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EMERSON

2000 Series

Automation Guide

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BRANSON

Manual Change Information

At Branson, we strive to maintain our position as the leader in ultrasonics plastics joining, cleaning and related technologies by continually improving our circuits and components in our equipment. These improvements are incorporated as soon as they are developed and thoroughly tested.

Information concerning any improvements will be added to the appropriate technical documentation at its next revision and printing. Therefore, when requesting service assistance for specific units, note the Revision information found on the cover of this document.

Foreword

Congratulations on your choice of a Branson Ultrasonics Corporation system!

The Branson 2000-Series system is process equipment for the joining of plastic parts using ultrasonic energy. It is the newest generation of product using this sophisticated technology for a variety of customer applications. This Automation Guide is supplemental to and should be used in conjunction with the documentation set for this system. Thank you for choosing Branson!

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1.1 Introduction

This guide will help you to better understand the automation features available to you with the introduction of the version 9.x software to the Branson product line. The major feature of this software/firmware change is the user-configurable I/O. In the event you require additional assistance or information, please contact our Product Support department or your local Branson representative.

1.2 About this Guide

This guide describes how to set up some representative automation process options available with Branson 2000 Series ultrasonic systems that are utilizing software version 9 or higher.

The information details the wiring hookup to DB9 on the actuator and to J3 on the power supply that establish the connections needed to accomplish the automation examples in this guide.

Additionally, detail is given about the use of the newly introduced features available for configuring the system to perform the desired functions.

Flow diagrams show the logical sequences for setup that include the wiring steps and appropriate assignment of menu items with clear and simple content such as; "In Weld Setup menu turn Ext U/S Delay to On", and "Set User I/O Menu to (in System Config): J3-32 to Select Preset #1".

Automation Interface timing diagrams are included for Process Flows 1, 3, 6, and 11. You can refer to 1.7 Frequently Asked Questions (FAQ) to enhance your back-ground knowledge about successfully setting up your automation processes.

A Glossary V9.xx of terminology is also included as an additional useful resource.

This guide is organized into the following sections.

- 1.3 Overview of Automation Examples: Table 1.1 lists 12 Automation possibilities, and references their respective Process Flow and Wiring Tables.
- 1.4 Special Features in V9.xx Firmware: Presents and defines Configurable User Input and Output features.
- 1.5 2000 Series Automation Logic Requirements: Basic minimum system requirements are presented line by line to run a complete cycle.
- 1.6 Process Flow and Wiring Tables: Defines each of the 12 Automation examples with complete flow diagrams and wiring tables.
- 1.7 Frequently Asked Questions (FAQ): Lots of useful information relevant to Branson Automation procedures and processes.
- 1.8 Glossary V9.xx: Definition of terminology used in this Guide.

1.3 Overview of Automation Examples

This overview shows representative examples of Automation possibilities. Availability is not limited to the examples shown. Options are shown for use with a Branson actuator, a custom actuator, and a converter stack. Each Option is referenced to its unique Process Flow diagram and Wiring Table.

Table 1.1 Process Flow diagram and Wiring Table Reference

For Use with a Branson Actuator	
Actuator with standard automation	Refer to 1.6.1 Actuator with Standard Automation, Process Flow 1, Table 1.3 Wiring Table Flow 1
Actuator, external preset select	Refer to 1.6.2 Actuator, External Preset Select, Process Flow 2, Table 1.4 Wiring Table Flow 2
Actuator, delayed sonics	Refer to 1.6.3 Actuator, Delayed Sonics, Process Flow 3, Table 1.5 Wiring Table Flow 3
Actuator, sonics disabled	Refer to 1.6.4 Actuator, Sonics Disabled, Process Flow 4, Table 1.6 Wiring Table Flow 4
Actuator, sonics disabled, via preset select	Refer to 1.6.5 Actuator, Sonics Disabled and Presets, Process Flow 5, Table 1.7 Wiring Table Flow 5
Actuator, external preset select and delayed sonics.	Refer to 1.6.6 Actuator, External Preset Select and Delayed Sonics, Process Flow 6, Table 1.8 Wiring Table Flow 6
Actuator delayed horn travel	Refer to 1.6.7 Actuator, Delayed Horn Travel, Process Flow 7, Table 1.11 Wiring Table Flow 7
Actuators, Multi-Syncro (simultaneous sonic start)	Refer to 1.6.8 Actuators, Multi-Syncro (simultaneous sonic start), Process Flow 8
Actuator, Interrupting Cycle for Device Position	Refer to 1.6.9 Interrupting Cycle for Device Position (Hold off on Horn Travel) Externally by PLC Device, Process Flow 9, Table 1.12 Wiring Table Flow 9

For Use with a Custom Actuator	
Custom actuator	Refer to 1.6.10 Custom Actuator, Process Flow 10, N/A

For Use with a Converter Stack	
Converter stack, standard automation	Refer to 1.6.11 Converter Stack, Standard Automation, Process Flow 11, Table 1.13 Wiring Table Flow 11
Converter stack, external preset select	Refer to 1.6.12 Converter Stack, External Preset Select, Process Flow 12, Table 1.14 Wiring Table Flow 12

1.4 Special Features in V9.xx Firmware

A major feature that is contained in Version 9.xx firmware is a user-configurable I/O. This feature is similar to features in modern home Audio-Video receivers: you can choose what output is present at the digitally optical jack, and which output is present at the digital hardware jacks, etc. in the 2000 Series welder it allows the user to configure certain connector J3 pin-outs (6 inputs and 3 outputs) to customer-desired features, optimizing the unit for specialized applications such as: switching up to 16 preset memories, switching converter/horn "stacks", or for syncing several welders together. You can also "interrupt" a welder cycle for external events or tests to occur, or allow the end user to choose what alarms may be most important to their particular machine or application. Underlined items are new V9.xx features, and are defined at the bottom of Table 1.2.

Any pins other than those shown operate similar to previous firmware Versions.

The factory defaulted (as-shipped) settings are chosen to duplicate earlier model and firmware functions.

NOTICE	
	No selection need to be chosen for a new V9.xx unit in order to replace and earlier unit.

Table 1.2 User-configurable I/O

J3 Input Pins	Default setting	Selectable Setting (any pin)	
J3-1	Ext Signal		Ext Sonics Delay
J3-17	Select Preset #8	Display Lock	Ext Signal
J3-19	Select Preset #4	Sonics Disable	Memory Reset
J3-31	Display Lock	Sync In	Ext Start (input)
J3-32	Select Preset #1	Select Preset #16 (pin 31 only)	
J3-33	Select Preset #2		

J3 Output Pins	Default Setting	Selectable Setting (any pin)	
J3-8	Disabled		
J3-22	Disabled	Cycle Okay	Overload Alarm
J3-36	Disabled	Confirm Preset	Modified Alarm
		External Beeper	Note
		No Cycle Alarm	Ext Start (output)
		Missing Part	Sync Out

NOTICE	
	Regardless of current settings, by choosing factory default setting in Menu, you will restore factory settings.

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Signal Definitions (Refer to 1.8 Glossary V9.xx for additional definitions.)

Confirm Preset: A user output signal that will indicate that a weld cycle preset # has been input from the external controller.

Cycle Okay: A user output signal that indicates no detectable alarm conditions occurred during the last weld cycle.

External Beeper: An output pin that operates the same as the internal beeper, and could operate an external (louder) device or light.

Ext Signal: Note: Not a new V9.xx feature but repeated here for clarity. Now the hardware pin and function is selectable in the User I/O menu.

Used as input to allow external input to trigger amplitude or force change (model dependant).

Optionally used as the start cycle input when in Hand Held mode.

Ext Sonics Delay: A cycle where the ultrasonics are not started after the horn contacts the workpiece until an external device has determined that the cycle should continue. It may be a test apparatus or perhaps a part-marking operation.

Note: The Cycle Abort input can be used to end the welder cycle and not waste time on a workpiece that the external apparatus determined to be a reject.

Ext Start (input and output): These are both input and output signals, and both must be turned on and assigned a hardware input and output pin in order to function.

Once the unit has received a legitimate start input the External Start output pin activates an external device (horn clamp cylinder, sound enclosure door, part in position, etc) before moving the horn. When the external device becomes active, it then signals the External Start input to commence the welder's horn travel and weld cycle. To enable this feature, select the System Configuration menu, then User I/O menu.

While in that menu you can also set "Ext Start Dly" of up to 10.0 sec. to wait before receiving the External Start input before setting an alarm.

Modified Alarm: A user output signal that indicates a user-set compensating condition occurred, (Only energy at this time).

Note: An alarm condition of the lowest priority.

Overload Alarm: A user output signal that will indicate that a power supply overload condition occurred during the last weld, test or seek cycle.

Sonics Disable: When this User I/O input is active, ultrasonic energy is forced off. If active throughout a weld cycle, a "dry" cycle will occur: should the weld mode be indeterminate (energy, power, etc) then the time normally used for the "weld" will extend out to the maximum allowed.

Sync In Sync Out (syncro weld cycle): This is when multiple welders cycle against the same workpiece, and their ultrasonic power is started simultaneously in Sync for a particular application issue. Sync In is used in conjunction with Sync Out.

(Another option would be to release all the horns from the workpiece simultaneously. You can use a longer than required hold time on each unit, then apply Cycle Abort to all the welders to make all retract simultaneously.)

1.5 2000 Series Automation Logic Requirements

NOTICE	
	Logic conditions shown are defaulted to factory shipped condition, with no configuration changes.This information applies to standard automation, such as a rotary index table application.

Minimum system requirement for Automated Operation:

NOTICE	
	Underlined actions must be done in the order shown by system controls.

You must provide an Emergency Stop function through the start cable (DB9 connector on rear of actuator).

- Connect pins 8 (Yellow) and 9 (Purple) together, and then connect to a Normally Closed contact of a switch or relay.
- Connect pins 3 (Red) and 4 (Green) together, and then connect to the other Normally Closed contact of the same switch or relay.

These connections must be closed for normal operation, opened in an abnormal condition. Keep in mind this closed condition is needed even if the automation system is in a powered off state, for actions such as maintenance or calibration to be performed on the ultrasonic welder.

Do not use this as a commonly used interlock, as a Reset input: apply +24VDC to J3 (User I/O HD44 connector) pin 3 (Green/Black) will be required to clear any Emergency Stop condition.

NOTICE	
	If you wish to be able to abort a weld cycle at any time and have the welder retract back towards the home or rest position, use the Cycle Abort input: apply +24VDC to J3 (User I/O HD44 connector) pin 2 (Red/Black).

1.5.1 To Start a Weld Cycle

The only time it is acceptable to “start” or initiate a cycle is when a welder is in the “ready” state. If the welder is Ready, it can be started.

Monitor Ready: J3 (User I/O HD44 connector) pin 21 @ 0v, (Blue/Black/White)

Initiate the cycle by applying +24VDC simultaneously (preferably sourced by the 2000 Series controls) or a contact closure within a maximum allowable stagger time of 200 ms. The voltage, or contact closure, must continue to be held closed (for now). You can get a signal flagging when to release later.

To Start Cycle: (DB9 connector on rear of actuator) Apply +24 (To start pins 1 (Black) and 2 (White) on the actuator connector, (use pins 6 (Blue) and 7 (Orange) as +24VDC voltage source), or

Close contacts (To start pins 1 (Black) and 7 (Orange), and 2 (White) and 6 (Blue) on the actuator connector.You may wish, dependant on application, to monitor the following signals.

J3 (User I/O HD44 connector) output signals:

- General Alarm is off, 24VDC, pin 6 (Black /White)

This gets flagged from any other alarm, useful as a master alarm. Recommended.

- Reject Alarm is off, 24VDC, pin 5 (Blue/Black)

This gets flagged from a reject welding parameter alarm.

- Suspect Alarm is off, 24VDC, pin 20 (Orange/Black/White)

This gets flagged from a suspect welding parameter alarm.

- Warning Alarm is off, 24VDC, pin 36 (Orange/Red/Green)

This gets flagged when a alarm is imminent, or that an authorized cycle modification occurred.

- Weld On is off, 24VDC, pin 35 (Green/White/Blue)

Ultrasonics are activated

- Actuator Clear goes off, 24VDC, pin 7 (Red/White)

Actuator is at height of upper limit switch, or height setting is set.

After the start circuit is activated the internal solenoid valve (S/V) will be activated allowing the horn to travel toward the workpiece. After the point of contact, force will develop against the workpiece. When the 2000 Series controls sense the trigger force set point the welder advances to the weld on state. Ultrasonics will start, and the start switches may now be released. We recommend monitoring the PB Release signal as the event to flag the release of the start signal. Had either or both start switches been released at any time before that point, the welder would abort the cycle, retract back towards the home or rest position, and dis-play an error message.

1.5.2 Ready Changes State

Ready changes state: S/V goes on; Weld trigger occurs,

PB Release signal goes on, J3 User I/O HD44 connector 0v @ pin 34 (Red/White/Green).

Then, on DB9 connector on rear of actuator, apply 0v to start pins 1 and 2 on the actuator connector before welder returns to home position, or

Release contacts on pins 1 and 7, 2 and 6 on the actuator connector before the welder returns to home position.

At User I/O HD44 connector:

Ready J3 pin 21 Blue/Black/ White @24VDC

SOL VALVE SRC pin 4 Orange/Black @ 24VDC

SOL VALVE RTN pin 16 Black/White/Red @ 0v

Weld ON goes on 0v @ pin 35 Green/White/Blue

1.5.3 Weld (ultrasonics) Finished, Hold Starts

User I/O HD44 connector:

Weld On goes off 24VDC @ pin 35 Green/White/Blue

1.5.4 Hold Finished, Horn Retract Starts

User I/O HD44 connector:

S/V goes off:

SOL VALVE SRC pin 4 @ 0v Orange/Black

SOL VALVE RTN pin 16 @ 0v Black/White/Red

Actuator clear pin 7 @ 0v Red/White

ACT RTN pin 7 @ 0v at setting

Horn is back to home position.

Start switches *must* be released by now

1.5.5 Check for Alarms

User I/O HD44 connector:

Return to Ready state.

Monitor that General Alarm is off 24VDC (pin 6 Black/White) recommended.

Wait for Ready (J3 pin 21 @ 0v Blue/Black/White.

1.6 Process Flow and Wiring Tables

Each Process Flow diagram has a wiring table associated with setting up the connections to DB-9 on the rear of the actuator, and HD-44 which is the User I/O connector on the rear of the power supply. One exception to this is “For Use with a Custom Actuator” Process Flow 10, which has no wiring table associated with it.

NOTICE	
	Process Flow 6 additionally has Preset Switching Diagrams, PLC Wiring Table, and an External Preset Select Binary Table.

