficiencies in the IE ActiveX components.

8.3.2 Alignment

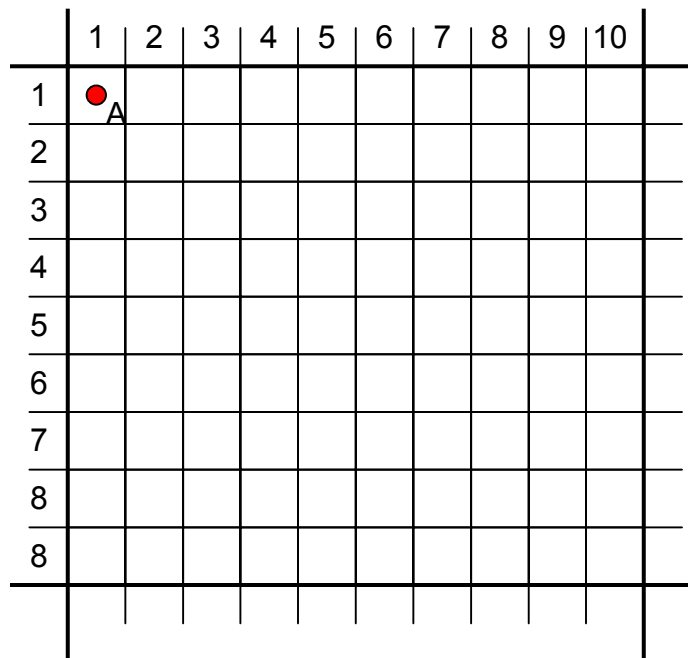
SHAPES associated with a TILE are aligned relative to that TILE. The pixels are referenced relative to the tile and the origin (1,1) within the tile is selected as:

- X: 1 at top left going positive to the right
- Y: 1 at the top left going positive down.

For instance consider the following example tile that is 10 pixels wide by 9 pixels high.

Alignment presents issues depending on the size of the tile in pixels, especially if the height and width is an even number of pixels.

So the pixel at (A) in the TILE is the origin.



8.3.3 Display, pan and zoom

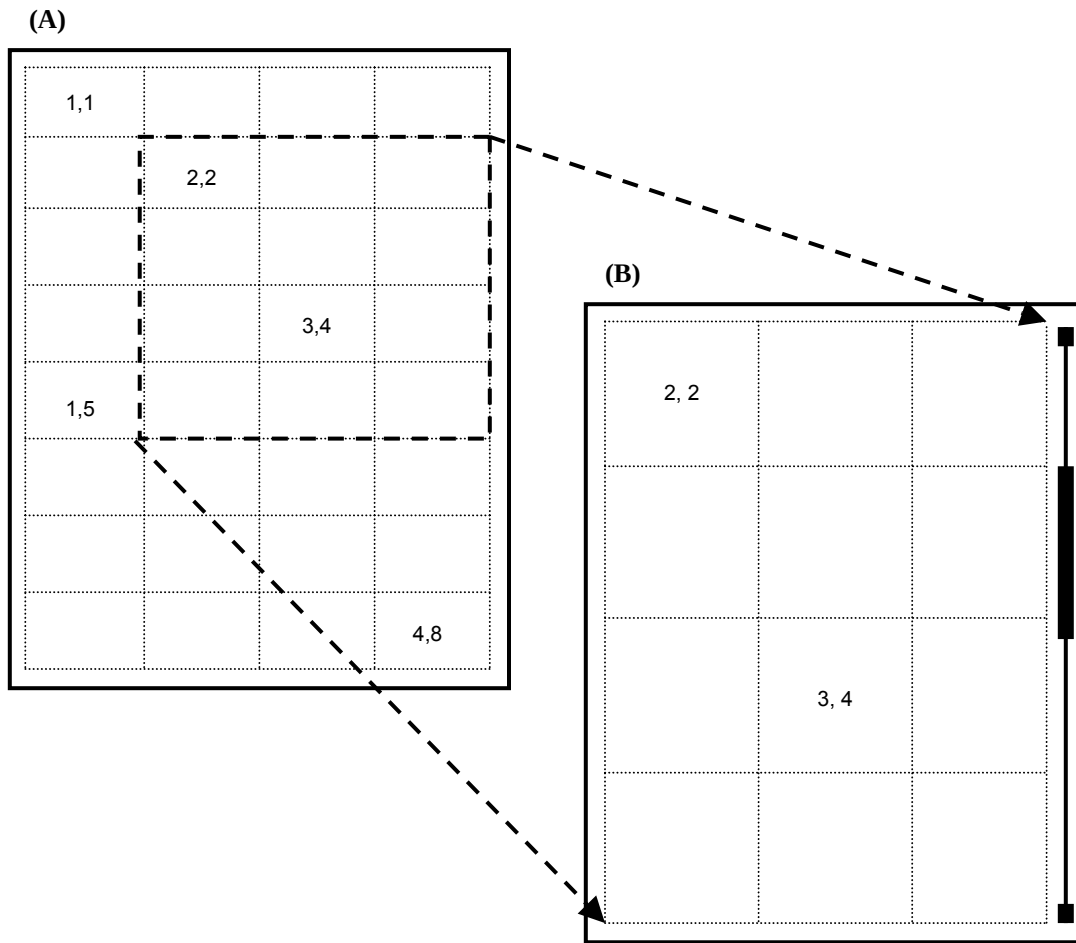
Since the SHAPES belong to TILES, and TILES belong to the GRID, the simple matter of moving around in the display is accomplished by specifying an origin TILE and dimensions to display.

Consider the following; a grid is initially created as 4 tiles wide by 8 tiles high is in example **(A)**.

The XML string:

```
<DISPLAY pos="2,2" dims="3,4"/>
```

will cause the a subset of the GRDI to be display as in example **(B)**.



The GRID may be displayed in its entirety as in **(A)**. Here the whole GRID occupies most of the display real estate.

But as the GRID tile count is increased, TILES become smaller; the items in these TILES shrink. At some point there is too much information and the TILES become too small to provide recognizable information. So we need to display a part of the grid.

In **(B)** a part of the grid is selected for display. What parts and how much is determined by the management software as part of the application on the robot controller.

Note: Example **(B)** also has a scroll bar indicator to aid the user in navigating.

8.3.4 Dynamic display

The GRID control can be dynamically updated. Either through the PIPE file mechanism or KAREL strings. Refer to section [8.4.17 Dynamic data](#)

There are many methods:

- TILES contain layers 0 through 10.
 - Layer 0 is always displayed.
 - Layers 1 through 10 can be turned on or off buy the user using the MODTILE tag.
 - A SHAPE can be in any layer0 through 10
- TILES may be deleted
 - All SHAPEs belonging to the TILE are automatically deleted.
- TILES may be modified

- Changing parameters such as color and font characteristics
- SHAPES may be modified
 - Changing all parameters associated with the SHAPE

8.3.5 Rendering

As previously described the GRID contains TILES and each TILE contains SHAPES.

The actual rendering is not handled simply as a multi-dimensional array. There is a specific order to rendering, but it can be used to the programmer's advantage!

When a TILE is created, it is put into the tail of a linear list. TILES are processed in order in this list from beginning to end. So it is important when architecting the display to consider the order in which TILES are placed in the XML.

Next, a TILE itself can be thought of as a linear list of SHAPES. As each SHAPE is specified (created) on the TILE it is placed at the end of this list.

When the rendering for the tile is done, the linear list of SHAPES is processed. The SHAPES are individually handled in the following order:

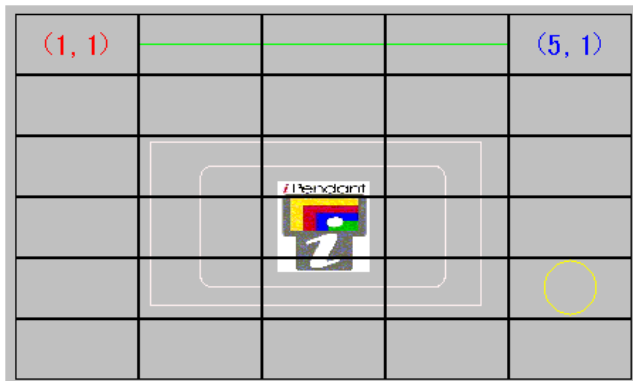
1. VT320
2. Button
3. Image
4. Circle
5. Rectangle
6. Text
7. Line

8.4 XML to the GRID

XML is standard Extensible Markup Language.

The Grid control understands a fairly strict XML syntax, a set of tags and attributes, as detailed in the following sections. Although the Grid control ignores unknown attributes, the user should be cautioned that, unknown attributes cause errors to be reported and can introduce delays in rendering or other iPendant problems.

As an example, the display produced in section [8_Using the GRID Control](#).



Is produced by the following XML:

(a)	<?xml version="1.0"?>
(b)	<GRID>
(c)	<TILE pos="1,1">
(d)	<TEXT font="+2" clr="#ff0000">(1,1)</TEXT>
(e)	<LINE clr="#00ff00" loc="100,50" eloc="400,50"/>
(f)	</TILE>
(g)	<TILE pos="5,1">
(h)	<TEXT clr="#0000ff" font="+2">(5,1)</TEXT>
(i)	</TILE>
(j)	<TILE pos="3,4">
(k)	<IMAGE size="75,150">ipend.gif</IMAGE>
(l)	</TILE>
(m)	<TILE pos="2,3">
(n)	<RECTANGLE clr="#fff0f0" align="top,left" size="200,200" radius="6"/>
(o)	< RECTANGLE clr="#fff0f0" align="top,left" loc="10,10" size="270,270"/>
(p)	</TILE>
(q)	<TILE pos="5,5">
(r)	<CIRCLE clr="#ffff00" diameter="90"/>
(s)	</TILE>
(t)	<DISPLAY Pos="1,1" DiMS="5,6" verbose="98" pad="6"/>

- (a) Is XML header information. This is not required for by GRID but is included for completeness.
- (b) Is the opening XML tag for the GRID.
- (c) Is the opening TILE tag for the TILE located at 1,1
- (d) Is TEXT "(1,1)" with font +2 more than the Grid control defaults, and in red
- (e) Is a LINE in green from the right side of the TILE (loc="100,50") for 400%.
- (f) Is the end tag for the TILE at 1,1
- (g) Is the opening XML tag for the TILE at 5,1
- (h) Is TEXT "(5,1)" with font +2 more than the Grid control defaults, and in blue
- (i) Is the end tag for the TILE at 5,1
- (j) Is the opening XML tag for the TILE at 3,4
- (k) Specifies and IMAGE ipend.gif, with a size of 75% the width of the TILE and 150% of the height
- (l) Is the end tag for the TILE at 3,4
- (m) Is the opening XML tag for the TILE at 2,3
- (n) Specifies a rounded RECTANGLE (corner radius="6"), aligned top and left, 200% of the TILE'S height and width
- (o) Specifies a RECTANGLE, aligned top and left, 270% of the TILE'S height and width
- (p) Is the end tag for the TILE at 2,3
- (q) Is the opening XML tag for the TILE at 5,5
- (r) Specifies a CIRCLE, in yellow, 90% of the TILE'S height
- (s) Is the end tag for the TILE at 5,5
- (t) Is the DISPLAY tag that causes the actual rendering of the TILES. This specifies that the TILE on pos="1,1" is the origin (upper left hand corner) and the display is 5 tile wide by 6 tiles high. Padding around the borders is 6 pixels. Note: verbose is the flag that turns on the TILE outlining.

The typical hierarchy of XML syntax, which the Grid control expects, is:

```
<?xml version="1.0"?>
<GRID>
  <TILE ...>
    <TEXT ...>string</TEXT>
    <LINE .../>
    <RECTANGLE .../>
    <CIRCLE .../>
    <IMAGE...>file</IMAGE>
    <BUTTON ... />
    <VT320 ... />
  </TILE>
  <DISPLAY .../>
  <DELTILE .../>
  <MODTILE/>
  <MODTEXT>string</MODTEXT>
  <MODLINE .../>
  <MODRECTANGLE .../>
  <MODCIRCLE .../>
  <MODIMAGE...>file</IMAGE>
  <MODBUTTON ... />
  <MODVT320 ... />
  <SETFOCUS ... />
</GRID>
```

8.4.1 XML tag

The following standard xml tag should be sent first:

```
<?xml version="1.0"?>
```

8.4.2 GRID tag

The GRID tag in the XML file data encapsulates a GRID and all of its sub-members. A GRID is composed of TILES and is X columns by Y rows. It has optional characteristics of color and padding to the display edges.

Prototype grid tag is:

```
<GRID id="userid" bclr="backcolor" fclr="forecolor" font="size"
pad="#pixels" padl="#pixels" padt="#pixels" padr="#pixels" padb="#pixels"
padv="#pixels" padh="#pixels" versn="n" verbose="#">
. . . . .
</GRID>
```

Optional parameters:

id="userid"	Specifies an optional user supplied ASCII identifier.
bclr="backcolor"	Specifies the background color. Supersedes the controls background color. If not specified then the control's background color is inherited.
fclr="forecolor"	Specifies the background color. Supersedes the controls foreground color. If not specified then the control's foreground color is inherited.
font="size"	Specifies the font size. If not present then the control's font size is inherited.

pad="#pixels"	Specifies general padding, for all sides of the display.
padl="#pixels"	Specifies padding for the left side of the display. Optional, if specified it overrides the general padding above.
padt="#pixels"	Specifies padding for the top of the display. . Optional, if specified it overrides the general padding above.
padr="#pixels"	Specifies padding for the right side of the display. . Optional, if specified it overrides the general padding above.
padb="#pixels"	Specifies padding for the bottom of the display. . Optional, if specified it overrides the general padding above.
padv="#pixels"	Specifies vertical padding between TILES.
padh="#pixels"	Specifies horizontal padding between TILES.
touch="method"	Specifies that the GRID is touchable. Method is a bit mask: 1 = event on touch or mouse down, 2 = event on release or mouse up, 4 = event on BUTTON
versn="n"	Specifies the functional version. 0 = Default and is 0 or all prior functionality for compatibility of any coding developed prior to version 1. 1 = Grid supports cleaner rendering with minimized flicker (flashing), hierarchical inheritance, and layer handling. 2 = Font sizes in Internet Explorer more closely match that of the real iPendant. That is, a character of a specified font takes the same relative space on the screen whether viewed on the virtual teach pendant, the real iPendant or in a browser in ECHO mode. Note: The iPendant firmware and iPendant Controls must be V7.50 or later to accept versn=2. Older versions will generate an error that prohibits your page from being displayed.
verbose="#"	Specifies debug level. This is internal. 99 will put a 1 pixel wide outline around TILES for ease of alignment.

The <GRID> tag is the only permissible way to begin a grid.

Upon ending the grid with the </GRID> tag, the display is cleared and all TILES are freed.

Note: The user should always specify, **versn="1"** unless they are supporting a display prior to V7.30 and wish to keep exiting functionality.

8.4.3 TILE tag

A GRID contains TILES. Each tile is placed at a specific row and column within the GRID.

TILES contain SHAPES to be displayed. All SHAPES placed on a tile are located relative to the tile's origin, which is the upper left hand corner pixel of the tile. Columns go positive right and rows go positive down.

Prototype tile tag is:

```
<TILE id="user_ID" pos="col#,row#" layeron="layerlist" layeroff="layerlist"
bclr="backcolor" fclr="forecolor" font="size" sclr="color" slct="flag">
. . . . .
</TILE >
```

Required parameters:

pos="col#,row#" Specifies the position as column and row in the grid.
Both rows and cols must be > 0.

Optional parameters:

id="userid" Specifies a user supplied ASCII identifier.

layeron="layerlist" Specifies a comma separated list of layers that are ON for this tile

layeroff=" layerlist" Specifies a comma separated list of layers that are OFF for this tile.

Layerlist = "*" is a special case that turns off all layers. Except of course layer 0 which is always displayed.

bclr="backcolor" Specifies the background color. Supersedes the GRID's background color. If not specified then the GRID's background color is inherited.

fclr="forecolor" Specifies the foreground color. Supersedes the GRID's foreground color. If not specified then the GRID's background color is inherited.

font="size" Specifies the font size. If not present then the control's font size is inherited.

sclr=" color" Specifies the tile's default select color. If not present DarkGray is assumed.

slct=" flag" Flag designating the tile as selected. If not present the tile is not selected.

In general:

- The <TILE> tag must be enclosed within a <GRID> tag.
- A <TILE> tag can only encapsulate SHAPes as outlined in the following sections.
- A <TILE> can encapsulate multiple SHAPes.
- TILES can be deleted using the <DELTILE> tag.
- TILES can be modified using the <MODTILE> tag.

Note: Layerlist = "*" is a special case that turns off all layers. Except of course layer 0, which is always displayed.

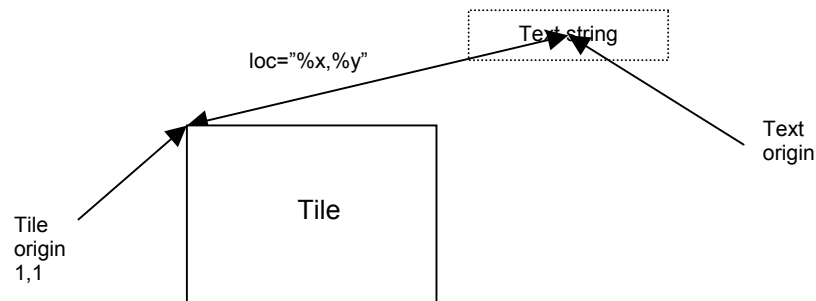
8.4.4 TEXT tag

A TEXT tag declares a text string to be displayed relative to the tile that it belongs to.

There are two origins to be concerned with:

- The TILE origin pixel (1,1) is at the upper left hand corner.
- The TEXT string origin, which the user can specify by the alignment argument. This argument specifies the vertical origin of the string as top, center or bottom and the horizontal origin as left, middle or right.

After that the string is offset by the % of the tile dimensions specified in the offset.



Prototype text tag:

```
<TEXT id="userid" clr="color" align="vert,horiz" font="size" loc="%x,%y"
layer="layer#" curs="index">Text string</TEXT>
```

Optional parameters:

id="userid"	Specifies a user supplied ASCII identifier.
clr="color"	Specifies text color. If not specified then the TILE's foreground color is inherited.
align="vert,horiz"	Specifies the vertical and horizontal alignment of the text string. Vertical values can be: • Top • Middle (default if not specified) • Bottom <u>Note:</u> these can be abbreviated as "t", "m" or "b" Horizontal values can be: • Left • Center (default if not specified) • Right <u>Note:</u> these can be abbreviated as "l", "c" or "r"
font="size"	Specifies the font size. If not present then the TILE's font size is inherited.
loc="%x,%y"	Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.
layer=" layer#"	Specifies the layer that the TEXT belongs to relative to the TILE. Values

can be 0 to 9, if not specified then layer 0 is used.

curs="index"

Cursor index, will draw an underline at the specified index of the string.
 0 = cursor off.
 1 to strlen = cursor position.
 > strlen = cursor 1 character past the end of the string.

Text string

Is the text string to be displayed. If the string contains "\n" (not a new line character), then the line is broken there and multi-line text can be written.

Note: in the case of multi-line text, the general horizontal and vertical alignment is extended on to each line.

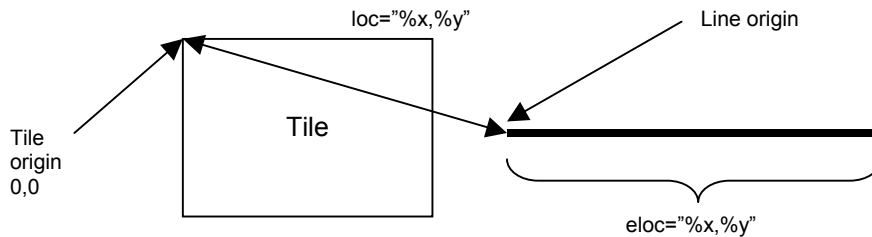
8.4.5 LINE tag

A LINE tag declares a line to be displayed relative to the tile that it belongs to.

There are two origins to be concerned with:

- The TILE origin pixel (1,1) is at the upper left hand corner.
- The LINE string origin.

After that the LINE is offset by the % of the tile dimensions specified in the offset.



Prototype text tag:

```
<LINE id="userid" loc="%x,%y" layer="layer#" clr="color" eloc="%x,%y" />
```

Required parameters:

loc="%x,%y"

Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.

eloc="%x,%y"

Specifies the end of the LINE relative to the TILE's origin. These values are % relative to the TILE's height and width.

Optional parameters:

id="userid"

Specifies a user supplied ASCII identifier.

layer=" layer#"

Specifies the layer that the LINE belongs to relative to the TILE. Values can be 0 to 9, if not specified then layer 0 is used.

clr="color"

Specifies line color. If not specified then the TILE's foreground color is inherited.

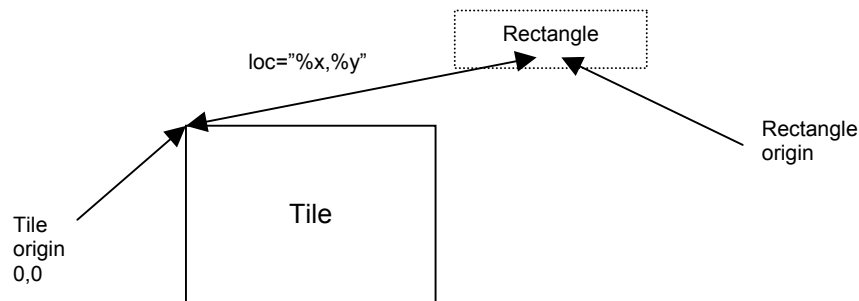
8.4.6 RECTANGLE tag

A RECTANGLE tag, which can be abbreviated as RECT, declares a rectangle to be displayed relative to the tile that it belongs to.

