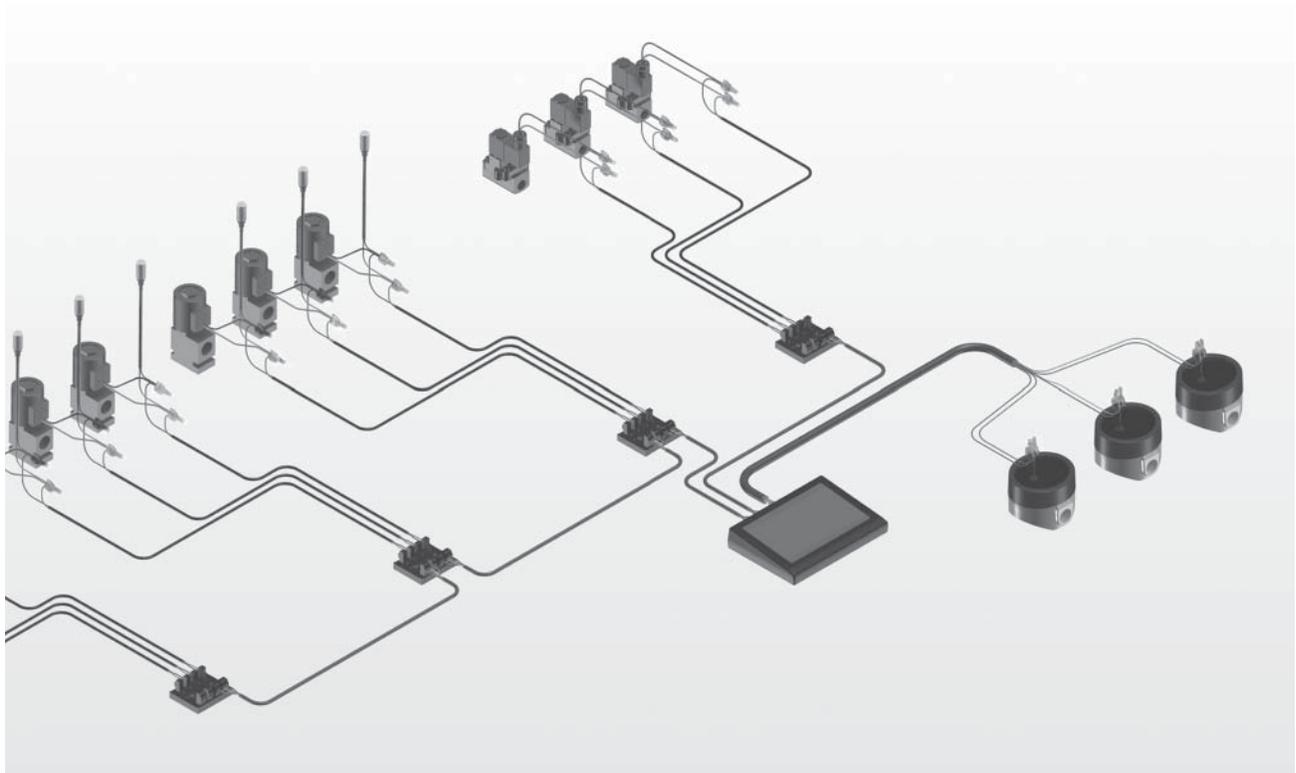




Spectrum 100™ V2.6 Electronic Fluid Inventory System

Model 3110-006P Queuing Console™
Model 3120-030..... Smart Controller™
Model 3120-031..... Ready Light
Model 3120-032..... Fluid Solenoid Valve
Model 3120-033..... Air Solenoid Valve
Model 3120-036..... Power Adapter



Thoroughly read and understand this manual before installing, operating or servicing described equipment.

Safety: General Notes, Warnings, and Precautions

Thoroughly read and understand this manual before installing, operating or servicing described equipment.

CAUTION

DO NOT TURN OFF CONSOLE IF JOBS ARE IN QUEUE !

Doing so can result in error, "Station not Available". Before turning off power to console, dispense all jobs or delete all jobs in queue by using Basic Procedure BP5: Job Deletion.

If "Station not Available" message appears, refer to Diagnostic Error Message and Code (pg 55); "No Code" "Station not Available" for recovery procedures.

CAUTION

Because The Spectrum™ System controls pressurized oil delivery, the following safety precautions should be observed:

- 1) Check equipment regularly and repair or replace worn and damaged parts. Be sure fluid connections are tight before operating this equipment.
- 2) Adhere to limits of intended use as described on page 4. Read all limitations which apply to fluid types, facility limits and installation configuration.
- 3) Relieve pressures built up in the system before any service or repair is begun. See pressure relief procedure, this page.
- 4) Never alter or modify any parts of this product; doing so may cause damage and/or personal injury.

NOTE

Failure to load fluid meter calibration factor (pulses per gallon) for each meter into Spectrum™ operating software will result in substantial dispense volume errors. See pages 37-38.

WARNING



DANGER: Not for use with fluids that have a flash point below 100 Deg F (38 Deg C, examples: gasoline, alcohol). Sparking could result in an explosion which could result in death.

WARNING



Fluid emitted under high pressure from leaks and/or ruptured components can penetrate the skin and cause extremely serious bodily injury. If any fluid appears to penetrate the skin, apply emergency medical care at once. Do not treat the penetration as a simple cut. Tell your physician exactly what type of fluid was injected into your skin.

WARNING



Turn off power at the Queuing Console™ at the end of each workday to eliminate the hazard of oil spills during unattended periods.

WARNING



Do not place your hand or fingers over the dispensing nozzle and/or aim the nozzle at a person at any time. Personal injury may result.

WARNING



Always use the following Pressure Relief Procedure whenever shutting off, cleaning, or in any way checking or servicing pressurized components:

- 1) Disconnect compressed air line or turn off power supply at the fluid pump.
- 2) Point the control handle outlet into a waste container and open trigger to relieve pressure.
- 3) Open any bleed-type supply air valves and fluid drain valves in the system.
- 4) Leave the drain valves open until you are ready to re-pressurize the system.

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Specifications: Overview

The Spectrum™ System...

Is a fluid inventory control system designed to operate, measure and control fluid distribution from centralized reservoirs to multiple dispense points.

True Control of Fluid Inventory...

The system features precise measurement of dispensed fluids in convenient units of measure. It provides comprehensive security to prevent oil theft, tailored through software options to provide levels of control and operator records to match the level of detail desired by the user. Records of each dispense job are created and stored in console memory.



Dispensing Ease...

Spectrum™ allows simultaneous dispensing of unlike products. It also features a unique automated job control system which allows the user to set up dispense jobs in an authorization queue. Console operating process steps are easily edited and verified. Units of measure are programmable.

Made for Performance-Oriented Facilities...

Spectrum 100™ has control capacity for moderate-size facilities: up to 16-station control for 3 or 4 fluids, 32 station control for 2 fluids or 64 station control for a single fluid. Components are compatible with automotive service fluids: petroleum and synthetic motor oils, gear oils, ATF, anti-freeze mixes (not windshield washer fluid). The wiring and control architecture is built around a simple power and communications network, with Smart Controller™ nodes near the dispense stations. Self test routines

and trouble diagnostics are built-in, to speed analysis and repair if something is wrong. Electronics components are robust and resistant to the effects of shop electrical noise, temperature and humidity variation, oil and dust.

Effective Information Handling...

The Spectrum™ system features an optional job ticket printer which records dispense data as each job is completed. Alternately, the system may be used with an optional computer interface to off-load data to a host PC, for analysis in an Access™ database

Intended use...

For successful installation and operation of Spectrum™ systems, observe the following limits of intended use:

System installation distance limits: 1100 ft. from console to most distant solenoid valve.

Dispense from centralized fluid reservoirs to a network of dispense points, rather than having one reservoir and pump for each dispense location.

Use Spectrum™ air solenoid valves to operate the air supply to each pump. The system is not designed to operate without these valves.

Do not substitute valves, cable or other devices in place of Spectrum™ components. Substitution may cause malfunction, or loss of eligibility for Balcrank's warranty.

This equipment is designed for indoor use only.

Spectrum™ systems are for use with specified automotive service fluids only.

Do not attempt to exceed dispense point or station capacity limits using unusual wiring schemes.

Be sure to provide electric power from sources with surge protection and ground fault interrupt protection.

To secure fluid inventory against theft or misuse, use the PIN code protection system provided in Spectrum™ software.

Specifications: Product Specifications

System Capacity:

The Spectrum 100™ system has a control capacity for dispensing 4 fluids at 1-16 stations or 3 fluid at 1-16 stations, or 2 fluids at 1-32 stations, or 1 fluid at 1-64 stations.

Metering Method and Accuracy:

The Spectrum™ system is equipped with electronic digital impulse meters which provide flow measurement of each dispensed fluid, with +/- 0.5 percent maximum measurement error. The system accommodates custom calibration of each meter for high accuracy, including in-place field calibration.

Job Queue and Concurrent Dispensing:

The Spectrum™ system is capable of simultaneous dispensing of unlike fluids.

The Spectrum™ system provides microprocessor-programmed automated sequential dispensing from a pre-authorized job queue, with provision for 4 jobs in queue per fluid, in addition to the active job.

The Spectrum™ system provides, as a control option, automated priority dispensing to a designated "quick lube service" bay. Dispense jobs designated to that station move automatically to first place in the queue program.

System Power and Control:

The Spectrum™ system operates under digital microprocessor program control, and uses 24 volt DC to power components.

All solenoid-operated fluid valves in the system use 24 volt DC power, with a maximum of 5 watts power consumption per solenoid. Maximum operating distance is 1100 feet from console to the farthest operated valve.

Job Record Handling:

The Spectrum™ system is equipped with a communication port and optional support software to allow dispense record data transfer to a host Personal Computer.

The Spectrum™ system is equipped to use an optional ticket printer, which prints on standard adding-machine paper tape rolls. The printer is capable of printing a record of each dispense job and associated data, as well as daily and monthly historic dispense-log reports.

Dispense Control and Tracking:

The Spectrum™ system control program is protected from unauthorized dispensing operations. PIN identification codes are assignable for all operators, with reserved priority PIN numbers for program management and equipment set-up functions.

Tank Level Monitoring:

The Spectrum™ system maintains and displays electronic tank level records, including current tank level, tank capacity and tank low-alert levels. The system also displays an alert message whenever low levels are reached.

Operating Pressure and Flow Ranges:

Fluid solenoid valves used with the Spectrum™ system are rated for 1500 psi working pressure. Air solenoid valves used with pumps in the Spectrum™ system are rated for 200 psi working pressure. Impulse meters used with the Spectrum™ system are rated for 1000 psi working pressure. Spectrum™ system components are compatible with fluid flow rates of 0-6.0 gallons per minute.

Ready Lights:

Each dispense point is equipped with a signal light to indicate readiness to dispense. The lights are actuated and automatically sequenced by the Spectrum Queuing Console™.

System Automated Self-test:

The electronic controls in the Spectrum™ system are equipped to conduct a system self-testing diagnostic procedure each time the console is powered up.

Compatible Fluids:

Spectrum™ system components are compatible with automotive service fluids: petroleum and synthetic motor oils, gear oil, ATF, ethylene glycol (not windshield washer fluid).

 WARNING	
	DANGER: Not for use with fluids that have a flash point below 100 Deg F (38 Deg C, examples: gasoline, alcohol). Sparking could result in an explosion which could result in death.

Specifications: System Components



Figure 5
Model 3110-006P
Spectrum 100™ Queuing Console
(Console-only service replacement p/n 831342; see SB3028 for repairs and service parts)

Console dimensions 7" x 5.5" x 1.5". Includes one Model 3120-036 AC Power Adapter. Features Mini DIN port for accessory printer. Power switch and power-in plug on back side. Fluid Label set and Smart Controller™ Decal set are included.



Figure 6
Model 3120-030
Smart Controller™

Controller Dimensions 2-5/8" x 2-1/8" x 1-1/8". Mounted with two No. 8 screws (included). Includes 8 removable wiring terminal plugs. Operates on 24 VDC power from the console. Controls air and fluid solenoid valves, operates ready lights and stores Queuing Console™ system configuration data in backup memory.



Figure 7
Model 3120-032
Fluid Solenoid Valve

Valve Dimensions 1-3/4" x 2" x 4-1/2". Rated 1500 psi. working pressure. Compatible with motor oils, ATF, gear oil, anti-freeze mix to 50-50. 1/2" NPT ports. Solenoid is rated for 24 VDC service. Order one per dispense point.



Figure 8
Model 3120-033
Air Solenoid Valve

Valve Dimensions 1-3/4" x 2" x 4-1/2". Rated 200 psi. working pressure. For on/off control of air-operated pumps. 3/8" NPT ports. Solenoid is rated for 24 VDC service. Order one per pump.



Figure 9
Model 3120-085 (for Tiger, Panther pumps)
Model 3120-086 (for Panther 5:1 pumps)
Model 3120-023 (for 50 Series Diaphragm pumps)
Model 3120-024 (for 100 Series Diaphragm pumps)
Model 3120-087 (for Lion 10:1 pumps)
Pressure Relief Valves

Protects oil distribution system from possible overpressure damage due to fluid thermal expansion. Select correct model from the Balcrank Catalog based on the pump model used. Pressure relief valves must be installed in all Spectrum™ systems to assure eligibility for product warranty. Order one per pump.



Figure 10
Model 3120-039
Long Distance Printer Cable

250 Ft. length cable connects communications port from Model 3120-026 Ticket Printer to Model 3110-007 Queuing Console, allowing remote viewing of printer reports. Up to two extensions may be used in series to provide printer operating distance up to 500 feet.

Specifications: System Components



Figure 11
Model 3120-035
Ticket Printer (Optional)

Dimensions 4.1" x 4.5" x 2". Impact dot matrix printer, prints system dispense reports on 24 character line width using 2.25" cash register paper tape roll. Includes 3 ft. communication cable and power adapter with 6 ft. cord.

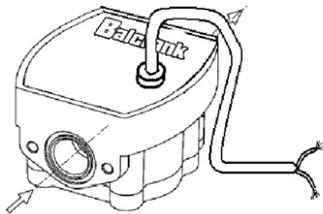


Figure 13
Model 3120-103
Impulse Meter
 (see SB3073 for repairs and service parts)

Dimensions 3" x 3 1/4" x 2 3/4". In-line mounting with 1/2" NPS ports. Rated 1000 psi. maximum working pressure. Oval gear movement transmits magnetic pulse to detector circuit, which pulses a nominal 12 volt signal to the Spectrum Queuing Console™. Order one per pump.



Figure 15
Model 3120-026
PC Interface Kit (Optional)
 (see SB3034 for repairs and service parts)

Includes 8 ft. long interface cable and compact disc with software to download dispense reports to a host PC. Results are prepared as standard Access™ database. PC Interface cannot be used if Model 3120-035 Ticket Printer is utilized.

NOTE

Parts of the Spectrum™ product warranty may be void if the system is not equipped with properly selected filter-regulators, fluid line strainers and pressure relief kits.



Figure 12
Model 3120-010
In-line Strainer

For use in the fluid line prior to fluid solenoids to assure reliable valve operation. 3/4" NPT ports. Cleanable filter. Order one per fluid solenoid valve.



Figure 14
Model 3120-031
Ready Light

Mounts directly in .500" diameter hole now provided on all Balcrank hose reels. Bright green LED lamp. Operates on 24 VDC. Order one per fluid solenoid valve.



Figure 16
Models 3121-xxx Cable, Communications/Power
3122-xxx Cable, Impulse Meter
3123-xxx Cable, Solenoid

Cables are configured to simplify system installation and provide reliable operation. Three cable styles are used, available in 100, 150, 200, 250, 500 and 1000 ft. lengths. Refer to layout planning sheet, Spectrum™ installation instructions and Balcrank price list. Dash number = cable length in feet.