1.6.1 Actuator with Standard Automation, Process Flow 1

Standard Automation

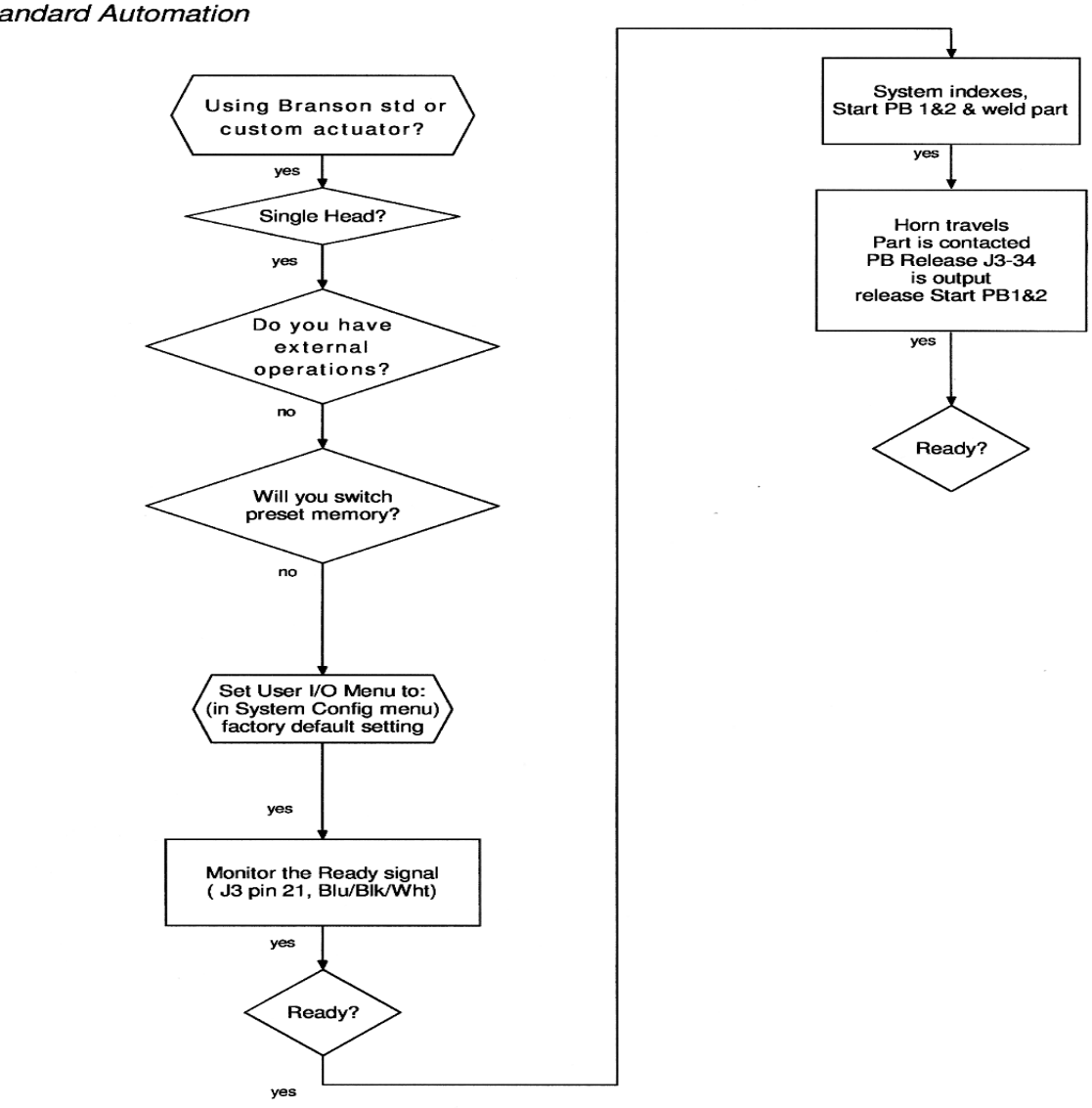


chart 7reva

1.6.1.1 Wiring Table, Actuator with Standard Automation, Process Flow 1

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.3 Wiring Table Flow 1

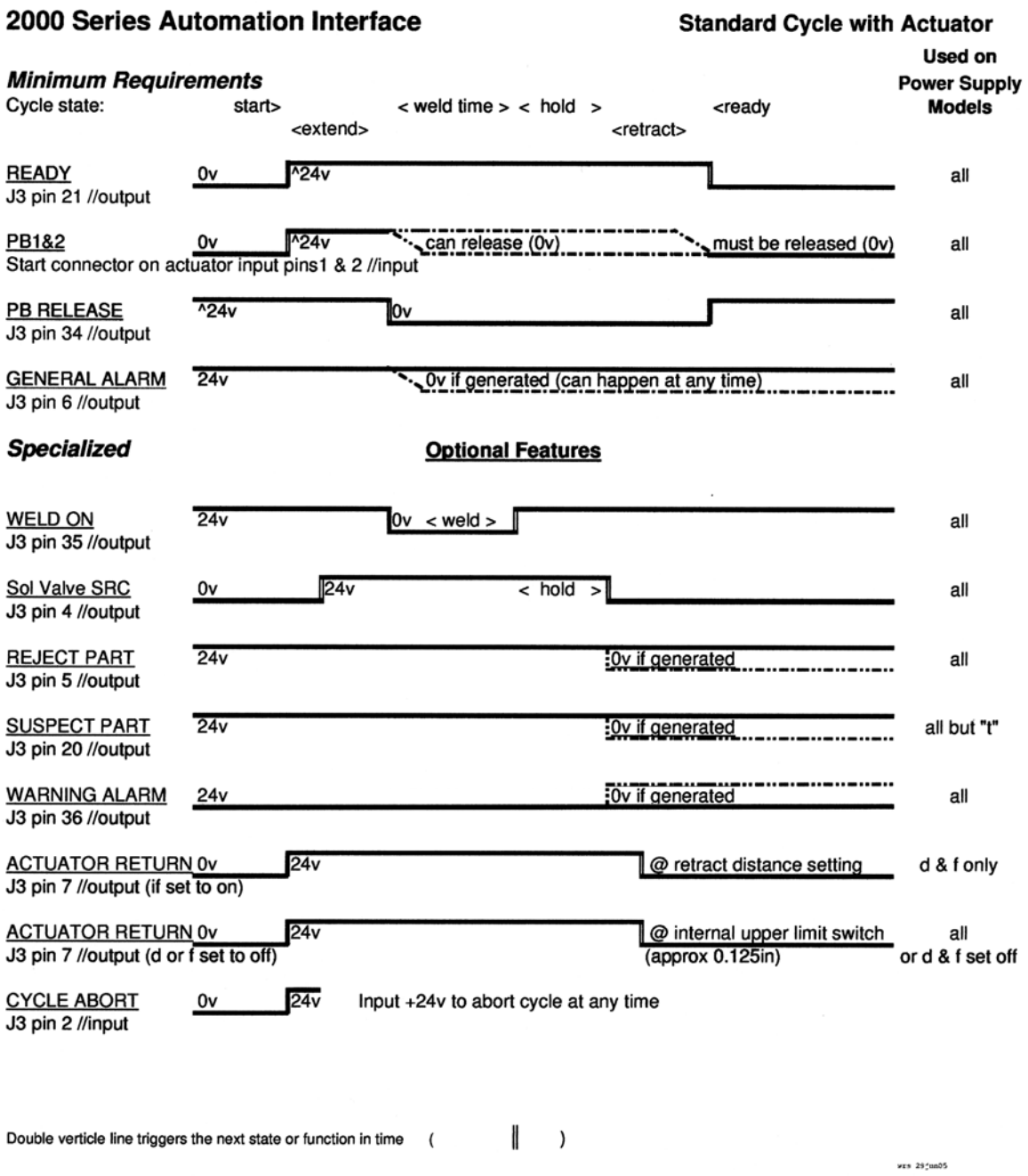
#1 Process Flowchart 1
Base/Start connector on actuator rear DB-9

Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
6	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
7	24V RETURN	12	Orn/Red	24V Return		24V Return
8	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
9	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
10	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
11	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
12	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
13	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
14	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.1.2 2000 Series Automation Interface, Process Flow 1



1.6.2 Actuator, External Preset Select, Process Flow 2

Selecting Presets Externally by PLC

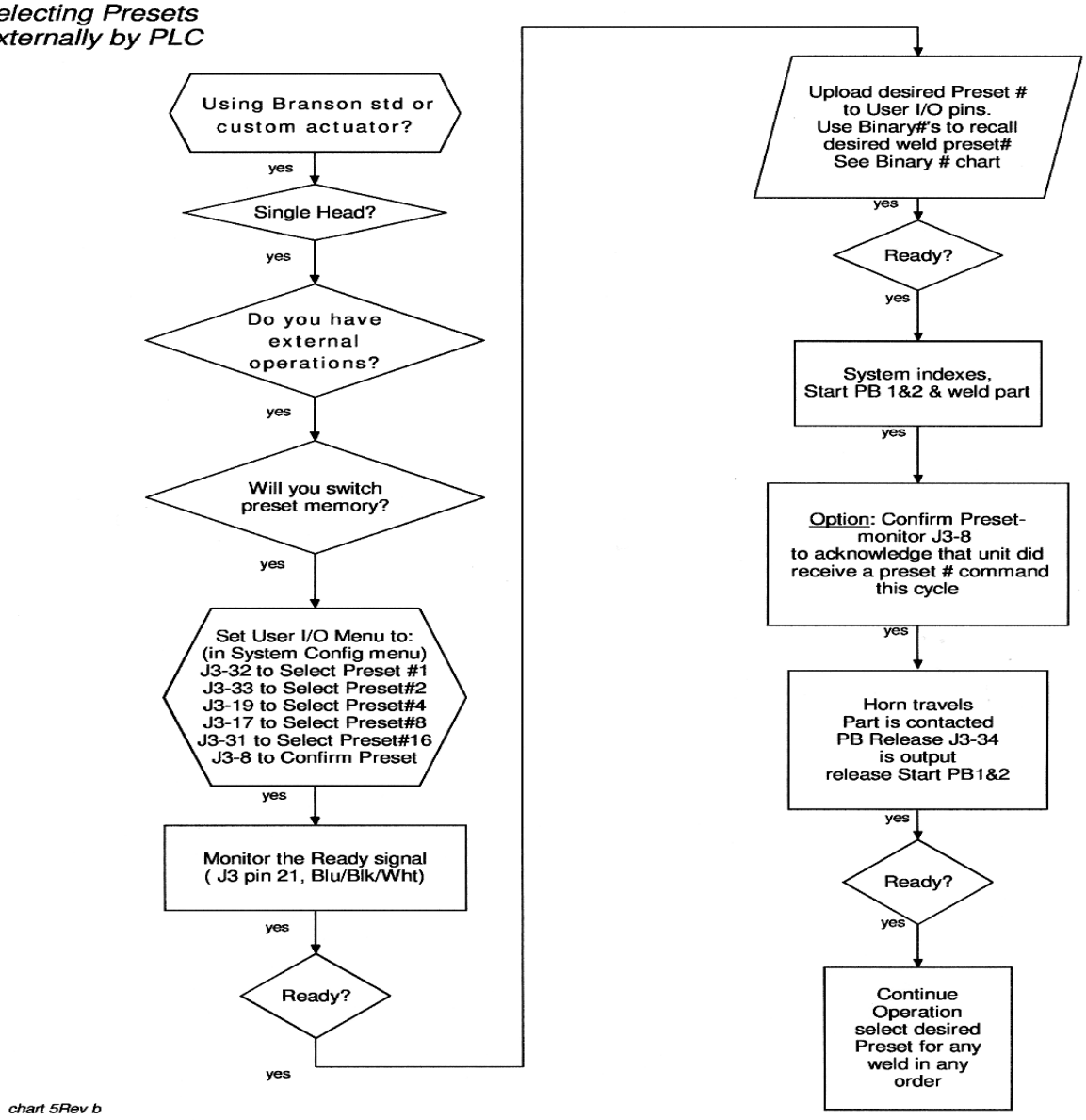


chart 5Rev b

1.6.2.1 Wiring Table, Actuator, External Preset Select Process Flow 2

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.4 Wiring Table Flow 2

#2 Process Flowchart 2
Base/Start connector on actuator rear DB-9

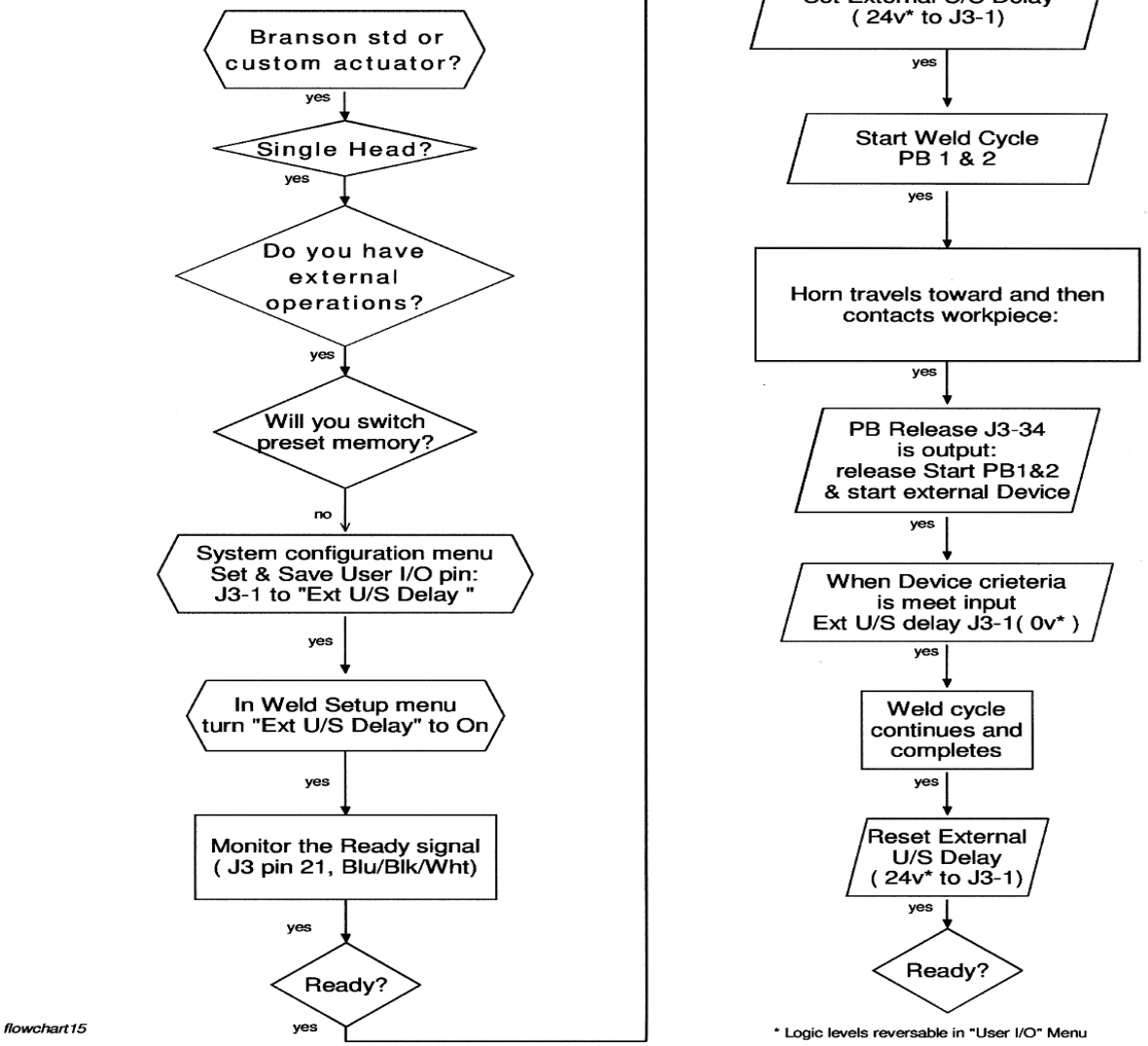
Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	EXT_RESE					
Blk/Wht/Orn				+24V		+24V Source
15	User definable input	31	Wht/Red/Blu	Input	24V True	Set:SELECT PRESET#16
16	User definable input	32	Blk/Grn/Wht	Input	24V True	Set:SELECT PRESET#1
17	User definable input	33	Wht/Blk/Grn	Input	24V True	Set:SELECT PRESET#2
18	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
19	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
20	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.3 Actuator, Delayed Sonics, Process Flow 3