There are two origins to be concerned with:

- The TILE origin pixel (1,1) is at the upper left hand corner.
- The RECTANGLE origin, which the user can specify by the alignment argument. This argument specifies the vertical origin of the string as top, center or bottom and the horizontal origin as left, middle or right.

After that the string is offset by the % of the tile dimensions specified in the offset.



Prototype rectangle tag:

```
<RECTANGLE id="userid" clr="color" align="vert,horiz" loc="%x,%y"
layer="layer#" size="%width,%height[,radius]" wt="#pixels" fill="color"
radius="radius"/>
```

Optional parameters:

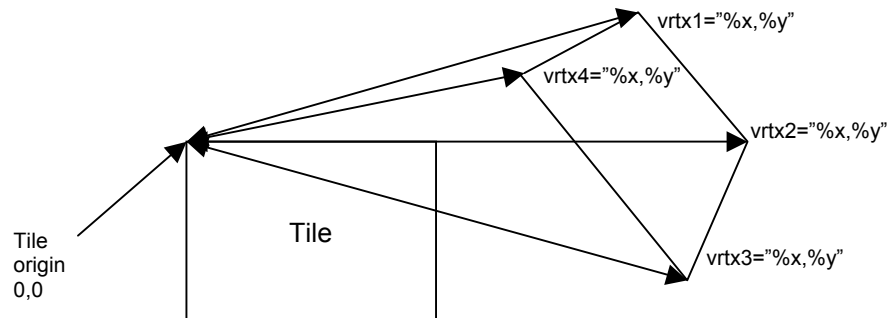
id="userid"	Specifies a user supplied ASCII identifier.
clr="color"	Specifies line color. If not specified then the TILE's foreground color is inherited.
align="vert,horiz"	Specifies the vertical and horizontal alignment of the text string. Vertical values can be: • Top • Middle (default if not specified) • Bottom Horizontal values can be: • Left • Center (default if not specified) • Right
font="size"	Specifies the font size. If not present then the TILE's font size is inherited.
loc="%x,%y"	Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.
layer=" layer#"	Specifies the layer that the RECTANGLE belongs to relative to the TILE. Values can be 0 to 9; if not specified then layer 0 is used.

size="%width,%height[,radius]"	Specifies the width and height as a % of the tile. And optional radius of the rectangle. Width and height are % relative to the tile's width and height. Optional radius makes this a rounded rectangle with corner radius of #pixels.
wt="#pixels"	Specifies the line weight in #pixels. If not present the default is 1.
fill="color"	Specifies the fill color for the RECTANGLE, also serves as a flag. If not present then the rectangle is not filled.
radius="#pixels"	Specifies a corner rounding radius in # of pixels. If not present then corners are not rounded.

8.4.7 POLYGON tag

A POLYGON tag declares a 3 or 4 sided polygon to be displayed relative to the tile that it belongs to.

The polygon is defined by three or four vertices, each located as a % of the tile dimensions relative to the tile's origin (upper left hand corner). A straight line is drawn between each successive vertex and from the last vertex to the first.



Prototype POLYGON tag:

```
<POLYGON id="userid" clr="color" align="vert,hORIZ" loc="%x,%y"
layer="layer#" size="%width,%height[,radius]" wt="#pixels" fill="color"
radius="radius"/>
```

Optional parameters:

id="userid"	Specifies a user supplied ASCII identifier.
clr="color"	Specifies line color. If not specified then the TILE's foreground color is inherited.
vrtx1="%x,%y"	Specifies the offset to the first vertex relative to the TILE's origin.
vrtx2="%x,%y"	Specifies the offset to the second vertex relative to the TILE's origin.
vrtx3="%x,%y"	Specifies the offset to the third vertex relative to the TILE's origin.
vrtx4="%x,%y"	Specifies the offset to the fourth vertex relative to the TILE's origin. This is optional and if not present, a triangle is drawn.

layer="layer#"	Specifies the layer that the POLYGON belongs to relative to the TILE. Values can be 0 to 9; if not specified then layer 0 is used.
fill="color"	Specifies the fill color for the POLYGON. If not present then the rectangle is not filled.

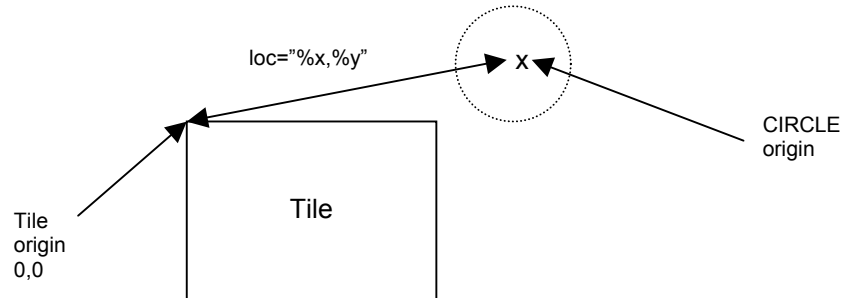
8.4.8 CIRCLE tag

A CIRCLE tag declares a circle to be displayed relative to the tile that it belongs to.

There are two origins to be concerned with:

- The TILE origin pixel (1,1) is at the upper left hand corner.
- The CIRCLE origin, which the user can specify by the alignment argument. This argument specifies the vertical origin of the string as top, center or bottom and the horizontal origin as left, middle or right.

After that the string is offset by the % of the tile dimensions specified in the offset.



Prototype circle tag:

```
<CIRCLE id="userid" clr="color" align="vert,horiz" loc="%x,%y"
layer="layer#" wt="#pixels" fill="color" diameter="%diameter"/>
```

Optional parameters:

id="userid"	Specifies a user supplied ASCII identifier.
clr="color"	Specifies line color. If not specified then the TILE's foreground color is inherited.
align="vert,horiz"	Specifies the vertical and horizontal alignment of the text string. Vertical values can be: • Top • Middle (default if not specified) • Bottom Horizontal values can be: • Left • Center (default if not specified) • Right
loc="%x,%y"	Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.
layer="layer#"	Specifies the layer that the TEXT belongs to relative to the TILE.

Values can be 0 to 9, if not specified then layer 0 is used.

wt="#pixels"

Specifies the line weight in #pixels. If not present the default is 1.

fill="color"

Specifies the fill color for the RECTANGLE, also serves as a flag. If not present then the rectangle is not filled.

diameter="%diameter"

Specifies the CIRCLE's diameter as a % of the TILE it is contained in. If not present then 100% is assumed..

8.4.9 IMAGE tag

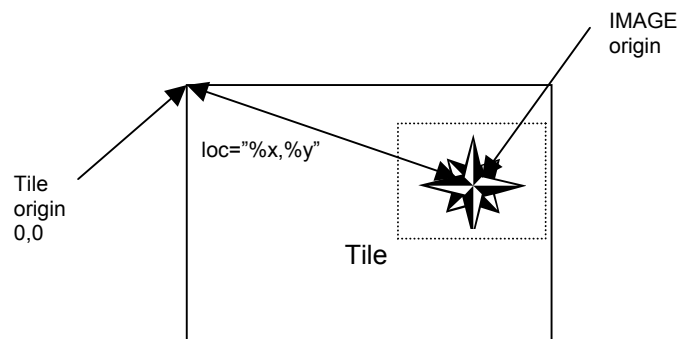
An IMAGE tag places an IMAGE (.jpg or .gif) into a tile for display.

There are two origins to be concerned with:

- The TILE origin pixel (1,1) is at the upper left hand corner.
- The IMAGE origin, which the user can specify by the alignment argument. This argument specifies the vertical origin of the string as top, center or bottom and the horizontal origin as left, middle or right.

After that the string is offset by the % of the tile dimensions specified in the offset.

The size of the IMAGE relative to the tile can be specified as percentages of the size of the TILE. If not specified the IMAGE is sized to 100% of the TILE.



Prototype IMAGE tag:

```
<IMAGE id="userid" clr="color" align="vert,hORIZ" loc="%x,%y"
size="%width,%height">image.gif</IMAGE>
```

Required parameters:

image.gif

Specifies the file name of the image. This can be absolute or URL relative. Allowable file types are .gif and .jpg

Optional parameters:

id="userid"

Specifies a user supplied ASCII identifier.

clr="color"

Specifies the color show if there is transparency in the image.

align="vert,hORIZ"

Specifies the vertical and horizontal alignment of the text string.

Vertical values can be:

- Top
- Middle (default if not specified)
- Bottom

Horizontal values can be:

- Left
- Center (default if not specified)
- Right

loc="%x,%y" Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.

layer=" layer#" Specifies the layer that the TEXT belongs to relative to the TILE. Values can be 0 to 9, if not specified then layer 0 is used.

size="%width,%height" Specifies the width and height as a % of the tile. Width and height are % relative to the tile's width and height.

If the size is not specified then the 100% is assumed.

Note: .png files should not be used for images due to deficiencies in the IE ActiveX components.

Note: for proper color rendering image files should be created with a Standard Windows Color Pallet.

Note: for a .gif file specifying a transparency color, the transparent color can be specified by the **clr** parameter, or inherited from TILE's **bclr** parameter.

8.4.10 BUTTON tag

BUTTONs are intended to be used just like a panel push button. A BUTTON can be constructed in such a way that it conveys information or state as well as accepting an action.

The information or state is pretty much under the programmer's control. The BUTTON tag defines the basic framing around the button shape. The content can be other SHAPES placed on the BUTTON. These include TEXT, RECTANGLES, CIRCLES, IMAGES, etc. The programmer then has control of these SHAPES as well as colors.

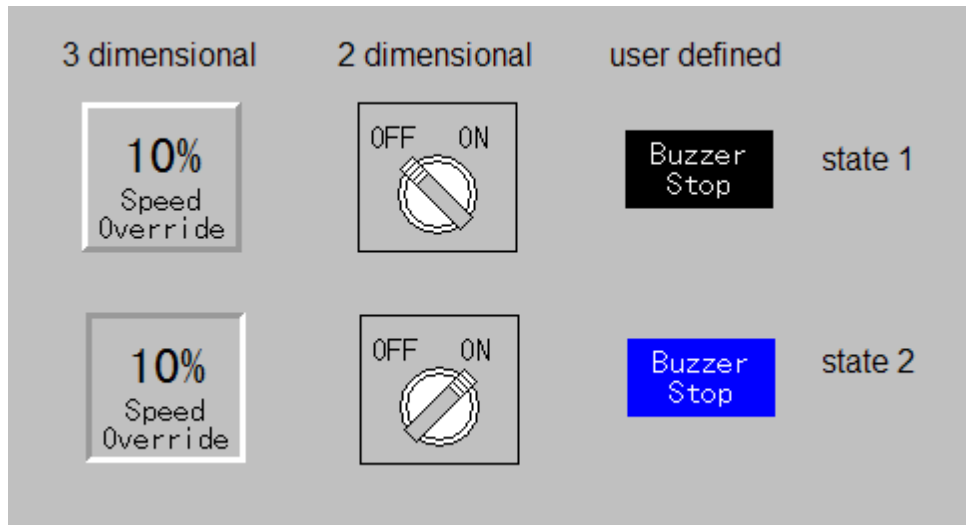
If the iPendant is capable of touch then touch sense is maintained by the iPendant control itself.

- Release or mouse up is sensed and can be sent back to the controller in a manner specified by any or all of the 3 parameters: **kcod**, **tpq** or **url**.
- Press or mouse down is sensed and can be sent back to the controller in a manner specified by any or all of the 3 parameters: **kcod2**, **tpq2** or **url2**.

If the iPendant is not capable of TOUCH then the programmer can monitor the TP arrow keys as a means of navigating and selecting a BUTTON on the display. The ENTER key can then be used to select the BUTTON.

Buttons have the same concept of alignment as the other SHAPES.

A few examples of BUTTONS and different states are:



Prototype BUTTON tag:

```
<BUTTON id="userid" bclr="color" align="vert,horiz" loc="%x,%y" layer="#"
size="%width,%height" latch="state" kcod="#" tprq="#1,#2" url="urlstring"
kcod2="#" tprq2="#1,#2" url2="urlstring"/>
```

Optional parameters:

id="userid"	Specifies a user supplied ASCII identifier.
bclr="color"	Specifies the background color.
align="vert,horiz"	Specifies the vertical and horizontal alignment of the text string. Vertical values can be: • Top • Middle (default if not specified) • Bottom Horizontal values can be: • Left • Center (default if not specified) • Right
loc="%x,%y"	Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.
layer=" layer#"	Specifies the layer that the TEXT belongs to relative to the TILE. Values can be 0 to 9, if not specified then layer 0 is used.
size="%width,%height"	Specifies the width and height as a % of the tile. Width and height are % relative to the tile's width and height. If the size is not specified then the 100% is assumed.
look="style"	Specifies the button style: 0 = not a button 1 = user defined border 2 = 2-dimensional border

3 = 3-dimensional border

latch="state"	Specifies that the button is latchable, or controlled by the user. State is one of: 0 = button is not currently pressed 1 = button is currently pressed
nolatch="state"	Specifies that the button is not latchable. State is meaningless but must be supplied for XML completeness.
kcod="#"	Specifies a 1 byte key code value that is sent back to the controller on the release or mouse up event.
tprq="#1,#2"	Specifies a 2 byte value that is sent back to the controller on the release or mouse up event.
This is intended for system use and should not be used otherwise.	
url="urlstring"	Specifies a URL string to be sent back to controller's the web server on the release or mouse up event. Some examples are: url="KCL/show%20var%20\$version" url="/KCLDO/reset" url="/KCLDO/set%20port%20tpout[1]=1">KCLDO set port tpout[1]=1 url="/KCLDO/set%20var%20[program]somevar%20"
kcod2="#"	Specifies a 1 byte key code value that is sent back to the controller on the press or mouse down event.
tprq2="#1,#2"	Specifies a 2 byte value that is sent back to the controller on the press or mouse down event.
This is intended for system use and should not be used otherwise.	
url2="urlstring"	Specifies a URL string to be sent back to controller's the web server on the press or mouse down event. Examples can be found under the description of url , above/

8.4.11 VT320 tag

The VT320 SHAPE defines a VT320 compatible terminal emulator that can be used for output to the user.

Prototype VT320 tag:

```
<VT320 id="userid" bclr="color" loc="%x,%y" layer="#" font="size"
size="%width,%height" pallet="c1,...,c8" lines="#lines" cols="#cols"
device="devicename" outline="flag"/>
```

Required parameters:

lines="#lines"	Specifies the number of lines that the VT320 device displays
cols="#cols"	Specifies the number of columns that the VT320 device displays.
device="devicename"	Specifies the device within the controller that the VT320 gets data from.

Optional parameters:

id="userid"	Specifies a user supplied ASCII identifier.
bclr="color"	Specifies the background color.
loc="%x,%y"	Specifies the offset relative to the TILE's origin. If not specified then the TILE's origin (1,1) is used. These values are % relative to the TILE's height and width.
layer=" layer#"	Specifies the layer that the VT320 belongs to relative to the TILE.
font="size"	Specifies the font size. If not present then the TILE's font size is inherited.
size="%width,%height"	Specifies the width and height of the VT320 related to a percentage of the TILE that it belongs to.
pallet="c1,...c8"	Specifies a color pallet in terms of 8 colors that the VT320 uses internally.
outline="flag"	Specifies a outline flag to the VT320 device. If flag is != 0 then characters separated by spaces are outlined by a 1 pixel box.

8.4.12 SETFOCUS tag

The SETFOCUS tag is used to force a specified VT320 device to show a visible indication that it has focus. Focus is indicated by a change in color of the display device.

Prototype VT320 tag:

```
<SETFOCUS id="userid" device="devicename" />
```

Optional parameters:

id="userid"	Specifies a user supplied ASCII identifier.
device="devicename"	Specifies the device within the controller that the VT320 gets data from.

Note: if the id and device parameters are not specified all VT320 devices will show as not having focus.

8.4.13 DISPLAY tag

The display tag defines what part of the whole grid is visible on the display. This is how pan and zoom is implemented. (See section [8.3.3 Display, pan and zoom](#)).

For example, a GRID may have been defined as 100 by 200 and its tiles populated. This is too large to display any amount of detail that the user might make sense of.

The DISPLAY tag defines the origin tile and a X,Y extent, as a dimension, to display. The origin tile will be the top left TILE actually displayed. And the ending extent TILE will be in the lower right.

Additionally the DISPLAY tag can supersede the default font, pad, foreground and background colors, and specify display of scroll bars to aid the user in visualizing where they are within the whole grid.

Prototype DISPLAY tag:

```
<DISPLAY pos="col#,row#" dims="#cols,#rows" bclr="color" fclr="color"  
font="size" pad="pixels" padt="pixels" padr="pixels" padb="pixels"  
padl="pixels" padh="pixels" padv="pixels" scrollbar="style"  
hscroll="thick,pos,amount" vscroll="thick,pos,amount" />
```

Required parameters:

pos="col#,row#" Specifies the position as column and row in the grid that is the origin to be displayed.

Optional parameters:

dims="#cols,#rows" Specifies the dimensions, # columns and # rows to be displayed..

bclr="color" Specifies the tile's background color for all tiles in the range of pos by dims. It supersedes the TILE's background color. If not specified then the TILE's background color is not affected.

fclr="color" Specifies the tile's foreground color for all tiles in the range of pos by dims. It supersedes the TILE's foreground color. If not specified then the TILE's foreground color is not affected.

font="size" Specifies the font size. If not present then the TILE's font size is inherited.

pad="#pixels" Specifies general padding, for all sides of the display.

padl="#pixels" Specifies padding for the left side of the display.

padt="#pixels" Specifies padding for the top of the display.

padr="#pixels" Specifies padding for the right side of the display.

padb="#pixels" Specifies padding for the bottom of the display.

padh="#pixels" Specifies horizontal padding between TILES.

padv="#pixels" Specifies vertical padding between TILES.

scrollbar="style,bgcolor,fgcolor" Specifies the style 1, through 10. 0 = No scrollbar.

hscroll="thick,offset,amount" Specifies the horizontal scroll bar characteristics.
Refer to section [8.4.13.1 Scroll bars with the DISPLAY tag](#)

vscroll="thick,offset,amount" Specifies the vertical scroll bar characteristics:
Refer to section [8.4.13.1 Scroll bars with the DISPLAY tag](#)

So we might want to only display a 10 by 12 area within the grid. The DISPLAY tag does that.

An example would be:

```
<DISPLAY pos="1,4" dims="10,12"/>
```

This starts at the tile located at 1,4 within the GRID and displays TILES 10 columns wide by 12 rows high.

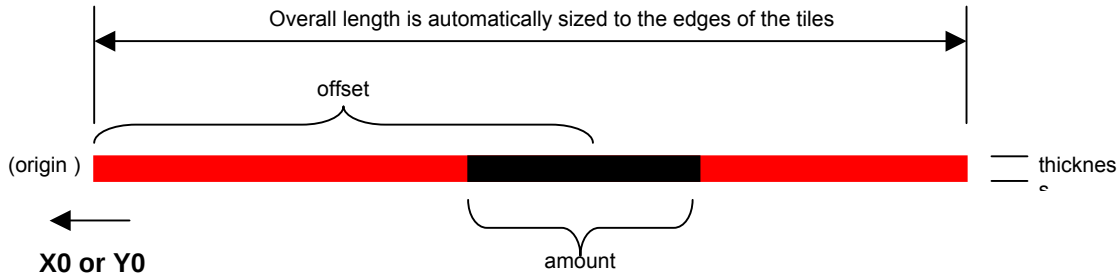
8.4.13.1 Scroll bars with the DISPLAY tag

Additionally the display tag allows the user to display scroll bars along the right side of the control and at the bottom.

Scroll bars are normally used to represent where the current offset is within the total possible display.

The horizontal scrollbar and vertical scrollbar are completely independent and under the control of the user, as XML content.

Scroll bars are specified as part of the <DISPLAY> tag because at the time the DISPLAY command is issued the user should have a good handle of what portion and offset within the total they are showing.