Planning: Configuration Planning Procedure

Configuration Planning Procedure:

Use the following procedure to complete and fill out the Configuration Planning Worksheet, opposite page:

- 1 Determine the **number of system fluids** to be dispensed.
 - 2 If the number of fluids in the system is 3 or 4, or if you will configure for future expansion, you must use the **standard fluid configuration** plan. Up to 16 stations are permitted.
 - 3 If the number of fluids in the system is 2 and you are not configuring for future expansion, you must use the **dual fluid configuration** plan. Up to 32 stations are permitted.
 - 4 If the number of fluids in the system is 1 and you are not configuring for future expansion, you must use the **single fluid configuration** plan. Up to 64 stations are permitted.
 - 5 Above the station blocks for the service area, **write in the fluid types** for each of the fluids to be dispensed, working left to right. Fill in both LH and RH **fluid type** blocks. Also enter **fluid types** in the designated row of the air station block.
 - 6 In the first service area station block (next to SC01), **fill in the station row**: use 1,1,1,1 for **standard plan**, 1,1,2,2 for **dual fluid plan**, 1,2,3,4 for **single fluid plan**.
 - 7 In the second service area station block (next to SC02), **fill in the station row**: use 2,2,2,2 for **standard plan**, 3,3,4,4 for **dual fluid plan**, 5,6,7,8 for **single fluid plan**.
 - 8 **Continue filling in additional station rows**, using sequential numbering in a similar manner, until the last entered number is equal to the total number of stations in your system.
 - 9 Now enter **check marks** in all of the numbered station blocks, but only beneath port positions which will be used.
 - 10 Now **compile an equipment requirements list**, next column, using the information on the Planning Worksheet.
 - 11 During worksheet preparation, for each fluid, enter **tank size, alarm level amount, fluid type** and estimated **current tank level** (all in gallon units). At factory set-up time, Balcrank will add **meter PPG** factors. At field installation time, adjust exact tank current-level amounts.
 - 12 Record the **user name and location, distributor name and distributor PO number**.
 - 13 Indicate by **checked box** whether the system will include a **ticket printer**. If a **quick lube bay** is to be used, identify the designated quick lube bay.
 - 14 All systems are **factory pre-programmed** and will be shipped with a copy of your completed **planning sheet**, with final information added.
- Save this information** as a record of configuration for future use in equipment expansion or repair.

Equipment list:

- 3120-030 Smart Controller™.** Order one per checked station **block**, including the air block.
- 3120-031 Ready Light.** Order one per **check mark** in the combined service area station blocks.
- 3120-032 Fluid Solenoid Valve.** Order one per **check mark** in the combined service area station blocks.
- 3120-033 Air Solenoid Valve.** Order one per **fluid used** in the air station block.
- 3110-006P Spectrum 100 Console.** Order one per **system**.
- 3120-039 Extension Cable for Printer.** (optional) Allows printer to be up to 250 ft from console. Use two to go 500 ft. max.
- 3120-035 Ticket Printer.** (optional). Order one per **system**.
- 3120-026 Host PC Interface.** (optional). Order one per **system**. Do not combine printer with PC interface.
- 3120-103 Impulse Meter.** Order one per **check mark** in the air station block.
- 3123-xxx Solenoid Cable, 3121-xxx Comm/Power Cable, 3122-xxx Impulse Meter Cable.** Use the system wiring diagram to assist in identifying where each cable type is used. Actual facility dimensions will determine best order lengths. Select cable spools lengths from a range of model choices, shown in the Balcrank price list.

Model	Description	Quantity
3120-030	Smart Controller	
3120-031	Ready Light	
3120-032	Fluid Solenoid Valve	
3120-033	Air Solenoid Valve	
3110-006P	Queuing Console	
3120-039	Printer Extension Cable	
3120-035	Ticket Printer	
3120-103	Impulse Meter	
3123-xxx	Solenoid Cable	
3121-xxx	Comm/Power Cable	
3122-xxx	Impulse Meter Cable	
3120-026	Host PC Interface	

Definitions:

SC: Smart Controller, an electronic control card which manages operation of fluid solenoid valves in the service bay areas and air solenoid valves in the pump room.

Port: A solenoid actuator location on the electronic Smart Controller. A port equates to a single fluid dispense point, or to a single on/off valve for an air pump.

Station: an individual dispensing location, with 1 to 4 dispense points, in the service area. Note that a station may serve more than one bay whenever dispensing handles are shared by operators.

Planning: Configuration Planning Worksheet

Balcrank Spectrum 100™ Configuration Planning Sheet

Parts Counter

PC: (13)

(or) Printer:

Quick Lube Bay:

Bay Number:

Console

Pump Room

SC 00 Air

SC00 Air Station Block

Configure for future expansion:

Station:	SC00 Air			
Ports:	1	2	3	4
Fluid Type:				
Meter PPG				
Tank Size				
Alarm Amt				
Current Amt				

Service Area Blocks

Service Area

SC 01

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 02

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 03

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 04

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 05

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 06

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 07

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 08

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

Service Area Blocks

Service Area

SC 16

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 15

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 14

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 13

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 12

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 11

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 10

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

SC 09

Station:

--	--	--	--

Ports:

1	2	3	4
---	---	---	---

User:

User City, State:

Balcrank Distributor:

Distributor PO No.: (12)

for factory entry only:

Balcrank Sales Order No.:

Pre-programming Date:

Console Serial No.:

Programmed By:

Figure 17
Planning Worksheet for
Spectrum 100™ System Installation
Available as Form F5192

F5192 Rev A 7/04

Planning: Configuration Worksheet Example

Balcrank Spectrum 100™ Configuration Planning Sheet

Parts Counter

PC:

(or) Printer:

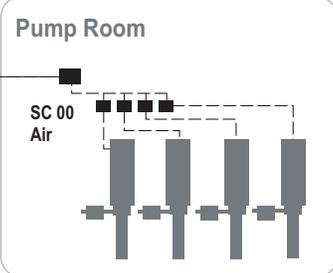
Quick Lube Bay:

Bay Number:



Console

Pump Room



SC 00 Air

SC00 Air Station Block

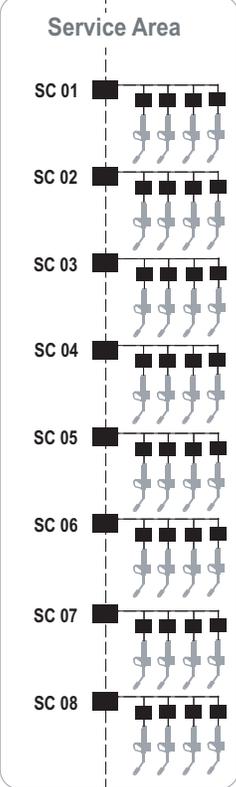
Configure for future expansion:

Station:	SC00 Air			
Ports:	1	2	3	4
Fluid Type:	10 W 30	ATF	FUTURE	
Meter PPG	522	518	522	
Tank Size	500	275	500	
Alarm Amt	100	80	100	
Current Amt	417	210	417	

Service Area Blocks

Fluid Type	10 W 30	ATF	FUTURE
------------	---------	-----	--------

Service Area



Station:	1	1	1	
Ports:	1	2	3	4
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Station:	2	2	2	
Ports:	1	2	3	4
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Station:	3	3	3	
Ports:	1	2	3	4
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Station:	4	4	4	
Ports:	1	2	3	4
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

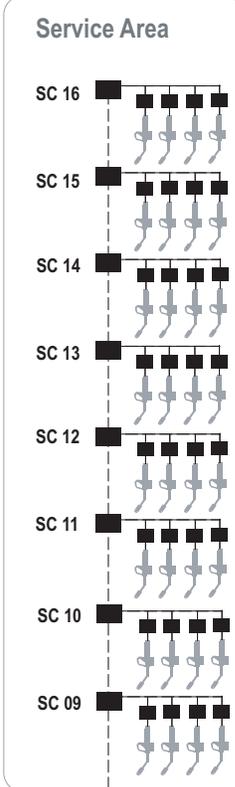
Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Service Area Blocks

Fluid Type				
------------	--	--	--	--

Service Area



Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

Station:				
Ports:	1	2	3	4

for factory entry only:

User: Jerry's Auto Mart	Balcrank Sales Order No.: 242355
User City, State: Los Angeles, CA	Pre-programming Date: 7/21/04
Balcrank Distributor: City Oil Company	Console Serial No.: 10037 V3.2
Distributor PO No.: 81339	Programmed By: Larry Smith

Figure 18
Planning Worksheet: Worked Example
Spectrum 100™ System Installation
4 Stations, 2 Fluids per station, configured for expansion

Planning: Configuration Worksheet Example

Balcrank Spectrum 100™ Configuration Planning Sheet

Parts Counter

PC:

(or) Printer:

Quick Lube Bay:

Bay Number:

Console

Pump Room

SC 00 Air

SC00 Air Station Block

Configure for future expansion:

Station:	SC00 Air			
Ports:	1	2	3	4
Fluid Type:	10 W 30	ATF		
Meter PPG	522	518		
Tank Size	500	275		
Alarm Amt	100	80		
Current Amt	417	210		

Service Area Blocks

Service Area

SC 01	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	1	1	2	2
SC 02	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	3	3	4	4
SC 03	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	5	5	6	6
SC 04	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	7	7	8	8
SC 05	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	9	9	10	10
SC 06	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	11	11	12	12
SC 07	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	13	13	14	14
SC 08	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	15	15	16	16

Service Area Blocks

Service Area

SC 16	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:				
SC 15	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:				
SC 14	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:				
SC 13	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:				
SC 12	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:				
SC 11	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:				
SC 10	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	19	19	20	20
SC 09	Fluid Type	10 W 30	ATF	10 W 30	ATF
	Station:	17	17	18	18

User: Car City

User City, State: Austin, TX

Balcrank Distributor: Texas Pump Service

Distributor PO No.: 81339

Balcrank Sales Order No.: 242355

Pre-programming Date: 7/21/04

Console Serial No.: 10037 V3.2

Programmed By: Larry Smith

for factory entry only:

F5192 Rev A 7/04

Figure 18
Planning Worksheet: Worked Example
Spectrum 100™ System Installation
20 Stations, 2 Fluids per station, some of the ports not used

Installation: Step-by Step Procedure

Required Tools & Materials:

- Jeweler's screwdriver, flat 2 mm blade
- Permanent magnet, small
- Portable power drill
- 1.50" dia. drill bit or hole saw (if needed, step 10)
- .500" dia. drill bit (if needed, step 14)
- No. 29 (.136" dia.) drill bit
- Wire cutting and stripping tool
- 11/32" open-end wrench
- Small Phillips screwdriver
- Pliers for wire crimping
- 2 pipe wrenches for 1/2" to 1" NPT range
- 1-gallon certified fluid measuring container, with 1-cubic-inch calibration scale
- Cable ties
- Wire connectors, screw cap or crimp-lug type

Procedure:

 CAUTION	
	Use only specified Balcrank Spectrum™ system components. Substitutions may cause reduced product performance levels, signal and information errors or electrical hazard. Additionally, Spectrum™ warranty will be void if substitute components are installed in the system.

Installation Planning:

- 1 A "SYSTEM PLANNING WORKSHEET" [Figure 17, page 9] was created to accompany your Spectrum purchase order at Balcrank. Locate your copy of the worksheet, which was shipped with the equipment order.
- 2 Check for completeness of on-hand parts & components. Match component quantities to the results of the "SYSTEM PLANNING WORKSHEET" analysis (see page 8).

Installing Pump Room Components:

- 3 Be sure pumps are equipped with air filter-regulators, air shutoff valves, pressure relief kits, pump outlet shutoff valves and suction air eliminators. See "PUMP INSTALLATION DIAGRAM", [Figure 20, page 16].

NOTE	
	Parts of the Spectrum™ product warranty may be void if the system is not equipped with properly selected filter-regulators, fluid line y-strainers and pressure relief kits.

 CAUTION	
	Be sure air regulators for pumps are set below 150 psi prior to applying air pressure. Excessive pressure might damage pumps.

- 4 Install in-line Impulse Meters (model 3120-103) at each pump, **as factory-marked for Fluid 1, Fluid 2**, etc.
- 5 Install Air Valves (model 3120-033) at each pump; locate valves between the pumps and their respective filter-regulators. See "PUMP INSTALLATION DIAGRAM", [Figure 20, page 16].
- 6 Install the Smart Controller™ marked "**SC00, air**" (model 3120-030) approx. 8 ft. high on the wall, adjacent to the pumps, using No.8 fasteners supplied, power drill, No.29 drill bit, Phillips screwdriver and 11/32" wrench. See "INSTALLATION DETAIL, SMART CONTROLLER", [Figure 21, page 16].
- 7 Run local wiring from the Air Smart Controller™ to each Air Solenoid Valve. Use lengths of Solenoid Cable (model 3123-xxx). Strip ends per "WIRE END DETAIL", [Figure 27, page 21]. Attach wire at Air Solenoid Valves using crimp connectors or screw caps. Attach wires at the Smart Controller™ using the jeweler's screwdriver to secure wires to port connectors. Fluid 1 to port 1, fluid 2 to port 2, etc. Refer to "WIRING DETAIL, AIR VALVES", [Figure 28, page 21] and "WIRING DETAIL, SMART CONTROLLERS", [Figure 26, page 20].

Installation: Step-by Step Procedure

NOTE

Use care when wiring components. Prepare wire ends per WIRE END DETAIL recommendations. Be careful to match wire color codes to the wiring diagram specifications.

Initial Cable Runs & Console Placement:

8 Pull one Impulse Meter Cable (model 3122-xxx) and one Comm/Power Cable (model 3121-xxx) from the pump room to the parts counter. Allow plenty of extra cable length to provide for final wiring at each end location. Secure the cable along this path (onto convenient existing piping, if available) with cable ties.

9 In the pump room, connect the terminations of the Impulse Meter Cable (model 3122-xxx) to the Impulse Meters (model 3120-103) per “WIRING DETAIL, IMPULSE METERS”, [Figure 31, page 23]. Be sure to use the correct black wire associated with each colored wire, just as they are spiral-wrapped on the cable. Terminate with crimp connectors or screw caps. If less than 4 Impulse Meters are used, cut back unused wires on the impulse meter cable.



CAUTION

Be sure to wire impulse meters correctly. Reverse wiring or attachment to wrong terminal points could cause immediate damage to the circuit board in the impulse meters.

10 Select a suitable location at the parts counter for the Spectrum Queuing Console™ (model 3110-006P). Provide a 1.50” dia hole in the counter-top, just behind the planned console location. Place the Spectrum Queuing Console™ in position. Attach the connector of the included 6 ft. extension cable to the back of the console. Mount the cable through the hole and beneath the counter (extension cable disassembly/re-assembly may be required to pass through the hole). Secure the terminal strip to a below-counter shelf or side wall, being sure that terminal wiring points are all accessible.

11 At the Queuing Console extension terminal strip, connect wires from the Impulse Meter Cable (model 3122-xxx) to their assigned empty locations

(outgoing side of terminal strip) using a flat screwdriver blade to push the terminal opening buttons. Be sure to match meter fluid-number color codes to the wiring in the pump room. Refer to “WIRING DETAIL, CONSOLE”, [Figure 25, page 19].

12 In the pump room, connect the terminations of the Comm/Power Cable (model 3121-xxx) wires to the input side of the Air Smart Controller™ (model 3120-030). Secure wires to the terminal plugs using the jeweler’s screwdriver. Refer to “WIRING DETAIL, SMART CONTROLLERS”, [Figure 26, page 20].

13 At the parts counter, strip ends of the Comm/Power Cable (model 3121-xxx) from the pump room. Connect wires from the pump room Comm/Power Cable (model 3121-xxx) to their assigned locations on the extension terminal strip of the Spectrum Queuing Console™. Refer to “WIRING DETAIL, CONSOLE”, [Figure 25, page 19].

Service Bay Parts & Their Cable Runs:

14 At each dispense point, use the provided .500” diameter hole in the hose reel or reel enclosure, as illustrated, “HOSE REEL HOLE LOCATIONS”, [Figure 22, page 17]. Press one Ready Light (model 3120-031) into the .500” dia. mounting hole on each of these hose reels.

15 At each dispense point, install a Y-Strainer (model 3120-010) and a Fluid Solenoid Valve (model 3120-032) into the supply piping at each hose reel, using the pipe wrenches. Also be sure that fluid line shutoff valves are installed at each dispense point (these are not provided with the Spectrum™ equipment set). Refer to “INSTALLATION DETAIL, FLUID SOLENOID VALVES”, [Figure 29, page 21].