Clamp part & hold for External Qualification
(Hold off U/S for external confirmation)
Externally by PLC/device



flowchart15

* Logic levels reversable in "User I/O" Menu

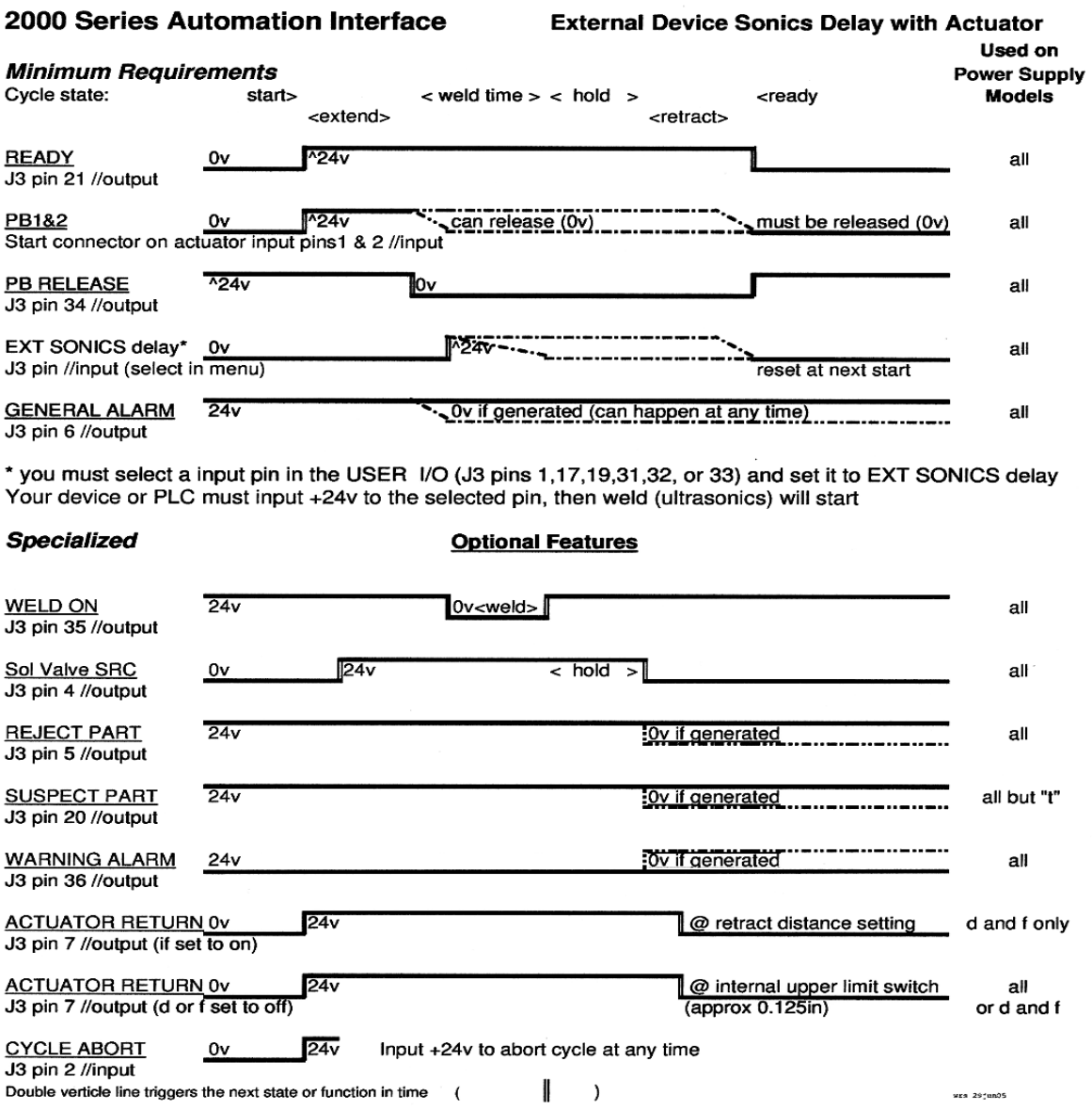
1.6.3.1 Wiring Table, Actuator, Delayed Sonics, Process Flow 3

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.5 Wiring Table Flow 3

	#3 Process Flowchart 3 Base/Start connector on actuator rear DB-9					
Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input
J3	User I/O connector on power supply rear HD-44					
	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	User definable input	1	Wht/Blk	Input	24V True	Set:EXT SONICS DELAY
5	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
6	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
7	24V RETURN	12	Orn/Red	24V Return		24V Return
8	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
9	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
10	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
11	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
12	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
13	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
14	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.3.2 2000 Series Automation Interface, Process Flow 3



1.6.4 Actuator, Sonics Disabled, Process Flow 4

Automation Cycle
Without Ultrasonics

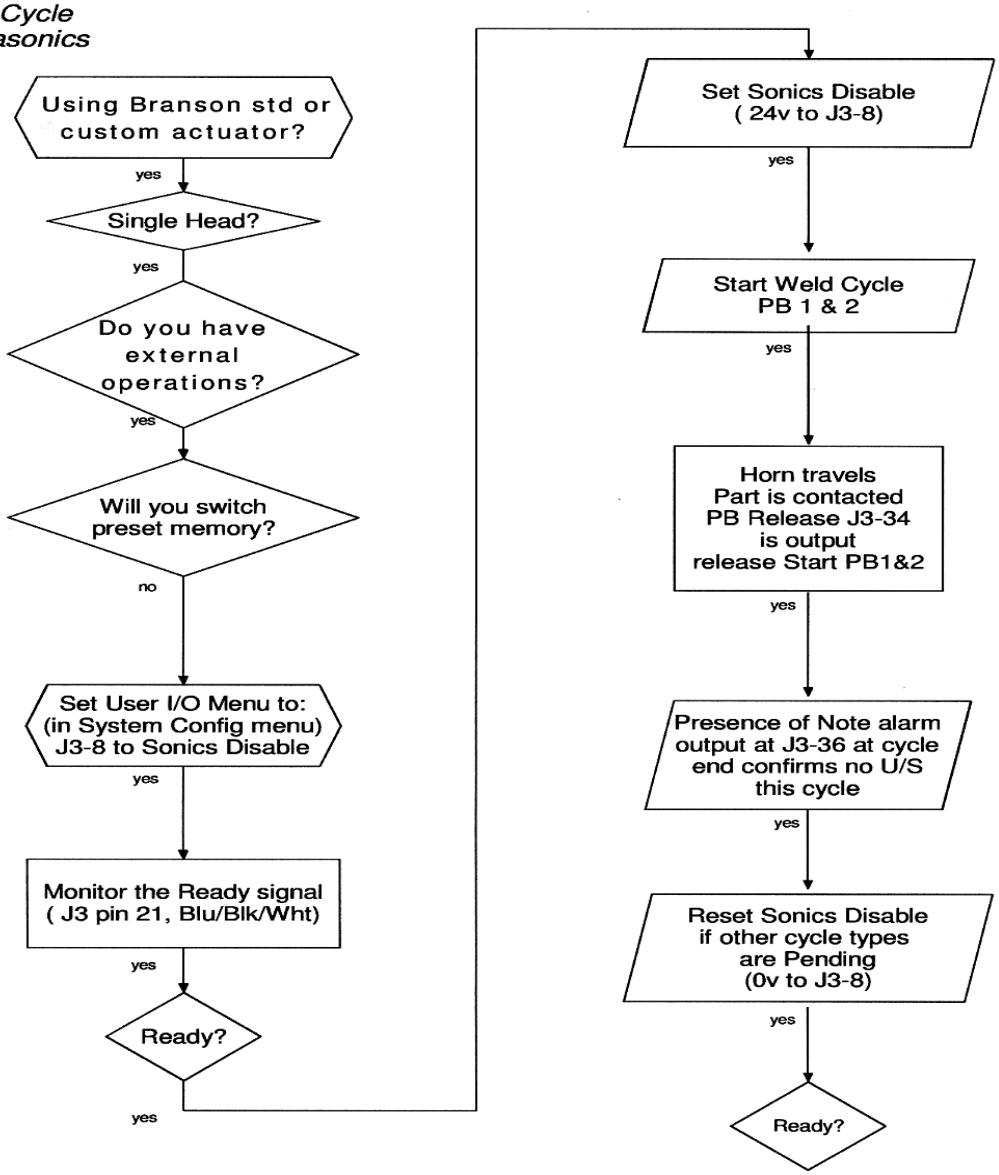


chart 14

1.6.4.1 Wiring Table, Actuator, Sonics Disabled, Process Flow 4

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.6 Wiring Table Flow 4

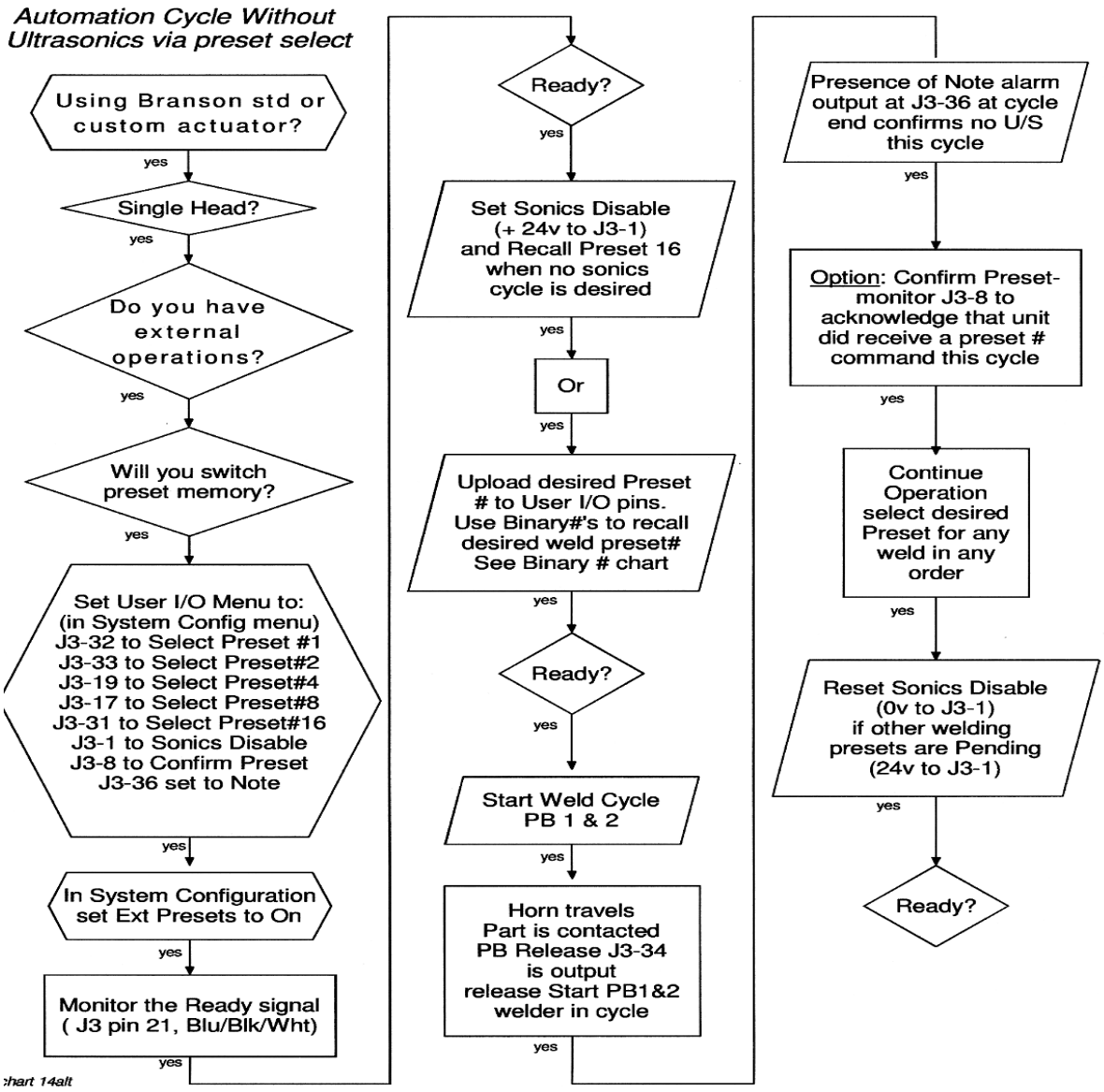
#4 Process Flowchart 4
Base/Start connector on actuator rear DB-9

Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	User definable input	1	Wht/Blk	Input	24V True	Set: SONICS DISABLE
5	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
6	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
7	24V RETURN	12	Orn/Red	24V Return		24V Return
8	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
9	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
10	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
11	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
12	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
13	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
14	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.5 Actuator, Sonics Disabled and Presets, Process Flow 5