Prototype DISPLAY tag:

```
<DISPLAY . . . scrollbar="style,bgcolor,fgcolor"
hscroll="thickness,offset,amount" vscroll="thickness,offset,amount" />
```

Optional parameters to the DISPLAY tag:

scrollbar="style,[bgcolor,[fgcolor]]" Specifies a style of scroll bar and optionally a foreground and background color. Valid styles are 1 through 10 as depicted below.

hscroll="thickness,[offset,[amount]]" Specifies the horizontal scrollbar characteristics:

- **thickness** is # of pixels wide.
- **offset** is the center of the scroll slider from the origin in %
- **amount** is the length of the scroll slider in %

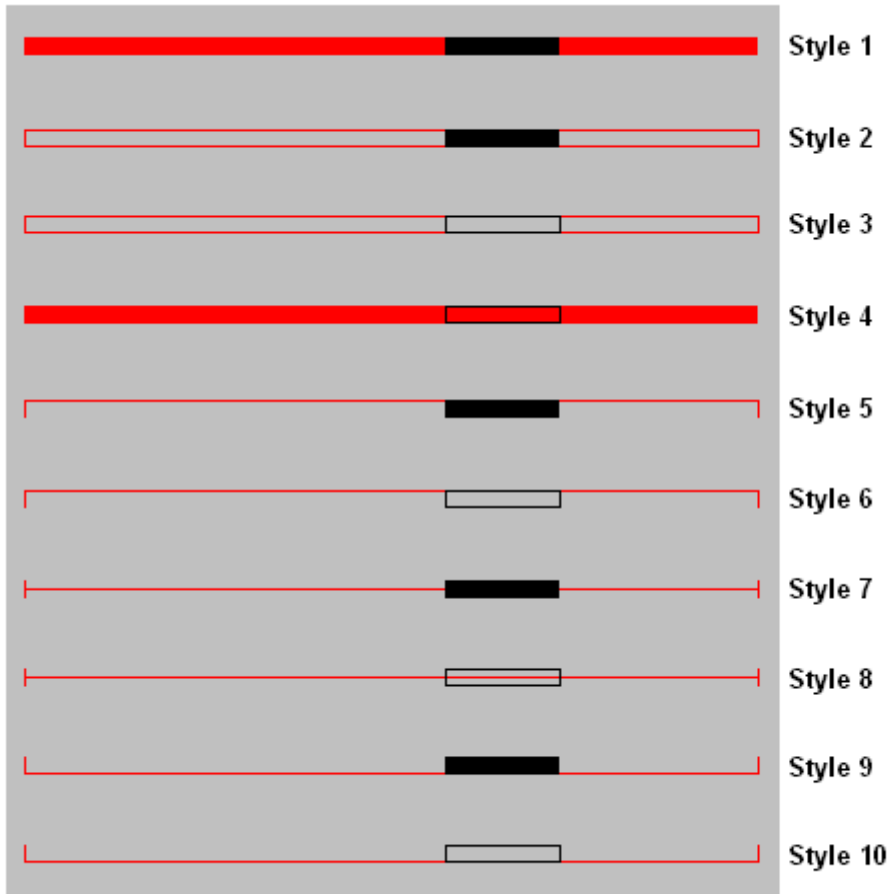
vscroll="thickness,[offset,[amount]]" Specifies the vertical scrollbar characteristics:

- **thickness** is # of pixels wide. 0 indicates no scrollbars.
- **offset** is the center of the scroll slider from the origin in %
- **amount** is the length of the scroll slider in %

A **thickness** of 0 on any scrollbar means, do not display it.

Offset must be between 0 and 100%.

Amount must be between 0 and 100%.



8.4.14 DELTILE tag

The GRID plug-in maybe sent many TILES that are not being displayed or may not even be relevant anymore.

The DELTILE tag is implemented to delete unneeded TILES. This also frees up internal memory that the plug-in is holding onto.

Prototype DELTILE tag:

```
<DELTILE id="userid" pos="col#,row#" dims="#cols,#row"/>
```

Required parameters:

Either

id="userid" Specifies a user supplied ASCII identifier.

or

pos="col#,row#" Specifies the position as column and row in the grid that is the origin to be deleted.

dims="#cols,#rows" Specifies the dimensions, # columns and # rows to be deleted..

or both

As with the previous example the GRID control may have been sent hundreds of TILES, for example a display of 100 by 200.

- If we want to clear row 10 entirely:

```
<DELTILE pos="1,10" dims="100,1" />
```

- If we want to clear column 5 entirely:

```
<DELTILE pos="5,1" dims="1,200" />
```

- If we want to clear all tiles from column 20 & row 10 through column 90 & row 190:

```
<DELTILE pos="20,10" dims="71,181" />
```

8.4.15 Modifying SHAPES

When a SHAPE is created, it is done in the context of being associated with a TILE. A requisite to the GRID control being useful is to be able to modify or change the characteristics of SHAPES being displayed. And to do so dynamically!

One way to accomplish this would be to delete the TILE that the SHAPE is associated with and recreate the necessary TILE and SHAPE. But remember the TILE may have many associated SHAPES and it is most likely a waste of time and processor since we would have to recreate many SHAPES. And of course there are more complication when rendering order is important.

Recall that all the SHAPE tags have a user specifiable identifier, **id="userid"**. This userid string is:

- a non-case sensitive string that should uniquely identify a shape.
- it can contain space characters.

Each SHAPE tag has a corresponding **<MODxxxx.... >** tag that will accept the same parameters as the definition tag.

For example, the TEXT tag :

```
<TEXT id="string 1" clr="#0000ff" font="10" loc="50,50" />Normal</TEXT>
```

Can be modified by :

```
<MODTEXT id="string 1" clr="#ff0000 font="+2,i" />Alarm</TEXT>
```

This changes the black text from "Normal" to "Alarm" in red in a font 2 points larger and Italic.

The following is the correlation of the definition tag to the modifier tag.

Definition tag:	Modification tag:
<TEXT ...	<MODTEXT ...>
<LINE ...	<MODLINE ...>
<RECTANGLE ...	<MODRECTANGLE ...>
<RECT ...	<MODRECT ...>
<CIRCLE ...	<MODCIRCLE ...>
<IMAGE ...	<MODIMAGE ...>
<BUTTON ...	<MODBUTTON ...>
<VT320 ...	<MODVT320 ...>

Please consult the corresponding section of the definition tag to verify the proper parameters.

In the modification tag if a parameter is not specified, then the original parameter setting is left unchanged.

8.4.16 Modifying TILES

In the same way that SHAPES can be modified, TILE can be too. Remember that a TILE is a container that can have many SHAPES associated with it. Careful structuring of the whole display can mean that a simple modification to a TILE can affect a large number of SHAPES, either through the use of layers or using inherited characteristics such as font, colors, etc.

The TILE definition tag has two ways of identifying the TILE. Using the **id="userid"** and the combination **pos="col#,row#"** and **dims="#cols,#rows"** parameters.

Like the SHAPE tag, the userid string is a non-case sensitive string that should uniquely identify a TILE. The id parameter is optional, the pos parameter is not.

Using these two parameters we can modify a TILE in one of 3 ways:

- 1) Specifying only the id parameter:

```
<MODTILE id="tile #12" layeroff="*" layeron="1" />
```

Will modify the TILE with the id of "tile #12" to turn off all layers 1 through 10, and turn on layer 1.

- 2) Specifying only the pos:

```
<MODTILE pos="1,12" layeroff="*" layeron="1" />
```

Will modify the TILE at position 1,12 to turn off all layers 1 through 10, and turn on layer 1.

```
<MODTILE pos="2,2" dims="2,3" bclr="#ff0000" />
```

Will modify all the TILES starting at position 2,2 in a rectangular array down to the TILE at position 4,5 modifying their background color to RED.

- 3) Specifying both the id and pos:

```
<MODTILE id="panel" pos="1,1" dims="2,5" layeron="2" />
```

This will turn on layer 2 for all tiles with the id "panel" in the TILES starting at position 1,1 through position 3,6.

8.4.17 Dynamic data

The following parameters are available but have limited use, except for dynamic rendering.

8.4.17.1 Using the Name Parameter

If a **Name** is designated for a chart, then KAREL variables as described for the **Name** parameter can be used to deliver dynamic commands to the Grid control. For example, a Grid with Name = grid1

```
KCL> set def grid1
KCL> create var command string[127]
KCL> create var cmdack integer
```

Go to the web page that creates grid1

```
KCL> set var command = '...' -- Will deliver this data to the drawing.
```

8.4.17.2 Using the Pipe parameter

The **Pipe** parameter of the Grid control specifies a data file located on the PIP: device. Once created, the controller will attempt to deliver data written to this pipe file to the control(s) using it.

8.4.17.3 Using the Data parameter

The data parameter of the web page can also be used to get XML content to the Grid control.

For example within the <OBJECT . . . in the .stm file:

```
<param name="data" value='<GRID><TILE pos='1,1'><TEXT font='+2'
clr='#ff0000'>(1,1)</TEXT><LINE clr='#00ff00' loc='100,50'
eloc='400,50' /></TILE><TILE pos='5,1'><TEXT clr='#0000ff'
font='+2'>(5,1)</TEXT></TILE><TILE pos='3,4'><IMAGE
size='75,150'>ipend.gif</IMAGE></TILE><TILE pos='2,3'><RECTANGLE
clr='#fff0f0' align='top,left' size='200,200' radius='6' />< RECTANGLE
clr='#fff0f0' align='top,left' loc='10,10' size='270,270' /></TILE><TILE
pos='5,5'><CIRCLE clr='#ffff00' diameter='90' /></TILE><DISPLAY Pos='1,1'
DiMS='5,6' verbose='98' pad='6' />'>
```

Notice that several special things must be done:

- The data value itself must be framed in double quotes “
- Since the data value must be framed in double quotes, any double quotes in the XML content should be converted to single quotes. The GRID control internally will translate single quotes to double quotes before processing the “data” parameter.
- Since single quotes are translated to double quotes, single quotes cannot be used.

Additionally the entire content of the data value parameter could be a separate file that is included with server side includes:

```
<param name="data" value="<!--#include file=data.xml -->">
```

Here, the file data.xml is included is the data stream to the Grid control.

9 PANE LINKING

9.1 Introduction

For V6.22 a set of utilities and features is provided for enhancing connecting together Web pages on the iPendant. These features fall into a number of different categories:

- Display Menu Functions
- Generic Linking Functionality
- Context Sensitive Help
- Related Views

This functionality has been improved for V6.31. This document will note where the V6.31 enhancements are. The iPendant setup screens are only available on V6.31.

This document includes some information on examples. It is much easier to understand the functionality by looking at some of these examples. These are simple to set up and should provide a good basis for understanding the potential of this functionality.

Generic documentation of the display menu and its use can be found in the operations manual. This document has some redundant information but most of this is more detailed to allow a user to tailor system operation in this area.

9.2 Display Menu functions

All of the entries in the display menu can be displayed or masked by setting the system variable `$UI_CONFIG.$DSPMEN_MASK`. For the default case not all of these entries are available.

“5 Related Views” is a new concept that is explained in a later section. It is fully implemented but there is no related view content at this time. Therefore it is masked out.

“6 Help/Diagnostics” provides the same functionality as the help key plus allows the user to bypass context sensitive help and get to the root help pages.

“7 User Views” allows the specification of a specific iPendant configuration. That is the number of windows and the menu page that is displayed in each window. These user views can be set up via system variable settings. If you run the procedures outlined in the example section you can see a set of user views that are set up via system variables. User Views are cleared in the iPendant setup screen

For menu history and menu favorites a menu is considered to be any page of the robot menu system. This is a bit different than a browser favorite or browser history that provides this information or Web pages. A menu page is both a specific softpart and a specific screen, or for the case of editing, a specific program. Any time the user selects an edit page from favorites or history he will be in the teach pendant editor in the program that he was editing when the favorite or history entry was created.

“8 Menu Favorites” allows any user to select a menu to put into his favorites. These are then accessible for a quick link to any menu in the system. This feature is only available at COLD start with FULL menus in force. Favorites are cleared in the iPendant setup screen.

“9 Menu History” provides a list of the eight most recently accessed menus. This allows a savvy user to quickly return to a recently accessed menu.

9.3 Commanding links from KAREL

A built-in `FORCE_LINK` is provided for V6.31 to command these links from a KAREL program. This built-in is fully described in Appendix G: KAREL built-ins.

This allows the KAREL user to have complete control over the display screen from a programming standpoint. This allows for Wizards and other complex Web based programs to be written in KAREL.

9.4 Generic Linking Functionality

All of these capabilities are built on top of generic linking. Generic linking provides the following key capabilities:

- Specification of any menu page in the system as a URL.
- Specification of any program edit as a URL.
- Specification of any of the three “panes” on iPendant as the destination for a link.
- Specification of links into multiple panes from a single complex link
- Specification explicitly or implicitly of any display configuration.

By bringing our menus in as URL’s we can now specify links in a generic way that can either be Web pages in the traditional sense or our legacy menus. This provides some very interesting capabilities.

The exact syntax of these is in a section to follow. The examples are full of these links.

9.5 Context Sensitive Help

Context sensitive help allows the application to specify a particular Web page as a help page at a particular instance in time. This means that help key will bring up the Web page specified for help at that instant. This is called “context sensitive” help.

If the user does not specify a help page the default page be brought up when the user hits the help key. This default page is currently specified based on screen ID and softpart ID. Context sensitive help is menu page specific. This means that when the user selects a different menu or Web page, the context sensitive help information is cleared.

Placing a HELP control on a Web page will specify context sensitive help for that page. This causes the URL specified in the HELP control to be activated when the user hits the help key. The default help in this case would be “Web Browser Help”. For a simple Web page the context is the page itself.

More typically context sensitive help is dependent on the exact place in the menu that the user is looking at. For example, context sensitive help in the CELLIO screen might provide help information on the specific I/O point the cursor is on. For this type of dynamic help content the program running the screen needs to make system calls to update the dynamic help URL.

From a KAREL program you can set the context help URL via:

```
$UI_PANELINK[connect_id].$HELP_URL[device_id] = 'some help url'
$UI_PANELINK[connect_id].$HELP_FLAG[device_id] = 1
```

The C system call is:

```
void tplink_set_help(UBYTE    conn_id,          /* Zero based connect ID */
                    UBYTE    device_id,
                    char      *partial_url,      /* Partial URL to be forced */
                    /*
                    ULONG     flags,              /* URL fully qualified? */
                    ULONG     context_id) /* context information if
applicable */
```

See the section “About identifiers” for details on connect_id and device_id.

9.6 About Identifiers

When working with links within multiple panes there is some terminology that is used to indicate which “instantiation” of a particular application we are talking about. With IE connections it is possible to have up to 4 IE sessions connected. Each IE session can have a total of three windows active. Conceivably, your application can appear in all windows on all connections. The total number of displayed windows is actually limited to nine.

It is possible for a single KAREL program to manage all of these connections if the KAREL program always knows which instance of the menu is of interest. For example, when you set the context sensitive help system variables, they need to be set based on your connection.

In order to manage this three indexes are used in the system. They are: `connect_id`, `device_id` and `pane_id`. The `connect_id` is iPendant or a particular browser attachment. For iPendant the `connect_id` is always 0. For IE connections the `connect_id` is in the range of 1 to 4 but you can't tell by looking at the IE session which connect ID is being used.

The `device_id` identifies one of the three panes that can be displayed on a connection. In single pane, the `device_id` is always zero. In dual pane the right hand pane is 1 and the left pane is zero. The third pane in triple mode is 2.

The `pane_id` is a number between one and nine which uniquely identifies the instance. This allows an application to have arrays of length nine where the `pane_id` is the index into that array. The real interpretation of `pane_id` is that this designates which system task (there are nine). The system variable `$UI_PANEDATA[9]` contains information about the status of all pages.

The `pane_id` is the same value as the `device_stat` for V6.31. If a menu is built into the system then the `device_stat` KAREL variable will be set by the system. You can also set the `device_stat` variable in order to instruct the system how to treat your menu.

The built-in `GET_DEVINFO` is provided to return all the information to the KAREL user. This is fully described in Appendix G: KAREL Built-ins.

In C all three of these numbers are stored in `tpglobals` as:

```
UBYTE conn_id;           /* CRT model, TP model or remote browse */
UBYTE device_id;         /* Device which this task services */
UBYTE uif_task_idx;      /* Assigned index for task/pane tables */
```

In KAREL the `pane_id` is always provided by the execution control. From the `pane_id` you can determine the `connect_id` and the `device_id`. This is a bit complicated but it is easy to find the `pane_id` from the `connect_id` and the `device_id` (in KAREL) via:

```
Pane_id = $UI_CONFIG.$PANEMAP[device_id*3 + pane_id + 1]
```

In C:

```
UBYTE tmlink_panium(BYTE conn_id, /* Zero based connect ID */
                    UBYTE device_id)
```

9.7 New/modified system variables

Several new system variables have been added in support of this functionality. The details of specific fields are covered in the reference manual sections. The variable `$UI_USERVIEW` is not covered in a manual section so is fully documented here.

9.7.1 \$UI_USERVIEW

This variable contains information on the content of all three-user windows and the configuration. By setting this variable a user can set up a pre-configured window configuration. This variable is used to contain the user views that are set by the —Add Current— selection in the User Views menu under display. The iPendant setup menus can be used to clear the user views.

To better understand this system variable you can set it from the menu and then examine what the system sets as the value.

- \$MENU – The ASCII test which appears in the fly out menu.
- \$CONFIG – Configuration, Whole, Double, Triple or Status/Single
- \$FOCUS – Pane which has focus.
- \$PRIM – URL for left pane.
- \$DUAL – URL for right pane if double, upper left pane if triple or status area for single status.
- \$TRIPLE - URL for lower right pane.

Note that the URL's can be standard Web URLs or special menu URL's as described above.

9.7.2 \$UI_CONFIG

This is a preexisting variable that contains some new fields for this release. Of specific interest are:

- \$PANEMAP – Provides relationship between pane_id, context_id and device_id.
- \$MENU_FAVS – URL's for menus in favorites fly out.
- \$HLPMEN_* - Definition of entries in HELP fly out which are by default not occupied (not implemented in V6.22)
- \$DSPMEN_MASK mentioned above configures what items are displayed in the display menu. This is bit mapped, setting it to 511 will enable all menus.

9.7.3 \$UI_MENHIST[5]

The index into this variable is the connect index. So \$UI_MENHIST[1] contains menu history information for iPendant. 2-5 contains the history information for the other connections.

History is saved as a URL to the menu plus a head index.

9.7.4 \$UI_PANEDATA[9]

The index into this variable is the pane_id. Up to 9 panes system wide can be active at any one time. This variable contains output information about what is currently executing in that pane. When the KAREL execution control is started up, the pane ID is provided to the KAREL program.

Note that the execution control passes up to 8 string parameters via this system variable. Fields in panedata are:

- \$PAGEURL – URL specification of the pane currently loaded into the frame
- \$FRAME - Name of the frame the URL is in
- \$HELPURL – URL which is posted when user hits help key (set by HELP control)
- \$PARAMETER1 – String parameter to execution partner
- \$PARAMETER2 – String parameter to execution partner
- \$PARAMETER3 – String parameter to execution partner
- \$PARAMETER4 – String parameter to execution partner
- \$PARAMETER5 – String parameter to execution partner
- \$PARAMETER6 – String parameter to execution partner
- \$PARAMETER7 – String parameter to execution partner
- \$PARAMETER8 – String parameter to execution partner

- \$INTERVAL – Dynamic update interval
- \$PANESTATE – State of the pane, UI_LOADED means the page is completely loaded. You should not interact with controls on the page until this is set.

9.7.5 \$UI_PANELINK[5]

The index into this variable in the connect index. So \$UI_PANELINK [1] contains link information for iPendant. 2-5 contains the link information for the other connections.

- \$HELP_URL[3] – Context help URL, one per device
- \$HLP_CONTEXT[3] – Context identifier for help one per device
- \$HELP_FLAG [3] – Flags relating to help one per device
- \$RELV_INDEX – Index of currently displayed relative view
- \$RELV_URL[8] – Related view URLs which might be posted
- \$RELV_MTEXT[8] – Text displayed in Related view menu
- \$RELV_CONTEX [8] – Related view context identifier
- \$RELV_FLAGS [8] - Related view flags

9.8 Generic Linking Detailed Information

All of the generic links are of the form:

href="/SOFTPART/GENLINK?parameter=value&etcetera"

There can be as many parameter=value pairs as are required to specify the link. In this case there are a fixed number of potential parameters with a fixed number of potential values. The order of the parameter value pairs is not relevant.

The parameter definitions are:

- PRIM – Put the URL in the parameter in the primary (left) pane.
- DUAL– Put the URL in the parameter in the dual (right) pane.
- TRIPLE – Put the URL in the parameter in the triple (lower right) pane.
- CURRENT–Put the URL in the parameter in the pane, which currently has focus.
- OTHER - Put the URL in the parameter in the primary (left) pane when linked from dual or triple; put it in the dual pane when linked from the primary pane.
- HELP – Put the URL in the help pane and treat it as HELP. That is dismiss it with PREV or HELP (V6.31 only).
- FOCUS – Set the focus pane (V6.31 only)
- CONFIG – Set the screen configuration
- ADDRELV – Add a relative view link (primarily for testing)
- CTXHELP– Add a context help link (primarily for testing)

The parameters and values are:

- PRIM=MENUPAGE,spid,scid | EDITPAGE,name | 'ArbitraryURL'
- DUAL=MENUPAGE,spid,scid | 'ArbitraryURL'
- TRIPLE=MENUPAGE,spid,scid | 'ArbitraryURL'

- OTHER=MENUPAGE,spid,scid | EDITPAGE,name | 'ArbitraryURL'
- CURRENT= MENUPAGE,spid,scid | EDITPAGE,name | 'ArbitraryURL'
- FOCUS= PRIM | DUAL | TRIPLE
- CONFIG= SINGLE | STATSING | DOUBLE | TRIPLE
- ADDRELV= 'ArbitraryURL Menu Text'
- CTXHELP= 'ArbitraryURL'

The operations are case insensitive. In the case of the MENUPAGE links, the softpart ID and screen ID of the target menu is also specified. In the case of an EDITPAGE the name of the program to launch in the editor is also supplied.

9.9 Related Views

There are no specific related views provided by the system. The only way to set a related view is via the link command ADDRELV.

Related views is a new concept which really only applies in two pane mode. This is a means to designate Web pages or other menus that are related to the current operation. These related menus are then selectable from the display pop-up.

For example you might want to look at a TPP program using some different display like a node map. In this case node map could be specified as the related view and the system would provide "node map" as a selection in the related view menu. This related view could be tied to the operation of the editor in the left pane. As the user cursors through the program and moves the robot the "related view" of the program as a gob of points is updated as well. Another example of related information is process data. The process parameters can be graphically displayed as a related view using this capability.

In some cases the related view is more specifically a related menu. For example editing a register line in a TPP program a related menu would be the register-editing screen where you could look at more detailed information about the register. It is also logical to provide access to the schedule editing of process parameters via this connection.

Almost all of the driving applications for related views are attached to the editor. This is generic functionality that could be applied to other menus as well. For example a related view of a system variable might be a chart of its values vs. time. The same sort of view of I/O point might also be utilized.