16 Adjacent to each dispensing station, locate convenient mounting points for the Smart Controllers™ (model 3120-030), on the facility walls (8 ft. height from floor is recommended), or on support beams. Select locations which have proximity to the dispense stations which the Smart Controllers™ are to control.

17 Mount all of the Smart Controllers™ (model 3120-030) in the exact planning sheet locations designated by their labels (SC01, SC02, etc) using the No.8 fasteners packaged with the controllers. Match drill .136” diameter holes into the beams or other convenient structural locations. Tighten fasteners using the Phillips screwdriver and 11/32” wrench. Refer to “INSTALLATION DETAIL, SMART CONTROLLER”, [Figure 21, page 16].

Installation: Step-by Step Procedure

18 For each dispense point, run one length of Solenoid Cable (model 3123-xxx) from the Fluid Solenoid Valve to its associated Smart Controller. Refer to the “SYSTEM PLANNING WORKSHEET” to assure correct cable run placement. Secure the cable at suitable locations with cable ties. Refer to “WIRING DETAIL, FLUID SOLENOID VALVES”, [Figure 29, page 21].

19 On each Solenoid Valve Cable, strip and mount the Smart Controller™ wire ends to the designated Smart Controller™ ports using the jeweler’s screwdriver. Strip the wire ends per “WIRE END DETAIL”, [Figure 27, page 21]. Refer also to “WIRING DETAIL, SMART CONTROLLERS”, [Figure 26, page 20]. Attach wires at the valve end using crimp connectors or screw caps. Be sure to include Ready Light wires in the valve-end connections, as shown in the “WIRING DETAIL, FLUID SOLENOID VALVES”, [Figure 29, page 21].

20 Run one Comm/Power Cable (model 3121-xxx) between each of the Smart Controllers™, beginning with the controller nearest the parts counter and ending with the controller most distant from the parts counter. Run cables in a single chain (no branching). Strip per “WIRE END DETAIL”, [Figure 27, page 21] and attach wire ends to the designated terminal plugs on the Smart Controllers™ using the jeweler’s screwdriver. Refer to “WIRING DETAIL, SMART CONTROLLER”, [Figure 26, page 20]. Secure cables using wire ties.

21 Run one Comm/Power Cable (model 3121-xxx) from the Smart Controller™ nearest the parts counter to the Spectrum Queuing Console™. Secure cable using wire ties.

22 Install a tail-end resistor (one is furnished with each Smart Controller) across the OUT (+) and OUT (-) terminals on the Air Smart Controller in the pump room and on the farthest Fluid Smart Controller in the service bays. Refer to “Wiring Detail, Smart Controller”, [Figure 26, page 20].

Queuing Console Installation

23 At the parts counter, terminate the console end of the Comm/Power Cable (model 3121-xxx) from the service bays. Attach wire ends at the designated terminal points on the extension cable terminal strip. Use a flat screwdriver blade to push the terminal opening buttons. Refer to “WIRING DETAIL, CONSOLE”, [Figure 25, page 19].

24 Place the console Power Adapter (model 3120-036) beneath the counter and plug into the console. Console power switch should be “OFF”. Leave the multipin connector detached from the console.

 CAUTION	
	Use gentle movement to remove or install the multipin connector in the console. Heavy force could damage the connector or its mating part.

25 Plug the console Power Adapter (model 3120-036) into an un-interruptable power supply (UPS) with an 80 watt, 110 VAC rating. Plug the UPS into a 110 VAC wall receptacle.

NOTE	
	For improved operating reliability, it is highly recommended that the console power adapter and ticket printer power plug be installed through an un-interruptable power supply (UPS) with an 80 watt rating.

26 If the optional Ticket Printer (model 3120-035) has been purchased, connect the printer power cord to the same UPS electric power source. Connect the communication cable of the printer to the “PTR” port on the back side of the console. Load the printer paper spool, per instructions in the printer box. Then turn “OFF” printer power switch.

27 If the Host PC Interface (model 3120-035) has been purchased, connect the PC cable between the console and the serial port on the PC, per the instruction in the Interface Kit.

28 In the pump room, determine the amount of fluid in each tank. Record tank fluid quantities on the “SYSTEM PLANNING WORKSHEET”, [Figure 17, page 9]. Other parts of the worksheet should already be completed by the factory to accompany your Spectrum shipment.

Installation: Step-by Step Procedure

Queuing Console Program Setup

29 With console power “OFF”, install the multipin connector plug into the slot in the back face of the console. Turn the console power “ON”. Also turn “ON” the ticket printer, if used. Allow the console to complete a self-test cycle, which should end at “SPECTRUM 100 / IDLE”. If you observe an error message at power-up, use the “ERROR DIAGNOSIS GUIDE”, [pages 47-56], before proceeding further. Call Balcrank for factory assistance if required.

30 Edit some of the set-up fluid parameters by following the procedure “FLUID IDENTIFICATION”, [Procedure SP2, page 37-38]. Step through the procedure **without changing existing entries except current tank amount**. Edit current tank amount for each fluid to show correct quantities now in the tanks.

31 Leave console power “ON”. Complete procedure “PIN ENTRY /REVISION”, [Procedure BP9, page 35]. Assist the customer in setting up personal I.D. PIN codes for service technicians and managers. Have the customer record and store PIN code information in a secure place. A convenient record form is available on page 67.

NOTE	
	It is strongly recommended that PIN code identification be set up and utilized in all Spectrum™ installations. This assures the full protection against fluid theft or mis-use which has been provided in the product design.

32 Cycle console power. If time and date are incorrect at console start-up, complete the procedure “SET TIME/DATE”, [Procedure SP5, page 42].

Purging Air and System Check Out

33 Check in the pump room to be sure that all air supply valves to the pumps are open; for best operation, set air regulators to 70-100 psi. Open all fluid shutoff valves in the system.

34 Have an attendant stand ready at station 1 with a 1-gallon calibrated measure container. Authorize and dispense 1.0 gallons of fluid 1 using the procedure “NEW DISPENSE JOB”, [Procedure BP2, page 28]. Observe for correct operation of the Ready Light. Check to be sure the correct fluid is dispensed

to station 1. If air is present in the fluid piping, less than 1.0 gallons will be dispensed. Therefore, repeat this procedure until the dispensed quantity reaches 1.0 gallon and becomes consistent. Then dispose or return the test fluid.

35 Repeat procedure step 34 for each of the additional fluids at station 1.

36 Repeat the procedure steps 34-35 at all other dispensing stations.

37 Again, turn Power “OFF” and then “ON” at the console. Allow the console to complete a self-test cycle, which should end at “SPECTRUM 100 / IDLE”. If you observe an error message at power-up, use the troubleshooting guide, pages 47-56, before proceeding further. Call Balcrank for factory assistance if required.

38 Re-save all system set-up parameters by following the procedure “SYSTEM CONFIGURATION”, [Procedure SP6, page 43].

39 If the optional Host PC Interface (model 3120-035) has been purchased, complete all software installation per instructions supplied in the option package, including test dispenses.

User Training and PIN Records

40 Review all console **basic procedures** with all authorized customer users. Review **management procedures** with the designated Spectrum™ user equipment manager.