1.6.5.1 Wiring Table, Actuator, Sonics Disabled and Presets, Process Flow 5

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.7 Wiring Table Flow 5

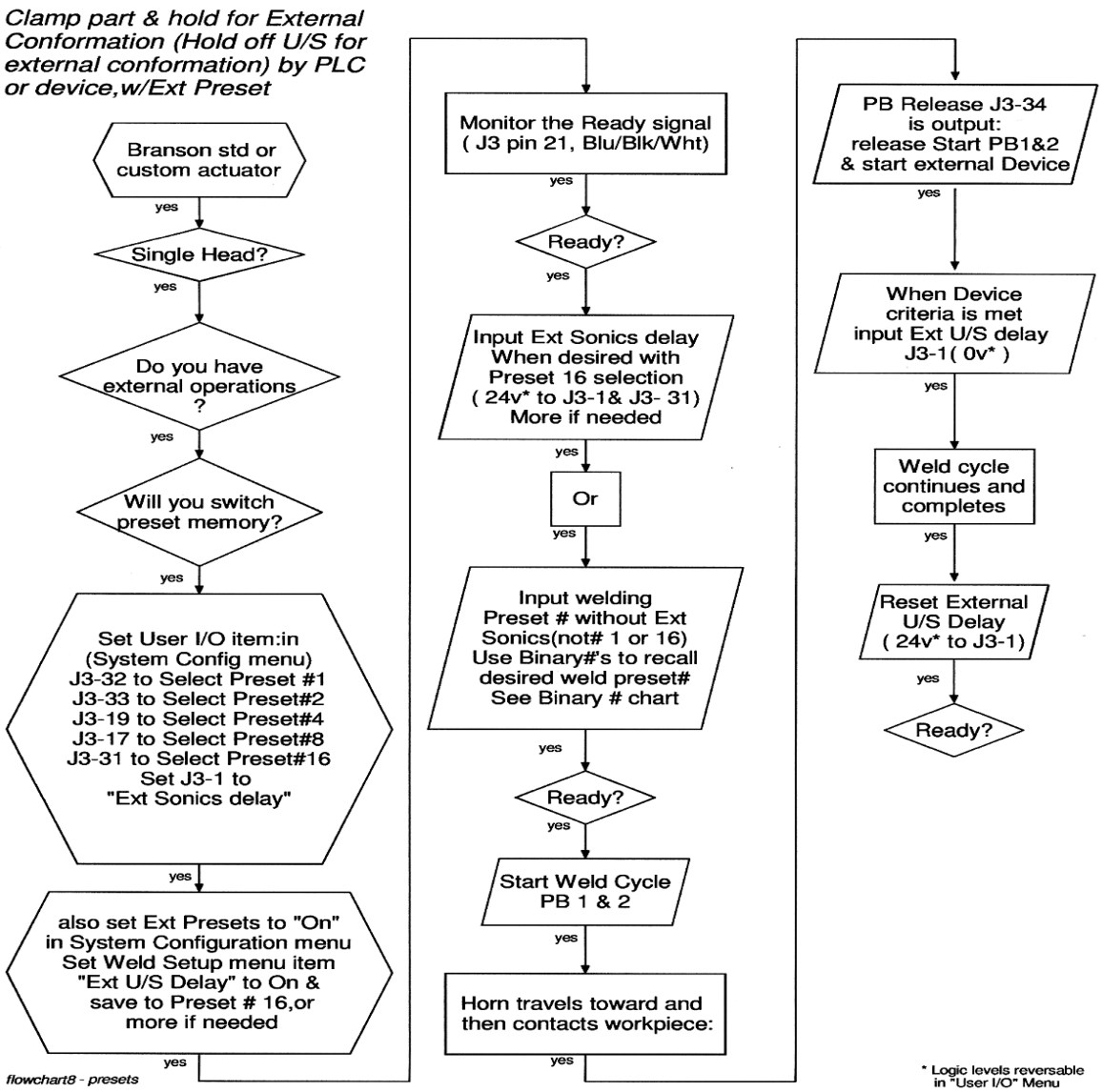
#5 Process Flowchart 5
Base/Start connector on actuator rear DB-9

Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	User definable input	1	Wht/Blk	Input	24V True	Set:EXT SONICS DISABLE
6	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
7	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
8	User definable output	8	Grn/Wht	Output	24V True	Set: Confirm Preset
9	24V RETURN	12	Orn/Red	24V Return		24V Return
10	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
11	User definable input	17	Wht/Blk/Red	Input	24V True	Set:SELECT PRESET #8
12	User definable input	19	Grn/Blk/Wht			
13	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
14	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
15	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
16	User definable input	31	Wht/Red/Blu	Input	24V True	Set:SELECT PRESET#16
17	User definable input	32	Blk/Grn/Wht	Input	24V True	Set:SELECT PRESET#1
18	User definable input	33	Wht/Blk/Grn	Input	24V True	Set:SELECT PRESET#2
19	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
20	User definable output	36	Orn/Red/Grn	Output	24V True	Set:NOTE
21	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
22	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.6 Actuator, External Preset Select and Delayed Sonics, Process Flow 6



1.6.6.1 Wiring table, Actuator External Preset Select and Delayed Sonics, Process Flow 6

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.8 Wiring Table Flow 6

#6 Process Flowchart 6
Base/Start connector on actuator rear DB-9

Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	User definable input	1	Wht/Blk	Input	24V True	Set:EXT SONICS DELAY
6	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
7	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
8	24V RETURN	12	Orn/Red	24V Return		24V Return
9	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
10	User definable input	17	Wht/Blk/Red	Input	24V True	Set:SELECT PRESET #8
11	User definable input	19	Grn/Blk/Wht	Input	24V True	Set:SELECT PRESET #4
12	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
13	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
14	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
15	User definable input	31	Wht/Red/Blu	Input	24V True	Set:SELECT PRESET#16
16	User definable input	32	Blk/Grn/Wht	Input	24V True	Set:SELECT PRESET#1
17	User definable input	33	Wht/Blk/Grn	Input	24V True	Set:SELECT PRESET#2
18	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
19	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
20	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.6.2 Wiring Table, Process Flow 6, Required Functions: Logical Sequence

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

REQUIRED FUNCTIONS

logical sequence

#10 flowchart8-presets

Base/Start connector on actuator rear DB-9

Pin#	*Colors*		*Direction*	*Signal Type*	*Definition*
1	Black	→	Input	24V True	PB (actuator start) input
2	White	→	Input	24V True	PB (actuator start) input
3	Red	→	Input	24V True	E-STOP input
4	Green	→	Input	24V True	E-STOP input

User I/O connector on power supply rear HD-44

J3 *Pin#*	*Colors*		*Direction*	*Signal Type*	*Definition*	*User I/O menu Choice?*
1	Wht/Blk	→	Input	24V True	Set:EXT SONICS DELAY	User I/O
3	Grn/Blk	→	Input	24V True	System Reset	
17	Wht/Blk/Red	→	Input	24V True	Set:SELECT PRESET #8	User I/O
19	Grn/Blk/Wht	→	Input	24V True	Set:SELECT PRESET #4	User I/O
31	Wht/Red/Blu	→	Input	24V True	Set:SELECT PRESET #16	User I/O
32	Blk/Grn/Wht	→	Input	24V True	Set:SELECT PRESET #1	User I/O
33	Wht/Blk/Grn/	→	Input	24V True	Set:SELECT PRESET #2	User I/O
6	Blk/Wht	→	Output	0V True	General Alarm	
21	Blu/Blk/Wht	→	Output	0V True	Ready Output	
34	Red/Wht/Grn	→	Output	0V True	PB Release	
12	Orn/Red	→		24V Return	24V Return	
27	Blu/Wht/Orn	→		24V Return	24V Return	
41	Grn/Orn/Red	→		24V Return	24V Return	
13	Blu/Red	→		+24V Source	+24V Source	
28	Blk/Wht/Orn	→		+24V Source	+24V Source	
42	Orn/Red/Blu	→		+24V Source	+24V Source	

1.6.6.3 Wiring Table, Process Flow 6, PLC Connections

Table 1.9 Wiring Table, Process Flow 6, PLC Connections

Pin	Definition, DB9, Actuator		
1	PB (actuator start) input		
2	PB (actuator start) input		
6	Source 24VDC (for hard contact)		
7	Source 24VDC (for hard contact)		
8	Source 24VDC (for hard contact)		
9	Source 24VDC (for hard contact)		
3	E-STOP input		
4	E-STOP input		
	Definition, J3, Power Supply	**Pin**	**Definition, cont´d**
• 1	• Set: EXT SONICS DELAY	23	10VDC reference voltage from PS
2	Cycle Abort	24	Amplitude signal from PS
3	System Reset	25	User Frequency offset control signal
4	SV1 Source	26	Run signal from PS
5	Reject Alarm	27	24VDC Return
6	General Alarm	28	+24VDC Source
7	Actuator return signal	29	General Alarm Relay
• 8	• AVAILABLE	30	Weld On Relay
9	Memory Signal P/S	• 31	• Set: SELECT PRESET #16
10	User Amplitude control signal	• 32	• Set: SELECT PRESET #1
11	Memory Clear signal to PS	• 33	• Set: SELECT PRESET #2
12	24VDC Return	34	PB Release
13	+24VDC Source	35	Weld On
14	Relay Contact Output 1	• 36	• AVAILABLE
15	Relay Contact Output 2	37	Power Signal from PS
16	SV1 Return	38	Frequency Signal from PS
• 17	• Set: SELECT PRESET #8	39	Seek Signal from PS
18	External Seek Input	40	Store Signal from PS
• 19	• Set: SELECT PRESET #4	41	24V Return
20	Suspect Part Alarm	42	+24V Source
21	Ready Output	43	Relay Contact Output
•22	•AVAILABLE	44	Relay Contact Output

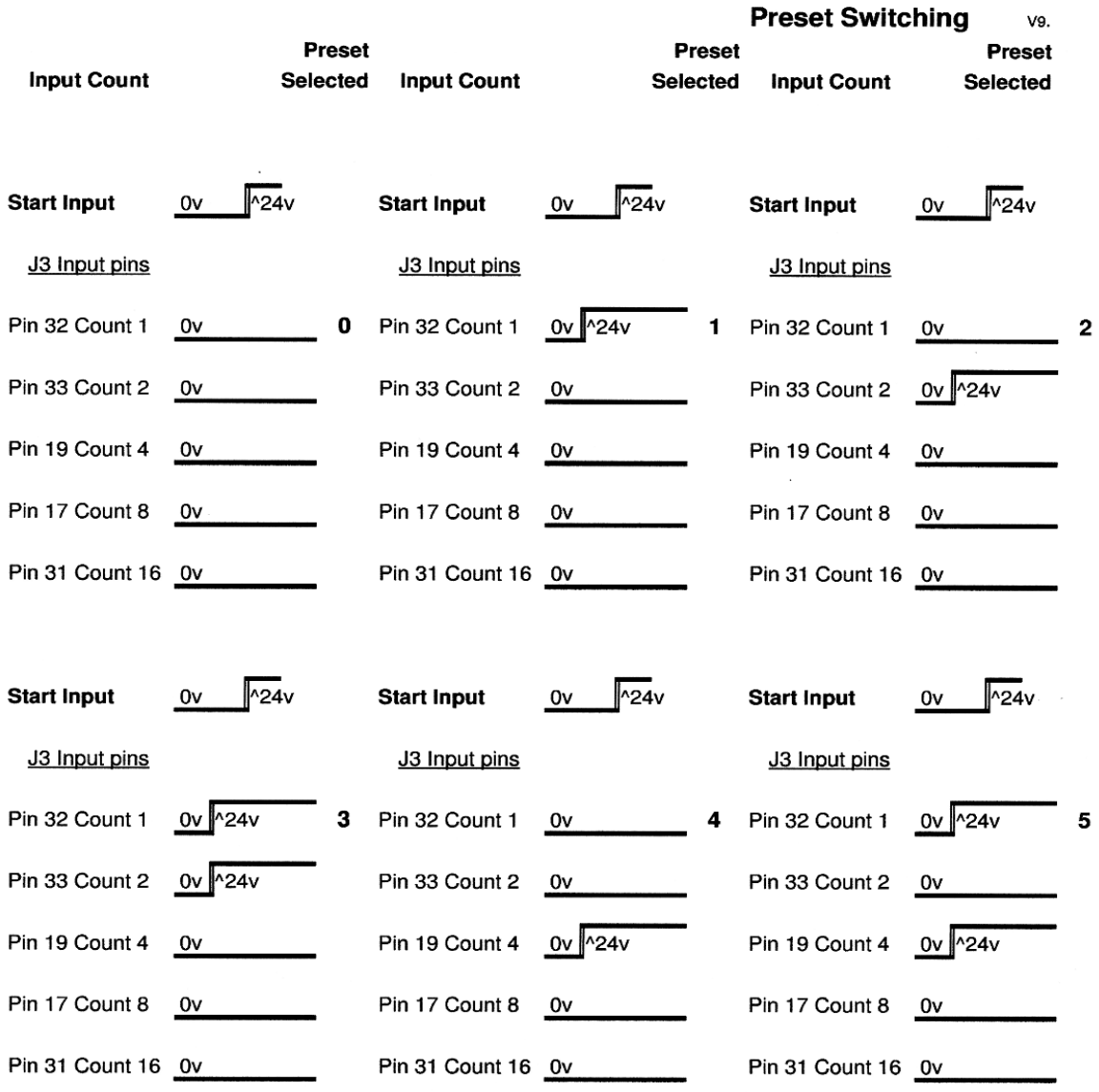
1.6.6.4 External Preset Select Binary Table

User I/O Input Pins When using External Preset Select.