Related views are always related to the information in the left pane of the pendant. This is device_id 0 or the primary pane. This is where TPMM runs and the only pane that can run the editor.

The related views menu entries go away when the menu goes away or when the application decides it's no longer related to what the user is doing. For example, in the editor the register setup screen is NOT related to a DIO instruction. So that entry is removed when the cursor is no longer on a register instruction.

This is similar to context sensitive help in the way in which it is set up. The user designates that a particular menu has particular related information and then that information is displayed as a choice in the related views menu. This information goes away when the menu goes away or when the application decides it's no longer related to what the user is doing.

A related view can be specified from a Web page, a C program or a KAREL program. From a Web page a related view can be set up via a link (see the detailed information and the examples). From C an interface routine is provided:

```
void tmlink_set_relv(UBYTE    conn_id,          /* Zero based connect ID */
                    UBYTE    device_id,         /* Device/frame identifier */
                    char      *partial_url,      /* URL */
                    ULONG     flags,            /* URL fully qualified? */
```

```
char    *menu_text,    /* Menu text */
ULONG   context_id,    /* context information */
UBYTE   *view_idx_p)   /* [Out] System variable
index used */
```

9.10 Examples

Working examples are provided in /linking in the examples zip set. The files there can be copied to a memory card or FRVRC MC: directory and exercised relatively easily. You can also look at the files and determine the exact syntax for a wide range of available links.

Once you have copied all of these files to your memory card execute the command file links.cf from KCL to set up the system variables and other parameters. This will set up the [TYPE] menu on the browser screen and links in the browser favorites menu. You can exercise the links in these files and look at the HTML to get a good understanding of this functionality

A APPENDIX A: HTML TAGS SUPPORTED BY IPENDANT

Key:

-- not yet supported

● supported

Tag	Function	Attribute	iPendant	Remarks
<!-- -->	Comment	<!-- -->	●	
&xxx;	Special character	&# nnn;	●	
		&# xhhh;	--	
		<& gt;& amp;& quot;& nbsp;	●	
		®& copy;	●	The actually employed code matches the installed font
<A>	Anchor	<A>	●	
			●	
			--	
			--	
			--	
			--	
			--	
			--	
			●	
			--	
			--	
			--	
			--	
			--	
			●	
			--	
			--	
			--	
			--	
			--	
			●	
			--	
			--	
			--	
<ADDRESS>	Information about author	<ADDRESS>	●	
		<ADDRESS CLASS=...>	--	
		<ADDRESS DIR=...>	--	
		<ADDRESS ID=...>	--	
		<ADDRESS LANG=...>	--	
		<ADDRESS LANGUAGE=...>	--	
		<ADDRESS STYLE=...>	--	
		<ADDRESS TITLE=...>	--	
<AREA>	Client side click area	<AREA>	●	
		<AREA ACCESSKEY=...>	--	
		<AREA ALT=...>	--	
		<AREA CLASS=...>	--	
		<AREA COORDS=...>	●	

Tag	Function	Attribute	iPendant	Remarks
		<AREA DIR=...>	--	
		<AREA HREF=...>	●	
		<AREA ID=...>	--	
		<AREA LANG=...>	--	
		<AREA LANGUAGE=...>	--	
		<AREA NAME=...>	--	
		<AREA NOHREF>	--	
		<AREA SHAPE= CIRC>	●	
		<AREA SHAPE= CIRCLE>	●	
		<AREA SHAPE= DEFAULT>	●	
		<AREA SHAPE= POLY>	●	
		<AREA SHAPE= POLYGON>	●	
		<AREA SHAPE= RECT>	●	
		<AREA SHAPE= RECTANGLE>	●	
		<AREA STYLE=...>	--	
		<AREA TABINDEX=...>	--	
		<AREA TARGET=...>	●	
		<AREA TITLE=...>	--	
	Bold		●	Bold font required.
		<B CLASS=...>	--	
		<B ID=...>	--	
		<B LANG=...>	--	
		<B LANGUAGE=...>	--	
		<B DIR=...>	--	
		<B STYLE=...>	--	
		<B TITLE=...>	--	
<BASE>	Base URL	<BASE>	●	
		<BASE HREF=...>	●	
		<BASE TARGET=...>	●	
<BASEFONT>	Base font	<BASEFONT>	●	Installed font dependent.
		<BASEFONT CLASS=...>	--	
		<BASEFONT COLOR=...>	--	
		<BASEFONT DIR=...>	--	
		<BASEFONT FACE=...>	--	
		<BASEFONT ID=...>	--	
		<BASEFONT LANG=...>	--	
		<BASEFONT SIZE=...>	●	
		<BASEFONT STYLE=...>	--	
<BG SOUND>	Background sound playback	<BG SOUND>	●	Peer layer installation dependent
		<BG SOUND BALANCE= n>	--	
		<BG SOUND CLASS=...>	--	
		<BG SOUND ID=...>	--	
		<BG SOUND LANG=...>	--	
		<BG SOUND LOOP=...>	●	
		<BG SOUND LOOP= INFINITE>	●	
		<BG SOUND SRC=...>	●	
		<BG SOUND TITLE=...>	--	
		<BG SOUND VOLUME= n>	--	

Tag	Function	Attribute	iPendant	Remarks
<BIG >	Big text	<BIG>	●	Installed font dependent.
		<BIG CLASS=...>	--	
		<BIG ID=...>	--	
		<BIG LANG=...>	--	
		<BIG LANGUAGE=...>	--	
		<BIG DIR=...>	--	
		<BIG STYLE=...>	--	
		<BIG TITLE=...>	--	
<BLINK>	Blinking text	<BLINK>	●	
		<BLINK CLASS=...>	--	
		<BLINK ID=...>	--	
		<BLINK STYLE=...>	--	
<BLOCKQUOTE>	Long quotation	<BLOCKQUOTE>	●	
		<BLOCKQUOTE CITE=...>	--	
		<BLOCKQUOTE CLASS=...>	--	
		<BLOCKQUOTE DIR=...>	--	
		<BLOCKQUOTE ID=...>	--	
		<BLOCKQUOTE LANG=...>	--	
		<BLOCKQUOTE LANGUAGE=...>	--	
		<BLOCKQUOTE STYLE=...>	--	
		<BLOCKQUOTE TITLE=...>	--	
<BODY>	Document body	<BODY>	●	
		<BODY ALINK=...>	●	
		<BODY BACKGROUND=...>	●	
		<BODY BGCOLOR=...>	●	
		<BODY BGPROPERTIES= FIXED>	--	
		<BODY BOTTOMMARGIN=...>	--	
		<BODY CLASS=...>	--	
		<BODY DIR=...>	--	
		<BODY ID=...>	--	
		<BODY LANG=...>	--	
		<BODY LANGUAGE=...>	--	
		<BODY LEFTMARGIN=...>	--	
		<BODY LINK=...>	●	
		<BODY MARGINHEIGHT=...>	--	
		<BODY MARGINWIDTH=...>	--	
		<BODY RIGHTMARGIN=...>	--	
		<BODY SCROLL= YES NO>	--	
		<BODY STYLE=...>	--	
		<BODY TEXT=...>	●	
		<BODY TITLE=...>	--	
		<BODY TOPMARGIN=...>	--	
		<BODY VLINK=...>	●	
 	Line break	 	●	
		<BR CLASS=...>	--	
		<BR CLEAR= ALL>	●	
		<BR CLEAR= LEFT>	●	
		<BR CLEAR= NONE>	●	
		<BR CLEAR= RIGHT>	●	
		<BR DIR=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<BR ID=...>	--	
		<BR LANG=...>	--	
		<BR LANGUAGE=...>	--	
		<BR STYLE=...>	--	
		<BR TITLE=...>	--	
<CAPTION>	Table caption	<CAPTION>	●	
		<CAPTION ALIGN= BOTTOM>	●	
		<CAPTION ALIGN= CENTER>	--	
		<CAPTION ALIGN= LEFT>	--	
		<CAPTION ALIGN= RIGHT>	--	
		<CAPTION ALIGN= TOP>	●	
		<CAPTION CLASS=...>	--	
		<CAPTION DIR=...>	--	
		<CAPTION ID=...>	--	
		<CAPTION LANG=...>	--	
		<CAPTION LANGUAGE=...>	--	
		<CAPTION STYLE=...>	--	
		<CAPTION TITLE=...>	--	
		<CAPTION VALIGN= BOTTOM>	--	
		<CAPTION VALIGN= TOP>	--	
<CENTER>	Center alignment	<CENTER>	●	
		<CENTER CLASS=...>	--	
		<CENTER DIR=...>	--	
		<CENTER ID=...>	--	
		<CENTER LANG=...>	--	
		<CENTER LANGUAGE=...>	--	
		<CENTER STYLE=...>	--	
		<CENTER TITLE=...>	--	
<CITE>	Citation reference	<CITE>	●	Italic font required.
		<CITE CLASS=...>	--	
		<CITE DIR=...>	--	
		<CITE ID=...>	--	
		<CITE LANG=...>	--	
		<CITE LANGUAGE=...>	--	
		<CITE STYLE=...>	--	
		<CITE TITLE=...>	--	
<CODE>	Computer code	<CODE>	●	Fixed font required.
		<CODE CLASS=...>	--	
		<CODE DIR=...>	--	
		<CODE ID=...>	--	
		<CODE LANG=...>	--	
		<CODE LANGUAGE=...>	--	
		<CODE STYLE=...>	--	
		<CODE TITLE=...>	--	
<DD>	Definition list item definition	<DD>	●	
		<DD CLASS=...>	--	
		<DD DIR=...>	--	
		<DD ID=...>	--	
		<DD LANG=...>	--	
		<DD LANGUAGE=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<DD STYLE=...>	--	
		<DD TITLE=...>	--	
<DFN>	Definition character string	<DFN>	●	Italic font required
		<DFN CLASS=...>	--	
		<DFN DIR=...>	--	
		<DFN ID=...>	--	
		<DFN LANG=...>	--	
		<DFN LANGUAGE=...>	--	
		<DFN STYLE=...>	--	
		<DFN TITLE=...>	--	
<DIR>	Directory list	<DIR>	●	Same as .
		<DIR CLASS=...>	--	
		<DIR COMPACT>	--	Normally displayed in compact format.
		<DIR DIR=...>	--	
		<DIR ID=...>	--	
		<DIR LANG=...>	--	
		<DIR LANGUAGE=...>	--	
		<DIR STYLE=...>	--	
		<DIR TITLE=...>	--	
<DIV>	Division (style container)	<DIV>	●	
		<DIV ALIGN= CENTER>	●	
		<DIV ALIGN= JUSTIFY>	--	
		<DIV ALIGN= LEFT>	●	
		<DIV ALIGN= RIGHT>	●	
		<DIV CLASS=...>	--	
		<DIV DATAFLD=...>	--	
		<DIV DATAFORMATS=...>	--	
		<DIV DATASRC=...>	--	
		<DIV DIR=...>	--	
		<DIV ID=...>	--	
		<DIV LANG=...>	--	
		<DIV LANGUAGE=...>	--	
		<DIV STYLE=...>	--	
		<DIV TITLE=...>	--	
<DL>	Definition list	<DL>	●	
		<DL CLASS=...>	--	
		<DL COMPACT>	--	
		<DL DIR=...>	--	
		<DL ID=...>	--	
		<DL LANG=...>	--	
		<DL LANGUAGE=...>	--	
		<DL STYLE=...>	--	
		<DL TITLE=...>	--	
<DT>	Definition list term	<DT>	●	
		<DT CLASS=...>	--	
		<DT DIR=...>	--	
		<DT ID=...>	--	
		<DT LANG=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<DT LANGUAGE=...>	--	
		<DT STYLE=...>	--	
		<DT TITLE=...>	--	
	Emphasis		●	Italic font required.
		<EM CLASS=...>	--	
		<EM DIR=...>	--	
		<EM ID=...>	--	
		<EM LANG=...>	--	
		<EM LANGUAGE=...>	--	
		<EM STYLE=...>	--	
		<EM TITLE=...>	--	
<EMBED>	Object embedding	<EMBED>	●	
		<EMBED ALIGN= ABSBOTTOM>	--	
		<EMBED ALIGN= ABSMIDDLE>	--	
		<EMBED ALIGN= BASELINE>	--	
		<EMBED ALIGN= BOTTOM>	--	
		<EMBED ALIGN= LEFT>	--	
		<EMBED ALIGN= MIDDLE>	--	
		<EMBED ALIGN= RIGHT>	--	
		<EMBED ALIGN= TEXTTOP>	--	
		<EMBED ALIGN= TOP>	--	
		<EMBED ALT=...>	--	
		<EMBED AUTOSTART= TRUE FALSE>	--	
		<EMBED BORDER=...>	--	
		<EMBED CLASS=...>	--	
		<EMBED CODE=...>	--	
		<EMBED CODEBASE=...>	--	
		<EMBED FRAMEBORDER= NO>	--	
		<EMBED HEIGHT=...>	●	
		<EMBED HIDDEN= TRUE FLASE>	●	
		<EMBED HSPACE=...>	--	
		<EMBED ID=...>	--	
		<EMBED NAME=...>	--	
		<EMBED PALETTE= BACKGROUND>	--	
		<EMBED PALETTE= FOREGROUND>	--	
		<EMBED PLUGINSOURCE=...>	--	
		<EMBED PLUGINURL=...>	--	
		<EMBED SRC=...>	●	
		<EMBED STYLE=...>	--	
		<EMBED TITLE=...>	--	
		<EMBED TYPE=...>	●	
		<EMBED UNITS= EN>	--	
		<EMBED UNITS= PIXELS>	--	
		<EMBED UNITS= PX>	--	
		<EMBED UNITS= EM>	--	
		<EMBED VSPACE=...>	--	
		<EMBED WIDTH=...>	●	
		<EMBED optional_ param=...>	--	
	Font		●	
			--	

Tag	Function	Attribute	iPendant	Remarks
			●	
			--	
			--	
			--	
			--	
			--	
			--	
			--	
			●	Installed font dependent.
			●	Installed font dependent.
			--	
			--	
<FORM>	Form	<FORM>	●	
		<FORM ACCEPT- CHARSET=...>	--	
		<FORM ACTION=...>	●	
		<FORM CLASS=...>	--	
		<FORM DIR=...>	--	
		<FORM ENCTYPE=...>	●	
		<FORM ID=...>	--	
		<FORM LANG=...>	--	
		<FORM LANGUAGE=...>	--	
		<FORM METHOD= GET>	●	
		<FORM METHOD= POST>	●	
		<FORM NAME=...>	--	
		<FORM STYLE=...>	--	
		<FORM TARGET=...>	●	
		<FORM TITLE=...>	--	
<FRAME >	Frame	<FRAME>	●	
		<FRAME BORDERCOLOR=...>	--	
		<FRAME CLASS=...>	--	
		<FRAME DATAFLD=...>	--	
		<FRAME DATASRC=...>	--	
		<FRAME FRAMEBORDER= 1 0>	--	
		<FRAME FRAMEBORDER= YES NO>	--	
		<FRAME HEIGHT=...>	--	
		<FRAME ID=...>	--	
		<FRAME LANG=...>	--	
		<FRAME LANGUAGE=...>	--	
		<FRAME LONGDESC=...>	--	
		<FRAME MARGINHEIGHT= n>	●	
		<FRAME MARGINWIDTH= n>	●	
		<FRAME NAME=...>	●	
		<FRAME NORESIZE>	--	
		<FRAME SCROLLING= AUTO NO YES>	●	
		<FRAME SRC=...>	●	
		<FRAME STYLE=...>	--	
		<FRAME TITLE=...>	--	
		<FRAME WIDTH=...>	--	
<FRAMESET>	Frame definition	<FRAMESET>	●	

Tag	Function	Attribute	iPendant	Remarks
		<FRAMESET BORDER=...>	●	
		<FRAMESET BORDERCOLOR=...>	●	
		<FRAMESET CLASS=...>	--	
		<FRAMESET COLS=...>	●	Cannot be designated simultaneously with ROWS.
		<FRAMESET FRAMEBORDER= 1 0>	●	
		<FRAMESET	●	
		<FRAMESET FRAMESPACING=...>	--	
		<FRAMESET ID=...>	--	
		<FRAMESET LANG=...>	--	
		<FRAMESET LANGUAGE=...>	--	
		<FRAMESET ROWS=...>	●	Cannot be designated simultaneously with COLS.
		<FRAMESET STYLE=...>	--	
		<FRAMESET TITLE=...>	--	
<HEAD>	Header	<HEAD>	●	
		<HEAD DIR=...>	--	
		<HEAD CLASS=...>	--	
		<HEAD ID=...>	--	
		<HEAD LANG=...>	--	
		<HEAD LANGUAGE=...>	--	
		<HEAD PROFILE=...>	--	
		<HEAD TITLE=...>	--	
<Hn>	Heading	<Hn>	●	Displayed in bold font.
		<Hn ALIGN= CENTER>	●	
		<Hn ALIGN= JUSTIFY>	--	
		<Hn ALIGN= LEFT>	●	
		<Hn ALIGN= RIGHT>	●	
		<Hn CLASS=...>	--	
		<Hn DIR=...>	--	
		<Hn ID=...>	--	
		<Hn LANG=...>	--	
		<Hn LANGUAGE=...>	--	
		<Hn STYLE=...>	--	
		<Hn TITLE=...>	--	
<HR>	Horizontal line	<HR>	●	
		<HR ALIGN= CENTER>	●	
		<HR ALIGN= LEFT>	●	
		<HR ALIGN= RIGHT>	●	
		<HR CLASS=...>	--	
		<HR COLOR=...>	--	
		<HR ID=...>	--	
		<HR LANG=...>	--	
		<HR LANGUAGE=...>	--	
		<HR NOSHADE>	●	
		<HR SIZE=...>	●	
		<HR SRC=...>	--	
		<HR STYLE=...>	--	
		<HR TITLE=...>	--	
		<HR WIDTH=...>	●	

Tag	Function	Attribute	iPendant	Remarks
<HTML >	Document type	<HTML>	●	
		<HTML DIR=...>	--	
		<HTML ID=...>	--	
		<HTML LANG=...>	--	
		<HTML LANGUAGE=...>	--	
		<HTML STYLE=...>	--	
		<HTML TITLE=...>	--	
		<HTML VERSION=...>	--	
<I>	Italic text	<I>	●	Italic font required.
		<I CLASS=...>	--	
		<I DIR=...>	--	
		<I ID=...>	--	
		<I LANG=...>	--	
		<I LANGUAGE=...>	--	
		<I STYLE=...>	--	
		<I TITLE=...>	--	
	Image		●	
			●	
			●	
			●	Default.
			●	Same as BASELINE.
			●	Same as MIDDLE.
			●	
			●	
			●	
			●	
			●	
			●	
			●	
			--	
			--	
			--	
			--	
			--	
			--	
			●	
			●	
			--	
			●	
			--	
			--	
			--	
			--	
			--	
			--	
			●	
			●	
		<IMG	--	
			--	
			--	

Tag	Function	Attribute	iPendant	Remarks
			--	
			●	
			●	
			●	
<INPUT>	Form input area	<INPUT>	●	
		<INPUT ACCEPT=...>	--	
		<INPUT ACCESSKEY=...>	●	submit and reset only.
		<INPUT ALIGN= ABSBOTTOM>	--	
		<INPUT ALIGN= ABSMIDDLE>	--	
		<INPUT ALIGN= BASELINE>	--	
		<INPUT ALIGN= BOTTOM>	--	
		<INPUT ALIGN= CENTER>	--	
		<INPUT ALIGN= LEFT>	--	
		<INPUT ALIGN= MIDDLE>	--	
		<INPUT ALIGN= RIGHT>	--	
		<INPUT ALIGN= TEXTTOP>	--	
		<INPUT ALIGN= TOP>	--	
		<INPUT ALT=...>	--	
		<INPUT CHECKED>	●	
		<INPUT CLASS=...>	--	
		<INPUT DATAFLD=...>	--	
		<INPUT DATAFORMATS=...>	--	
		<INPUT DATASRC=...>	--	
		<INPUT DIR=...>	--	
		<INPUT DISABLED>	●	
		<INPUT ID=...>	--	
		<INPUT LANG=...>	--	
		<INPUT LANGUAGE=...>	--	
		<INPUT MAXLENGTH=...>	●	
		<INPUT NAME=...>	●	
		<INPUT READONLY>	●	
		<INPUT SIZE=...>	●	
		<INPUT SRC=...>	●	
		<INPUT STYLE=...>	--	
		<INPUT TABINDEX=...>	--	
		<INPUT TITLE=...>	--	
		<INPUT TYPE= BUTTON>	●	Only when JavaScript is enabled.
		<INPUT TYPE= CHECKBOX>	●	
		<INPUT TYPE= FILE>	--	
		<INPUT TYPE= HIDDEN>	●	
		<INPUT TYPE= IMAGE>	●	
		<INPUT TYPE= PASSWORD>	●	
		<INPUT TYPE= RADIO>	●	
		<INPUT TYPE= RESET>	●	
		<INPUT TYPE= SUBMIT>	●	
		<INPUT TYPE= TEXT>	●	
		<INPUT USEMAP=...>	--	
		<INPUT VALUE=...>	●	
<INPUT TYPE= button>	Form input area button	<INPUT TYPE= button>	●	Only when JavaScript is enabled.