41 Installation is now complete and ready for dispensing service.

Illustrations: Pump & Smart Controller

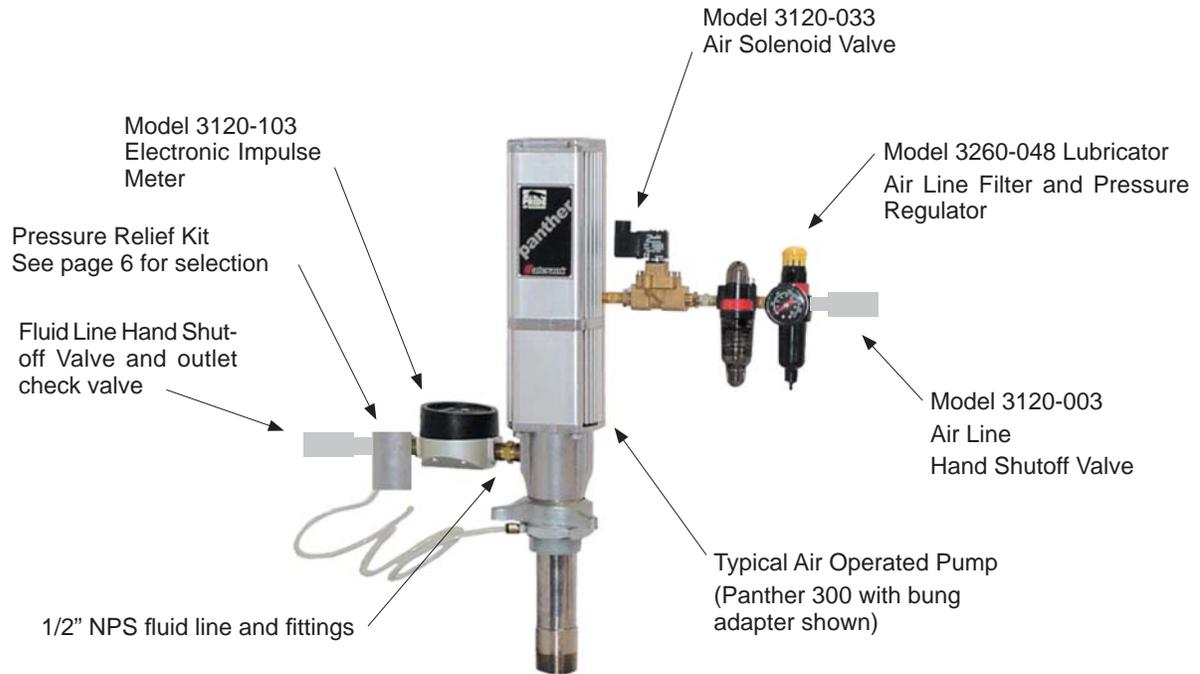


Figure 20
Pump Installation Diagram

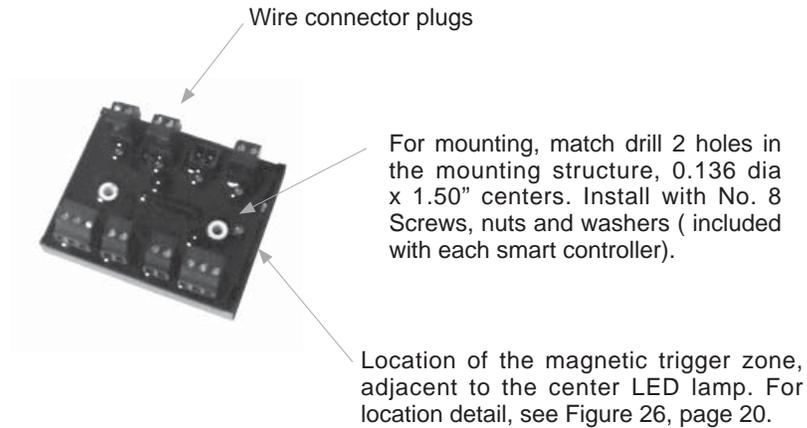


Figure 21
Installation Detail, Smart Controller

Illustrations: Fluid Valve & Ready Light

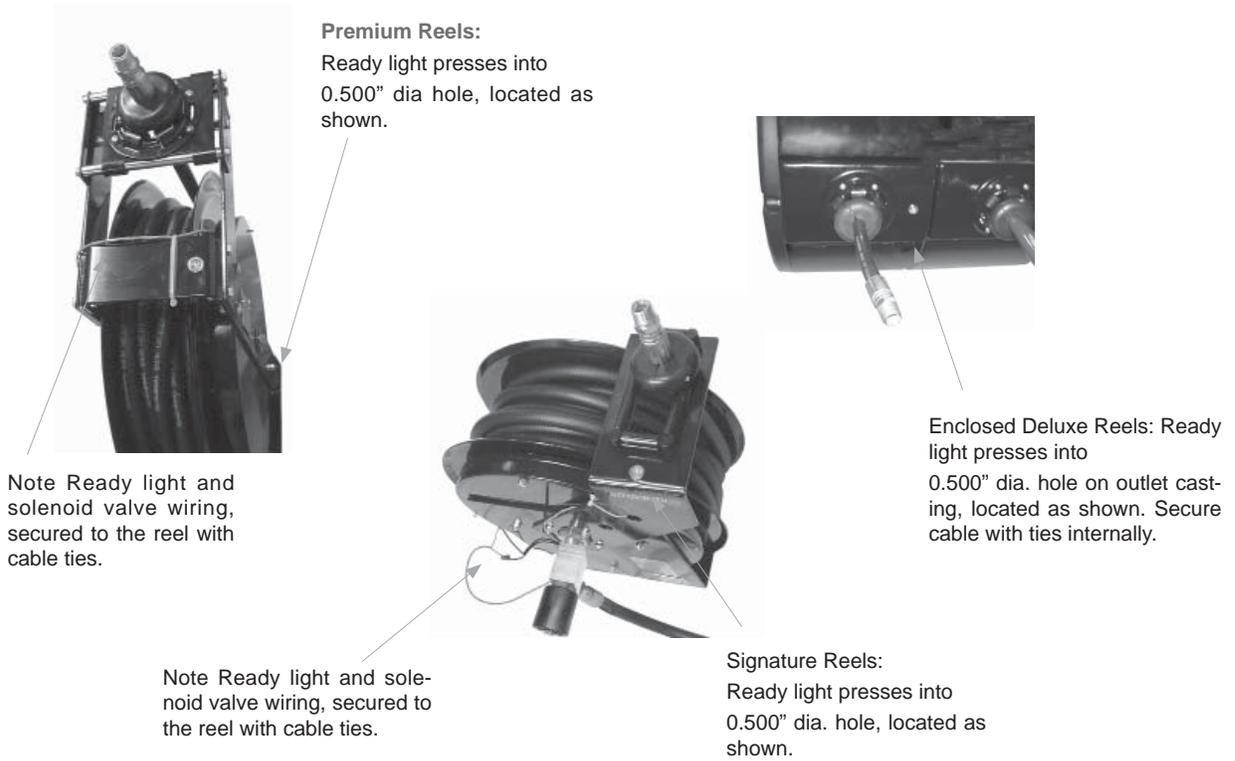


Figure 22
Installation Detail, Hose Reel Hole Locations

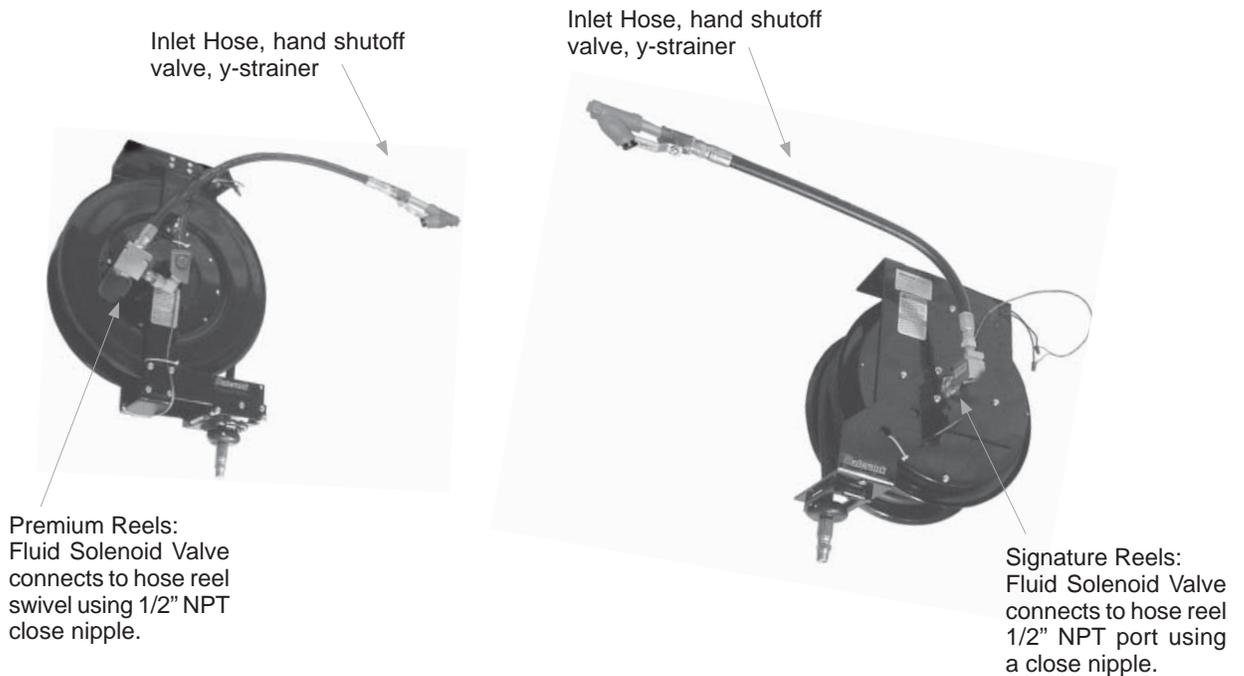


Figure 23
Installation Detail, Fluid Solenoid Valve

Illustrations: System Wiring Example

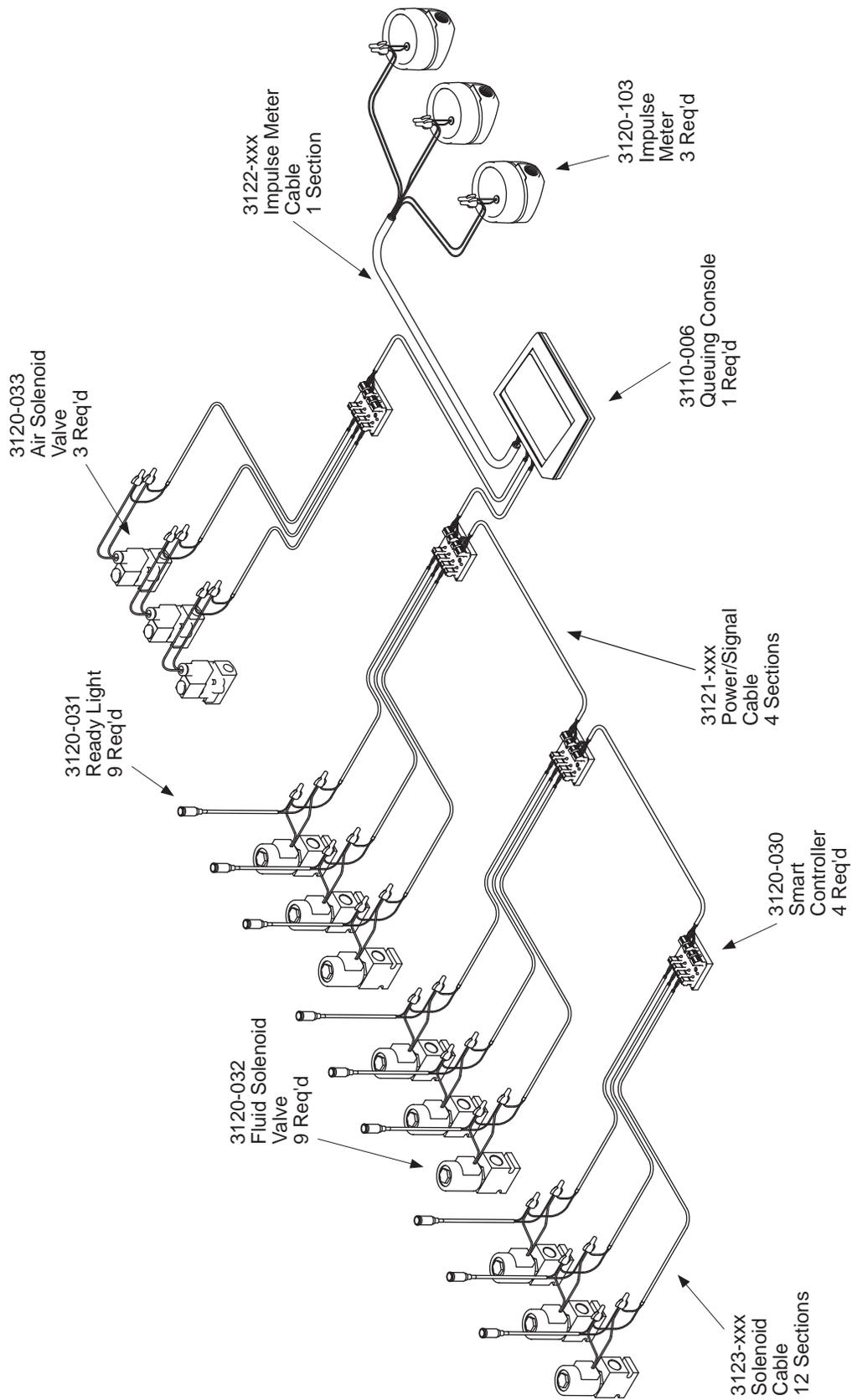


Figure 24:
Wiring Diagram
Spectrum 100 Fluid Inventory Control System
3 Fluid x 3 Station Configuration Shown

Illustrations: Queuing Console Wiring

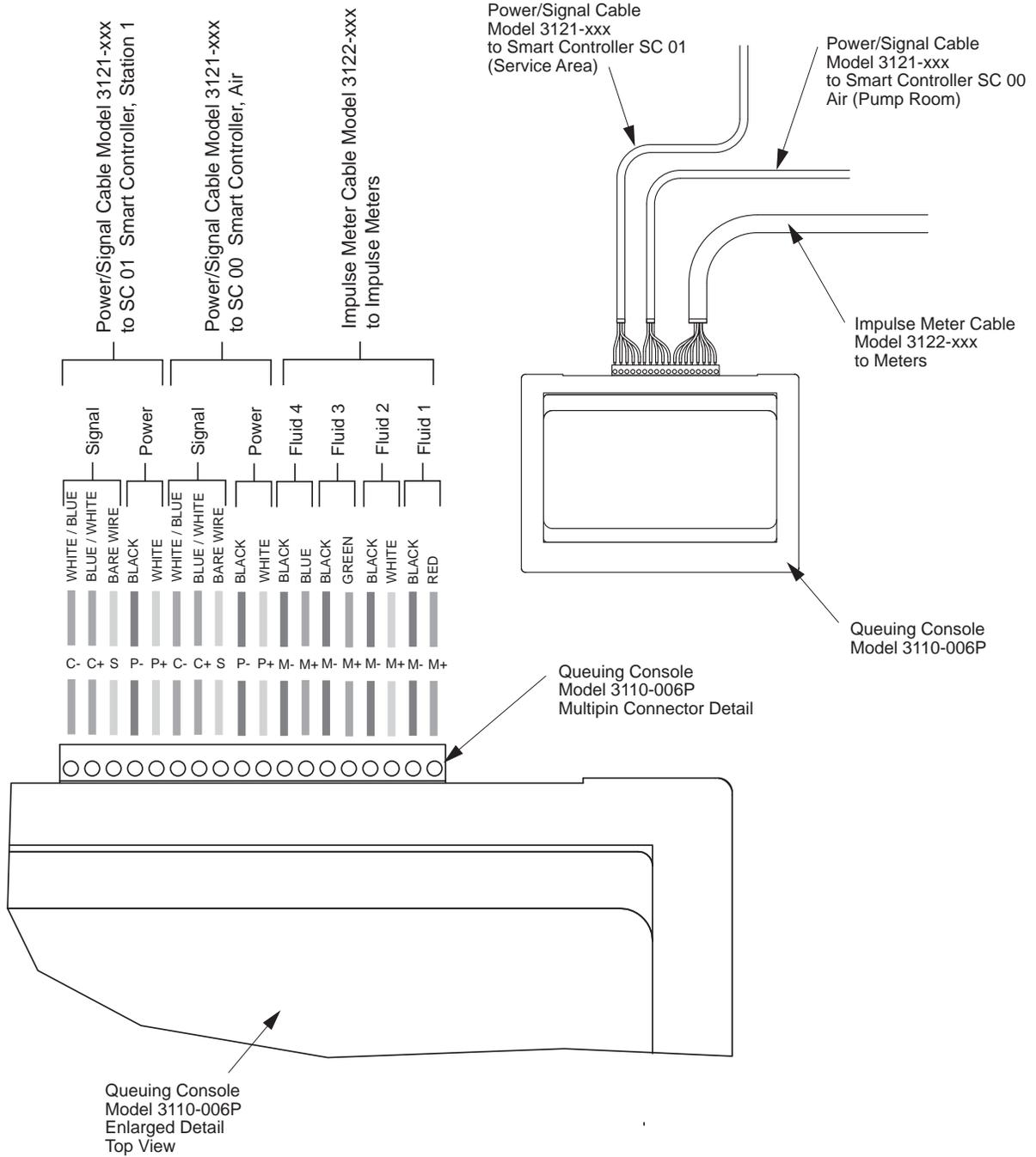
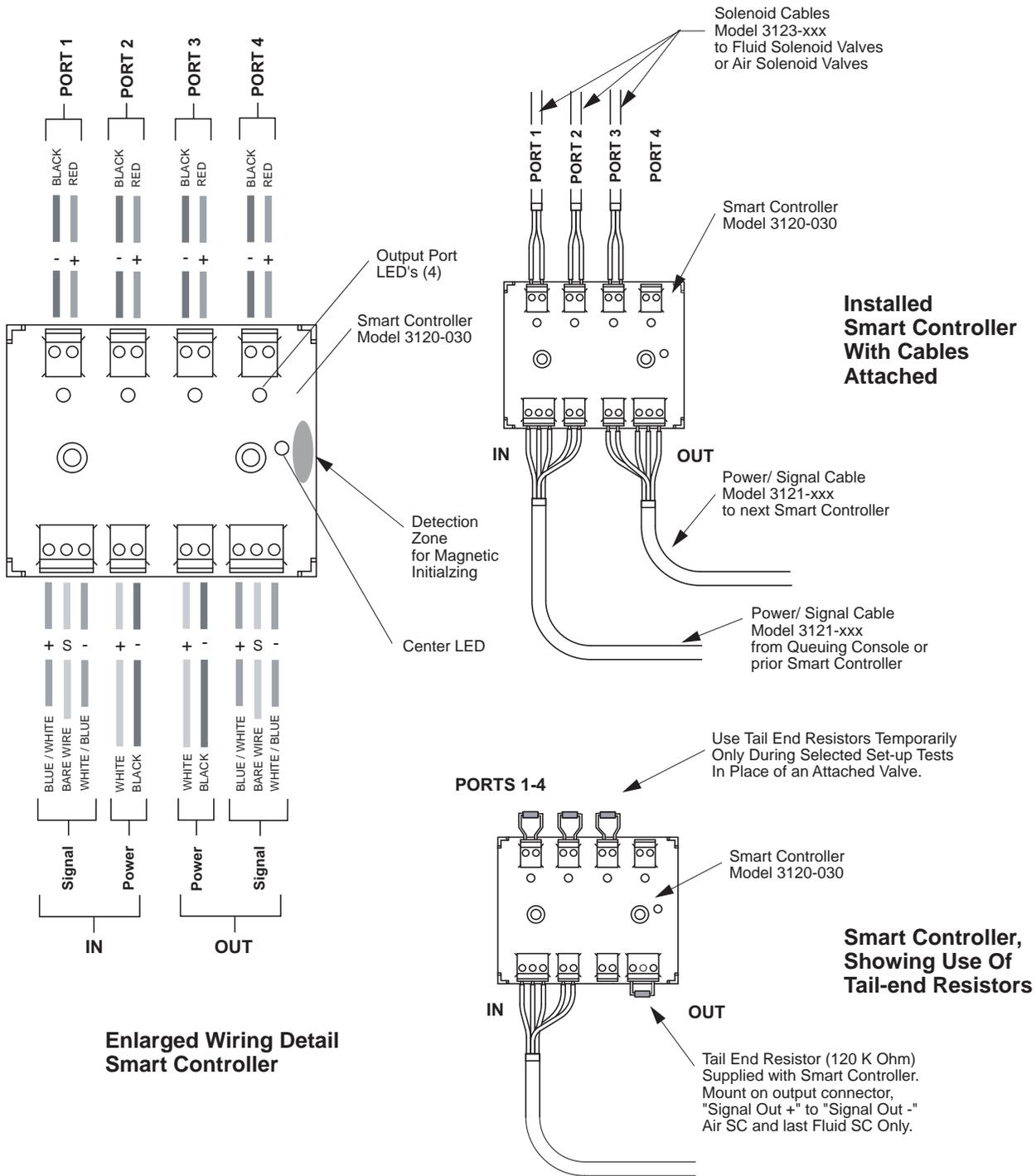


Figure 25:
Wiring Detail
Spectrum Queuing Console

Illustrations: Smart Controller Wiring



**Figure 26:
Wiring Detail
Smart Controller**

Illustrations: Component Wiring Details

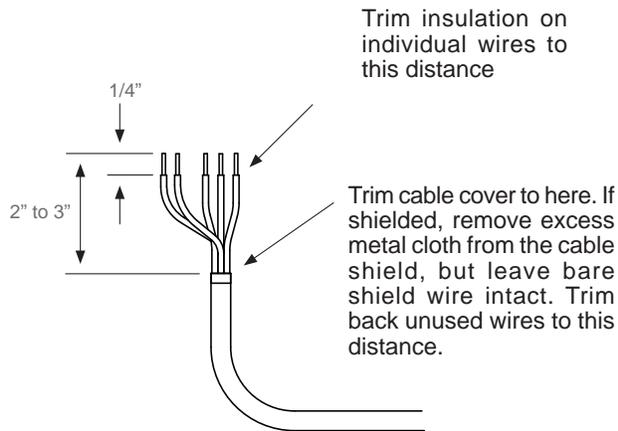
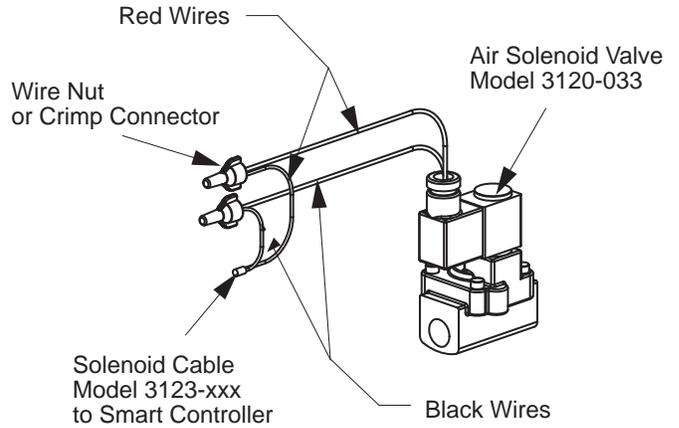


Figure 27:
Typical Wire End Detail



Note: Valve does not include wires. Use lengths of 18 AWG stranded copper wire with red/black insulation. Connect to terminations inside the DIN connector, as shown in Fig 28B, below.