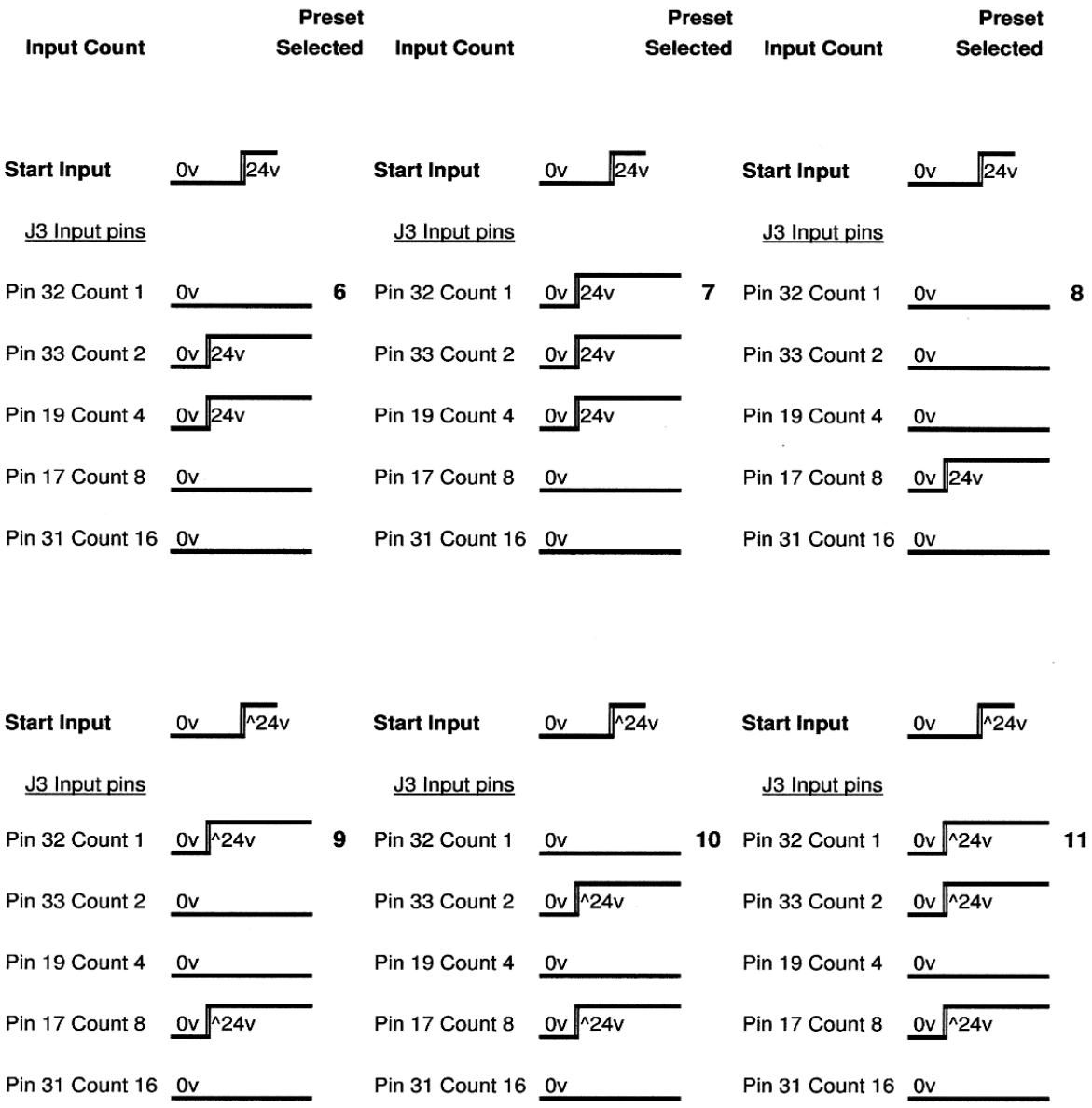
Table 1.10 User I/O Input Pins When using External Preset Select

	User I/O Input Pin #					
	31	17	19	33	32	
PRESET	(16)	(8)	(4)	(2)	(1)	**PRESET**
1	OFF	OFF	OFF	OFF	**ON**	1
2	OFF	OFF	OFF	**ON**	OFF	2
3	OFF	OFF	OFF	**ON**	**ON**	3
4	OFF	OFF	**ON**	OFF	OFF	4
5	OFF	OFF	**ON**	OFF	**ON**	5
6	OFF	OFF	**ON**	**ON**	OFF	6
7	OFF	OFF	**ON**	**ON**	**ON**	7
8	OFF	**ON**	OFF	OFF	OFF	8
9	OFF	**ON**	OFF	OFF	**ON**	9
10	OFF	**ON**	OFF	**ON**	OFF	10
11	OFF	**ON**	OFF	**ON**	**ON**	11
12	OFF	**ON**	**ON**	OFF	OFF	12
13	OFF	**ON**	**ON**	OFF	**ON**	13
14	OFF	**ON**	**ON**	**ON**	OFF	14
15	OFF	**ON**	**ON**	**ON**	**ON**	15
16	**ON**	OFF	OFF	OFF	OFF	16
	(16)	(8)	(4)	(2)	(1)	
	31	17	19	33	32	

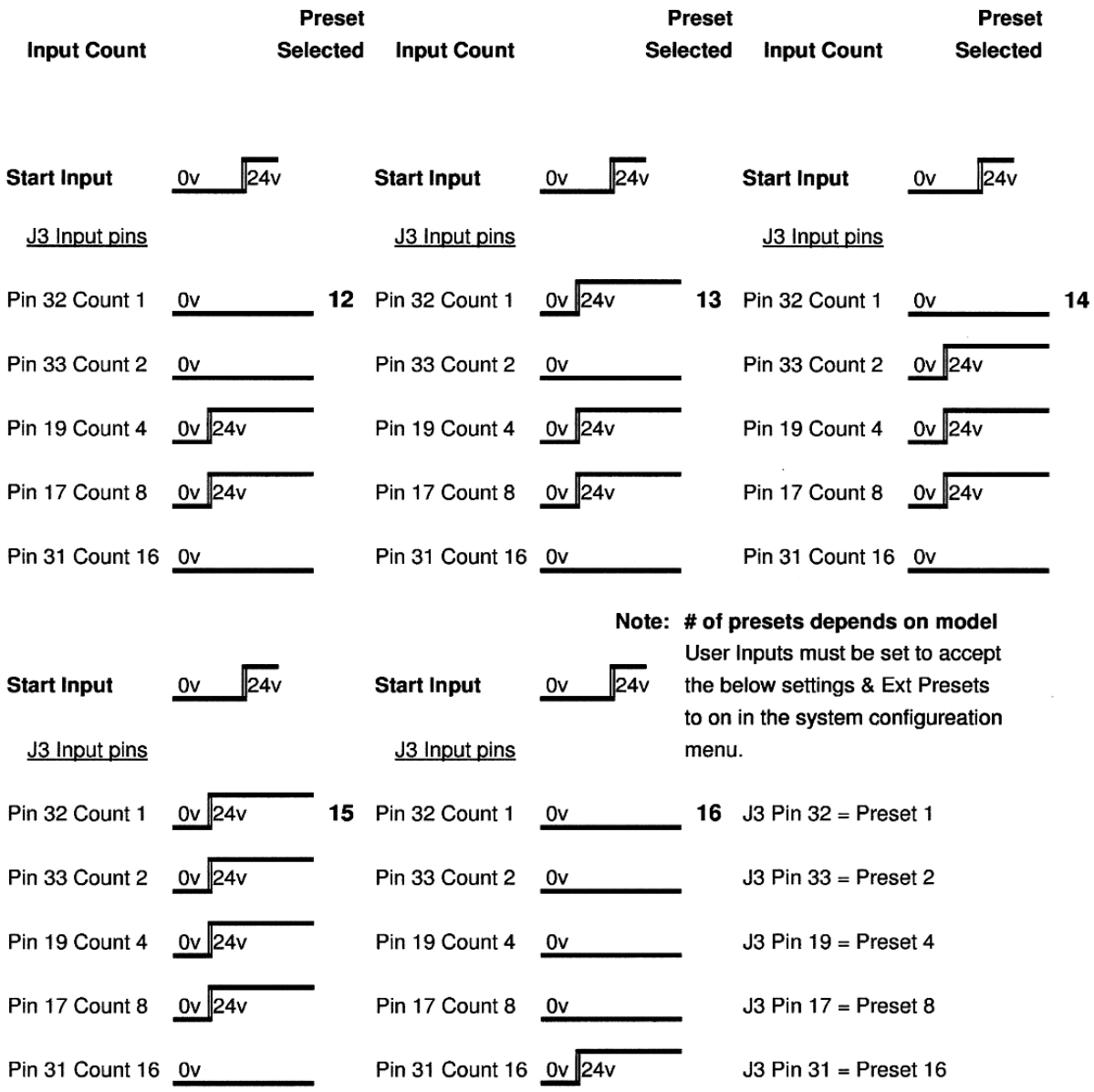
1.6.6.5 Preset Switching Diagrams, 1 of 4



Preset Switching Diagram, 2 of 4 continued.

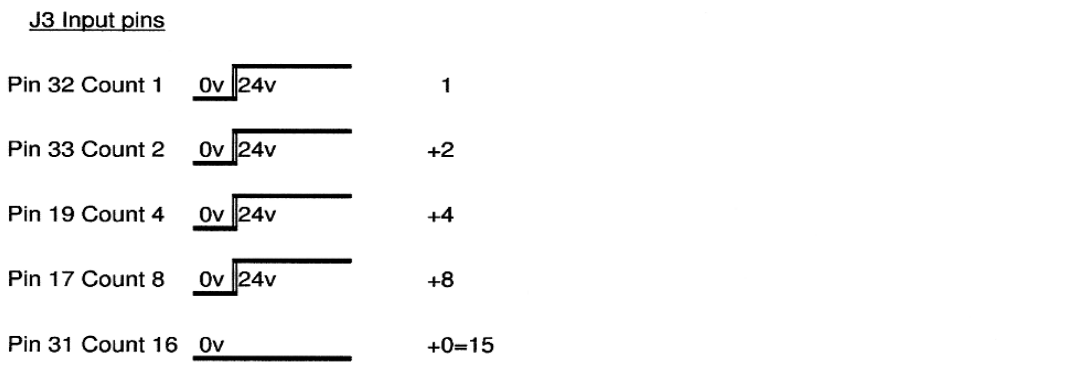


Preset Switching Diagrams, 3 of 4 continued.

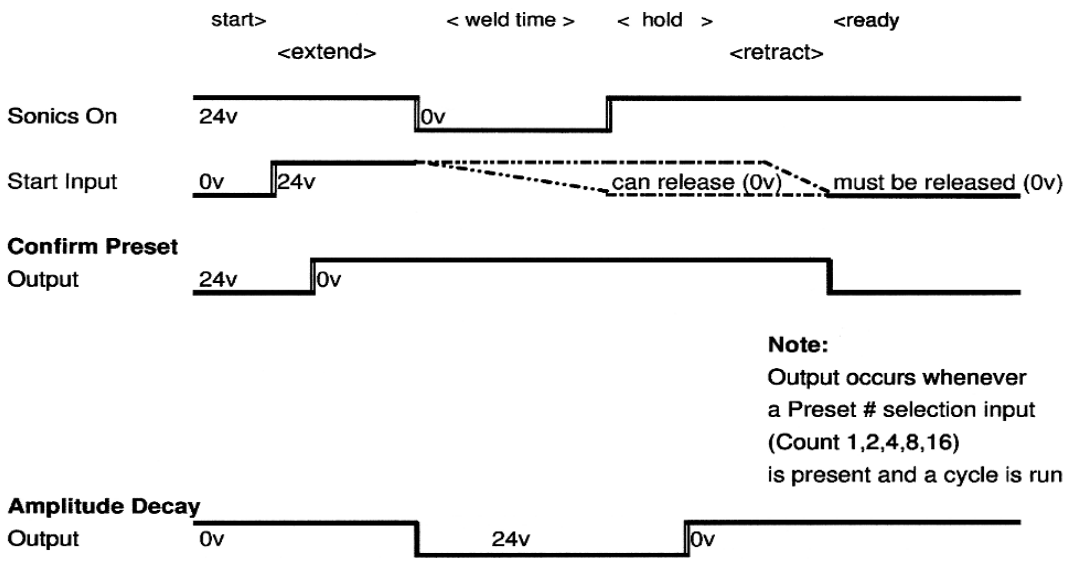


Preset Switching Diagrams, 4 of 4 continued.

Switching to Preset 15 shown as example:



User Outputs

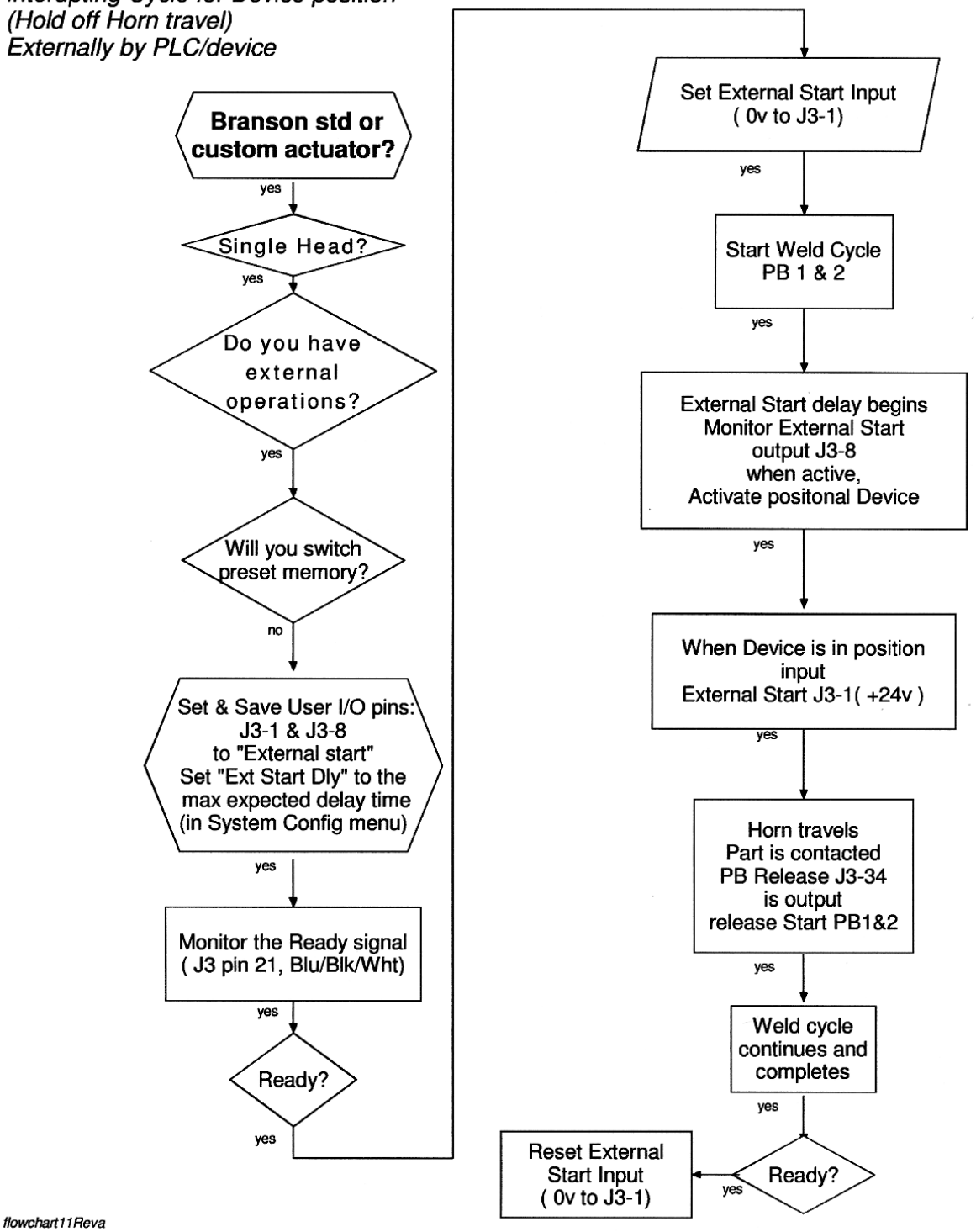


Note:
Output occurs whenever
a Preset # selection input
(Count 1,2,4,8,16)
is present and a cycle is run

Note:
Output occurs anytime amplitude
goes below the BUC Menu setting.
(test, weld, seek, timed seek,afterburst.)