Tag	Function	Attribute	iPendant	Remarks
		<INPUT TYPE= button CLASS=...>	--	
		<INPUT TYPE= button ID=...>	--	
		<INPUT TYPE= button LANGUAGE=...>	--	
		<INPUT TYPE= button NAME=...>	●	Only when JavaScript is enabled.
		<INPUT TYPE= button STYLE=...>	--	
		<INPUT TYPE= button VALUE=...>	●	Only when JavaScript is enabled.
<INPUT TYPE= checkbox>	Form input area check box	<INPUT TYPE= checkbox>	●	
		<INPUT TYPE= checkbox CHECKED>	●	
		<INPUT TYPE= checkbox CLASS=...>	--	
		<INPUT TYPE= checkbox ID=...>	--	
		<INPUT TYPE= checkbox	--	
		<INPUT TYPE= checkbox NAME=...>	●	
		<INPUT TYPE= checkbox STYLE=...>	--	
		<INPUT TYPE= checkbox VALUE=...>	●	
<INPUT TYPE= file>	Form input area file transfer	<INPUT TYPE= file>	--	
		<INPUT TYPE= file CLASS=...>	--	
		<INPUT TYPE= file ID=...>	--	
		<INPUT TYPE= file LANGUAGE=...>	--	
		<INPUT TYPE= file MAXLENGTH=...>	--	
		<INPUT TYPE= file NAME=...>	--	
		<INPUT TYPE= file SIZE=...>	--	
		<INPUT TYPE= file STYLE=...>	--	
		<INPUT TYPE= file VALUE=...>	--	
<INPUT TYPE= hidden>	Form input area hidden field	<INPUT TYPE= hidden>	●	
		<INPUT TYPE= hidden NAME=...>	●	
		<INPUT TYPE= hidden VALUE=...>	●	
<INPUT TYPE= image>	Form input area image	<INPUT TYPE= image>	●	
		<INPUT TYPE= image	●	
		<INPUT TYPE= image	●	
		<INPUT TYPE= image	●	
		<INPUT TYPE= image ALIGN= BOTTOM>	●	Same as BASELINE.
		<INPUT TYPE= image ALIGN= CENTER >	●	
		<INPUT TYPE= image ALIGN= LEFT>	●	
		<INPUT TYPE= image ALIGN= MIDDLE>	●	
		<INPUT TYPE= image ALIGN= RIGHT>	●	
		<INPUT TYPE= image	●	
		<INPUT TYPE= image ALIGN= TOP>	●	
		<INPUT TYPE= image ALT=...>	●	

Tag	Function	Attribute	iPendant	Remarks
		<INPUT TYPE= image BORDER=...>	●	
		<INPUT TYPE= image CLASS=...>	--	
		<INPUT TYPE= image ID=...>	--	
		<INPUT TYPE= image HEIGHT=...>	●	
		<INPUT TYPE= image NAME=...>	●	
		<INPUT TYPE= image SRC=...>	●	
		<INPUT TYPE= image STYLE=...>	--	
		<INPUT TYPE= image WIDTH=...>	●	
<INPUT TYPE= password>	Form input area password	<INPUT TYPE= password>	●	
		<INPUT TYPE= password CLASS=...>	--	
		<INPUT TYPE= password ID=...>	--	
		<INPUT TYPE= text LANGUAGE=...>	--	
		<INPUT TYPE= text MAXLENGTH=...>	●	
		<INPUT TYPE= password NAME=...>	●	
		<INPUT TYPE= password SIZE=...>	●	
		<INPUT TYPE= password STYLE=...>	--	
		<INPUT TYPE= password VALUE=...>	●	
<INPUT TYPE= radio>	Form input area radio button	<INPUT TYPE= radio>	●	
		<INPUT TYPE= radio CHECKED>	●	
		<INPUT TYPE= radio CLASS=...>	--	
		<INPUT TYPE= radio ID=...>	--	
		<INPUT TYPE= radio LANGUAGE=...>	--	
		<INPUT TYPE= radio NAME=...>	●	
		<INPUT TYPE= radio STYLE=...>	--	
		<INPUT TYPE= radio VALUE=...>	●	
<INPUT TYPE= reset>	Form input area reset button	<INPUT TYPE= reset>	●	
		<INPUT TYPE= reset CLASS=...>	--	
		<INPUT TYPE= reset ID=...>	--	
		<INPUT TYPE= reset LANGUAGE=...>	--	
		<INPUT TYPE= reset NAME=...>	●	
		<INPUT TYPE= reset STYLE=...>	--	
		<INPUT TYPE= reset VALUE=...>	●	
<INPUT TYPE= submit >	Form input area submit button	<INPUT TYPE= submit>	●	
		<INPUT TYPE= submit CLASS=...>	--	
		<INPUT TYPE= submit ID=...>	--	
		<INPUT TYPE= submit LANGUAGE=...>	--	
		<INPUT TYPE= submit NAME=...>	●	
		<INPUT TYPE= submit STYLE=...>	--	
		<INPUT TYPE= submit VALUE=...>	●	
<INPUT TYPE= text>	Form input area text box	<INPUT TYPE= text>	●	

Tag	Function	Attribute	iPendant	Remarks
		<INPUT TYPE= text CLASS=...>	--	
		<INPUT TYPE= text ID=...>	--	
		<INPUT TYPE= text LANGUAGE=...>	--	
		<INPUT TYPE= text MAXLENGTH=...>	●	
		<INPUT TYPE= text NAME=...>	●	
		<INPUT TYPE= text SIZE=...>	●	
		<INPUT TYPE= text STYLE=...>	--	
		<INPUT TYPE= text VALUE=...>	●	
<ISINDEX>	One- line prompt	<ISINDEX>	●	
		<ISINDEX ACTION=...>	●	
		<ISINDEX CLASS=...>	--	
		<ISINDEX DIR=...>	--	
		<ISINDEX ID=...>	--	
		<ISINDEX LANG=...>	--	
		<ISINDEX LANGUAGE=...>	--	
		<ISINDEX PROMPT=...>	●	
		<ISINDEX STYLE=...>	--	
		<ISINDEX TITLE=...>	--	
<KBD >	Keyboard input text	<KBD>	●	Possible when a fixed font is available.
		<KBD CLASS=...>	--	
		<KBD DIR=...>	--	
		<KBD ID=...>	--	
		<KBD LANG=...>	--	
		<KBD LANGUAGE=...>	--	
		<KBD STYLE=...>	--	
		<KBD TITLE=...>	--	
	List item		●	
		<LI CLASS=...>	--	
		<LI DIR=...>	--	
		<LI ID=...>	--	
		<LI LANG=...>	--	
		<LI LANGUAGE=...>	--	
		<LI STYLE=...>	--	
		<LI TITLE=...>	--	
		<LI TYPE= 1 a A i l>	●	Only numerals are displayed.
		<LI TYPE= CIRCLE>	●	Only SQUARE is displayed.
		<LI TYPE= DISC >	●	Only SQUARE is displayed.
		<LI TYPE= SQUARE>	●	
		<LI VALUE=...>	●	
<LISTING>	Program list (no tag)	<LISTING>	●	
		<LISTING CLASS=...>	--	
		<LISTING ID=...>	--	
		<LISTING LANG=...>	--	
		<LISTING LANGUAGE=...>	--	
		<LISTING STYLE=...>	--	
		<LISTING TITLE=...>	--	

Tag	Function	Attribute	iPendant	Remarks
<MAP>	Map data	<MAP>	●	
		<MAP CLASS=...>	--	
		<MAP DIR=...>	--	
		<MAP ID=...>	--	
		<MAP LANG=...>	--	
		<MAP LANGUAGE=...>	--	
		<MAP NAME=...>	●	
		<MAP STYLE=...>	--	
		<MAP TITLE=...>	--	
<MENU>	Menu list	<MENU>	●	Same as .
		<MENU CLASS=...>	--	
		<MENU COMPACT>	--	Normally displayed in compact format.
		<MENU DIR=...>	--	
		<MENU ID=...>	--	
		<MENU LANG=...>	--	
		<MENU LANGUAGE=...>	--	
		<MENU STYLE=...>	--	
		<MENU TITLE=...>	--	
<META>	Meta information	<META>	●	
		<META CONTENT=...>	●	
		<META DIR=...>	--	
		<META HTTP- EQUIV=...>	●	Only the following.
		<META HTTP- EQUIV= REFRESH>	●	
		<META HTTP- EQUIV= PRAGMA>	●	no- cache only.
		<META HTTP- EQUIV= CACHE-...>	●	no- cache and no- store only.
		<META LANG=...>	--	
		<META NAME=...>	--	
		<META SCHEME=...>	--	
		<META TITLE=...>	--	
		<META URL=...>	--	
		<META URL=...>	--	
<NOFRAMES>	No- frame support	<NOFRAMES>	●	Literal character strings are currently displayed
		<NOFRAMES CLASS=...>	--	
		<NOFRAMES DIR=...>	--	
		<NOFRAMES ID=...>	--	
		<NOFRAMES LANG=...>	--	
		<NOFRAMES LANGUAGE=...>	--	
		<NOFRAMES STYLE=...>	--	
		<NOFRAMES TITLE=...>	--	
	Numbered list		●	
		<OL COMPACT>	--	Normally displayed in compact format.
		<OL CLASS=...>	--	
		<OL DIR=...>	--	
		<OL ID=...>	--	
		<OL LANG=...>	--	
		<OL LANGUAGE=...>	--	
		<OL START=...>	●	
		<OL SEQNUM=...>	●	
		<OL STYLE=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<OL TITLE=...>	--	
		<OL TYPE= 1 A a I i>	--	
		<OL TYPE= 1 A a I i>	--	
<OPTION>	SELECT option	<OPTION>	●	
		<OPTION CLASS=...>	--	
		<OPTION DIR=...>	--	
		<OPTION DISABLED>	--	
		<OPTION ID=...>	--	
		<OPTION LABEL=...>	--	
		<OPTION LANG=...>	--	
		<OPTION LANGUAGE=...>	--	
		<OPTION SELECTED>	●	
		<OPTION STYLE=...>	--	
		<OPTION TITLE=...>	--	
		<OPTION VALUE=...>	●	
<P>	Paragraph	<P>	●	
		<P ALIGN= CENTER>	●	
		<P ALIGN= JUSTIFY>	--	
		<P ALIGN= LEFT>	●	
		<P ALIGN= RIGHT>	●	
		<P CLASS=...>	--	
		<P DIR=...>	--	
		<P ID=...>	--	
		<P LANG=...>	--	
		<P LANGUAGE=...>	--	
		<P STYLE=...>	--	
		<P TITLE=...>	--	
<PLAINTEXT>	Plain text (no tag)	<PLAINTEXT>	●	
		<PLAINTEXT CLASS=...>	--	
		<PLAINTEXT ID=...>	--	
		<PLAINTEXT LANG=...>	--	
		<PLAINTEXT LANGUAGE=...>	--	
		<PLAINTEXT STYLE=...>	--	
		<PLAINTEXT TITLE=...>	--	
<PRE>	Preformatted text	<PRE>	●	
		<PRE CLASS=...>	--	
		<PRE COLS=...>	--	
		<PRE DIR=...>	--	
		<PRE ID=...>	--	
		<PRE LANG=...>	--	
		<PRE LANGUAGE=...>	--	
		<PRE STYLE=...>	--	
		<PRE TITLE=...>	--	
		<PRE WIDTH=...>	--	
		<PRE WRAP>	--	
<S>	Text struck through	<S>	●	
		<S CLASS=...>	--	
		<S DIR=...>	--	
		<S ID=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<S LANG=...>	--	
		<S LANGUAGE=...>	--	
		<S STYLE=...>	--	
		<S TITLE=...>	--	
<SAMP>	Sample program output text	<SAMP>	●	Fixed font required.
		<SAMP CLASS=...>	--	
		<SAMP DIR=...>	--	
		<SAMP ID=...>	--	
		<SAMP LANG=...>	--	
		<SAMP LANGUAGE=...>	--	
		<SAMP STYLE=...>	--	
		<SAMP TITLE=...>	--	
<SELECT>	List box	<SELECT>	●	
		<SELECT ACCESSKEY=...>	--	
		<SELECT ALIGN= ABSBOTTOM>	--	
		<SELECT ALIGN= ABSMIDDLE>	--	
		<SELECT ALIGN= BASELINE>	--	
		<SELECT ALIGN= BOTTOM>	--	
		<SELECT ALIGN= LEFT>	--	
		<SELECT ALIGN= MIDDLE>	--	
		<SELECT ALIGN= RIGHT>	--	
		<SELECT ALIGN= TEXTTOP>	--	
		<SELECT ALIGN= TOP>	--	
		<SELECT CLASS=...>	--	
		<SELECT DATAFLD=...>	--	
		<SELECT DATAFORMATS=...>	--	
		<SELECT DATASRC=...>	--	
		<SELECT DIR=...>	--	
		<SELECT DISABLED>	--	
		<SELECT ID=...>	--	
		<SELECT LANG=...>	--	
		<SELECT LANGUAGE=...>	--	
		<SELECT MULTIPLE>	●	
<SELECT>	List box	<SELECT NAME=...>	●	
		<SELECT SIZE=...">	●	
		<SELECT STYLE=...>	--	
		<SELECT TABINDEX=...>	--	
		<SELECT TITLE=...>	--	
<SMALL>	Small text	<SMALL>	●	Installed font dependent.
		<SMALL CLASS=...>	--	
		<SMALL DIR=...>	--	
		<SMALL ID=...>	--	
		<SMALL LANG=...>	--	
		<SMALL LANGUAGE=...>	--	
		<SMALL STYLE=...>	--	
		<SMALL TITLE=...>	--	
<STRIKE>	Text struck through	<STRIKE>	●	
		<STRIKE CLASS=...>	--	
		<STRIKE DIR=...>	--	
		<STRIKE ID=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<STRIKE LANG=...>	--	
		<STRIKE LANGUAGE=...>	--	
		<STRIKE STYLE=...>	--	
		<STRIKE TITLE=...>	--	
	Strong typographic emphasis		●	Bold font required.
		<STRONG CLASS=...>	--	
		<STRONG DIR=...>	--	
		<STRONG ID=...>	--	
		<STRONG LANG=...>	--	
		<STRONG LANGUAGE=...>	--	
		<STRONG STYLE=...>	--	
		<STRONG TITLE=...>	--	
<SUB>	Subscript	<SUB>	●	
		<SUB CLASS=...>	--	
		<SUB DIR=...>	--	
		<SUB ID=...>	--	
		<SUB LANG=...>	--	
		<SUB LANGUAGE=...>	--	
		<SUB STYLE=...>	--	
		<SUB TITLE=...>	--	
<SUP>	Superscript	<SUP>	●	
		<SUP CLASS=...>	--	
		<SUP DIR=...>	--	
		<SUP ID=...>	--	
		<SUP LANG=...>	--	
		<SUP LANGUAGE=...>	--	
		<SUP STYLE=...>	--	
		<SUP TITLE=...>	--	
<TABLE>	Table	<TABLE>	●	
		<TABLE ALIGN= CENTER>	●	
		<TABLE ALIGN= LEFT>	●	
		<TABLE ALIGN= RIGHT>	●	
		<TABLE BACKGROUND=...>	--	
		<TABLE BGCOLOR=...>	●	
		<TABLE BORDER=...>	●	
		<TABLE BORDERCOLOR=...>	--	
		<TABLE BORDERCOLORDARK=...>	--	
		<TABLE BORDERCOLORLIGHT=...>	--	
		<TABLE CELLPADDING=...>	●	
		<TABLE CELLSPACING=...>	●	
		<TABLE CLASS=...>	--	
		<TABLE COLS=...>	--	
		<TABLE DATAPAGESIZE=...>	--	
		<TABLE DATAFLD=...>	--	
		<TABLE DATAFORMATS=...>	--	
		<TABLE DATASRC=...>	--	
		<TABLE DIR=...>	--	
		<TABLE FRAME= ABOVE>	--	

Tag	Function	Attribute	iPendant	Remarks
		<TABLE FRAME= BELOW>	--	
		<TABLE FRAME= BORDER>	--	
		<TABLE FRAME= BOX>	--	
		<TABLE FRAME= HSIDES>	--	
		<TABLE FRAME= LHS>	--	
		<TABLE FRAME= RHS>	--	
		<TABLE FRAME= VOID>	--	
		<TABLE FRAME= VSIDES>	--	
		<TABLE HEIGHT=...>	--	
		<TABLE HSPACE=...>	●	
		<TABLE ID=...>	--	
		<TABLE LANG=...>	--	
		<TABLE LANGUAGE=...>	--	
		<TABLE RULES= ALL>	--	
		<TABLE RULES= COLS>	--	
		<TABLE RULES= GROUPS>	--	
		<TABLE RULES= NONE>	--	
		<TABLE RULES= ROWS>	--	
		<TABLE STYLE=...>	--	
		<TABLE SUMMARY=...>	--	
		<TABLE TITLE=...>	--	
		<TABLE VSPACE=...>	●	
		<TABLE WIDTH=...>	●	
<TD>	Table data cell element	<TD>	●	
		<TD ABBR=...>	--	
		<TD ALIGN= CENTER>	●	
		<TD ALIGN= CHAR>	--	
		<TD ALIGN= JUSTIFY>	--	
		<TD ALIGN= LEFT>	●	
		<TD ALIGN= RIGHT>	●	
		<TD AXIS=...>	--	
		<TD BACKGROUND=...>	--	
		<TD BGCOLOR=...>	●	
		<TD BORDERCOLOR=...>	--	
		<TD BORDERCOLORDARK=...>	--	
		<TD BORDERCOLORLIGHT=...>	--	
		<TD CHAR=...>	--	
		<TD CHAROFF=...>	--	
		<TD CLASS=...>	--	
		<TD COLSPAN=...>	●	
		<TD DIR=...>	--	
		<TD HEADERS=...>	--	
		<TD HEIGHT=...>	●	
		<TD ID=...>	--	
		<TD LANG=...>	--	
		<TD LANGUAGE=...>	--	
		<TD NOWRAP>	●	
		<TD ROWSPAN=...>	●	
		<TD SCOPE=...>	--	
		<TD STYLE=...>	--	
		<TD TITLE=...>	--	
		<TD VALIGN= BASELINE>	●	Same as TOP.

Tag	Function	Attribute	iPendant	Remarks
		<TD VALIGN= BOTTOM >	●	
		<TD VALIGN= CENTER>	●	Same as MIDDLE.
		<TD VALIGN= MIDDLE >	●	Default.
		<TD VALIGN= TOP >	●	
		<TD WIDTH=...>	●	
<TEXTAREA>	Text area	<TEXTAREA>	●	
		<TEXTAREA ACCESSKEY=...>	--	
		<TEXTAREA ALIGN= ABSBOTTOM>	--	
		<TEXTAREA ALIGN= ABSMIDDLE>	--	
		<TEXTAREA ALIGN= BASELINE>	--	
		<TEXTAREA ALIGN= BOTTOM>	--	
		<TEXTAREA ALIGN= LEFT>	--	
		<TEXTAREA ALIGN= MIDDLE>	--	
		<TEXTAREA ALIGN= RIGHT>	--	
		<TEXTAREA ALIGN= TEXTTOP>	--	
		<TEXTAREA ALIGN= TOP>	--	
		<TEXTAREA CLASS=...>	--	
		<TEXTAREA COLS=...>	●	
		<TEXTAREA DATAFLD=...>	--	
		<TEXTAREA DATAFORMATS=...>	--	
		<TEXTAREA DATASRC=...>	--	
		<TEXTAREA DIR=...>	--	
		<TEXTAREA DISABLED>	--	
		<TEXTAREA ID=...>	--	
		<TEXTAREA LANG=...>	--	
<TEXTAREA>	Text area	<TEXTAREA LANGUAGE=...>	--	
		<TEXTAREA NAME=...>	●	
		<TEXTAREA READONLY>	●	
		<TEXTAREA ROWS=...>	●	
		<TEXTAREA STYLE=...>	--	
		<TEXTAREA TABINDEX=...>	--	
		<TEXTAREA TITLE=...>	--	
		<TEXTAREA WRAP= HARD>	--	
		<TEXTAREA WRAP= OFF>	--	
		<TEXTAREA WRAP= PHYSICAL>	--	
		<TEXTAREA WRAP= SOFT>	--	
		<TEXTAREA WRAP= VIRTUAL>	--	
<TH>	Table header element	<TH>	●	
		<TH ABBR=...>	--	
		<TH ALIGN= CENTER>	●	
		<TH ALIGN= CHAR>	--	
		<TH ALIGN= JUSTIFY>	--	
		<TH ALIGN= LEFT>	●	
		<TH ALIGN= RIGHT>	●	
		<TH AXIS=...>	--	
		<TH BACKGROUND=...>	--	
		<TH BGCOLOR=...>	●	
		<TH BORDERCOLOR=...>	--	
		<TH BORDERCOLORDARK=...>	--	

Tag	Function	Attribute	iPendant	Remarks
		<TH BORDERCOLORLIGHT=...>	--	
		<TH CHAR=...>	--	
		<TH CHAROFF=...>	--	
		<TH CLASS=...>	--	
		<TH COLSPAN=...>	●	
		<TH DIR=...>	--	
		<TH HEADERS=...>	--	
		<TH HEIGHT=...>	●	
		<TH ID=...>	--	
		<TH LANG=...>	--	
		<TH LANGUAGE=...>	--	
		<TH NOWRAP>	●	
		<TH ROWSPAN=...>	●	
		<TH SCOPE=...>	--	
		<TH STYLE=...>	--	
		<TH TITLE=...>	--	
		<TH VALIGN= BASELINE>	●	Same as TOP.
		<TH VALIGN= BOTTOM >	●	
		<TH VALIGN= CENTER>	●	Same as MIDDLE.
		<TH VALIGN= MIDDLE >	●	Default.
		<TH VALIGN= TOP >	●	
		<TH WIDTH=...>	●	
<TITLE>	Document title	<TITLE>	●	
		<TITLE DIR=...>	--	
		<TITLE ID=...>	--	
		<TITLE LANG=...>	--	
		<TITLE TITLE=...>	--	
<TR>	Table row	<TR>	●	
		<TR ALIGN= CENTER>	●	
		<TR ALIGN= CHAR>	--	
		<TR ALIGN= JUSTIFY>	--	
		<TR ALIGN= LEFT>	●	
		<TR ALIGN= RIGHT>	●	
		<TR BACKGROUND=...>	--	
		<TR BGCOLOR=...>	●	
		<TR BORDERCOLOR=...>	--	
		<TR BORDERCOLORDARK=...>	--	
		<TR BORDERCOLORLIGHT=...>	--	
		<TR CHAR=...>	--	
		<TR CHAROFF=...>	--	
		<TR CLASS=...>	--	
		<TR DIR=...>	--	
		<TR ID=...>	--	
		<TR LANG=...>	--	
		<TR LANGUAGE=...>	--	
		<TR STYLE=...>	--	
		<TR TITLE=...>	--	
		<TR VALIGN= BASELINE>	●	Same as TOP.
		<TR VALIGN= BOTTOM >	●	
		<TR VALIGN= CENTER>	●	Same as MIDDLE.
		<TR VALIGN= MIDDLE>	●	Default.