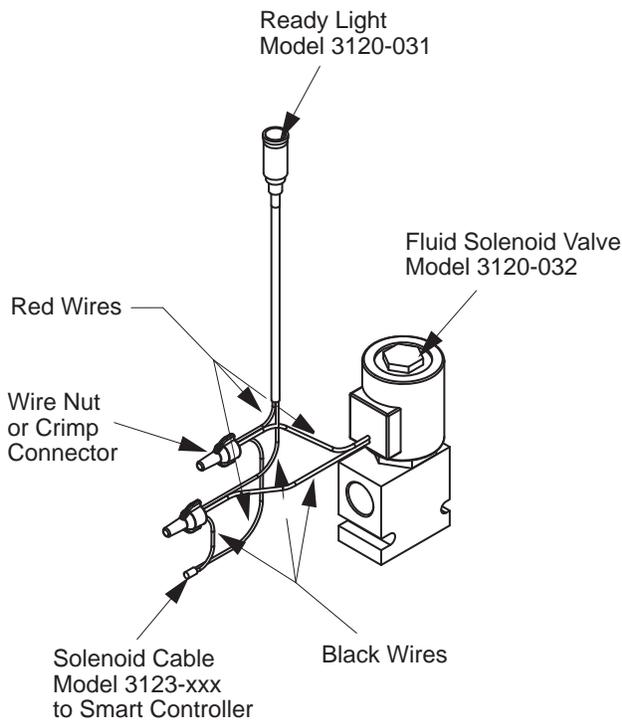


Figure 29:
Wiring Detail
Fluid Solenoid Valve
and Ready Light

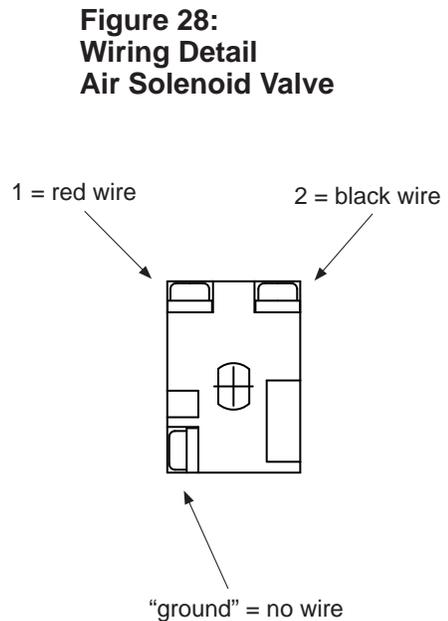


Figure 28B:
Wiring Connection Detail
DIN Connector
on Air Solenoid Valve

Installation: System Set-up Wiring

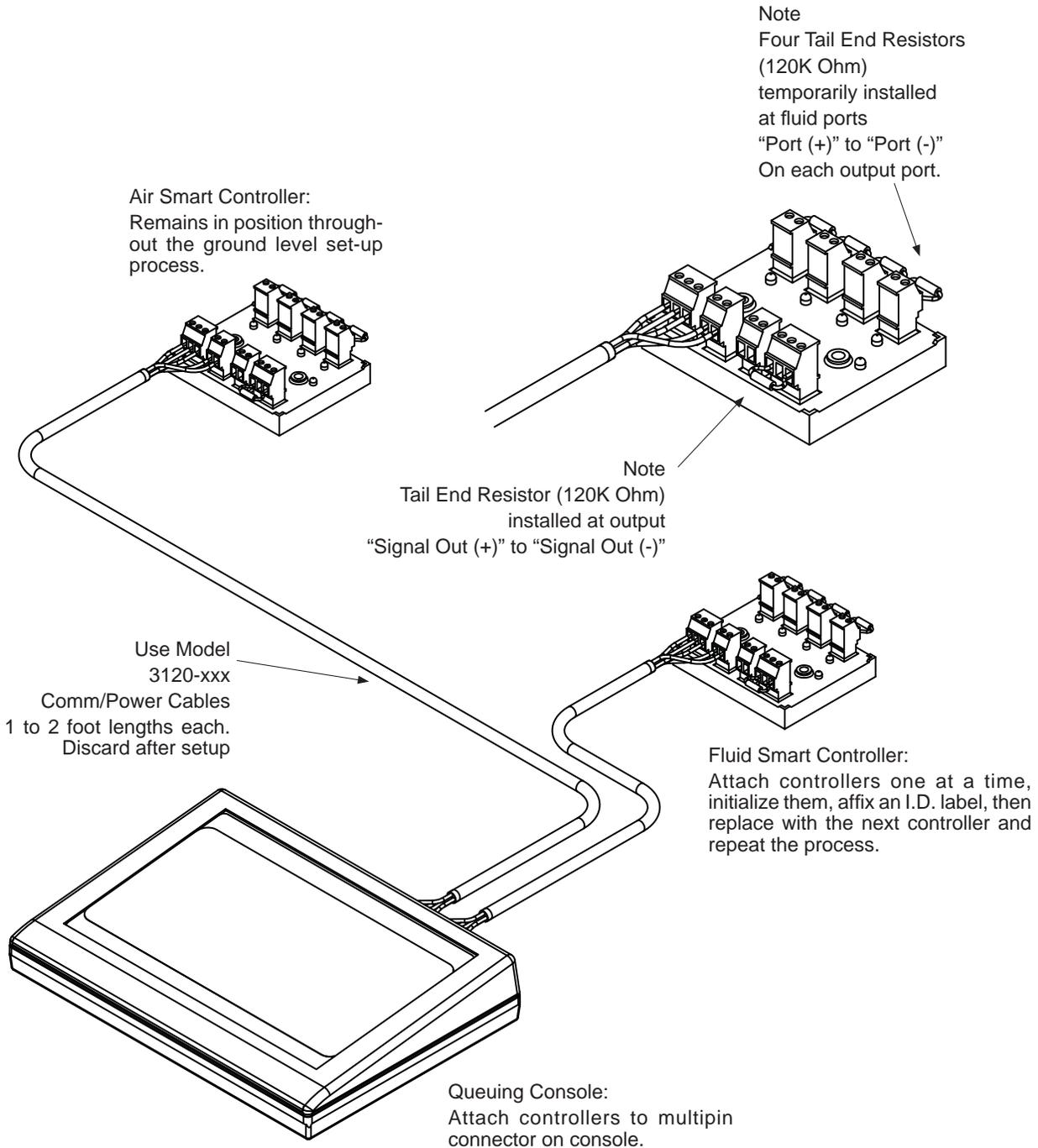
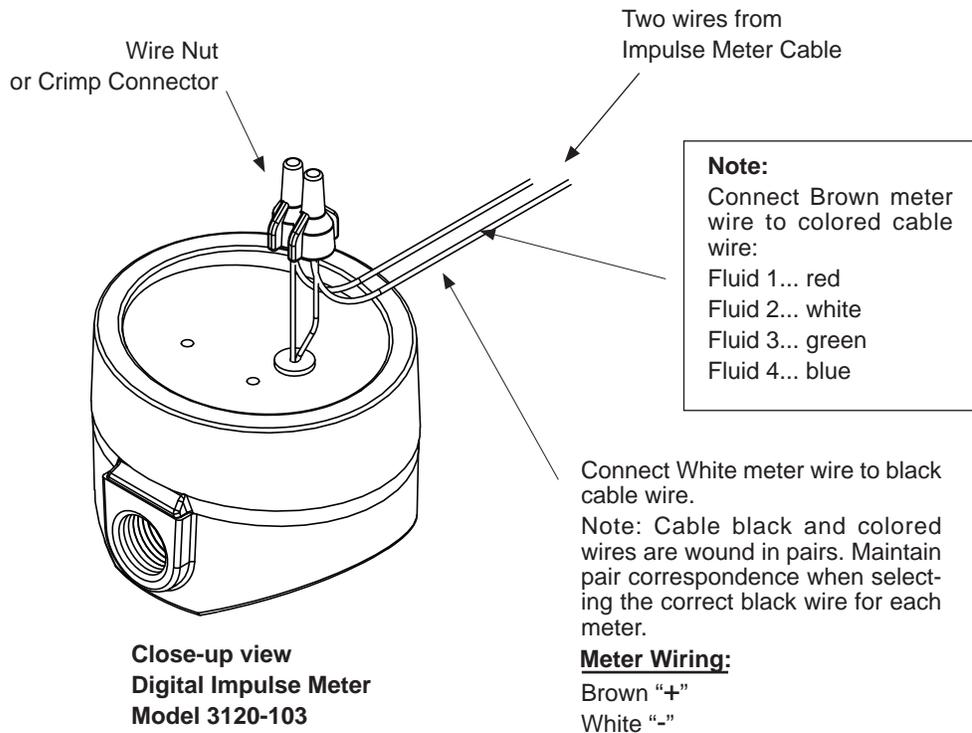
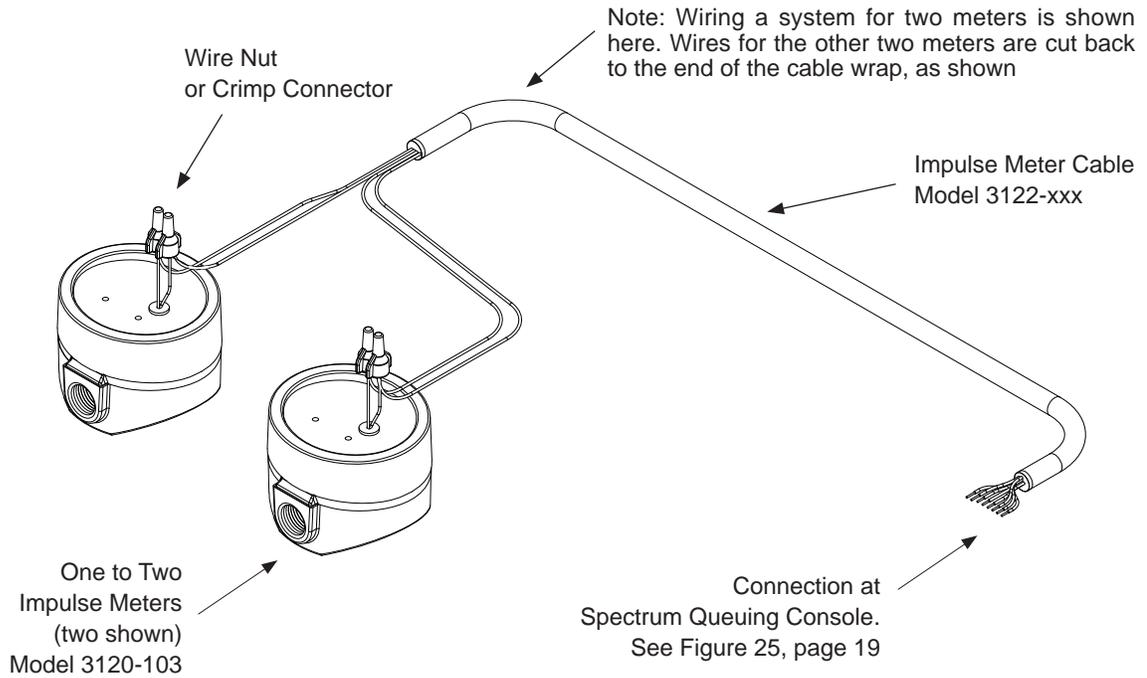


Figure 30:
Set-up Wiring Detail
Ground Level Smart Controller Initialization

Installation: Impulse Meter Wiring



**Figure 31:
Wiring Detail
Impulse Meters**

Operation: Understanding PIN Codes

NOTE

It is highly recommended that PIN code identification be set up and utilized in all Spectrum™ installations. This assures the full protection against fluid theft or mis-use which has been provided in the product design. **DO NOT LOSE YOUR CODES.** Restoring operation to a protected system if codes are lost may require a lengthy procedure.

Spectrum™ PIN Codes... The operating programs in the Spectrum™ queuing console may be set up to require personal identification, or PIN, codes to limit authority to use procedures, and to associate particular users with system transactions. Specifically:

Condition A, Power Up: PIN code entry is required when the console is powered up, typically each morning, before any further procedures are allowed.

Condition B, Management Routines: PIN code entry is required when the console operator uses any management or setup procedures, PAGES 32-48, which are always accessed with the 3-keys (“NEW” + “ENTER” + “STATUS”) step.

Condition C, Dispense Jobs: PIN code entry is required when the console operator authorizes a new dispense job using the “NEW DISPENSE JOB” routine, [procedure BP2, page 28].

Configuration Choices... The Spectrum™ system allows the user to select one of 4 levels of PIN code protection and to store up to 32 “Operator” PIN codes

in memory and up to 5 additional “Management” PIN codes. These 4 levels of protection are applied in the following way:

Configuration Level 1, No Protection: PIN code entry and use is bypassed for all operating procedures. No user number is associated with job transaction data.

Configuration Level 2, Maximum Protection, Dual Authority Levels: System PIN protection barriers and PIN entry steps are used for Conditions A, B and C. Operator PIN codes allow Condition C authorization only. Management PIN codes allow console use under all conditions. User numbers are associated with job transaction data and printed on job ticket reports.

Configuration Level 3, Maximum Protection, Uniform Authority Level: System PIN protection barriers and PIN entry steps are used for Conditions A,B and C. Both Operator and Management PIN codes allow console use under all conditions. User numbers are associated with job transaction data and printed on job ticket reports.

Configuration Level 4, Limited Protection: System PIN protection barriers and PIN entry steps are used for Conditions A and B only. Operator PIN codes allow product start-up (**Condition A**) only. Management PIN codes allow product start-up (**Condition A**) and use of all management (“3-KEYS”) program subroutines (**Condition B**). No PIN number is required for individual dispense jobs. User numbers are associated with job transaction data and printed on job ticket reports.

Setting up PIN Code Protection... Follow the procedure, “PROCEDURES: PIN Entry/Revision” [Procedure BP9, page 35] to set up the preferred Pin code configuration for your system. When you are done, record PIN code information on the record form on page 69, then remove and store in a safe place.

Summary of PIN Code Configurations						
“Y” = PIN code level required to authorize or use						
Condition	A: Power up		B: Management		C: Dispense Jobs	
	All	Manager	All	Manager	All	Manager
Configuration						
1						
2		Y		Y	Y	
3	Y		Y		Y	
4	Y			Y		

Operation: Guide to Basic Procedures (BP)

Nine console procedures are used to control dispense operations and manage jobs in queue, to review and maintain tank level information, and to inspect job history:

General Access Procedures

(All PIN numbers may use these procedures.)

BP1 [page 27] Console Power-Up... at the beginning of each working day, the console power switch should be turned “ON”. This will initiate an electronic self-testing cycle, which will last approximately 3 to 20 seconds. When the cycle is complete, the console display will show the default message “SPECTRUM 100, IDLE”. Or, the console program will request a PIN number to proceed, if you have set up the system for PIN code protection (see page 24 for details). If requested, respond with any valid PIN number to continue. If error messages appear at start-up, refer to the “PROBLEM DIAGNOSTICS” section of this manual, pages 52-58.

BP2 [page 28] Authorize a New Dispense Job... in the Spectrum™ system, all fluid dispensing jobs must be initiated at the console. With the console display at “SPECTRUM 50, IDLE”, press the “NEW” key to begin a new job authorization.

BP3 [page 29] Review the Status of Undispensed Jobs... at any time, the status of all authorized, undispensed jobs may be reviewed. Press the “STATUS” key to access the job summary quick-view screens, which are organized by fluid type. Right-scroll to see jobs in queue, represented by Q0 (the active job), Q1, Q2, ...etc.

BP4 [page 30] Changing the Job Queue Order... at any time, an authorized job waiting in queue may be jumped forward for immediate dispensing. All other jobs will move back one space in the queue.

BP5 [page 31] Deleting a Job from Queue... at any time, an authorized job ready for immediate dispense (queue position Q0) may be deleted. All other jobs in queue will move forward one step.

Management Access Procedures

(Under some system set-up conditions, only management PIN numbers may use these procedures. Refer to “UNDERSTANDING PIN CODES” page 24.)

BP6 [page 32] Adding Fluid to Tanks... at any time, a Spectrum™ manager may record fluid additions made to any tank, in gallon units.

BP7 [page 33] Checking Tank Inventory Status... at any time, a Spectrum™ manager may review the status of all fluid reservoirs.

BP8 [page 34] Looking at the Dispense Log... at any time, a Spectrum™ manager may review a dispense history log, which records the total amount of each fluid dispensed by day or by month.

BP9 [page 35] Adding or Editing PIN Numbers... at any time, a Spectrum™ manager may add new PIN numbers or edit existing ones (up to a maximum of 37 PIN numbers).

Operation: Special Methods and Suggestions

During Spectrum™ operation, certain situations require special technique. For improved job handling and fluid management, read and use the following recommendations:

1 How to dispense two jobs in a row to the same dispense point... on rare occasions, two jobs may be placed back-to-back in queue to the same dispense point. At dispense time, the service technician should use the following steps: a) Open the control handle and begin dispensing the first job. Be attentive to observe when oil stops flowing and the ready light goes out. b) After the first job is completed, the console will display a back-to-back job alert. Make a console entry to ok the second job. c) After the ready light resumes, dispense the second job.

2 How to make fine adjustments to the tank fluid levels... To adjust a mis-match between reported and actual tank levels, go to the procedure "FLUID IDENTIFICATION", [Procedure SP2, page 37], and step through the screens without changing entries until the "INITIAL AMOUNT:?" is displayed for the fluid you are adjusting. Edit this value to match the actual amount. Then step through the remainder of the procedure without making other changes.

3 Observe the ready lights on the shop floor... the ready lights are your shop-floor prompt for efficient dispensing. An energized ready light means "authorized and ready to dispense". As soon as a job dispense is complete, the light will go off, and a new light will be energized at the location of the next job in queue. Note that, at any time, only one ready light may be on for each of the fluid types in the system.