1.6.7 Actuator, Delayed Horn Travel, Process Flow 7

Interupting Cycle for Device position
(Hold off Horn travel)
Externally by PLC/device



flowchart11Reva

1.6.7.1 Wiring Table, Actuator Delayed Horn Travel, Process Flow 7

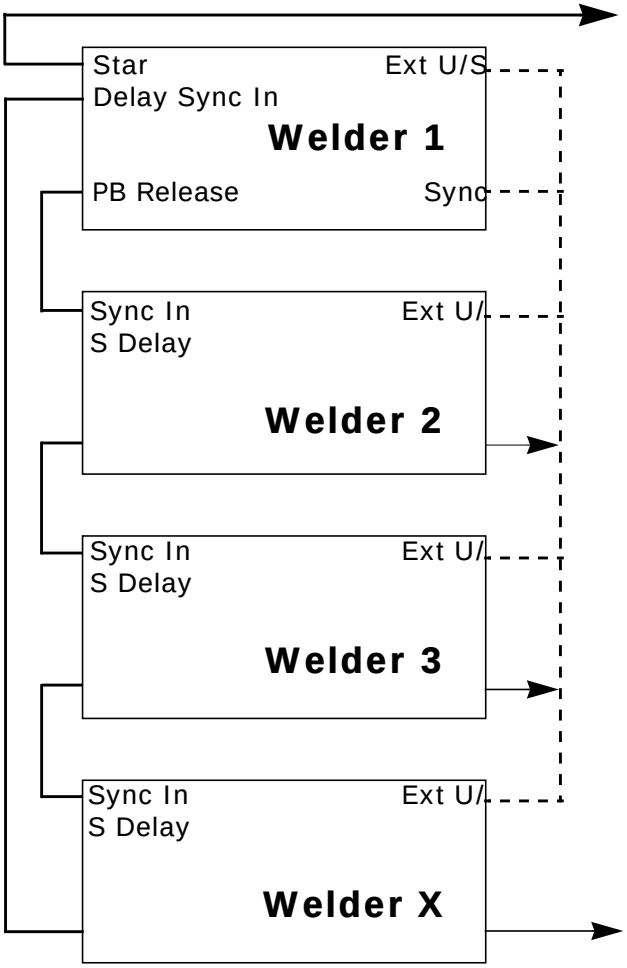
NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.11 Wiring Table Flow 7

	#7 Process Flowchart 7 Base/Start connector on actuator rear DB-9					
Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input
J3	User I/O connector on power supply rear HD-44					
	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	User definable input	1	Wht/Blk	Input	24V True	Set:EXTERNAL START
6	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
7	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
8	User definable output	8	Grn/Wht	Output	24V True	Set: EXTERNAL START
9	24V RETURN	12	Orn/Red	24V Return		24V Return
10	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
11	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
12	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
13	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
14	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
15	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
16	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

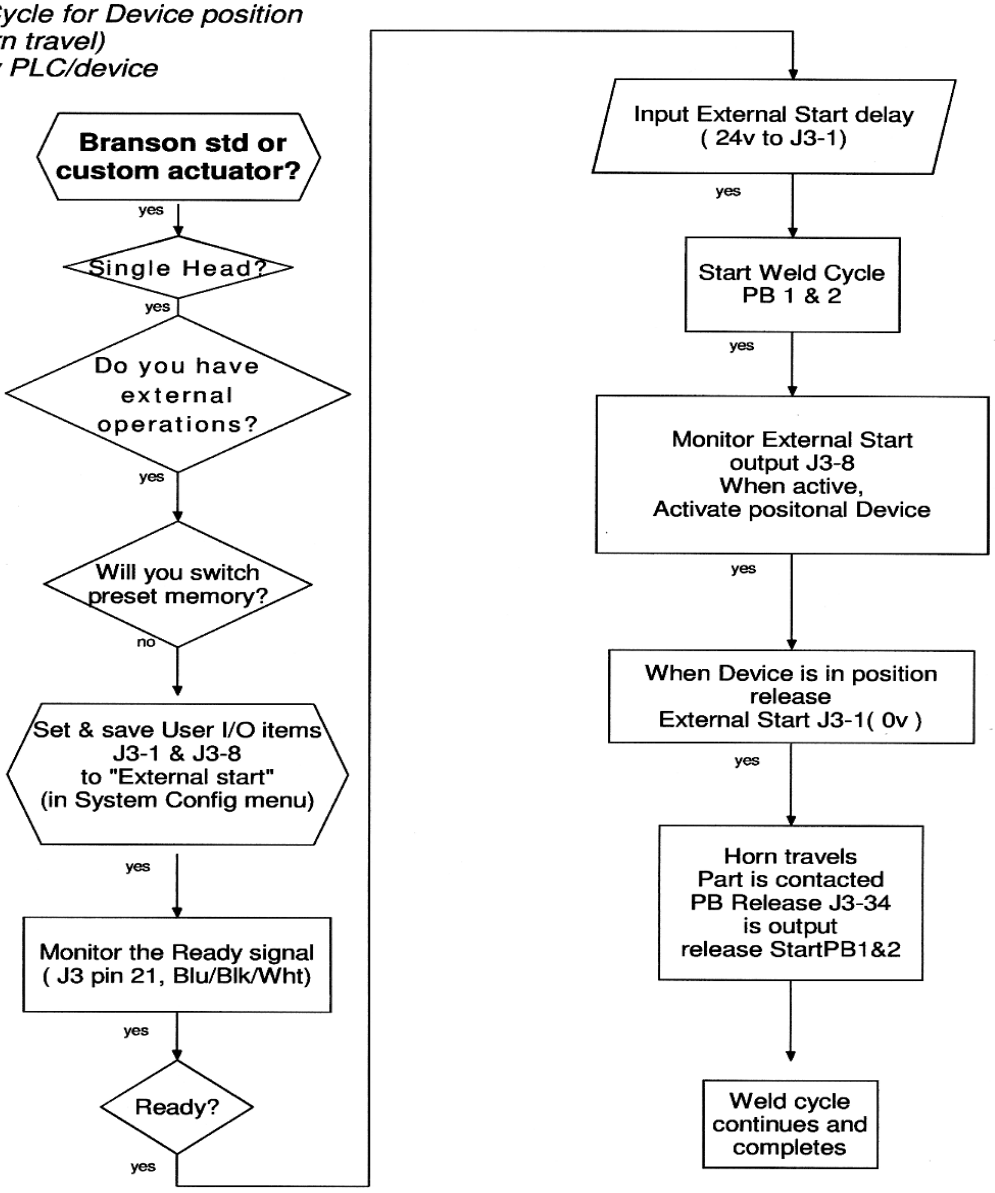
1.6.8 Actuators, Multi-Syncro (simultaneous sonic start), Process Flow 8

1. All welders get start signal from external control.
2. All welders move down to the part to be welded.
3. All welders reach trigger.
4. On all welders sonics is not activated because at this point, Sync In and Ext U/S Delay is missing.
5. On welder 2, Sync Out is activated by Sync In (=PB Release welder 1) and has reached trigger. Chain sequence links Sync Out 2-Sync In 3-Sync Out 3-Sync in X-Sync Out X-Sync in 1-Sync Out 1
6. Sync Out 1 activates all Ext U/S Delay inputs, see dotted line. Ultrasonics is started on all welders at the same time.



1.6.9 Interrupting Cycle for Device Position (Hold off on Horn Travel) Externally by PLC Device, Process Flow 9

Interupting Cycle for Device position
(Hold off Horn travel)
Externally by PLC/device



flowchart10

1.6.9.1 Wiring Table, Interrupting Cycle for Device Position, Process Flow 9

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.12 Wiring Table Flow 9

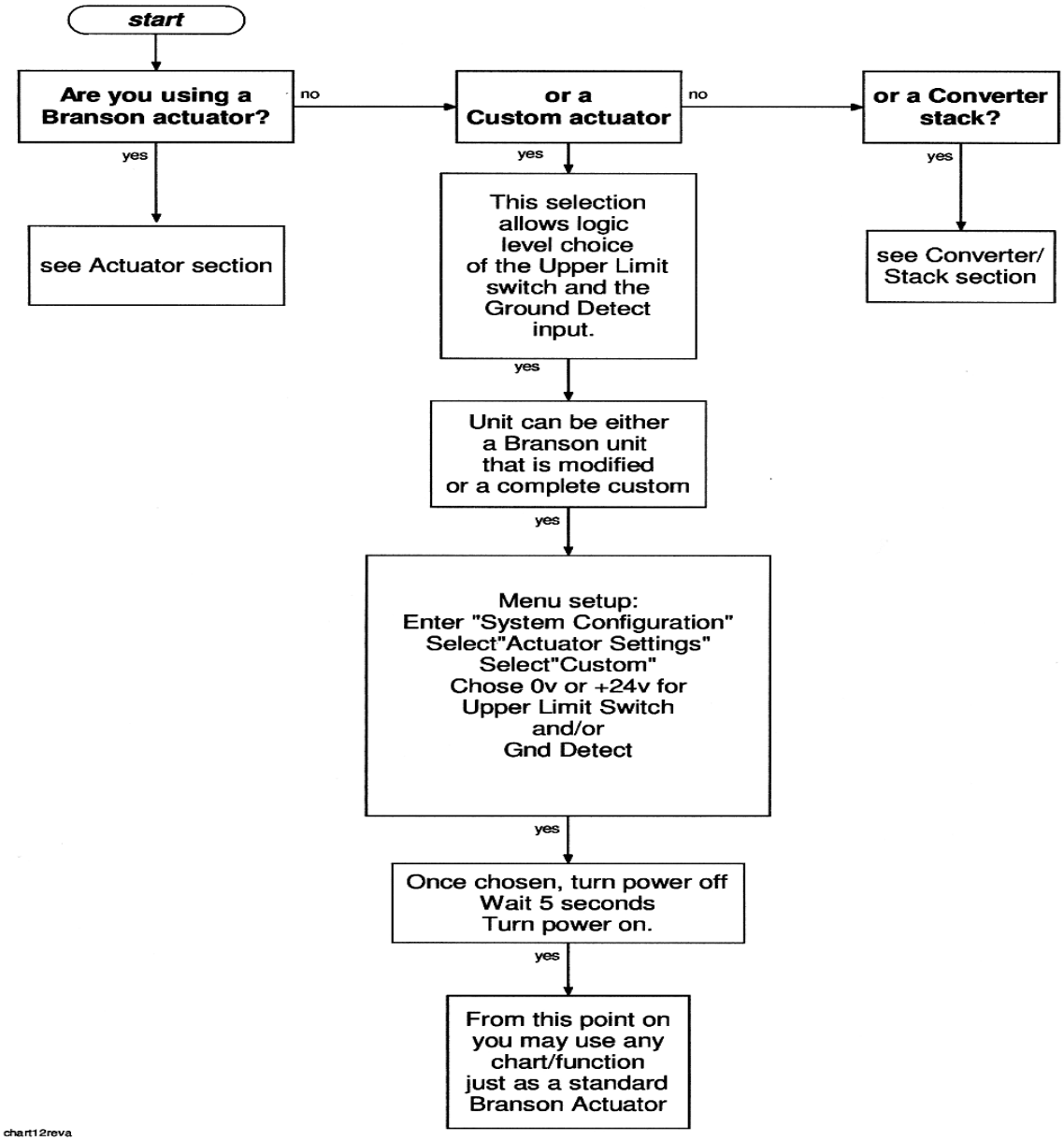
#9 Process Flowchart 9
Base/Start connector on actuator rear DB-9

Step	*Signal Name*	*Pin*	*Colors*	*Direction-*	*Signal Type*	*Definition*
1	PB2 RETURN	1	Black	Input	24V True	PB (actuator start) input
2	PB1 RETURN	2	White	Input	24V True	PB (actuator start) input
3	E-STOP RETURN	3	Red	Input	24V True	E-STOP input
4	E-STOP RETURN	4	Green	Input	24V True	E-STOP input