Tag	Function	Attribute	iPendant	Remarks
		<TR VALIGN= TOP >	●	
<TT>	Typewriter text	<TT>	●	Fixed font required.
		<TT CLASS=...>	--	
		<TT DIR=...>	--	
		<TT ID=...>	--	
		<TT LANG=...>	--	
		<TT LANGUAGE=...>	--	
		<TT STYLE=...>	--	
		<TT TITLE=...>	--	
<U>	Underlined text	<U>	●	
		<U CLASS=...>	--	
		<U DIR=...>	--	
		<U ID=...>	--	
		<U LANG=...>	--	
		<U LANGUAGE=...>	--	
		<U STYLE=...>	--	
		<U TITLE=...>	--	
	Unnumbered list		●	
		<UL COMPACT>	--	Normally displayed in compact format.
		<UL CLASS=...>	--	
		<UL DIR=...>	--	
		<UL ID=...>	--	
		<UL LANG=...>	--	
		<UL LANGUAGE=...>	--	
		<UL STYLE=...>	--	
		<UL TITLE=...>	--	
		<UL TYPE= DISC>	●	Only SQUARE is displayed.
		<UL TYPE= CIRCLE>	●	Only SQUARE is displayed.
		<UL TYPE= SQUARE>	●	
<VAR>	Variable	<VAR>	●	Italic font required.
		<VAR CLASS=...>	--	
		<VAR DIR=...>	--	
		<VAR ID=...>	--	
		<VAR LANG=...>	--	
		<VAR LANGUAGE=...>	--	
		<VAR STYLE=...>	--	
		<VAR TITLE=...>	--	
<XMP>	Sample text	<XMP>	●	
	(no tag interpretation)	<XMP CLASS=...>	--	
		<XMP ID=...>	--	
		<XMP LANG=...>	--	
		<XMP LANGUAGE=...>	--	
		<XMP STYLE=...>	--	
		<XMP TITLE=...>	--	

B APPENDIX B: JAVASCRIPT SUPPORTED BY IPENDANT

Key:

N/A Not applicable

● supported

-- not yet supported

x some limitation

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
Navigator	(Properties)				
	appName	●	●	●	
	appVersion	●	●	●	
	language	N/A	●	●	
	platform	N/A	●	●	
	userAgent	●	●	●	
	(Methods)				
	javaEnabled	●	●	--	
	preference	N/A	●	--	
	taintEnabled	●	N/A	--	
MimeType(mimeTypes)	(Properties)				
property of navigator	description	●	●	●	
	enabledPlugin	●	●	●	
	suffixes	●	●	●	
	type	●	●	●	
Plugin(plugins)	(Properties)				
property of navigator	description	●	●	●	
	filename	●	●	●	
	length	●	●	●	
	name	●	●	●	
Screen	(Properties)				
	availHeight	N/A	●	●	
	availWidth	N/A	●	●	
	colorDepth	N/A	●	●	
	height	N/A	●	●	
	pixelDepth	N/A	●	●	
	width	N/A	●	●	
Event	(Properties)				
	data	N/A	●	--	
	layerX	N/A	●	--	
	layerY	N/A	●	--	
	modifiers	N/A	●	--	
	pageX	N/A	●	--	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	pageY	N/A	●	--	
	screenX	N/A	●	--	
	screenY	N/A	●	--	
	target	N/A	●	--	
	type	N/A	●	--	
	which	N/A	●	--	
	x	N/A	●	--	
	y	N/A	●	--	
	(Methods)				
	handleEvent	N/A	●	--	
Object	(Properties)				
	Constructors	●	●	--	
	prototype	●	●	--	
	(Methods)				
	eval	●	●	●	
	unwatch	N/A	●	●	do not function
	valueOf	●	●	●	
	watch	N/A	●	●	do not function
	toString	●	●	●	
	(Constructors)				
	new Object ()	●	●	●	
Boolean	(Constructors)				
	new Boolean ()	●	●	●	
Number	(Properties)				
	MAX_VALUE	●	●	●	
	MIN_VALUE	●	●	●	
	NaN	●	●	●	
	NEGATIVE_INFINITY	●	●	●	
	POSITIVE_INFINITY	●	●	●	
	(Constructors)				
	new Number ()	●	●	●	
Function	(Properties)				
	arguments	●	●	●	
	arguments.length	●	●	●	
	arity	●	●		
	caller	●	●	--	
	(Constructors)				
	new Function ()	●	●	●	
Date	(Methods)				
	getDate	●	●	●	
	getDay	●	●	●	
	getHours	●	●	●	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	getMinutes	•	•	•	
	getMonth	•	•	•	
	getSeconds	•	•	•	
	getMilliseconds	N/A	N/A	•	
	getTime	•	•	•	
	getTimezoneOffset	•	•	•	
	getYear	•	•	•	
	parse	•	•	x	only the following format is supported. (Wen Jan 02 02:03:55 1980 (GMT))
	setDate	•	•	•	
	setHours	•	•	•	
	setMinutes	•	•	•	
	setMonth	•	•	•	
	setSeconds	•	•	•	
	setMilliseconds	N/A	N/A	•	
	setTime	•	•	•	
	setYear	•	•	•	
	toGMTString	•	•	x	the same format as toLocaleString (Wen Jan 02 02:03:55 1980 GMT)
	toLocaleString	•	•	x	the same format as toGMTString (Wen Jan 02 02:03:55 1980)
	UTC	•	•	•	
	(Constructors)				
	new Date ()	•	•	•	
Math	(Properties)				
	E	•	•	•	
	LN 1 0	•	•	•	
	LN2	•	•	•	
	LOG 1 0E	•	•	•	
	LOG2E	•	•	•	
	PI	•	•	•	
	SQRT 1 _2	•	•	•	
	SQRT2	•	•	•	
	(Methods)				
	abs	•	•	•	
	acos	•	•	•	
	asin	•	•	•	
	atan	•	•	•	
	atan2	•	•	•	
	ceil	•	•	•	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	cos	•	•	•	
	exp	•	•	•	
	floor	•	•	•	
	log	•	•	•	
	max	•	•	•	
	min	•	•	•	
	pow	•	•	•	
	random	•	•	•	
	round	•	•	•	
	sin	•	•	•	
	sqrt	•	•	•	
	tan	•	•	•	
Array	(Properties)				
	length	•	•	•	
	(Methods)				
	concat	N/A	•	•	
	join	•	•	•	
	pop	N/A	•	•	
	push	N/A	•	•	
	reverse	•	•	•	
	shift	N/A	•	•	
	slice	N/A	•	•	
	splice	N/A	•	•	
	sort	•	•	x	argument ignored
	unshift	N/A	•	•	
history	(Properties)				
property of window	current	•	•	•	
	length	•	•	•	
	next	•	•	--	
	previous	•	•	--	
	(Methods)				
	back	•	•	•	
	forward	•	•	•	
	go	•	•	•	
location	(Properties)				
property of window	hash	•	•	--	
	host	•	•	•	
	hostname	•	•	•	
	href	•	•	•	
	pathname	•	•	•	
	port	•	•	•	
	protocol	•	•	•	
	search	•	•	•	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPenda t	COMMENTS
	(Methods)				
	reload	•	•	x	argument ignored. always reload from server.
	replace	•	•	•	
String	(Properties)				
	length	•	•	•	
	(Methods)				
	anchor	•	•	•	
	big	•	•	•	
	blink	•	•	•	
	bold	•	•	•	
	charAt	•	•	•	
	charCodeAt	N/A	•	--	
	concat	N/A	•	•	
	fixed	•	•	•	
	fontcolor	•	•	•	
	fontSize	•	•	•	
	fromCharCode	N/A	•	--	
	indexOf	•	•	•	
	italics	•	•	•	
	lastIndexOf	•	•	•	
	link	•	•	•	
	match	N/A	•	--	
	replace	N/A	•	--	
	search	N/A	•	--	
	slice	N/A	•	•	
	small	•	•	•	
	split	•	•	x	regular expression is not supported.(JavaScrip t 1.1)
	strike	•	•	•	
	sub	•	•	•	
	substr	N/A	•	•	
	substring	•	•	•	
	sup	•	•	•	
	toLowerCase	•	•	•	
	toUpperCase	•	•	•	
	(Constructors)				
	new String	•	•	•	
window	(Properties)				
	closed	•	•	•	always false
	defaultStatus	•	•	•	
	innerHeight	N/A	•	•	
	innerWidth	N/A	•	•	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	length	●	●	●	
	name	●	●	●	
	opener	●	●	●	
	parent	●	●	●	
	locationbar.visible	N/A	●	●	always false
	menubar.visible	N/A	●	●	always false
	outerHeight	N/A	●	●	
	outerWidth	N/A	●	●	
	pageXOffset	N/A	●	●	always 0
	pageYOffset	N/A	●	●	always 0
	personalbar.visible	N/A	●	●	always false
	scrollbars.visible	N/A	●	●	always false
	self	●	●	●	
	status	●	●	●	
	statusbar	N/A	●	--	
	toolbar.visible	N/A	●	●	always false
	top	●	●	●	
	window	●	●	●	
	(Methods)				
	alert	●	●	●	
	back	N/A	●	●	
	blur	●	●	●	
	captureEvents	N/A	●	--	
	clearInterval	N/A	●	●	
	clearTimeout	●	●	●	
	close	●	●	--	
	confirm	●	●	●	
	disableExternalCapture	N/A	●	--	
	enableExternalCapture	N/A	●	--	
	find	N/A	●	--	
	focus	●	●	●	
	forward	N/A	●	●	
	home	N/A	●	●	
	moveBy	N/A	●	--	
	moveTo	N/A	●	--	
	open	0	●	--	
	print	N/A	●	--	
	prompt	●	●	●	
	releaseEvents	N/A	●	--	
	resizeBy	N/A	●	--	
	resizeTo	N/A	●	--	
	routeEvent	N/A	●	--	
	scroll	●	●	●	
	scrollBy	N/A	●	●	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	scrollTo	N/A	●	●	
	setInterval	N/A	●	x	setInterval (expression,msec) Syntax only
	setTimeout	●	●	x	setTimeout (expression,msec) Syntax only
	stop	N/A	●	●	
	(Event Handlers)				
	onBlur	●	●	●	
	onDragDrop	N/A	●	--	
	onError	●	●	--	
	onFocus	●	●	●	
	onLoad	●	●	●	
	onMove	N/A	●	--	
	onResize	N/A	●	--	
	onUnload	●	●	●	
	(Constructors)				
	new window()	N/A	N/A	--	
Frame(frames)	the same as window				
document	(Properties)				
property of window	alinkColor	●	●	x	cannot set this property after the HTML source has been rendered
	bgColor	●	●	x	cannot set this property after the HTML source has been rendered
	cookie	●	●	●	
	domain	●	●	--	
	fgColor	●	●	x	cannot set this property after the HTML source has been rendered
	lastModified	●	●	x	always empty string
	linkColor	●	●	x	cannot set this property after the HTML source has been rendered
	referrer	●	●	●	
	title	●	●	●	
	URL	●	●	●	
	vlinkColor	●	●	x	cannot set this property after the HTML source has been rendered
	(Methods)				
	captureEvents	N/A	●	--	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	close	●	●	●	
	getSelection	N/A	●	--	
	open	●	●	●	
	releaseEvents	N/A	●	--	
	routeEvent	N/A	●	--	
	write	●	●	●	
	writeln	●	●	●	
	(Event Handlers)				
	onClick	N/A	●	--	
	onDbClick	N/A	●	--	
	onKeyDown	N/A	●	--	
	onKeyPress	N/A	●	--	
	onKeyUp	N/A	●	--	
	onMouseDown	N/A	●	--	
	onMouseUp	N/A	●	--	
Anchor (anchors)	(Properties)				
property of document	name	●	●	●	
	text	N/A	●	--	
Applet(applets)	(Properties)				
property of document	name	●	●	●	
	(Methods)				
	all public methods of the applet	N/A	N/A	--	
Image(images)	(Properties)				
property of document	border	●	●	●	
	complete	●	●	●	
	height	●	●	●	
	hspace	●	●	●	
	lowsrc	●	●	--	
	name	●	●	●	
	src	●	●	●	
	vspace	●	●	●	
	width	●	●	●	
	(Event Handlers)				
	onabort	●	●	●	
	onError	●	●	●	do not function
	onKeyDown	N/A	●	--	
	onKeyPress	N/A	●	--	
	onKeyUp	N/A	●	--	
	onLoad	●	●	●	
Link(links)	(Properties)				
property of document	hash	●	●	●	
	host	●	●	●	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	hostname	●	●	●	
	href	●	●	●	
	pathname	●	●	●	
	port	●	●	●	
	protocol	●	●	●	
	search	●	●	--	
	target	●	●	●	
	(Event Handlers)				
	onClick	●	●	●	
	onKeyDown	N/A	●	--	
	onKeyPress	N/A	●	--	
	onKeyUp	N/A	●	--	
	onMouseDown	N/A	●	--	
	onMouseOut	●	●	●	
	onMouseOver	●	●	●	
	onMouseUp	N/A	●	--	
Layer(layers)	(Properties)				
property of document	above	N/A	●	--	
	background	N/A	●	--	
	below	N/A	●	--	
	bgColor	N/A	●	--	
	clip.bottom	N/A	●	--	
	clip.height	N/A	●	--	
	clip.left	N/A	●	--	
	clip.right	N/A	●	--	
	clip.top	N/A	●	--	
	clip.width	N/A	●	--	
	hidden	N/A	●	--	
	id	N/A	●	--	
	left	N/A	●	--	
	name	N/A	●	--	
	pageX	N/A	●	--	
	pageY	N/A	●	--	
	parentLayer	N/A	●	--	
	siblingAbove	N/A	●	--	
	siblingBelow	N/A	●	--	
	src	N/A	●	--	
	top	N/A	●	--	
	visibility	N/A	●	--	
	x	N/A	●	--	
	y	N/A	●	--	
	zIndex	N/A	●	--	
	(Methods)				
	captureEvents	N/A	●	--	
	load	N/A	●	--	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	moveAbove	N/A	●	--	
	moveBelow	N/A	●	--	
	moveBy	N/A	●	--	
	moveTo	N/A	●	--	
	moveToAbsolute	N/A	●	--	
	releaseEvents	N/A	●	--	
	resizeBy	N/A	●	--	
	resizeTo	N/A	●	--	
	(Event Handlers)				
	onBlur	N/A	●	--	
	onFocus	N/A	●	--	
	onLoad	N/A	●	--	
	onMouseOut	N/A	●	--	
	onMouseOver	N/A	●	--	
Form(forms)	(Properties)				
property of document	action	●	●	●	
	elements	●	●	●	
	encoding	●	●	●	
	length	●	●	●	
	name	●	●	●	
	method	●	●	●	
	target	●	●	●	
	(Methods)				
	reset	●	●	●	
	submit	●	●	●	
	(Event Handlers)				
	onReset	●	●	●	
	onSubmit	●	●	●	
Button	(Properties)				
property of Form	form	●	●	●	
	name	●	●	●	
	type	●	●	●	
	value	●	●	●	
	(Methods)				
	blur	●	●	●	
	click	●	●	●	
	focus	●	●	●	
	(Event Handlers)				
	onBlur	●	●	●	
	onClick	●	●	●	
	onFocus	●	●	●	
	onMouseDown	N/A	●	--	
	onMouseUp	N/A	●	--	
Checkbox	(Properties)				

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPenda t	COMMENTS
property of Form	checked	•	•	•	
	defaultChecked	•	•	•	
	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	click	•	•	•	
	focus	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onClick	•	•	•	
	onFocus	•	•	•	
	onMouseDown	N/A	•	--	
	onMouseUp	N/A	•	--	
FileUpload	(Properties)				
property of Form	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	focus	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onChange	•	•	•	
	onFocus	•	•	•	
	onKeyDown	N/A	•	--	
	onKeyPress	N/A	•	--	
	onKeyUp	N/A	•	--	
Hidden	(Properties)				
property of Form	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
Password	(Properties)				
property of Form	defaultValue	•	•	•	
	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	focus	•	•	•	
	select	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onFocus	•	•	•	
	onKeyDown	N/A	•	--	
	onKeyPress	N/A	•	--	
	onKeyUp	N/A	•	--	
Radio	(Properties)				
property of Form	checked	•	•	•	
	defaultChecked	•	•	•	
	form	•	•	•	
	length	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	click	•	•	•	
	focus	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onClick	•	•	•	
	onFocus	•	•	•	
	onMouseDown	N/A	•	--	
	onMouseUp	N/A	•	--	
Reset	(Properties)				
property of Form	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	click	•	•	•	
	focus	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onClick	•	•	•	
	onFocus	•	•	•	
	onMouseDown	N/A	•	--	
	onMouseUp	N/A	•	--	
Submit	(Properties)				
property of Form	form	•	•	•	
	name	•	•	•	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPenda t	COMMENTS
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	click	•	•	•	
	focus	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onClick	•	•	•	
	onFocus	•	•	•	
	onMouseDown	N/A	•	--	
	onMouseUp	N/A	•	--	
Text	(Properties)				
property of Form	defaultValue	•	•	•	
	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	focus	•	•	•	
	select	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onChange	•	•	•	
	onFocus	•	•	•	
	onKeyDown	N/A	•	--	
	onKeyPress	N/A	•	--	
	onKeyUp	N/A	•	--	
	onSelect	•	•	--	
Textarea	(Properties)				
property of Form	defaultValue	•	•	•	
	form	•	•	•	
	name	•	•	•	
	type	•	•	•	
	value	•	•	•	
	(Methods)				
	blur	•	•	•	
	focus	•	•	•	
	select	•	•	•	
	(Event Handlers)				
	onBlur	•	•	•	
	onChange	•	•	•	
	onFocus	•	•	•	

OBJECTS		JavaScript 1.1	JavaScript 1.2		
		(Netscape3.0)	(Netscape4.0)	iPendan t	COMMENTS
	onKeyDown	N/A	●	--	
	onKeyPress	N/A	●	--	
	onKeyUp	N/A	●	--	
	onSelect	●	●	--	
Select	(Properties)				
property of Form	form	●	●	●	
	length	●	●	●	
	name	●	●	●	
	options	●	●	●	
	selectedIndex	●	●	●	
	type	●	●	●	
	(Methods)				
	blur	●	●	●	
	focus	●	●	●	
	(Event Handlers)				
	onBlur	●	●	●	
	onChange	●	●	●	
	onFocus	●	●	●	
Option(options)	(Properties)				
property of Select	defaultSelected	●	●	●	
	selected	●	●	●	
	text	●	●	●	
	value	●	●	●	
	(Constructors)				
	new Option()	●	●	--	

C APPENDIX C: EXTENDED STATUS TEMPLATE

```

<html>
<head>
<title>Extended Status</title>
<script language="JavaScript"><!--
function NotifyTPTX() {
    // Notify TPTX softpart that extended status #EXTNUM is loaded in browser
    // TPTX must be loaded in SID_HTTPPEX
    // #define tpf_c_gtp_ext_c (SSC_TP*0x10000 + 44)
    window.location.href =
        "/SOFTPART/tptx?fc=0x9002C&idx=#EXTNUM";
}
//--></script>
</head>
<body onload="NotifyTPTX()">
<font face="Arial">
    <table border="0" cellpadding="0" cellspacing="5" width="100%">
        <tr>
            <td width="2%">
                <!-- ***** -->
                <!-- Add your image here -->
                <!-- ***** -->
                
            </td>
            <td width="98%">
                <!-- ***** -->
                <!-- Add your title here -->
                <!-- ***** -->
                <a href="#EXTPAGE.stm"><font color=black>Title</font></a>
            </td>
        </tr>
        <tr>
            <td width="100%" bgcolor="#C6F9E3" colspan="2">
                <!-- ***** -->
                <!-- Add your code here -->
                <!-- To avoid scroll bars -->
                <!-- width = 200, height = 280 -->
                <!-- ***** -->
            </td>
        </tr>
    </table>
</font>
</body>
</html>

```

NOTE

#EXTNUM and #EXTPAGE are placeholders. They will be replaced with the correct values after the Extended Status pages are generated.

D APPENDIX D: CUSTOM SCREEN EXAMPLES

D.1 Using tables to set size

The following example is also included with the iPendant Controls setup. (wtest.stm). This file sets up a table with 2 columns. The first column defines the height of the table by setting the column Height (365) and inserting a 1x1 pixel gif image into it. The table width is set by the width of the first column (5) and the width of the first row of the second column (623), which also has this 1x1 pixel image. A 1x1 pixel image is used instead of a non-blanking space, which takes up more height. To add you information and controls, insert a second table into the cell which contains the "Insert a new...", replacing this text.