4 Use the NEW key to escape console subroutines... if you are using the console and become confused or are interrupted in the middle of a procedure, use the "NEW" key to escape to the beginning of the procedure. Continuing to use "NEW" will eventually return the program to "SPECTRUM 50, IDLE".

5 Complete all dispense jobs before turning power "OFF"... Except in emergencies, power should remain ON until all dispense jobs are completed or discontinued using the procedure "JOB DELETION", [Procedure BP5, page 31].

6 Turn OFF console power at night... Turning off the console at the end of a workday assures that air solenoid valves in the pump room remain closed overnight. This is an important step toward spill prevention! Turning power back on each morning invokes the system self-test diagnostic routine, which helps assure your system remains in peak operating condition.

7 Active jobs are automatically deleted after 90 minutes... If Spectrum™ system power is not turned off at the end of a workday and jobs are still active, those jobs will be automatically deleted after 90 minutes.

8 Dispensing a job when the amount of fluid required is unknown (topping off)... Occasionally, it may be necessary to dispense a job when the fluid capacity of the vehicle is unknown. Follow these steps: a) authorize slightly more fluid than the job will require. Make note of the job number. b) dispense with the control handle incrementally, checking the dipstick or reservoir mark to determine full condition, then close the dispense handle. c) at the console, enter the job status screen and kill the job. The undispensed remainder will be deleted. The job record and tank fluid adjustments will show the amount actually dispensed.

9 If error messages occur on the console... refer at once to the "TROUBLE DIAGNOSIS" section of this manual, pages 47-56.

10 You can view recent job history... using the "JOB STATUS" screen. See "DISPENSE JOB STATUS REVIEW", [Procedure BP3, page 29], for details.

11 Queue jumps will not replace a job which is already partially dispensed... if you use the queue jump procedure and the active job is partially dispensed, the jumped job will move to first in queue, immediately behind the partially-dispensed active job.

12 A tank low level alert will be displayed... whenever you enter a new job and the tank fluid is below the alarm level.

13 If you lose electric power during the work-day... the console will retain all data, including queue and active jobs. When power resumes, you may select to continue those jobs or delete them.

Basic Procedure BP1: Normal Power-up

1 With power adapter plugged into a 115VAC power supply and into the power port on the console, turn the console power switch to "ON".

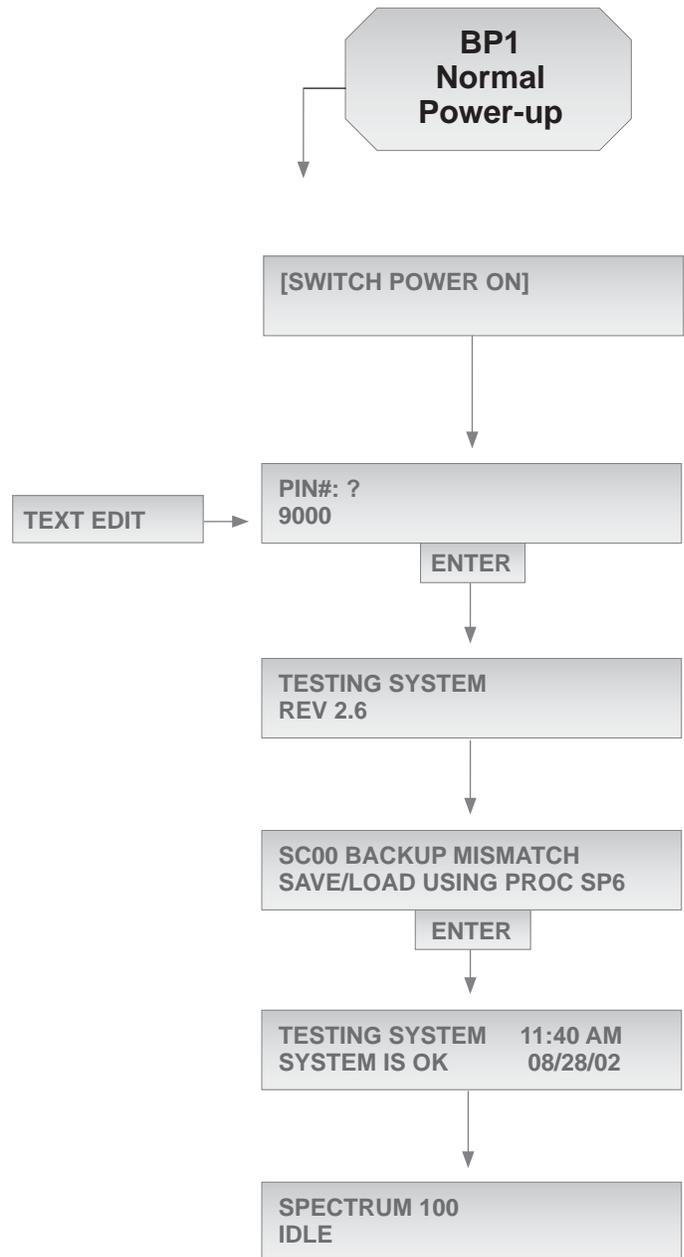
2 If you have set up PIN code security in the system, the display will prompt for a PIN number before continuing immediately after power-up. Any valid management PIN number may be entered. Then press "ENTER" to continue the start-up routine.

3 The console will begin a self-test procedure. During the self test cycle (5 to 10 seconds), the display will show "TESTING SYSTEM" and will display the software version being used.

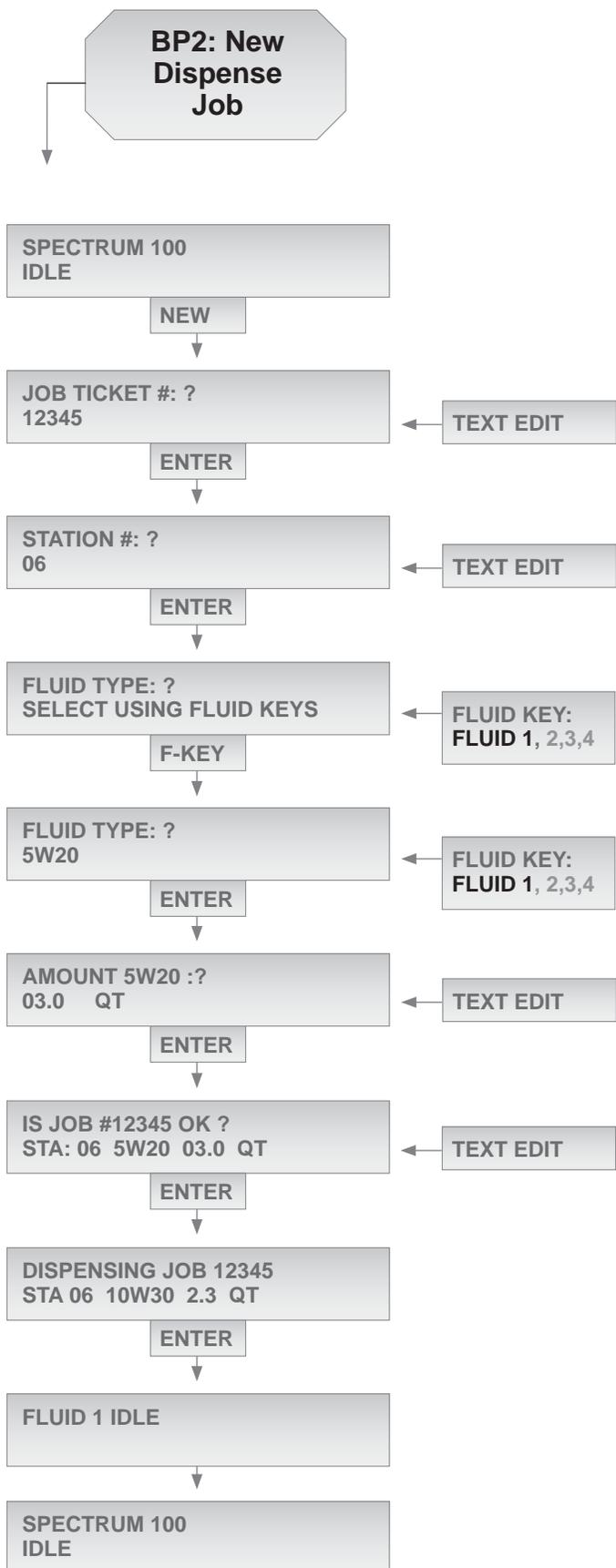
4 This prompt occurs *only* if the current system setup program does not match the backup memory in the air smart controller (per procedure SP6). This message prompts to do one of the following: a) read a previously-saved system setup immediately from the Air SC to the console using procedure SP6 or b) save the current console setup to the Air SC using procedure SP6 (if you have just completed program changes, for example). *Call Balcrank for assistance if you are not sure of appropriate action.* Press "ENTER" to resume the start-up routine.

5 After the self test is complete, and if there are no detected errors, the display will show "SYSTEM IS OK", along with the current time and date. This message will discontinue after 2 seconds.

6 Next, the system will display "SPECTRUM 100 IDLE". The console is now ready for dispense operations.



Basic Procedure BP2: New Dispense Job



During these steps, if you make an entry mistake, press "NEW" to erase the job entry and re-initiate the new job request.

1 With the display showing "SPECTRUM 100 IDLE", Press "NEW" to begin key entries for a new dispense job.

2 The prompt will ask for a job number. Enter a job number, or the program will automatically use the most recent job number plus 1. *In the displayed example, using automatic numbering, the prior job was 12344.* Press "ENTER" to continue.

3 The prompt will ask for a station number. Enter the station number where the new fluid batch is to be dispensed, then press "ENTER" to continue.

4 The prompt will ask for a fluid type. Select the fluid choice by pressing one of the four fluid selector keys on the console. After selection, the fluid type (such as "5W20") will appear on line 2. *You can still edit the selection by pressing another fluid key.* Or press "ENTER" to continue.

5 The prompt will ask for a fluid batch amount. Enter the desired quantity by editing the value on line 2, scrolling right or left to edit the characters. Then press "ENTER" to continue.

6 The prompt will then display "IS JOB #12345 OK ?". Review carefully. *If there are entry errors, you may text-edit this screen to make corrections before proceeding.* Use the scroll-arrow keys to select text entries for editing. Then press "ENTER" to authorize the batch job.

7 At any time, you may enter up to 4 additional batch jobs into queue for the selected fluid by repeating this procedure, step by step. Begin by pressing "NEW"; or to conclude the new-entry process, press "ENTER". *If no jobs are in queue, the display will show the newly entered job as active and will display the actual dispense count while the technician works in the service bay.*

8 When the current fluid batch is fully dispensed, the display will momentarily show a "FLUID IDLE" message, then return to the "SPECTRUM 100

Basic Procedure BP3: Job Status Review

During these steps, if you make an entry mistake, press "NEW" to return to "SPECTRUM 100, IDLE".

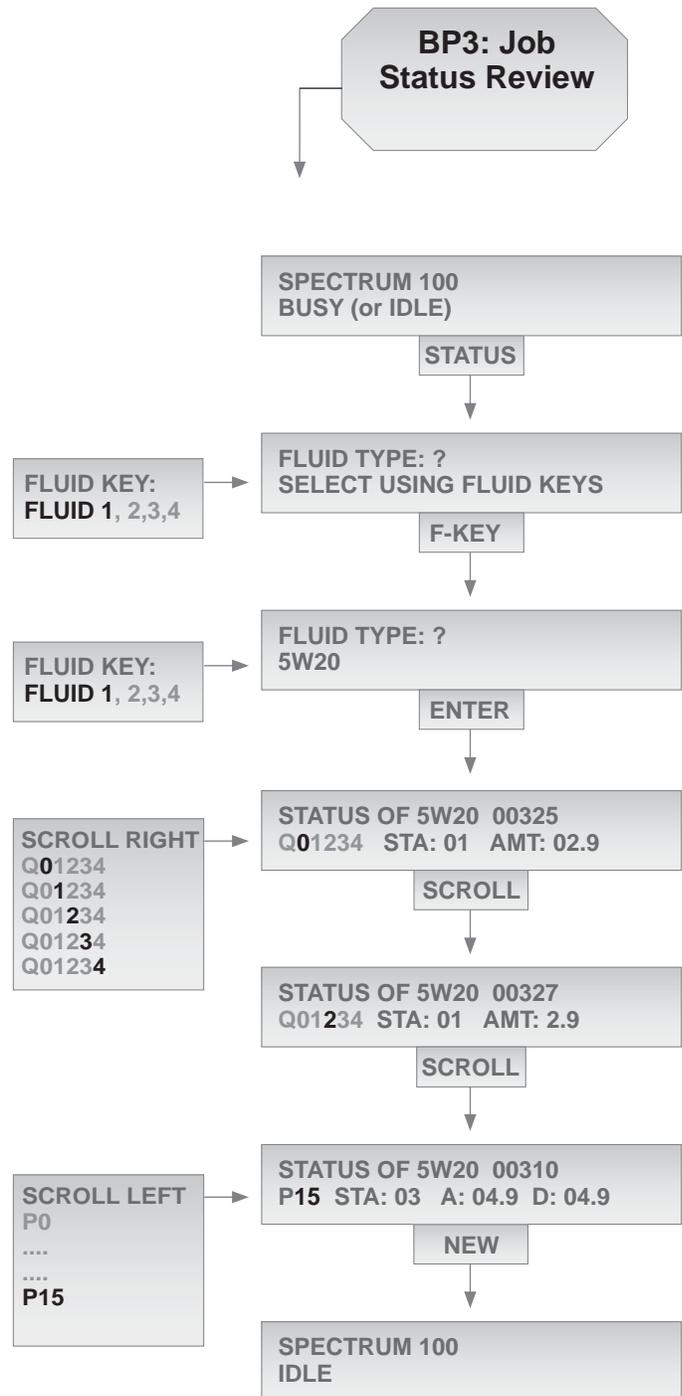
1 Begin with the program at home position: "SPECTRUM 100, BUSY (or IDLE)". Press the "STATUS" key to observe the status of all current dispense jobs.

2 The prompt will ask "FLUID TYPE: ?". Select the fluid to be reviewed by using one of the four fluid selector keys on the console. After selection, the fluid type (such as "5W20") will appear on line 2. You can still edit the selection by pressing another fluid key. Then press "ENTER" to continue.