J3 User I/O connector on power supply rear HD-44

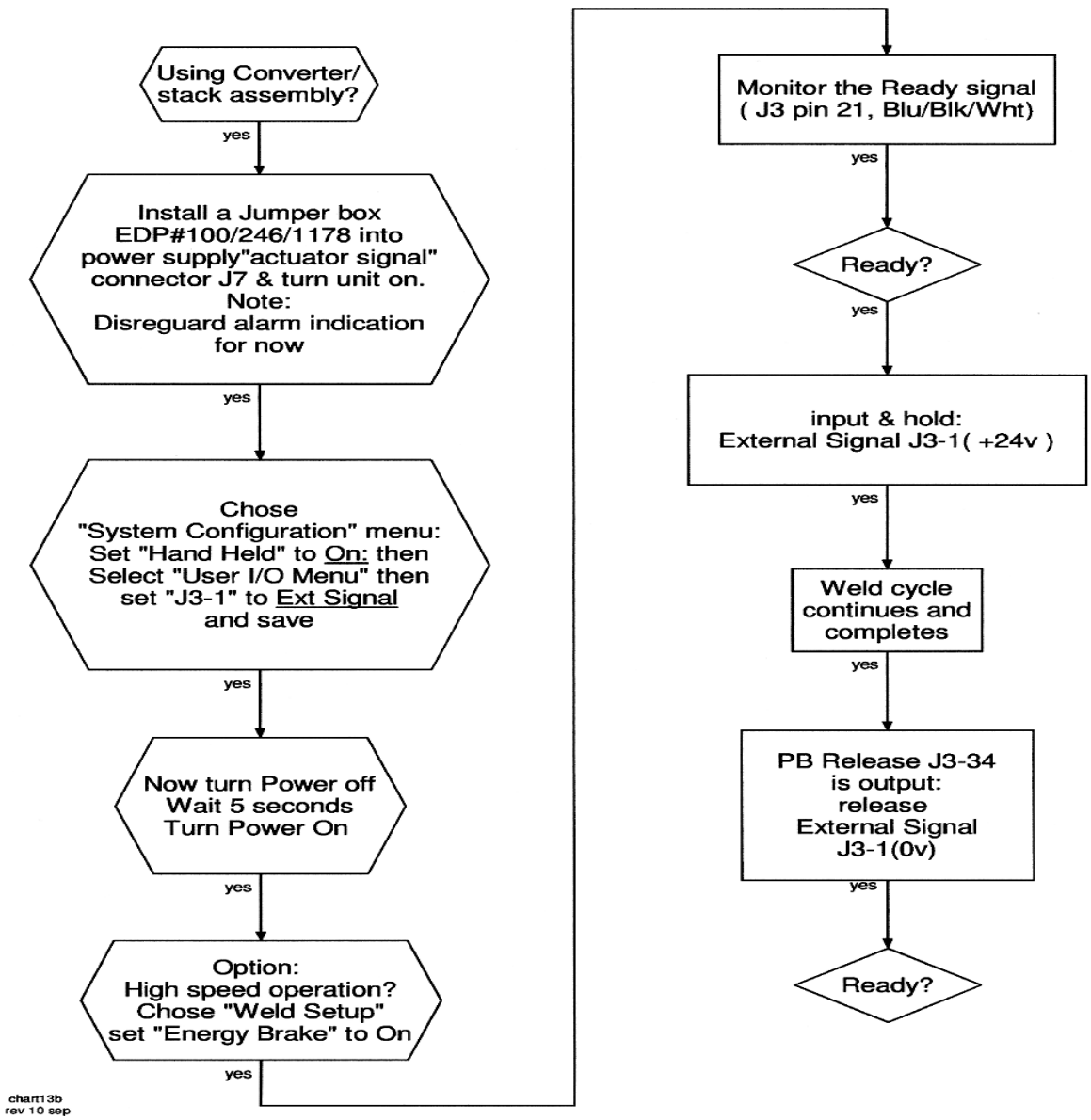
	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
5	User definable input	1	Wht/Blk	Input	24V True	Set:EXTERNAL START
6	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
7	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
8	User definable output	8	Grn/Wht	Output	24V True	Set: EXTERNAL START
9	24V RETURN	12	Orn/Red	24V Return		24V Return
10	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
11	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
12	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
13	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
14	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
15	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
16	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.10 Custom Actuator, Process Flow 10



1.6.11 Converter Stack, Standard Automation, Process Flow 11

Converter/Stack Use



1.6.11.1 Wiring Table, Converter Stack, Standard Automation, Process Flow 11

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.13 Wiring Table Flow 11

#10 Process Flowchart 11
Install 100-246-1178
jumper box into J7

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
1	User definable input	1	Wht/Blk	Input	24V True	Set:EXT SIGNAL
2	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
3	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
4	24V RETURN	12	Orn/Red	24V Return		24V Return
5	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
6	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
7	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
8	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
9	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
10	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
11	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.6.11.2 2000 Series Automation, Process Flow 11 (Requires Jumper 100-246-1178)

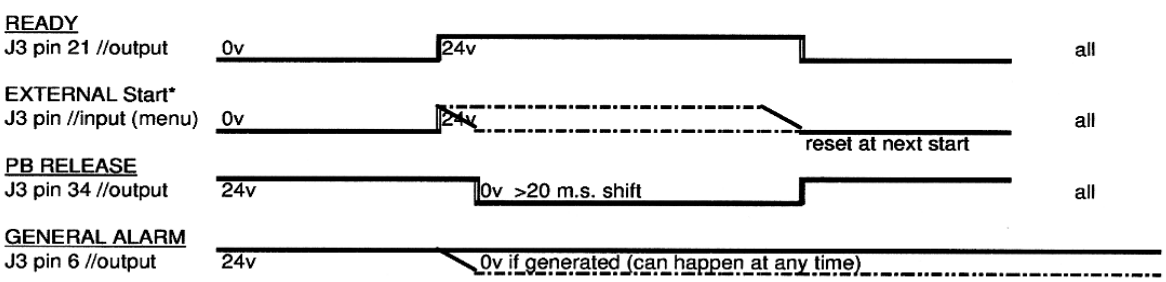
2000 Series Automation Interface

External Start Cycle no Actuator
Requires jumper 100-246-1???

Minimum Requirements

Cycle state: start> < weld time < hold > <ready

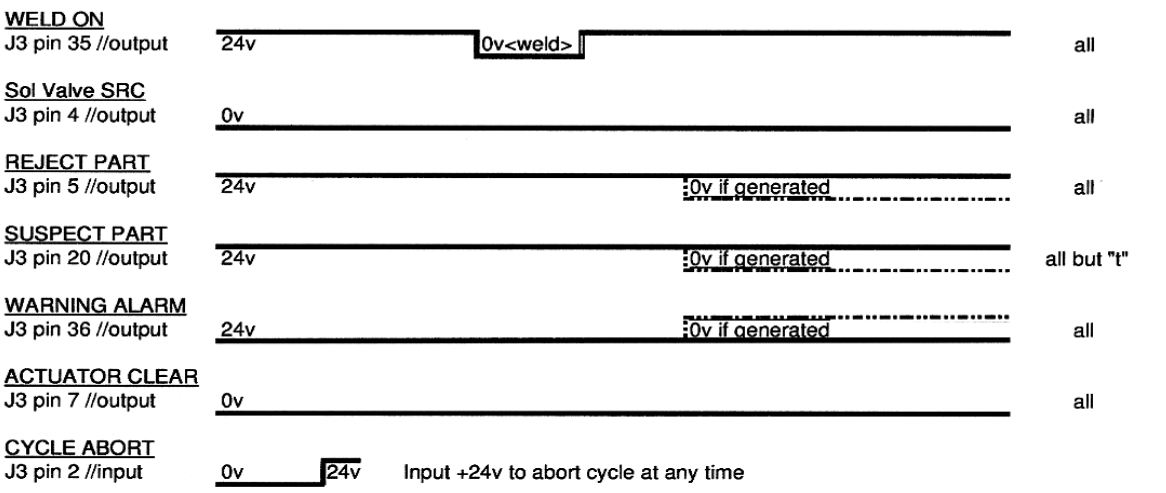
Used on Power Supply Models



* you must select a input pin in the USER I/O (J3 pins 1,17,19,31,32, or 33) and set it to EXTERNAL START

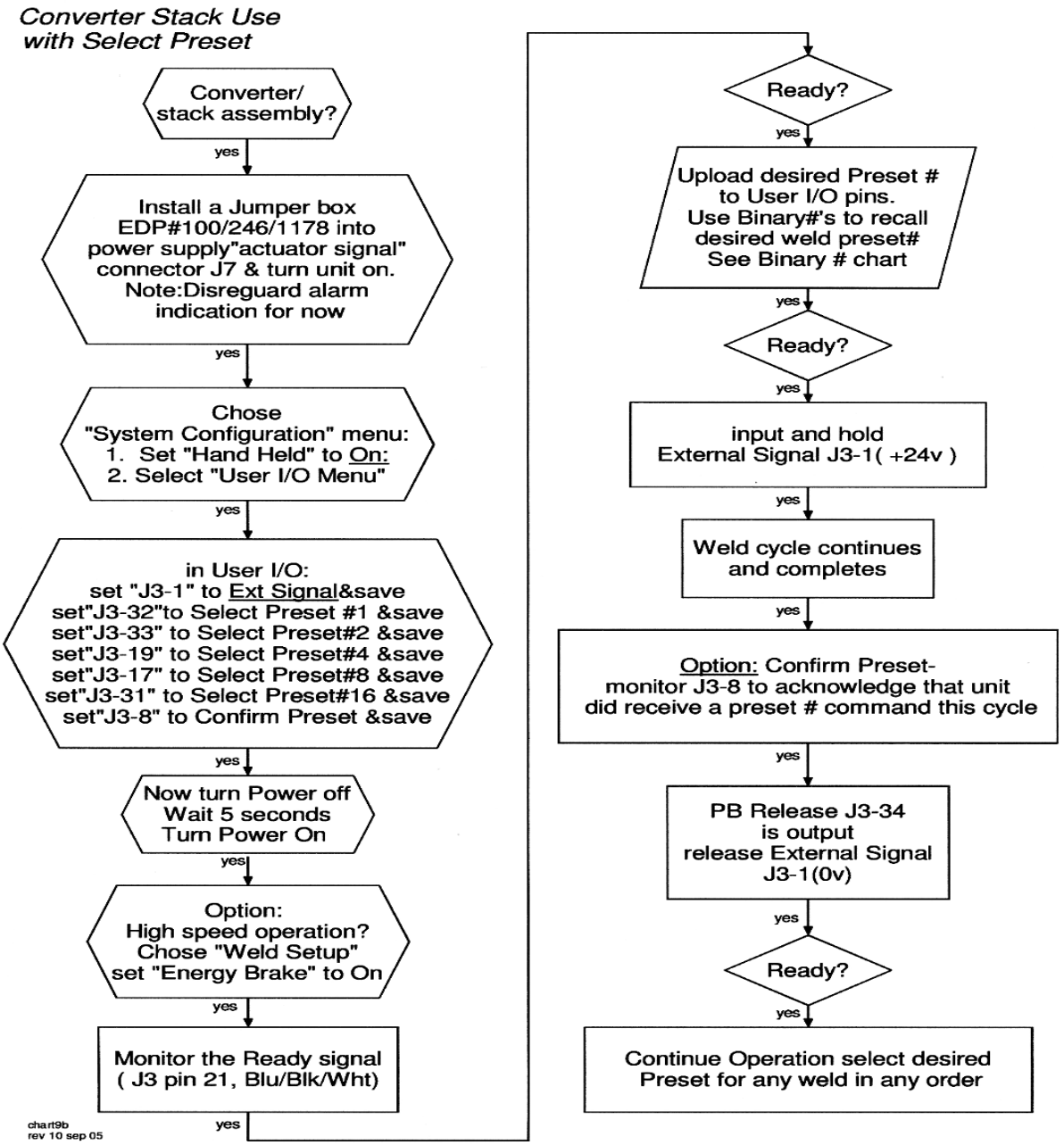
Specialized

Optional Features



Double verticle line triggers the next state or function in time (‖)

1.6.12 Converter Stack, External Preset Select, Process Flow 12



1.6.12.1 Wiring Table, Converter Stack, External Preset Select, Process Flow 12

NOTICE	
	All voltages shown in this manual are direct current (DC) unless otherwise noted.

Table 1.14 Wiring Table Flow 12

#11 Process Flowchart 12
Install 100-246-1178
jumper box into J7

J3 User I/O connector on power supply rear HD-44

	Signal Name	*Pin #*	*Colors*	*Direction*	*Signal Type*	*Definition*
1	User definable input	1	Wht/Blk	Input	24V True	Set:EXT SIGNAL
2	EXT_RESET	3	Grn/Blk	Input	24V True	System Reset
3	G_ALARM	6	Blk/Wht	Output	0V True	General Alarm
4	User definable output	8	Grn/Wht	Output	24V True	Set:Confirm Preset
5	24V RETURN	12	Orn/Red	24V Return		24V Return
6	24V SOURCE	13	Blu/Red	Output	+24V Source	+24V Source
7	User definable input	17	Wht/Blk/Red	Input	24V True	Set:SELECT PRESET #8
8	User definable input	19	Grn/Blk/Wht	Input	24V True	Set:SELECT PRESET #4
9	READY	21	Blu/Blk/Wht	Output	0V True	Ready Output
10	24V RETURN	27	Blu/Wht/Orn	24V Return		24V Return
11	24V SOURCE	28	Blk/Wht/Orn	+24V		+24V Source
12	User definable input	31	Wht/Red/Blu	Input	24V True	Set:SELECT PRESET
13	User definable input	32	Blk/Grn/Wht	Input	24V True	Set:SELECT PRESET #1
14	User definable input	33	Wht/Blk/Grn	Input	24V True	Set:SELECT PRESET #2
15	PB RELEASE	34	Red/Wht/Grn	Output	0V True	PB Release
16	24V RETURN	41	Grn/Orn/Red	24V Return		24V Return
17	24V SOURCE	42	Orn/Red/Blu	+24V		+24V Source

1.7 Frequently Asked Questions (FAQ)

FAQ
2000 SERIES AUTOMATION

V9.xx

Q. What is the best tip for automating a Branson welder?
A. Perhaps the best advice is to provide a "manual jog" function where the welder can be cycled by the system control panel without indexing the whole machine. The time saved debugging, optimizing, calibrating and servicing the welder over it's lifetime will pay-back to the end user and machine builder many times over the cost of Input hardware and code.

Q. *What are the electrical characteristics of the input/output lines in the START and USER I/O cables?*
A. They are rated at 10ma. 24Vdc. This is compatible with most PLC's available.

Q. *Can't I use 120 volt AC LOGIC?*
A. Not directly. Use relays to interface between the 2 logic levels. Note: use relays with low-power requirement coils, and use back biased diodes to suppress induced back EMF.

Q. *But you forgot about the RELAY outputs in your diagrams.*
A. They are SOLID STATE relays, and can safely withstand 40 V ac 250 ma, or 24 V dc, 250 ma. So they may be suited better to drive relays, if required to interface to relay coils.

Q. *Why do you have so many pins in the USER I/O cable?*
A. We combined the alarm and advanced feature connector outputs from the 900 Series with 2000 Series additions to provide maximum features and flexibility while retaining backward compatibility.

Q. *What do I do with the UNUSED PINS?*
A. You should electrically isolate each unused pin so that shorts to ground and other outputs are avoided. This could possibly damage the USER I/O board and other system components.

Q. *Do I ground the shields on the START and USER I/O cables?*
A. No; leave the shields from the cables isolated and cut-back so they do *not* touch ground: this prevents ground loop interference from occurring.

Q. *Should I ground the RETURN lines in the START and USER I/O cables?*
A. If required: this generally is not a problem. If problems occur, see "OTHER THAN 24 VOLTS"

Q. *What are those SQUARE PLASTIC HOUSINGS on the cables?*
A. They are ferrites that are used to reduce crosstalk and interference from entering the system. DO NOT remove them.

Q. *How LONG can I run the CABLES?*
A. Cable sets are available in 8, 15, 25, and on special order 50-foot lengths. Contact Branson Product Support or Customer Service if you have special needs.
Q. *Can I run the Branson welder cables in a WIRING TROUGH with other system cables?*

A. Generally yes. But it would be best to avoid other potentially troublesome noise source cables or wiring.

Q. *What other system cables might cause a NOISE TROUBLE SOURCE?*
A. Avoid wiring of devices such as solenoids, large relays, motors, or anything that has the potential of large inductive currents. Digital devices may also create broad-spectrum noise. Generally, all automation controls can be noise generators.

Q. *Why do you require the READY signal to be monitored by the system PLC?*
A. The welder mandatory requirements dictate the unit be READY or else the unit will DISREGARD any start command.