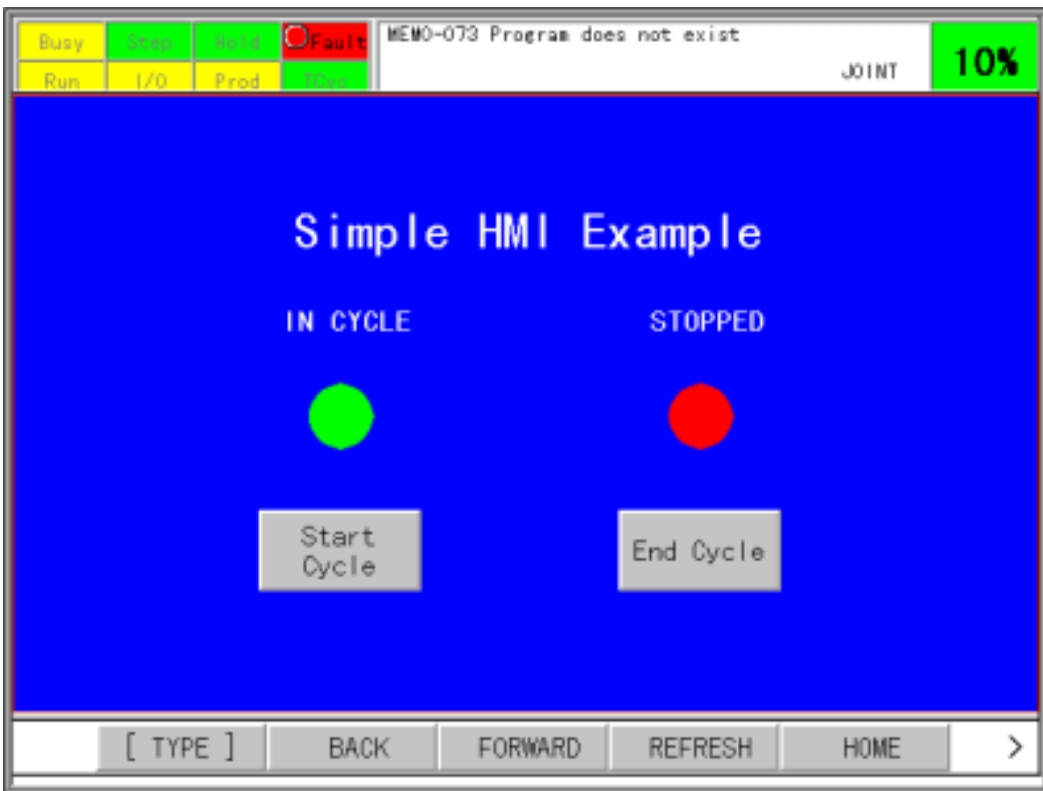
(wtest.stm)

```
<html>
<head>
<meta http-equiv="Content-Language" content="en-us">
<meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<meta name="GENERATOR" content="Microsoft FrontPage 4.0">
<meta name="ProgId" content="FrontPage.Editor.Document">
<title>628 x 365</title>
</head>
<body bgcolor="#00FFFF">
<div align="left">
  <table border="0" cellpadding="0" bgcolor="#0000FF" cellspacing="0">
    <tr>
      <td valign="top" align="left" height="365" bgcolor="#FF00FF" width="5"
        rowspan="2"></td>
      <td valign="top" align="left" bgcolor="#FF00FF" height="5" width="623"></td>
    </tr>
    <tr>
      <td valign="middle" align="center">
        <p align="center"><font size="6">Insert a new table in this</font></p>
        <p align="center"><font size="6">space for your controls</font></p>
      </td>
    </tr>
  </table>
</div>
</body>
</html>
```



D.2 Simple HMI Example

The following example is also included with the iPendant Controls setup. (examp_1.stm). Refer to this file for the actual source code. This file uses the example above and creates a simple HMI screen by adding a second table within the main table and then inserting the iPendant Controls and Text into this new table.



D.3 Form Example

D.3.1 Overview

The following example illustrates how to use standard HTML form components like buttons to interact with a KAREL program running on the robot to cause actions to occur. These can be anything that can be done from a KAREL program, including running programs, setting variables, registers and I/O. This is intended to be a simple example of what can be done. Many of these operations can be accomplished using the iPendant Controls without the need to have a KAREL program, however, the methods illustrated here can be used to perform complex functions that cannot be done with the iPendant Controls.

The basic operation of the example is: The FORM components are set up as SUBMIT buttons. The SUBMIT action sends the parameters to the web server (in this case the robot controller). One of the parameters passed from the HTML page is the KAREL program that is run to process the other parameters (in this case mpnlsvr). The Web Server starts the KAREL program and passes the parameters (via variables declared in the KAREL program). The KAREL program parses the parameters, performs the appropriate action, sends a status back to the Web Server, and EXITS. (For more information on using KAREL with the Web Server, see the Web Server Chapter in the R-30iA Internet Options Manual)

Both the HTML file (forms.stm) and the source and executable files for the KAREL Program (mpnlsvr.kl and mpnlsvr.pc) are included with the iPendant Controls setup for your reference.

D.3.2 Web Page

The following is the HTML page shown on the iPendant.

The screenshot shows a KAREL control interface. At the top, there is a status bar with buttons for 'Busy', 'Sleep', 'Hold', 'Fault' (with a red circle icon), 'Run', 'I/O', 'Prod', and 'Tidy'. To the right of these buttons is a 'JOINT' label and a green box displaying '100%'. Below the status bar is a large blue area titled 'FORM EXAMPLE'. Inside this area are four buttons: 'Reset Parts Counter (Numreg[1])', 'Run TP Program Part1', 'Auto Mode (DOUT[1])', and 'GenOverride=100'. At the bottom of the interface is a navigation bar with buttons for '[TYPE]', 'BACK', 'FORWARD', 'REFRESH', 'HOME', and a right-pointing arrow '>'.

Below is the portion of the HTML code that defines the Reset Parts Counter Button.

```
<form action="/KAREL/mpnlsvr" method="GET">
  <div align="center">
    <input type="hidden" name="object" value="numreg">
    <input type="hidden" name="operate" value="setint">
    <input type="hidden" name="index" value="1">
    <input type="hidden" name="value" value="0">
    <input type="submit" value="Reset Parts Counter (Numreg[1]) ">
  </div>
</form>
```

The form "action" is defined to run the program mpnlsvr (which has been loaded on the controller). All of the parameters that are to be passed to the KAREL program are defined as "hidden" types. Note the "Name" of each of the hidden parameters is the variable in the KAREL program. Pushing this button on the iPendant will cause NUMREG[1] to be set to 0.

D.3.3 KAREL Program

The following are key sections of the example KAREL program (mpnlsvr.kl). This program is run whenever a button on the HTML form is "pressed". It shows how the different commands that can be input, are processed.

-- Example KAREL program

```
program mpnlsvr
.
.
.
var

-- Declare HTML parameter names and value
object  : string[12]
pname   : string[12]
operate : string[12]
index   : string[12]
value   : string[12]
URL     : string[128]
vname   : string[128]
```

```

-- These are duplicates that will be used to
-- convert the input parameters to Upper case

uobject : string[12]
uoperate: string[12]
uindex  : string[12]
uvalue  : string[12]
upname  : string[12]
uvname  : string[128]

-- Misc Variables
.
.
.
-- Convert input string to Uppercase for consistent comparison
routine toupper(p_char: integer): string
begin
  if (p_char > 96) and (p_char < 123) then
    p_char = p_char - 32
  endif
  return (chr(p_char))
end toupper

begin
-- Good practice to check for uninitialized variables before using them
.
.
.
-- Change all character of input parameters to uppercase for string comparison
.
.
.
-- Handle setting DOUTs
if (uobject = 'DOUT') then
  if (uoperate = 'SET') then
    cnv_str_int(uindex, index_i)
    if (uvalue = 'ON') then
      DOUT[index_i] = ON
    endif
    if (uvalue = 'OFF') then
      DOUT[index_i] = OFF
    endif
  endif
endif
.
.
.
-- Handle Setting Numreg values
if (uobject = 'NUMREG') then
  cnv_str_int(uindex, index_i)
  if (uoperate = 'SETINT') then
    cnv_str_int(uvalue, value_i)
    set_int_reg(index_i, value_i, status)
  endif

  if (uoperate = 'SETREAL') then
    cnv_str_real(uvalue, value_r)
    set_real_reg(index_i, value_r, status)
  endif
endif

-- Handle Running and Aborting a program
if (uobject = 'PROG') then

```

```
    if (uoperate = 'RUN') then
        kcommand = 'RUN ' + upname
        KCL_no_wait (kcommand, status)
    else
        kcommand = 'ABORT ' + upname
        KCL_no_wait (kcommand, status)
    endif
endif

-- Handle Setting a System Variable

if (uobject = 'SYSVAR') then
    if (uoperate = 'SETINT') then
        cnv_str_int(uvalue, value_i)
        set_var(entry, '*SYSTEM*', uvname, value_i, status)
    endif

    if (uoperate = 'SETREAL') then
        cnv_str_real(uvalue, value_r)
        set_var(entry, '*SYSTEM*', uvname, value_r, status)
    endif

    if (uoperate = 'SETSTR') then
        set_var(entry, '*SYSTEM*', uvname, uvalue, status)
    endif
endif

-- Return a NO RESPONSE Required code

return_code = 204

end mpnlsvr
```

E APPENDIX E: USING DISCTRL_FORM TO DISPLAY A WEB PAGE

E.1 Overview

The KAREL built-in DISCTRL_FORM can be used to display and control a web page on the teach pendant screen. This is an existing built-in that is documented in the KAREL Reference Manual. It is normally used to display and control a dictionary form. When using it to display a web page, a dictionary form is not used and many of the parameters are not used.

Syntax : DISCTRL_FORM(dict_name, ele_number, value_array, inact_array, change_array, term_mask, def_item, term_char, status)

Input/Output Parameters :

```
[in] dict_name : STRING
[in] ele_number : INTEGER
[in] value_array : ARRAY OF STRING
[in] inact_array : ARRAY OF BOOLEAN
[out] change_array : ARRAY OF BOOLEAN
[in] term_mask : INTEGER
[out] def_item : INTEGER
[out] term_char : INTEGER
[out] status : INTEGER
```

%ENVIRONMENT Group :PBcore

Details:

- *dict_name* is the URL of the web page.
- *ele_number* is not used.
- *value_array* is not used. It can be declared as an ARRAY[1] of STRING[1] and left uninitialized.
- *inactive_array* is not used. It can be declared as an ARRAY[1] of BOOLEAN and left uninitialized.
- *change_array* is an array of Booleans that corresponds to each control in the web page.
 - If the corresponding value is set, then the Boolean will be set to TRUE, otherwise it is set to FALSE. You do not need to initialize the array.
 - The array size can be greater than or less than the number of controls in the web page.
 - If *change_array* is not used, an array size of 1 can be used.
- *term_mask* is a bit-wise mask indicating conditions that will terminate the web page. This should be an OR of the constants defined in the include file *klevmsk.kl*.
 - kc_func_key* -- Function keys
 - kc_enter_key* -- Enter and Return keys
 - kc_prev_key* -- PREV key
 If either a ButtonChange Control or a new menu is selected, the web page will always terminate, regardless of *term_mask*.
- *def_item* is not used on input. *def_item* returns the item that was currently highlighted when the termination character was pressed. *def_item* will be dynamically changed as the controls receive focus.
- *term_char* receives a code indicating the character or other condition that terminated the web page. The codes for key terminating conditions are defined in the include file *klevkeys.kl*. Keys normally returned are pre-defined constants as follows:
 - ky_undef* -- No termination character was pressed
 - ky_select* -- A ButtonChange Control was selected
 - ky_new_menu* -- A new menu was selected
 - ky_f1* -- Function key 1 was selected
 - ky_f2* -- Function key 2 was selected
 - ky_f3* -- Function key 3 was selected
 - ky_f4* -- Function key 4 was selected
 - ky_f5* -- Function key 5 was selected
 - ky_f6* -- Function key 6 was selected
 - ky_f7* -- Function key 7 was selected
 - ky_f8* -- Function key 8 was selected

- ky_f9 -- Function key 9 was selected
- ky_f10 -- Function key 10 was selected
- DISCTRL_FORM will display the web page on the teach pendant device.
- *status* explains the status of the attempted operation. If *status* returns a value other than 0, an error has occurred.

Note
DISCTRL_FORM will only display the web page if the USER2 menu is the selected menu. Therefore, use FORCE_SPMENU(device_stat, SPI_TPUSER2, 1) before calling DISCTRL_FORM to force the USER2 menu.

E.2 Web Page Example 1

The following is a simple HTML page (execkex1.stm) shown on the iPendant, which allows the selection of a menu item.

Busy Stop Hold Fault Focus on 1 JOINT 10%

Run I/O Prod Test

KAREL FORM EXAMPLE 1

Menu Item 1

Menu Item 2

Menu Item 3

Menu Item 4

Menu Item 5

An Execution control is placed on the web page with the following properties. The Name must be webexec and the type must be SOFTPART. Otherwise DISCTRL_FORM will not operate correctly.

If Click Events is checked, then the ButtonChange objects will cause the form to exit with *term_char* = *ky_select* and *def_item* will equal the Object Tag selected. (i.e. If M2 is selected, *def_item* = 2.)

If Change Events is checked, then the objects that change a value will cause an element in *change_array* to be set TRUE. The element set will be the Object Tag that was changed. (i.e. If V5 is changed, *change_array*[5] is TRUE.)

If Focus Events is checked, then *def_item* will be updated with the currently focused object. (i.e. If M4 has focus, then *def_item* = 4.)

General	General2	Indirect	Object Tag	Parameters
---------	----------	----------	------------	------------

Name:

Type:

☒ Click Events

☒ Change Events

☒ Focus Events

In the example, there are 5 ButtonChange Controls for the menu items. The PageName is not used.

The id's for the ButtonChange Controls are labeled "M1" to "M5". When computing the number from the Object Tag, the letters are ignored.

Indirect	Object Tag	Parameters		
General	Images	Style	Colors	Fonts

Caption:

ViewType:

PageName: ...

Indirect	Object Tag	Parameters
Name: M1	Style...	

E.3 KAREL Program Example 1

The following is the KAREL program (execkex1.kl).

```
--
-- KAREL program to run web pages using DISCTRL_FORM
--
PROGRAM execkex1
%NOLOCKGROUP
%ENVIRONMENT UIF
%INCLUDE klevccdf

VAR
  value_array: ARRAY[1] OF STRING[1]
  inactive_array: ARRAY[1] OF BOOLEAN
  change_array: ARRAY[1] OF BOOLEAN
  def_item: INTEGER
  def_item_sav: INTEGER
  term_char: INTEGER
  status: INTEGER

ROUTINE notify_user
  BEGIN
    def_item_sav = def_item
    WRITE TPERROR (CHR(cc_clear_win))
    WRITE TPERROR ('Focus on ', def_item::1)
  END notify_user

BEGIN
  condition[1]:
  when def_item <> def_item_sav do
    notify_user
    enable condition[1]
  endcondition
  --
  -- /MC/EXECKEX1.STM: contains selectable menu items
  --
  FORCE_SPMENU(tp_panel, SPI_TPUSER2, 1)
  def_item = 1 -- start with menu item 1
  def_item_sav = 1
  enable condition[1]
  DISCTRL_FORM(
    '/MC/EXECKEX1.STM', -- dict_name contains web page
    0, -- ele_number not used
    value_array, -- not used
    inactive_array, -- not used
    change_array, -- not used in this web page
    0, -- term_mask not used in this web page
    def_item, term_char, status)
  disable condition[1]
  WRITE TPERROR (CHR(cc_clear_win))
  IF status <> 0 THEN
    WRITE TPERROR ('DISCTRL_FORM status ', status)
    ABORT
  ELSE
    IF term_char = ky_select THEN
      WRITE TPERROR ('Menu item ', def_item::1, ' was selected.')
    ENDIF
  ENDIF
END execkex1
```

E.4 Web Page Example 2

The following is an HTML page (execkex2.stm) shown on the iPendant, which allows the editing of different types of values.

Busy	Stop	Hold	Fault	Focus on 2	10%
Run	I/O	Prod	IOvs	HRTL-050 Network is down JOINT	

KAREL FORM EXAMPLE 2

Integer:

Integer:

Real:

Boolean:

String:

String:

Byte:

	F2	F3	F4	EXIT	>
--	----	----	----	------	---

An Execution control is placed on the web page with Name = webexec, Type = SOFTPART, Check Events, Change Events, and Focus Events are checked. Each EditText Control has a name starting with V1 and ending with V18.

E.5 KAREL Program Example 2

The following is the KAREL program (execkex2.kl).

```
--
-- KAREL program to run web pages using DISCTRL_FORM
--
PROGRAM execkex2
%NOLOCKGROUP
%ENVIRONMENT UIF

%INCLUDE klevccdf

TYPE
    mystruc = STRUCTURE
        byte_var1: BYTE
        byte_var2: BYTE
        short_var: SHORT
    ENDSTRUCTURE

VAR
    value_array: ARRAY[1] OF STRING[1]
    vptr_array: ARRAY[1] OF INTEGER
    inact_array: ARRAY[1] OF BOOLEAN
    change_array: ARRAY[20] OF BOOLEAN
    def_item: INTEGER
    def_item_sav: INTEGER
    term_char: INTEGER
    status: INTEGER
    idx: INTEGER
    done: BOOLEAN

    int_var1: INTEGER
    int_var2: INTEGER
    real_var: REAL
    bool_var: BOOLEAN
    str_var1: STRING[20]
    str_var2: STRING[12]
    struc_var: mystruc
    term_text: STRING[12]
    color_sel1: INTEGER
    color_sel2: INTEGER
    color_text1: STRING[12]
    color_text2: STRING[12]
    prog_name1: STRING[12]
    prog_name2: STRING[12]
    prog_name3: STRING[12]
    prog_name4: STRING[12]
    choices: ARRAY[100] OF STRING[12]

ROUTINE notify_user
    BEGIN
        def_item_sav = def_item
        WRITE TPEERROR (CHR(cc_clear_win))
        WRITE TPEERROR ('Focus on ', def_item::1)
    END notify_user

BEGIN
    condition[1]:
        when def_item <> def_item_sav do
            notify_user
            enable condition[1]
        endcondition
```

```

--
--      /MC/EXECKEX2.STM:  contains edit data items
--
FORCE_SPMENU(tp_panel, SPI_TPUSER2, 1)

-- The combo boxes uses WEBF dictionary
-- Make sure 'WEBF' dictionary is added.
CHECK_DICT('WEBF', 1, status)
IF status <> 0 THEN
    ADD_DICT('WEBF', 'WEBF', dp_default, dp_cmos, status)
ENDIF

-- Initialize variables
int_var1 = 12345
str_var1 = 'This is a test'
choices[1] = ''      -- not used
choices[2] = 'Red'    -- corresponds to color_sel2 = 1
choices[3] = 'Blue'   -- corresponds to color_sel2 = 2
choices[4] = 'Green'  -- corresponds to color_sel2 = 3
choices[5] = 'Yellow' -- corresponds to color_sel2 = 4
FOR idx = 6 TO 100 DO
    CNV_INT_STR(idx - 1, 0, 0, choices[idx])
ENDFOR

done = FALSE
WHILE NOT done DO
    def_item = 1  -- start with menu item 1
    def_item_sav = 1
    enable_condition[1]
    DISCTRL_FORM(
        '/MC/EXECKEX2.STM', -- dict_name contains web page
        0,                  -- ele_number not used
        value_array,        -- not used
        inact_array,        -- not used
        change_array,       -- change_array
        0,                  -- term_mask not used in this web page
        def_item, term_char, status)
    disable_condition[1]
    done = TRUE
    WRITE TPEERROR (CHR(cc_clear_win))
    IF status <> 0 THEN
        WRITE TPEERROR ('DISCTRL_FORM status ', status)
    ELSE
        IF term_char = ky_select THEN
            WRITE TPEERROR ('Funckey ', def_item::1, ' was selected.')
            IF def_item <> 5 THEN -- F5 is EXIT
                done = FALSE
            ENDIF
        ENDIF
    ENDIF
ENDWHILE

END execkex2

```

F APPENDIX F: SYSTEM VARIABLES

From a KAREL program, it may be useful to know the web page that is being displayed in the iPendant browser. The web page is in the form of a URL.

There are a maximum of 5 iPendant connections and a maximum of 9 tasks. Each task controls a separate pane. The system variable, \$UI_PANEDATA[PANEID] will store for each pane; the current web page, the container frame, and the pane state.

[*SYSTEM*] \$UI_PANEDATA Storage: DRAM Access: RW : ARRAY[9] OF UI_PANEDAT_T

\$UI_PANEDATA[1] will always contain the primary iPendant pane information.

\$UI_PANEDATA[2] will always contain the dual iPendant pane information.

\$UI_PANEDATA[3] will always contain the third iPendant pane information.

\$UI_PANEDATA[4-9] will contain pane information for Internet Explorer connections.

\$UI_CONFIG.\$PANEMAP can be used to find the PANEID for a specific connection.

[*SYSTEM*] \$UI_CONFIG.\$PANEMAP Storage: CMOS Access: RW : ARRAY[16] OF SHORT

\$UI_PANEDATA is stored in DRAM so the values are not retained between power up. The values do not need to be saved.