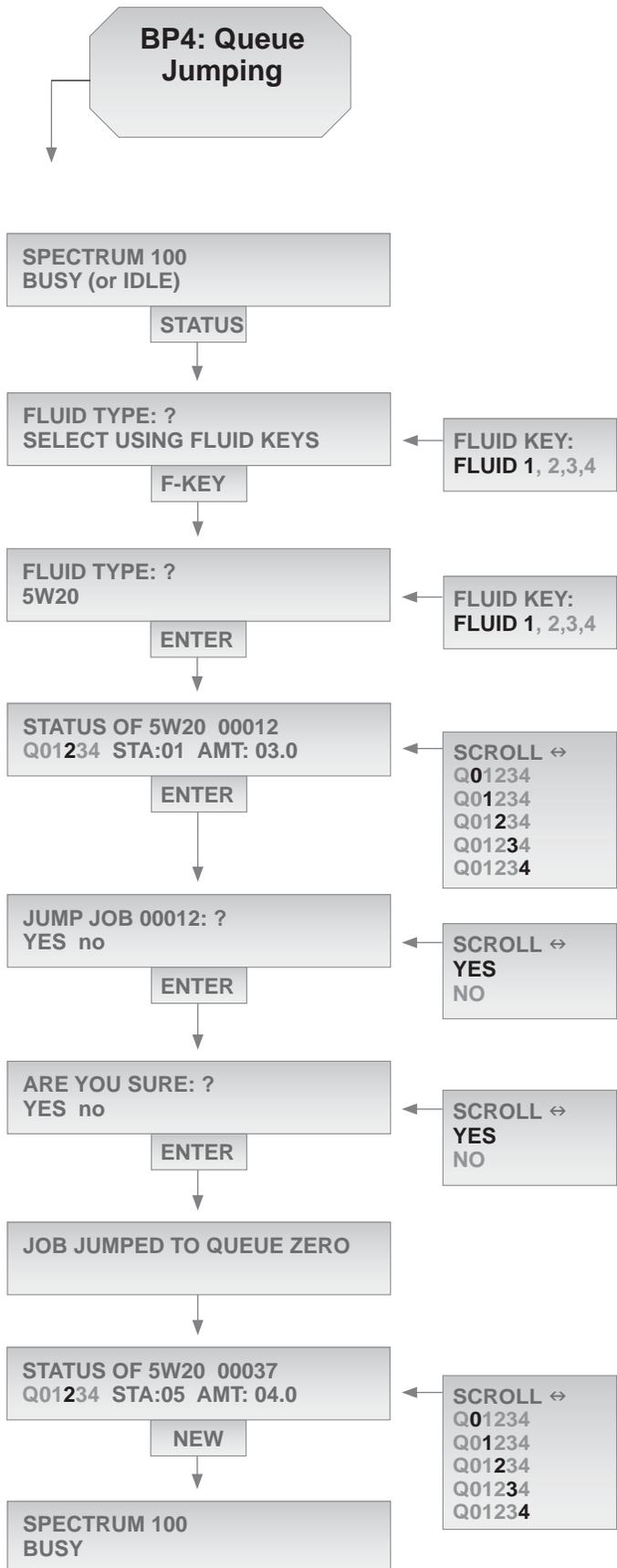
3 The next display shows status details for dispense jobs. The first line shows the fluid type and job number. The second line shows a queue indicator (Q01234), in which the highlighted queue item is the displayed job. *For example, Q0 highlighted means the current active job is displayed, Q2 highlighted means the second job in queue is displayed, etc.* The second line also shows the job station number, amount authorized and amount dispensed. Scroll to observe information for the other jobs currently in queue. *Generally, if Job 00000 is displayed, then no job is loaded into the displayed historical queue position. BE CAREFUL: Do NOT press "ENTER" while reviewing job screens!*

4 If you scroll left instead of right from Q0, the display will allow review of *job history data* (completed jobs), designated by the label P("xx") on the second line, where "xx" is a value which varies between "00" and "15". The first left-scroll item is the most recently completed dispense job. Continuing to scroll left allows viewing of 15 more job history records, progressing in historical order. The 17th left-scroll returns the display to the most recent completed job. *BE CAREFUL: Do NOT press "ENTER" while reviewing job screens!*

5 After all jobs have been reviewed for the selected fluid, press "NEW" to return to "SPECTRUM 100, IDLE". Repeat the procedure for review of another fluid type, if needed.



Basic Procedure BP4: Queue Jumping



During these steps, if you make an entry mistake, press “NEW” to return to “SPECTRUM 100, IDLE” .

1 Begin with the program at home position: “SPECTRUM 100, BUSY (or IDLE)”. Press the “STATUS” key to begin the queue jump procedure.

2 The prompt will ask “FLUID TYPE: ?”. Select the fluid type to be jumped by using one of the four fluid selector keys on the console. After selection, the fluid type (such as “5W20”) will appear on line 2. You can still edit the selection by pressing another fluid key. Then press “ENTER” to continue.

3 The next display shows status details for dispense jobs. The first line shows the fluid type and job number. The second line shows a queue indicator (Q01234), in which the highlighted queue item is the displayed job. For example, Q0 highlighted means the current active job is displayed, Q2 highlighted means the second job in queue is displayed, etc. The second line also shows the job station number, amount authorized and amount dispensed. Scroll to highlight the job you wish to place into immediate availability (for example, scroll to Q2). Then press “ENTER” to jump the selected (highlighted) job to Q0. All other jobs will move back one space in the queue.

4 The display will show two consecutive confirming statements, beginning with “JUMP JOB 00012:?”, for which you will respond with yes/no, then “ENTER”

5 After your confirmation, the job queue will be changed, and a message will confirm that the selected job has been jumped to Q0. All displaced jobs will move back one position in que. Allow 6 to 8 seconds for the system to refresh information.

6 After a brief interval, the display returns to the current queue list. Repeat the jump process if desired, else press “NEW” to return to the “BUSY” display. DO NOT press “ENTER” if you wish to escape from the queue jump subroutine.

Basic Procedure BP5: Job Deletion

During these steps, if you make an entry mistake, press "NEW" to return to "SPECTRUM 100, IDLE".

1 Begin with the program at home position: "SPECTRUM 100, BUSY (or IDLE)". Press the "STATUS" key to begin the job deletion process.

2 The prompt will ask "FLUID TYPE: ?". Select the fluid type to be deleted by using one of the four fluid selector keys on the console. After selection, the fluid type (such as "5W20") will appear on line 2. You can still edit the selection by pressing another fluid key. Then press "ENTER" to continue.

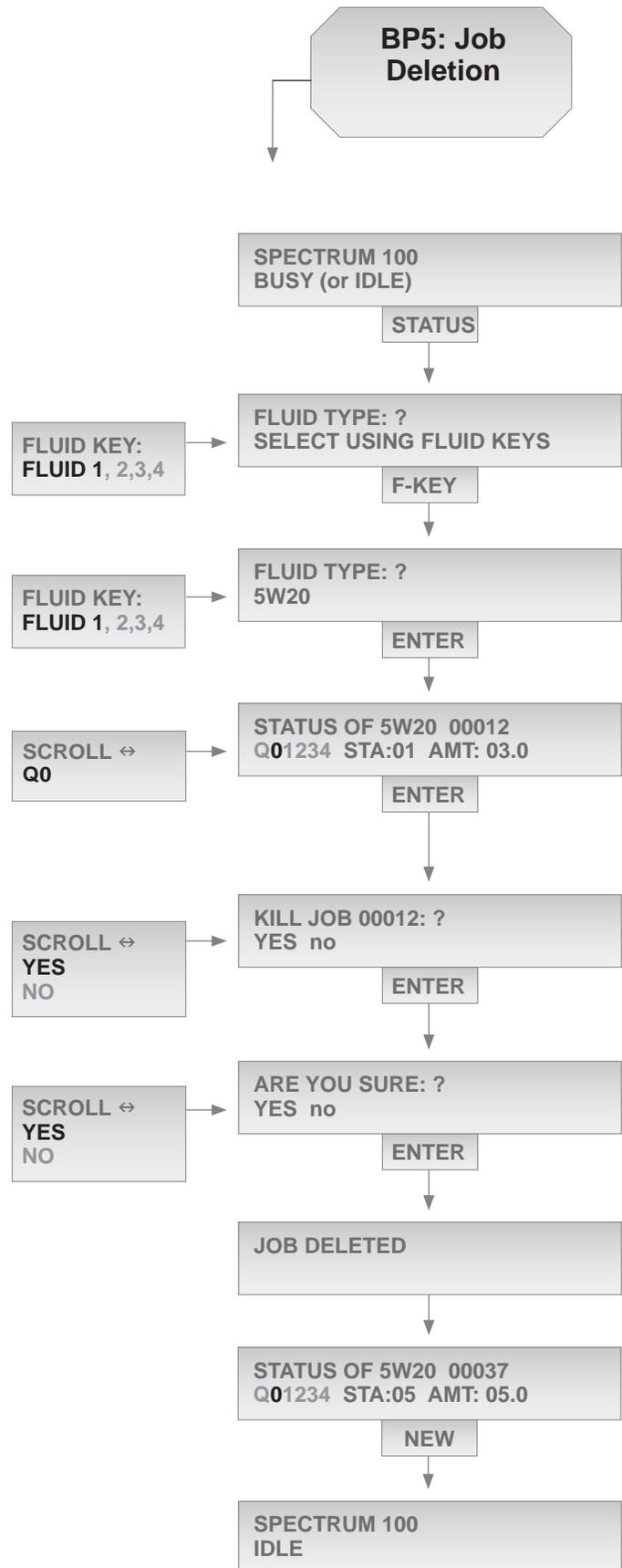
3 The next display shows status details for dispense jobs. The first line shows the fluid type and job number. The second line shows a queue indicator (Q01234), in which the highlighted queue item is the displayed job. For example, Q0 highlighted means the current active job is displayed, Q2 highlighted means the second job in queue is displayed, etc. The second line also shows the job station number, amount authorized and amount dispensed. Scroll to highlight job Q0. Then press "ENTER" to delete job Q0. All other jobs will move forward one space in the queue.

If you wish to delete a different job from queue, you must first "jump" that job forward to Q0 status, using the "QUEUE JUMPING" procedure, then use this procedure to delete the job.

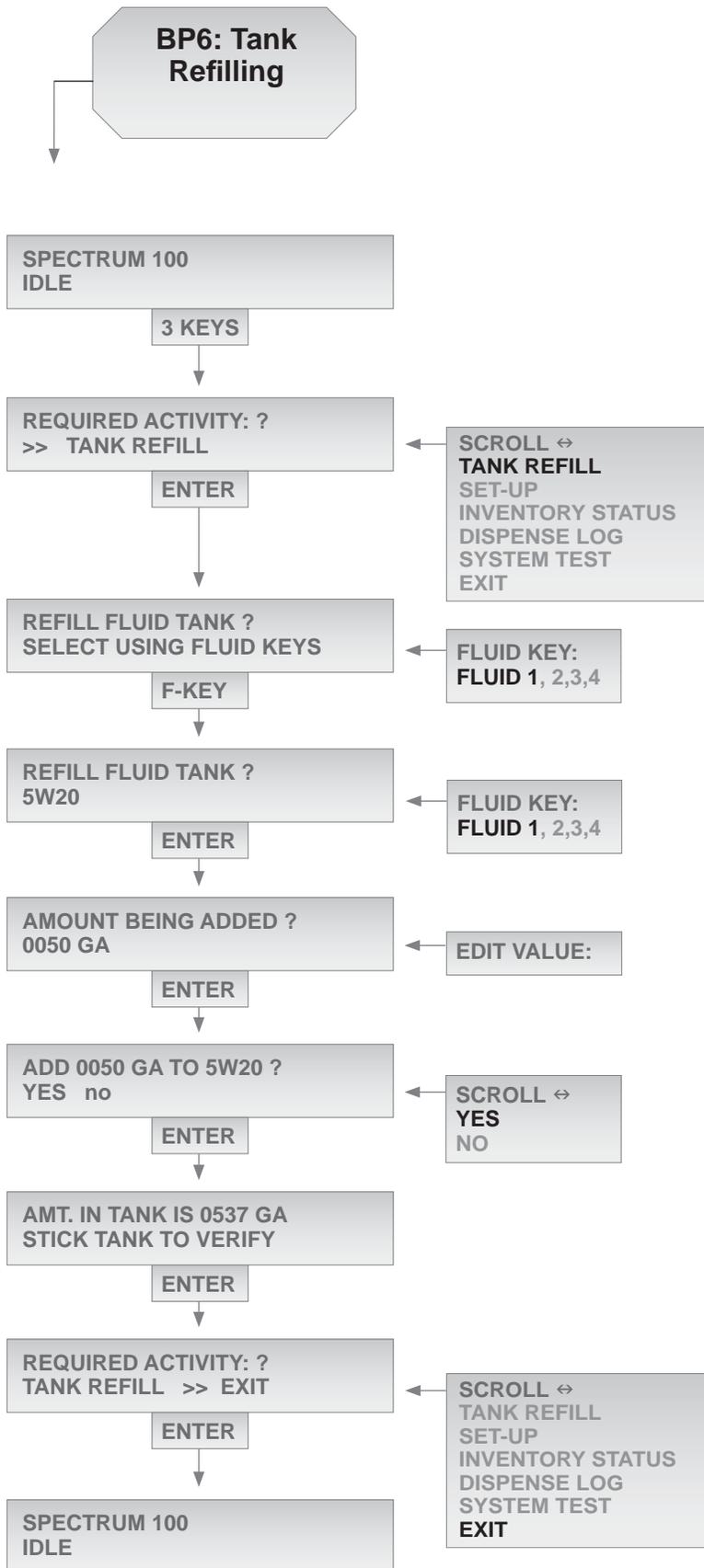
4 The display will then show two consecutive confirming statements, beginning with "KILL JOB 00012:?", for which you will respond with yes/no, then "ENTER"

5 After confirmation, the job queue will be changed, and a message will confirm that the selected job has been deleted. Allow 6 to 8 seconds for the system to refresh information.

6 The display then returns to a queue status format. The process may be repeated to delete additional jobs, or press "NEW" to return to the "SPECTRUM 100 IDLE" home screen.



Basic Procedure BP6: Tank Refilling



During these steps, if you make an entry mistake, press "NEW" to return to "SPECTRUM 100, IDLE".

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: Use the scroll-arrow keys to select "TANK REFILL", then press "ENTER".

3 The display will then prompt "REFILL FLUID TANK?". Select the tank to be refilled by using one of the four fluid selector keys on the console. After selection, the fluid type (such as 5W20) will appear on line 2. You can still edit the selection by pressing another fluid key. Then press "ENTER" to continue.

4 The display will then prompt "AMOUNT BEING ADDED?". Edit the numerical value on line 2 to match the number of gallons (or liters) added to the tank. Then press "ENTER" to continue.

5 The display will ask for confirmation of the amount. Select yes/no, then press "ENTER": to respond. After confirmation, the display will briefly show the updated quantity of fluid in the selected tank.

This is a good time to verify the tank level with a gauge measurement. If the stored quantity in Spectrum memory is incorrect, use the "FLUID IDENTIFICATION" procedure to correct the amount.

6 The next prompt will ask you to choose the required management activity: If you wish to record a refill into another tank, select "TANK REFILL", then press "ENTER".

Or select "EXIT" and then press "ENTER" to return to the "SPECTRUM 100, IDLE" display.

Basic Procedure BP7: Inventory Status

During these steps, if you make an entry mistake, press "NEW" to return to "SPECTRUM 100, IDLE".

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: Use the scroll-arrow keys to select "INVENTORY STATUS", then press "ENTER".

3 The display will then prompt "INVENTORY STATUS FLUID?". Select the fluid to be checked by using one of the four fluid selector keys on the console. After selection, the fluid type (such as 5W20) will appear on line 2. You can still edit the selection by pressing another fluid key. Then press "ENTER" to continue.

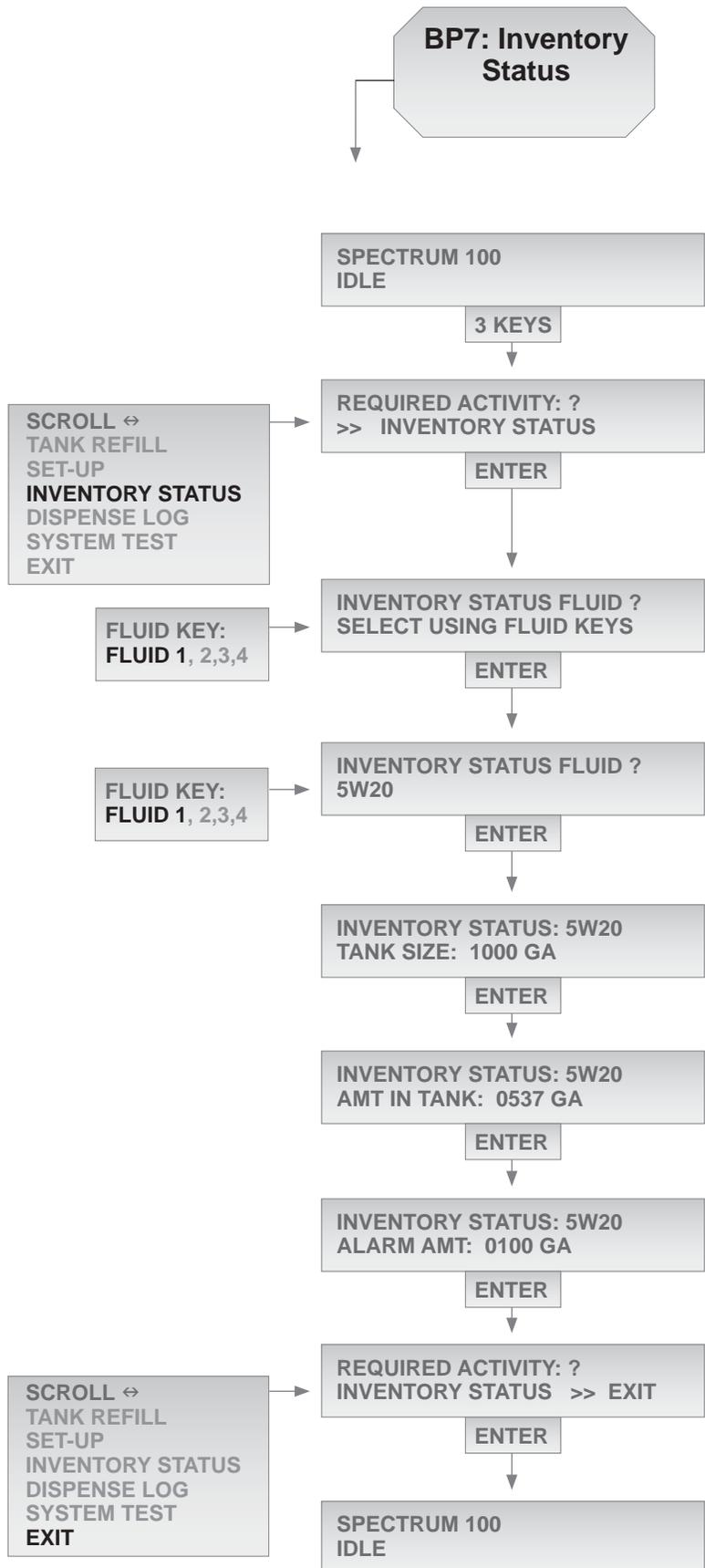
4 After selecting the fluid, the display shows the tank size in gallons (or liters). Press "ENTER" to continue.