Q. *Why must I MAINTAIN THE START SIGNAL?*
A. This is the way the built-in safety circuits operate. Also, the vast library of error-detection firmware code is based on these same requirements: it will simplify automation system/PLC/welder debugging during system integration. Watch for the PB RELEASE signal, then you can release the START SIGNAL.

Q. *My machine is CAM driven. Do I need to do anything special?*
A. For one thing, monitor the GENERAL ALARM output and send a RESET as soon as the alarm is received. This will allow the power supply to recover from a fault, and go to READY as soon as possible. Otherwise the next weld may be missed if the system is not reset. Also, see WITHOUT A BRANSON ACTUATOR below.

Q. *Why can't I use a SINGLE START input to signal the welder?*
A. This is not preferable as you are running the signals in parallel, and cable capacitance can reduce the noise immunity designed into the controls. The dual inputs are required for the use of manual start switches (or equivilent PLC I/O), and the necessary circuit needs of an actuator welder utilizing solenoid valve control. If you are using just a "stack", see below.

Q. *I'm going to use a welder station WITHOUT A BRANSON ACTUATOR. Do I need to use all those cables?*
A. If you only need a "stack" (converter/booster/horn) rather than a full featured actuator, you can use the USER I/O cable. This is a feature available in Version 8.05 or later operating system, referred to as Hand Held mode.

Q. *Does it wire up the same way?*
A. The USER I/O inputs wire the same way, but the start only needs a SINGLE START input into Pin 1.

Q. *But you said you need DUAL START Inputs?*
A. Yes, when using a solenoid valve equipped actuator. But in this case we are only controlling ultrasonics with just a stack. For this function a SINGLE START input works fine.

Q. *What can I do to make sure I run at MAXIMUM CYCLE RATE for my machine?*
A. You can:

- Use the Cycle Abort input instead of the Emergency Stop input for aborting the weld cycle under system operations in *non-safety related* conditions, such as having no part loaded in fixture, or a fault sensed in a different station somewhere else on the machine. It does not require Reset afterward to clear an

alarm as Emergency Stop would, so operation can be restored sooner. Save the Emergency Stop feature for conditions that require actual emergency situation.

- RESET immediately after an GENERAL ALARM output.
- RELEASE the DUAL START inputs immediately after an GENERAL ALARM output.
- RELEASE the DUAL START inputs immediately after sensing PB RELEASE output.
- If you have a aed/aod, or aef actuator model using 8.05 or higher firmware: and if the stroke length is more than about 0.5 inches, turn on the ACTUATOR CLEAR function and set the distance value to whatever is required for the horn to clear the welded workpiece without jamming. Use the ACTUATOR CLEAR output to let your PLC start the index the material handling, rather than wait for the welder to become READY.
- If you have a model ae actuator and 9.03 or higher firmware, you can also save some cycle time using the actuator clear feature outlined above. The actuator clear output will toggle when the welder's internal upper limit switch is activated.
- 2000f models have RAPID TRAVERSE feature built-in: if your stroke is over about 1.0 inch, this may help cycle rate.
- 2000f models have a return speed that is not weld pressure sensitive: it returns at a maximum actuator-safe speed regardless of weld or hold force.
- Never run in an open-loop mode (that is not releasing the start after sensing the PB release signal), if possible. Fixed timing can be too short should a fault or alarm occur, or may be longer in time than is necessary.

Q. *Do all models run at the same CYCLE RATE?*
A. See above.

Q. *Are there any special requirements for operation with the ACTUATOR UP-SIDE DOWN?*
A. Always let Branson know when you plan to run in this manner. Model-specific advice will be provided.

Q. *Are there any special requirements for operation with the ACTUATOR HORIZONTAL?*
A. Always let Branson know when you plan to run in this manner. Model-specific advice will be provided.

Q. *How does EMERGENCY STOP work?*
A. Keep in mind that it is meant for EMERGENCY usage only, not for normal head retraction functions. Additional time is allotted for checking the welders' hardware and system status after an EMERGENCY STOP. Note: A front panel or external signal Reset is required after an Emergency Stop to reinitialize the welder(8.05 or later firmware. Also see CYCLE ABORT below.

Q. *So the CYCLE ABORT function is the preferred fast welder head retraction function?*
A. Yes. It does not require the additional time that is allotted for checking the welders' hardware and system status that is used for EMERGENCY STOP.

Q. *How does RESET work? Can I hold it on?*
A. RESET is only acted upon *after* a GENERAL ALARM. Do *not* hold it in the RESET state as it will be ignored.

Q. *My system logic uses some value OTHER THAN 24 VOLTS. What do I do?*

A. A set of dipswitches are provided on the rear panel slot that contains the USER I/O connector. Setting the switches to OFF (open) converts the 24volt USER I/O to OPEN COLLECTOR configuration. The same voltage/current spec.'s apply when in this mode. (24 volt dc,25ma max.) Use them to control devices that have outputs compatible to your requirements.

Q. *Are there any environmental conditions to be concerned about?*
A. Any electrical/electronic equipment does not work well in: high humidity (*condensing*) conditions: also in dusty areas, in particular *conductive dust* (carbon granule or fiber, charcoal, metal particle, etc.)
A Fan Filter Kit with instructions can be factory or customer installed for just ordinary dusty areas.
Always contact your area representative, Branson Danbury Product Support or Customer Service should any like conditions or for inquires about explosion-proof requirements.

Note: the following features are only available in Version 9.xx and later firmware.

Q: *Can I have multiple welders come down together and start ultrasonics at the same time?*
A: Yes, if you have 9.x firmware. This is called Syncro operation. Using PB release, Ultrasonic trigger delay, sync in and sync out signals.

Q: *Can I make multiple welders retract at the exact same time?*
A: Yes, extend the hold time on all welders to more than required. When the last weld on signal goes away, time your hold time from the PLC (you can also use the SOL VALVE SRC from one of the welders). When the proper time is reached, activate the cycle abort input on each welder. This will start retracting all welders at the same time.

Q: *Can I run a "Dry" cycle with no ultrasonics?*
A: Yes, using the ultrasonics *sonics disable* input, a cycle can be run with all the proper timing, but the ultrasonics will not be activated.

Q: *After I run a "Dry" cycle, how can I be sure that ultrasonics is on when it's supposed to be?*
A: You can monitor the weld on signal to see if it activates and deactivates as in a normal cycle. It should not if sonics are disabled Or, if a cycle is run with the ultrasonics disabled, a Note alarm will be generated. A user output pin can be assigned to this group of alarms allowing a signal to be fed to the PLC.

Q: *How do I recall presets using the inputs on the J3 connector?*
A: Assign as many inputs as are needed in User I/O section of System Configuration. Up to 16 presets can be recalled this way. You can select a Confirm Preset output to J3 to sense a preset change did occur.

Q: *Is it possible to delay ultrasonics for a short time after force (trigger) is applied to the part, for a (leak, resistance, vacuum, etc.) test?*
A: Assign a user input to external trigger *U/S Delay*. Maintain this input until your test is complete. When this signal goes away, the ultrasonics will start.

Q: *How can I insure the safety door is in place before the horn is moving?*
A: Assign, in the User I/O menu (in System Configuration screen) one input pin and one output pin to the External Start function. When a valid start signal is received, the

External Start output will go active. When the External Start input is active, indicating the door is in place, then the horn will start moving.

Q: *How do I know when it's safe to switch stacks when I'm sequencing, without excessive time delays?*
A: Assign one output pin to Amplitude decay. When the amplitude is at a low value, this output becomes active indicating it is safe to switch stack relays.

Q: *How can I know when a part is missing?*
A: In the weld setup menu, turn on missing part. Assign one output pin to the missing part alarm. When the missing part alarm occurs, the assigned pin will also go active. .

Q. How much air consumption does the 2000 Series use?
A. 2000 Series products use identical air cylinder sizes as prior models, therefor the air consumption tables from prior series documentation will still apply.

Cubic Feet of air per Minute per inch of stroke length (each direction)

Cylinder Size	Air Press. 10	20	30	40	50	60	70	80	90	100
1.5	0.00174	0.00243	0.00312	0.00381	0.00450	0.00513	0.00590	0.00660	0.00730	0.00800
2	0.00317	0.00437	0.00557	0.00677	0.00800	0.00930	0.01040	0.01170	0.01300	0.01420
2.5	0.00490	0.00680	0.00870	0.01060	0.01250	0.01440	0.01630	0.01830	0.02040	0.02230
3	0.00680	0.00960	0.01240	0.01520	0.01800	0.02080	0.02350	0.02670	0.02910	0.03190

Use the above table to calculate the air used by the air cylinder.
Add 0.034 Cubic foot per Second of actual weld time to account for converter cooling air per weld cycle. (2 CFM)

As an example:

3.0 inch aed actuator running at full pressure (100psi) and stroke length (4inches) at a cycle rate of 20 parts per minute = 0.0319 CFM per inch of stroke (from above table) X 8 inches (total stroke is 4 inches down and 4 inches back) equals 0.2552 CFM per stroke. Weld time is 1 second so: 0.034 X 1 equals 0.034 CFM for cooling.

Adding 0.2552 CFM for the cylinder and 0.034 CFM for cooling equals 0.2892 CFM per cycle. Multiply for parts per minute (20) and you get a total of 5.784 CFM.

This would very likely be a worst-case condition any welder could run at.

However we have a slightly different condition for an 2000f/aef welding system. Because the pneumatics are used as differential mode of operation, I would suggest to always use the 100 psi values from the above table to be on the conservative side for sizing airflow, rather than on the actual force values. Still add the same converter cooling values (0.034) as in the prior example.

1.8 Glossary V9.xx

Actuator type

This refers to the feature set of the device that delivers the horn to the workpiece. It may be just a converter/horn “stack”, or a Branson furnished basic actuator, or a Branson furnished actuator with distance and force sensors.

Automation

When an ultrasonic welder is integrated as a component or station into an assembly machine.

Confirm Preset

A user output signal that will indicate that a weld cycle preset # has been input from the external controller.

Cycle Abort

Note: Not a new Version 9.xx feature but repeated here for clarity and usefulness in conjunction with several new V9.xx features.

External Input fixed at J3-pin 2 that +24VDC applied will immediately terminate the current weld cycle, retract the horn if using an actuator, and not accept another Start or PB input until removed. The welder is much quicker to go back to Ready when used in lieu of the Emergency Stop function as it does not require a Reset to clear the alarm afterwards. It is, thus, the preferred method to terminate a weld cycle if human safety conditions are not the reason for welder stoppage. Emergency Stop should still be used for those conditions where safety, such as the machine Emergency Stop, are encountered.

Cycle Okay

A user output signal that indicates no detectable alarm conditions occurred during the last weld cycle.

Cycle Completed

A User Output signal that indicates no detectable alarm condition occurred during the last weld cycle.

Disabled

This selection in User I/O will shut off the hardware pin from any occurrence. It will not change state under any condition after the unit becomes Ready.

External Operations

This is a cycle when the welder would normally be in full control (as in a standard cycle) BUT and external device is performing an operation that interrupts the cycle. A typical example would be to perform a “test” on the workpiece to determine its merit before the weld (ultrasonics) cycle begins. If the device tests OK the weld cycle is allowed to proceed: if the device tests BAD the weld cycle can be aborted by PLC assuming the User I/O is properly configured to send a Cycle Abort input and the workpiece be handled

appropriately using the fixed User I/O functions such as Suspect or Reject Alarm outputs. Also can be used with a sound enclosure or part clamping device, where the door or clamp arms have to go into place before the actuator is allowed to travel.

Ext(ernal) Signal

Note: Not a new V9.xx feature but repeated here for clarity. Now the hardware pin and function is selectable in the User I/O menu.

Used as input to allow external input to trigger amplitude or force change (model dependant).

Or as the start cycle input when in Hand Held mode.

External Sonics delay

A cycle where the ultrasonics are not started after the horn contacts the workpiece until an external device has determined that the cycle should continue. It may be a test apparatus or perhaps a part-marking operation.

Note: The Cycle Abort input can be used to end the welder cycle and not waste time on a workpiece that the external apparatus determined to be a reject.

External Start

These are both input and output signals, and both must be turned on and assigned a hardware input and output pin in order to function.

Once the unit has received a legitimate start input the External Start output pin activates an external device (horn clamp cylinder, sound enclosure door, part in position, etc) before moving the horn. When the external device becomes in position, it then signals the External Start input to commence the welder's horn travel and weld cycle. To enable this feature, select the System Configuration menu, then User I/O menu.

While in that menu you can also set "Ext Start Dly" of up to 10.0 sec. to wait before receiving the External Start input before setting an alarm.

External Trigger delay

This is when the external input normally used for Amplitude or Force Stepping is instead used to delay the start of ultrasonics, to allow for external device functions prior to the start of welding.

External Beeper

An output pin that operates the same as the internal beeper, and could operate an external (louder) device or light.

Missing Part

A user output signal that indicates trigger occurred above the minimum or below the maximum user-set allowable distance settings.

Modified Alarm

A user output signal that indicates a user-set compensating condition occurred, (Only energy at this time).

Multi head

Multi head uses more than 1 horn, each horn has its own respective ultrasonic power supply.

No Cycle Alarm

A user output signal that indicates the last weld cycle was aborted due to an abnormal welder internal system malfunction, an aborted external start signal, or an external cycle abort command.

Note

An alarm condition of the lowest priority.

Overload Alarm

A user output signal that will indicate that a power supply overload condition occurred during the last weld, test or seek cycle.

Single head

Single head has only 1 horn and power supply.

Sonics Disable

When this User I/O input is active, ultrasonic energy is forced off. If active throughout a weld cycle, a “dry” cycle will occur: should the weld mode be indeterminate (energy, power, etc) then the time normally used for the “weld” will extend out to the maximum allowed.

Standard weld cycle

A cycle where the automation controls when the ultrasonic welder is given the start signal, but the welder controls the entire weld cycle function to the finish. It then reports to the automation controls it is ready (to start again) the next weld.

Switching preset memories

This is when different weld setups are stored in memory. They can be recalled from memory by the user from the front panel, or remotely from the User I/O input pins if properly selected settings are chosen in the System Configuration menu.

Sync in (see Sync out)

Sync out (Syncro weld cycle)

This is when multiple welders cycle against the same workpiece, and their ultrasonic power is started simultaneously in Sync for a particular application issue. Used in conjunction with Sync in.

(Another option would be to also release all the horns from the workpiece simultaneously. You can use a longer than required hold time on each unit, then apply Cycle Abort to all the welders to make all retract simultaneously.)

Warning

A user output signal that indicates a warning message was generated during the prior weld cycle. They are of a class of minor operating conditions that do not generate a General Alarm output, but may be important to the end-user (Energy Compensation occurred, for example).