[*SYSTEM*] \$UI_PANEDATA[1] Storage: DRAM Access: RW : UI_PANEDAT_T
 Field: \$UI_PANEDATA[1].\$PAGEURL Access: RW : STRING[125] = '/mc/fmt.stm'
 Field: \$UI_PANEDATA[1].\$FRAME Access: RW : STRING[41] = 'prim'
 Field: \$UI_PANEDATA[1].\$PANESTATE Access: RW : BYTE = 2
 Field: \$UI_PANEDATA[1].\$HELPURL Access: RW : STRING[125] = Uninitialized
 Field: \$UI_PANEDATA[1].\$PARAMETER1 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER2 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER3 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER4 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER5 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER6 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER7 Access: RW: STRING[41] = "
 Field: \$UI_PANEDATA[1].\$PARAMETER8 Access: RW: STRING[41] = "

\$PAGEURL will store the web page URL.

\$FRAME will store the frame name. This could be a user frame.

A user frame may be put into a pane and this may contain many web pages. Only the last requested URL and frame will be stored.

\$PANESTATE will store the document state:

UI_DISCONNECT = 0 /* connection has been disconnected */
 UI_CONNECTED = 1 /* document has been requested */
 UI_LOADED = 2 /* document is loaded */

\$HELPURL will be set by the Help Control. If \$HELPURL is set, then the Help system will use this URL instead of the default help file.

\$PARAMETER1 - \$PARAMETER8 will be set by the Execution Control and can be used as parameters to your KAREL program.

G APPENDIX G: KAREL BUILTINS

G.1 FORCE_LINK Built-in

From a KAREL program, it may be useful to display a web page in the BROWSER menu. Use FORCE_LINK built-in.

FORCE_LINK(pane_id: integer; url: string)

pane_id	Description
tp_panel = 1	Primary iPendant pane
tp2_panel = 2	Dual iPendant pane
tp3_panel = 3	Third iPendant pane
4 – 9	Panes for Internet Explorer connections

url can be any valid URL location.

Some examples:

Force fr:\pw_op1.stm into primary pane of iPendant:

```
FORCE_LINK(tp_panel, '/fr/pw_op1.stm')
```

Force fr:\pw_op1.stm into the currently focused frame of iPendant:

```
FORCE_LINK(tp_panel, 'current=/fr/pw_op1.stm')
```

Force other robot home pages into second and third pane of iPendant:

```
FORCE_LINK(tp2_panel, 'http://robot05')  
FORCE_LINK(tp3_panel, 'http://robot08')
```

Force the page in the appropriate pane to be refreshed:

```
FORCE_LINK(tp_panel, 'refresh=prim')  
FORCE_LINK(tp_panel, 'refresh=dual')  
FORCE_LINK(tp_panel, 'refresh=third')
```

G.2 GET_DEV_INFO Built-in

From a KAREL program running as a UIF task, it may be useful to know what the display device is and what it is capable of. Use the GET_DEV_INFO built-in to get this information.

GET_DEV_INFO(device_type, dev_id, pane_id, connect_id, parent, status)

All parameters are integers.

device_type returns the device type.

device_type	Description
no_uif_dev = 0	No Teach Pendant is connected
tp_uif_dev = 1	Legacy Teach Pendant is connected
ip_uif_dev = 2	iPendant is connected
ie_uif_dev = 3	KAREL program was run from Internet Explorer connection
crt_uif_dev= 254	KAREL program was run from CRT Menus

dev_id returns the Device ID.

dev_id	Description
1	Primary (left window)
2	Dual (right window)
3	Third (lower right window)

pane_id returns the Pane ID.

pane_id	Description
tp_panel = 1	Primary iPendant pane
tp2_panel = 2	Dual iPendant pane
tp3_panel = 3	Third iPendant pane
4 – 9	Panes for Internet Explorer connections

Connect_id returns the connection index.

connect_id	Description
tp_panel = 1	Teach Pendant connection
crt_panel = 254	CRT connection
2-5	Internet Explorer connections

parent returns the parent 'C' UIF task id. Internal use only.

Status returns:
 SUCCESS
 -1 for invalid
 -2 inactive connection

Some examples:

Use device_type to determine if this KAREL program was run from an Internet Explorer connection:

```
GET_DEV_INFO(device_type, dummy, dummy, dummy, dummy, status)
IF (status = 0) AND (device_type = ie_uif_dev) THEN
  -- this is an Internet Explorer connection
ENDIF
```

Use pane_id as a parameter to FORCE_LINK.

```
GET_DEV_INFO(dummy, dummy, pane_id, dummy, dummy, status)
IF (status = 0) THEN
  FORCE_LINK(pane_id, '/fr/pw_op1.stm')
ENDIF
```

G.3 Display Web Page Macro

A Teach Pendant macro called DSP_WEBP.MR is included with the Menu Utility option. It can be called from the Teach Pendant programs to display any web pages created by users for the iPendant.

User can call this macro with a parameter in the TP programs.

Usage:

CALL DSP_WEBP(1) -- Displays the Favorites menu in the BROWSER

CALL DSP_WEBP(2) -- Displays the first user created web page in the BROWSER [TYPE] pull-up

...

CALL DSP_WEBP(11) -- Displays the tenth user created web page in the [TYPE] pull-up

Parameters 2-11 are for displaying user-created web pages (created with or without the Panel Wizard).

The menu will be displayed only if the teach pendant is iPendant. It will always be displayed on the active pane on the iPendant.

Note: If this macro does not appear in the SELECT Menu or as a selection in the CALL Statement, then this option might not be loaded on your controller. In this case, you will need to load this option from the CTRL Start menu. (See the INSTALL OPTIONAL SOFTWARE section in the Software Installation Manual for more information.)

G.4 DISCTRL_DIAG

The KAREL built-in DISCTRL_DIAG can be used to display and control a dialog box on the iPendant screen. The legacies teach pendant is not supported. The built-in will return status 9147, "TP firmware version is too old".

Syntax : DISCTRL_DIAG(file_spec, term_mask, term_char, status)

Input/Output Parameters:

[in] file_spec : STRING
[in] term_mask : INTEGER
[out] term_char : INTEGER
[out] status : INTEGER

%ENVIRONMENT Group :UIF

Details:

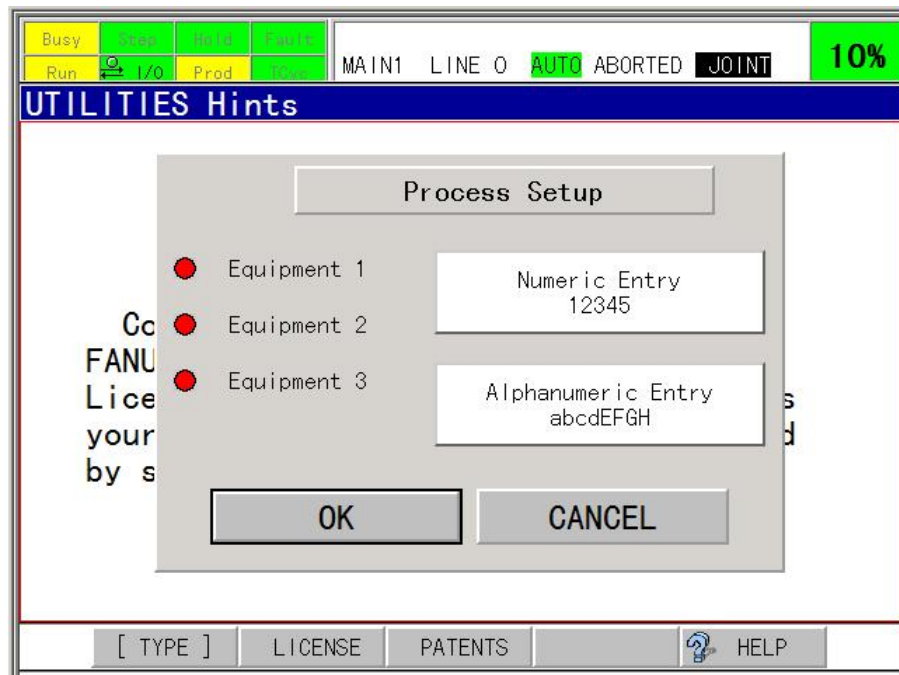
- *file_spec* specifies the device and filename of the XML file defining the dialog box. If no device name is specified, the default device is used.
- *term_mask* is a bit-wise mask indicating conditions that will terminate the dialog box. This should be an OR of the constants defined in the include file *klevkmsk.kl*.
kc_prev_key -- PREV key
kc_enter_key -- Enter key
kc_func_key -- Function keys
0 is also a valid term_mask if one or more of the controls on the dialog box are used to dismiss it.
- *term_char* receives a code indicating the character or other condition that terminated the dialog box. The codes for key terminating conditions are defined in the include file *klevkeys.kl*. Keys normally returned are pre-defined constants as follows:
ky_cancel -- Dialog box was dismissed
ky_prev -- Prev key was pressed (only if kc_prev_key mask is used)
ky_enter -- Enter key was pressed (only if kc_enter_key mask is used)
ky_new_menu -- A new menu was selected
- DISCTRL_DIAG will display the dialog box on the teach pendant device over top of the menu being displayed.
- *status* explains the status of the attempted operation. If *status* returns a value other than 0, an error has occurred.
- If the KAREL program is aborted, the dialog box is automatically dismissed.

A Dialog Box can contain a single item like a string entry or it can be a collection of several items such as string entry, radio buttons and check boxes. The following are some of the items that may be included in a Dialog Box.

- Discrete buttons (Yes, No, OK, Cancel etc.)
- Labels
- String entry
- Numeric entry
- Check boxes
- Choice boxes (popup lists)
- Radio buttons
- Images
- Charts

The Dialog Box uses standard iPendant Controls on an independent window to provide these items.

The size and location of the Dialog Box are configurable and it can be displayed across multiple panes.



G.4.1 Dialog Box XML File

To make a Dialog Box, you must first create an XML file to define the box and then store that file in controller memory (FR:, MC:, etc.) where it can be accessed by the KAREL built-in. The XML file is an ASCII file with .xml extension. Later, to display the box, you call the KAREL built-in DISCTRL_DIAG and provide it the name of the XML file.

The XML file defines the following items:

- General layout of the Dialog Box and position of all items
- Definition of the items on the Dialog Box (checkbox, radio button etc.)
- Standard iPendant Control information including:
 - Size and color
 - Label text
 - Data type
 - Data index

Tags and attributes are used to define these items.

The typical layout of a dialog box XML file is:

```

<DIALOG [DIALOG attributes] >          - One of these required in the file

<TEXT [TEXT attributes]>title</TEXT>    - An optional title

<DLGTILE [DLGTILE attributes] >        - One for each control

  <object [object attributes] >          - One per DLGTILE
    <object parameter>                   - iPendant Control parameters
    .
    .
    .
    <object parameter>
  </object>                             - End of object

</DLGTILE>                             - End of tile

```

<DLGTILE [DLGTILE attributes] > - Next tile in dialog box

<object [object attributes] >
<object parameter>

.

.

.

<object parameter>
</object>

</DLGTILE>

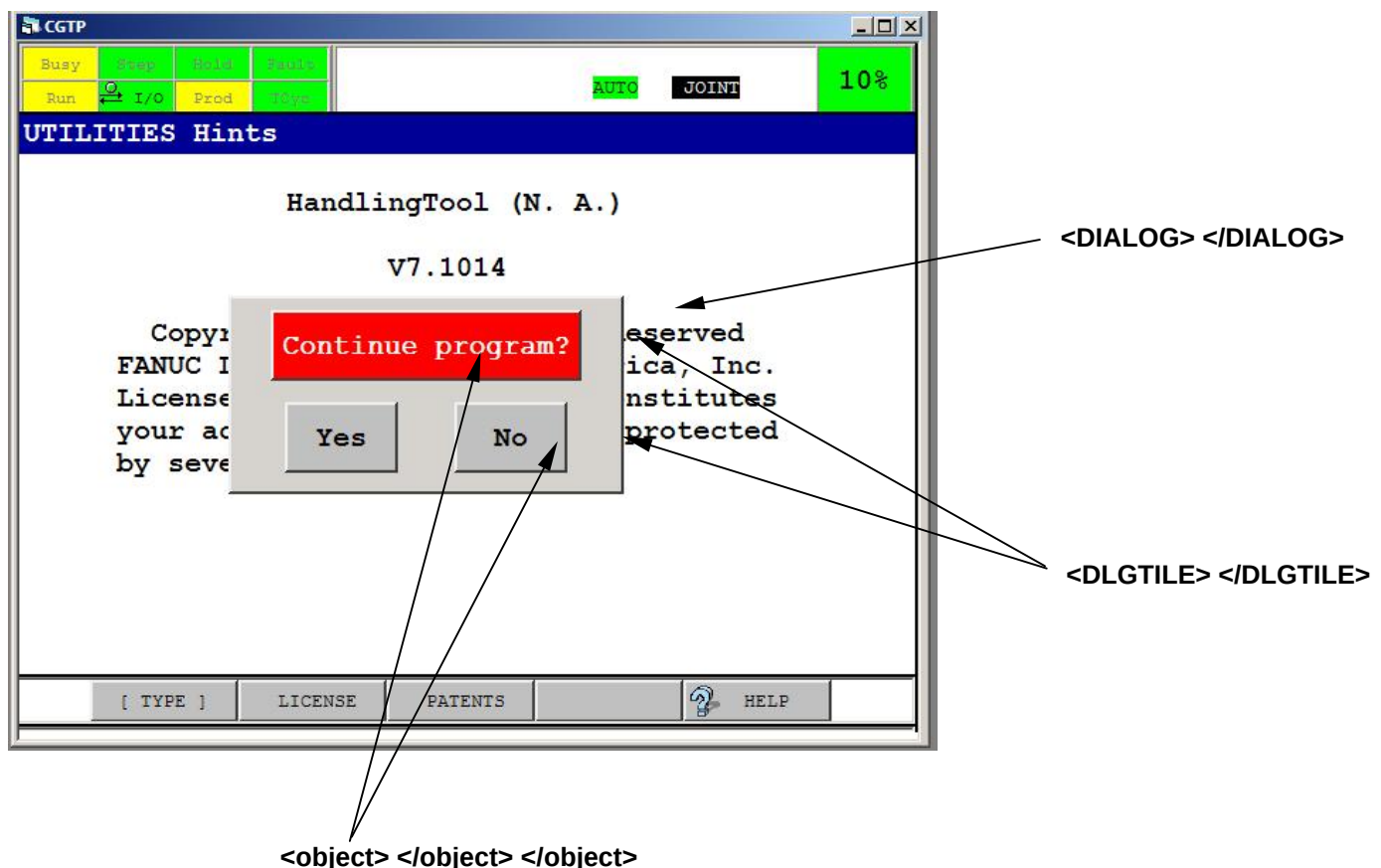
</DIALOG> - End of Dialog Box

There can only be one Dialog Box definition per XML file.

G.4.1.1 Tags and Attributes

Several XML tags are defined to describe a dialog box and the iPendant Controls that make it up.

- **<DIALOG> </DIALOG>** - The overall dialog box
- **<TEXT> </TEXT>** - An optional dialog box title
- **<DLGTILE> </DLGTILE>** - The individual tiles that contain each iPendant Control
- **<object> </object>** - The actual iPendant Controls that make up the dialog box



G.4.1.1.1 <DIALOG> </DIALOG>

This tag defines the overall dialog box window including the size and its location on the screen. The location is based on the whole screen and not an individual pane.

<DIALOG posx="col#" posy="row#" width="#cols" height="#rows" bgcolor="color#">

.....
</DIALOG>

posx="col#"	Specifies the column position of the dialog box.
posy="row#"	Specifies the row position of the dialog box.
width="#cols"	Specifies the width of the dialog box in pixels.
height="#rows"	Specifies the height of the dialog box in pixels.
bgcolor="color#"	Specifies the background color in RGB values.

G.4.1.1.2 <TEXT> </TEXT>

This is an optional tag that defines a title for the dialog box. The location is based on the overall dialog box window. Only one TEXT tag is supported.

<TEXT clr="color#" font="font#" align="horiz,vert" loc="x,y" dims="#cols,#rows">

.....
</TEXT>

clr="color#"	Specifies the foreground color in RGB values.
font="font#"	Specifies the font size.
align="horiz,vert"	Specifies the horizontal (left,center,right) and vertical (top,middle,bottom) alignment within the text area.
loc="x,y"	Specifies the column and row within the dialog box.
dims="#cols,#rows"	Specifies the width and height in pixels of the text area.

G.4.1.1.3 <DLGTILE> </DLGTILE>

This tag defines the size and location of individual tiles on the dialog box that will contain the iPendant Controls. Their location is based on the overall dialog box window. This tag also contains a special attribute that defines whether selecting this control will dismiss the dialog box. There must be at least one <DLGTILE> tag with this attribute set to 1 when calling DISCTRL_DIAG with term_mask = 0. If one of more of the iPendant Controls need to use enter or prev to operate than term_mask should be 0.

<DLGTILE posx="col#" posy="row#" width="#cols" height="#rows" type="dismiss">

.....
</DLGTILE>

posx="col#"	Specifies the column position of the entity within the dialog box.
posy="row#"	Specifies the row position of the entity within the dialog box.
width="#cols"	Specifies the width of the entity in pixels.
height="#rows"	Specifies the height of the entity in pixels.
type="dismiss"	Specifies whether the dialog box will be dismissed when this entity is selected. 1 = dismiss, 0 or not specified = not dismissed

G.4.1.1.4 <object> </object>

This tag is the normal tag for an iPendant Control. It defines one control in each tile on the dialog box. The format of the object tag is the standard format for iPendant Controls. The information can be copied verbatim from the HTML view of a web page editor.

This is an example of a typical object tag:

```
<object classid="clsid:7106065C-0E45-11D3-81B6-0000E206D650"
```

```

    id="FRIPLabel1" width="300" height="35">
    <param name="_Version" value="65536">
    <param name="_ExtentX" value="2646">
    <param name="_ExtentY" value="1323">
    <param name="_StockProps" value="6">
    <param name="Caption" value="Dialog Box">
    <param name="FontName" value=" Courier New ">
    <param name="FontSize" value="16">
    <param name="DataType" value="100">
    <param name="DataIndex" value>
    <param name="Interval" value="250">
    <param name="FastLoad" value="1">
    <param name="BackColor" value="13554646">
  </object>

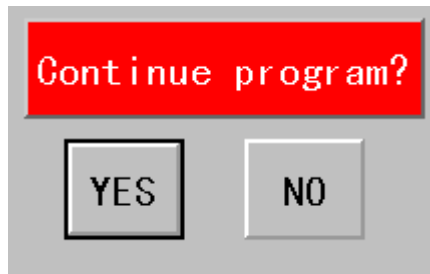
```

Note the parameters that start with `_`, such as `"_Version"`, are not required and can be omitted. In addition, the width and height on the object tag is not used. The width and height on the DLGTILE is used instead.

G.4.1.2 XML content example

To create the Dialog Box XML file, you first create the iPendant Controls using a web page editor such as FrontPage. Then you copy and paste the `<object> .. </object>` sections into the Dialog Box XML as shown below.

Below is an example of an XML file that defines the following dialog box.



This box contains three iPendant Controls, a Label ("Continue program?") and two Toggle Buttons ("YES" and "NO"). When a Toggle Button is pressed, the KAREL variable is set and the dialog box is dismissed.

```
<DIALOG posx="220" posy="170" width="220" height="140" bgcolor="#C0C0C0">
```

```
<!--Continue program? -->
```

```
<DLGTILE posx="10" posy="10" width="200" height="50">
```

```
<object classid="clsid:7106065C-0E45-11D3-81B6-0000E206D650" id="LABEL1">
```

```
  <param name="Caption" value="Continue program?">
```

```
  <param name="DataType" value="100">
```

```
  <param name="FontSize" value="16">
```

```
  <param name="ForeColor" value="16777215">
```

```
  <param name="BackColor" value="255">
```

```
</object>
```

```
</DLGTILE>
```

```
<!-- Yes -->
```

```
<DLGTILE posx="30" posy="70" width="60" height="50" type="1">
```

```
<object classid="clsid:7106066C-0E45-11D3-81B6-0000E206D650" id="TGBTN1">
```

```
  <param name="Caption" value="YES">
```

```

<param name="DataType" value="103">
<param name="DataIndex" value="[runyesno]yes">
<param name="FontSize" value="16">
<param name="TrueColor" value="12632256">
<param name="FalseColor" value="12632256">
<param name="BackColor" value="16777215">
</object>
</DLGTILE>

<!-- No -->
<DLGTILE posx="120" posy="70" width="60" height="50" type="1">
<object classid="clsid:7106066C-0E45-11D3-81B6-0000E206D650" id="TGBTN2">
  <param name="Caption" value="NO">
  <param name="DataType" value="103">
  <param name="DataIndex" value="[runyesno]no">
  <param name="FontSize" value="16">
  <param name="TrueColor" value="12632256">
  <param name="FalseColor" value="12632256">
  <param name="BackColor" value="16777215">
</object>
</DLGTILE>
</DIALOG>

```

G.4.1.3 KAREL program example

```

--
-- KAREL program to display dialog box
--
PROGRAM runyesno

%NOLOCKGROUP
%ENVIRONMENT uif

%INCLUDE klevkmsk
%INCLUDE klevccdf

VAR
  term_char: INTEGER
  status: INTEGER
  yes: BOOLEAN
  no: BOOLEAN

BEGIN
  yes = FALSE
  no = FALSE
  DISCTRL_DIAG('MC:DLGYESNO.XML', kc_prev_key, term_char, status)
  IF term_char = ky_prev THEN
    no = TRUE
  ENDIF
  IF yes = TRUE THEN
    WRITE TPERROR (CHR(cc_home) + CHR(cc_clear_win) + 'Continue program')
  ELSE
    WRITE TPERROR (CHR(cc_home) + CHR(cc_clear_win) + 'Do not continue program')
  ENDIF
END runyesno

```