5 Next, the display shows the amount of fluid in the tank, in gallons (or liters). Press "ENTER" to continue.

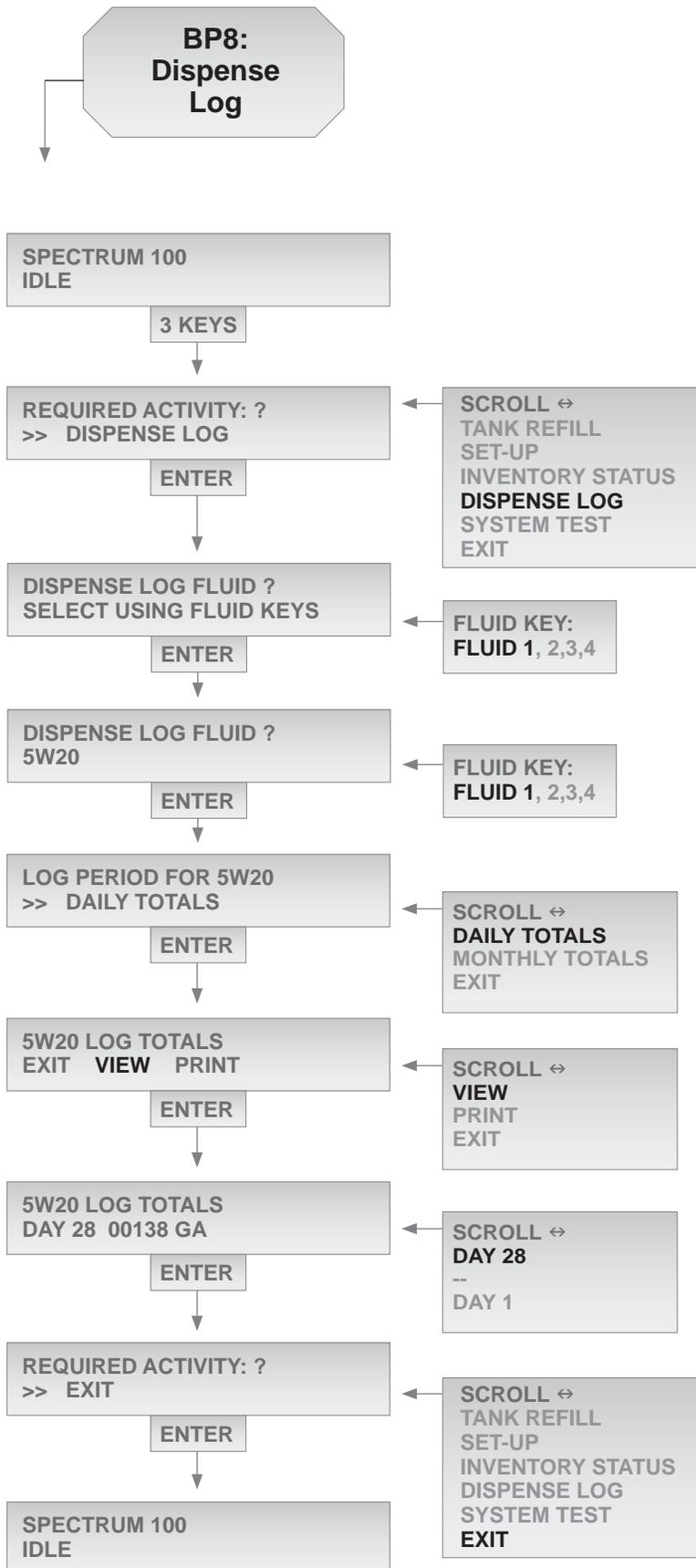
6 Next, the display shows the low level amount of fluid in the tank which will trigger a low level alert message. Press "ENTER" to continue.

7 The next prompt will ask you to choose the required management activity: If you wish to check the data for another tank, select "INVENTORY STATUS", then press "ENTER".

Or select "EXIT" and then press "ENTER" to return to the "SPECTRUM 100, IDLE" display.



Basic Procedure BP8: Dispense Log



During these steps, if you make an entry mistake, press "NEW" to return to "SPECTRUM 100, IDLE".

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: Use the scroll-arrow keys to select "DISPENSE LOG", then press "ENTER".

3 The display will then prompt "DISPENSE LOG FLUID?". Select the fluid to be checked by using one of the four fluid selector keys on the console. After selection, the fluid type (such as 5W20) will appear on line 2. You can still edit the selection by pressing another fluid key. Then press "ENTER" to continue.

4 The next prompt will ask you to choose the required management activity: Use the scroll-arrow keys to select "INVENTORY STATUS", then press "ENTER".

5 The next prompt will ask you to choose the time period for totals in the log summary report. Scroll to select "DAILY TOTALS" or "MONTHLY TOTALS", then press ENTER.

Note: time periods are defined by numerical days of the CURRENT month (April 8, 2002= day 8) or numerical months of the year (April=month 5).

6 The next prompt will ask you to choose whether to view or print the log summary report. Scroll to select VIEW" or "PRINT", then press ENTER.

7 If you have selected "VIEW", dispense totals are displayed on scrolled screens. Use the scroll-left to view all of the periods. Press "ENTER" to return to beginning menu.

8 The next prompt will ask you to choose the required management activity: If you wish to view other dispense period totals, select "DISPENSE LOG", then press "ENTER".

Or select "EXIT" and then press "ENTER" to return to the "SPECTRUM 100, IDLE" display.

Basic Procedure BP9: PIN Entry/Revision

During these steps, if you make an entry mistake, press "NEW" repeatedly to return to "SPECTRUM 100, IDLE".

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: Use the scroll-arrow keys to select "SET-UP", then press "ENTER".

3 The next prompt will ask you to choose the required SET-UP activity: Use the scroll-arrow keys to select "PIN#", then press "ENTER".

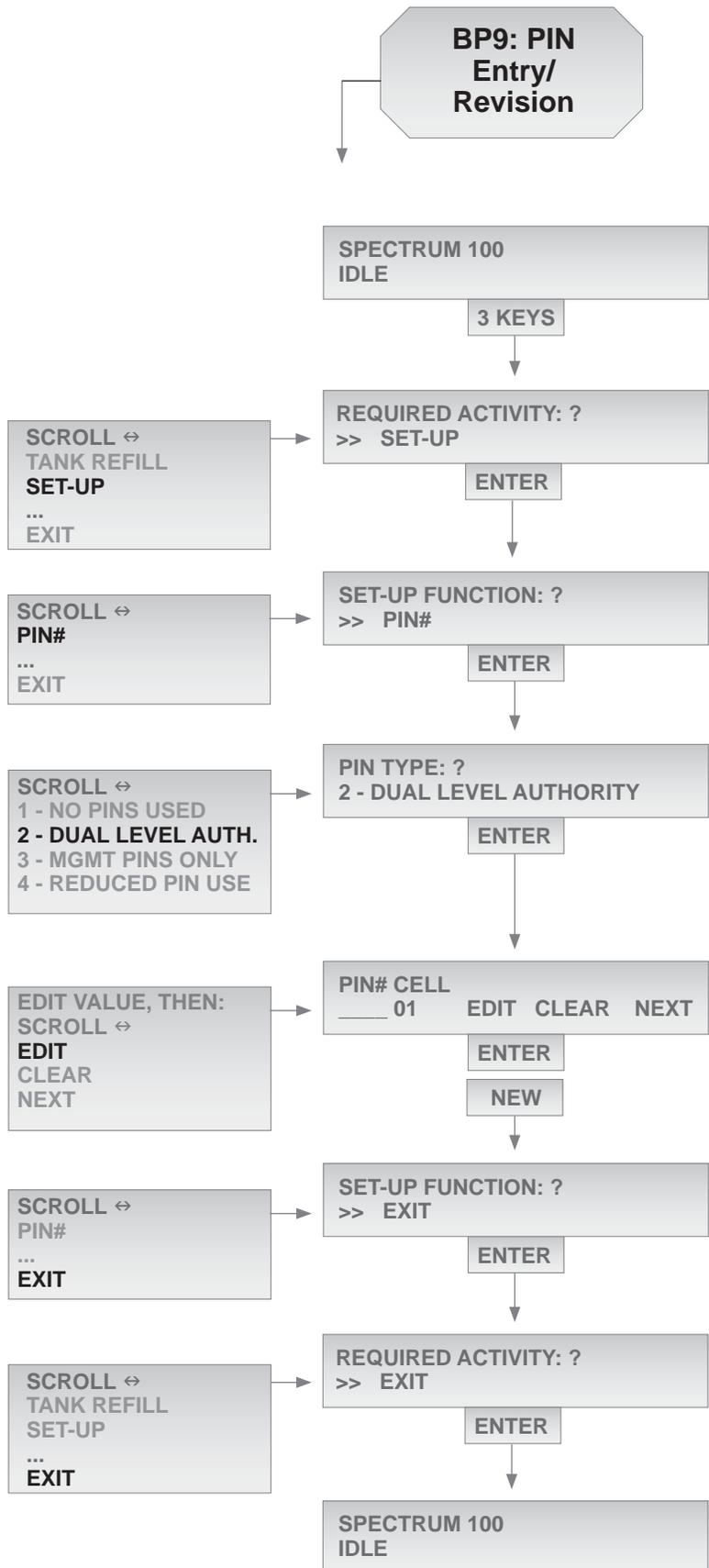
4 The next prompt will ask you to select a PIN protection configuration. Scroll to select configuration 1, 2, 3, or 4. Then press "ENTER" to make the selection. Refer to page 24 for a detailed explanation of configuration choices.

5 The next prompt will invite you to edit PIN codes, using the prompt, "PIN# CELL:?". There are 37 PIN code cells available in memory. *Note: The first five cell locations are management-privilege cells; all others are not.* Select "NEXT" and "ENTER" until the cell number matches the PIN code you wish to edit or add. Then enter "EDIT" and revise the code number (0000-9999). *You must use all four digits!* Press "ENTER" when done to execute a PIN number revision or addition.

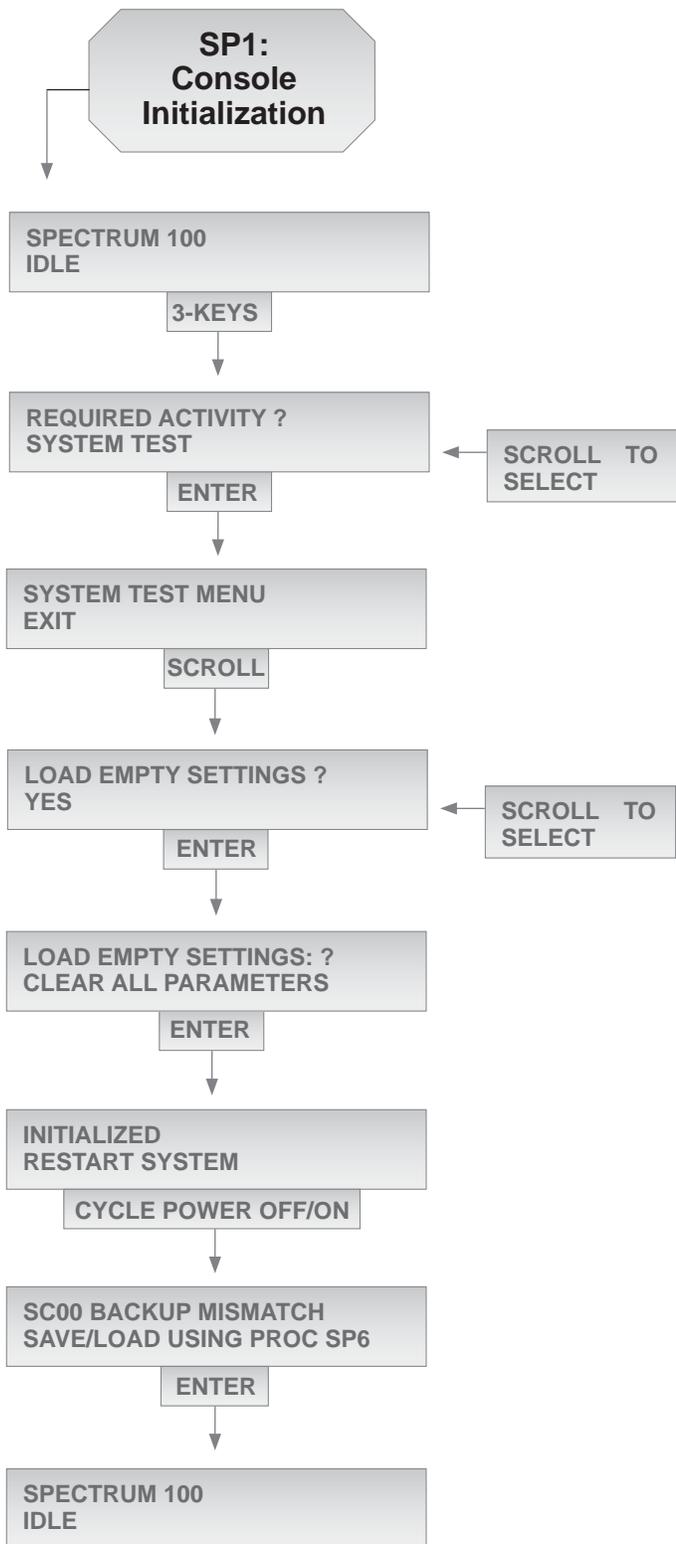
You may change an existing PIN number using "EDIT", or erase the number by selecting "CLEAR". You can move to the next cell by selecting "NEXT" then "ENTER", or leave the subroutine when done by pressing "NEW".

6 The next prompt will ask you to choose the required management activity. Select "EXIT" and then press "ENTER" to return to the "REQUIRED ACTIVITY: ?" display.

7 The next prompt will ask you to choose the required management activity. Select "EXIT", then press "ENTER" to return to the "SPECTRUM 100, IDLE" display.



Special Procedure SP1: Console Initialization



⚠ CAUTION

Use this procedure with care. Follow instruction steps exactly. An incorrect key sequence can disrupt Spectrum programming, or require a lengthy re-setup. You may press NEW to escape the routine at any time.

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SYSTEM TEST", then press "ENTER".

3 The next prompt will display "SYSTEM TEST MENU, EXIT". Scroll to the right to highlight "LOAD FACTORY SETTINGS, YES", then press "ENTER".

4 The display will change to "CLEAR ALL PARAMETERS, YES". Press "ENTER" to continue.

5 The display will change to "INITIALIZED" on the first line. Cycle the power switch "OFF" and then "ON".

6 If the system setup programming has been previously saved to backup memory in the air smart controller (per procedure SP6), it will no longer match that backup due to initialization. This message prompts to do one of the following: a) download a previous system setup from the Air SC using SP6 or b) be sure and complete a new backup using SP6 *after all new setup programming has been completed.*

7 On restoring power, the system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.

Special Procedure SP2: Fluid Identification

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

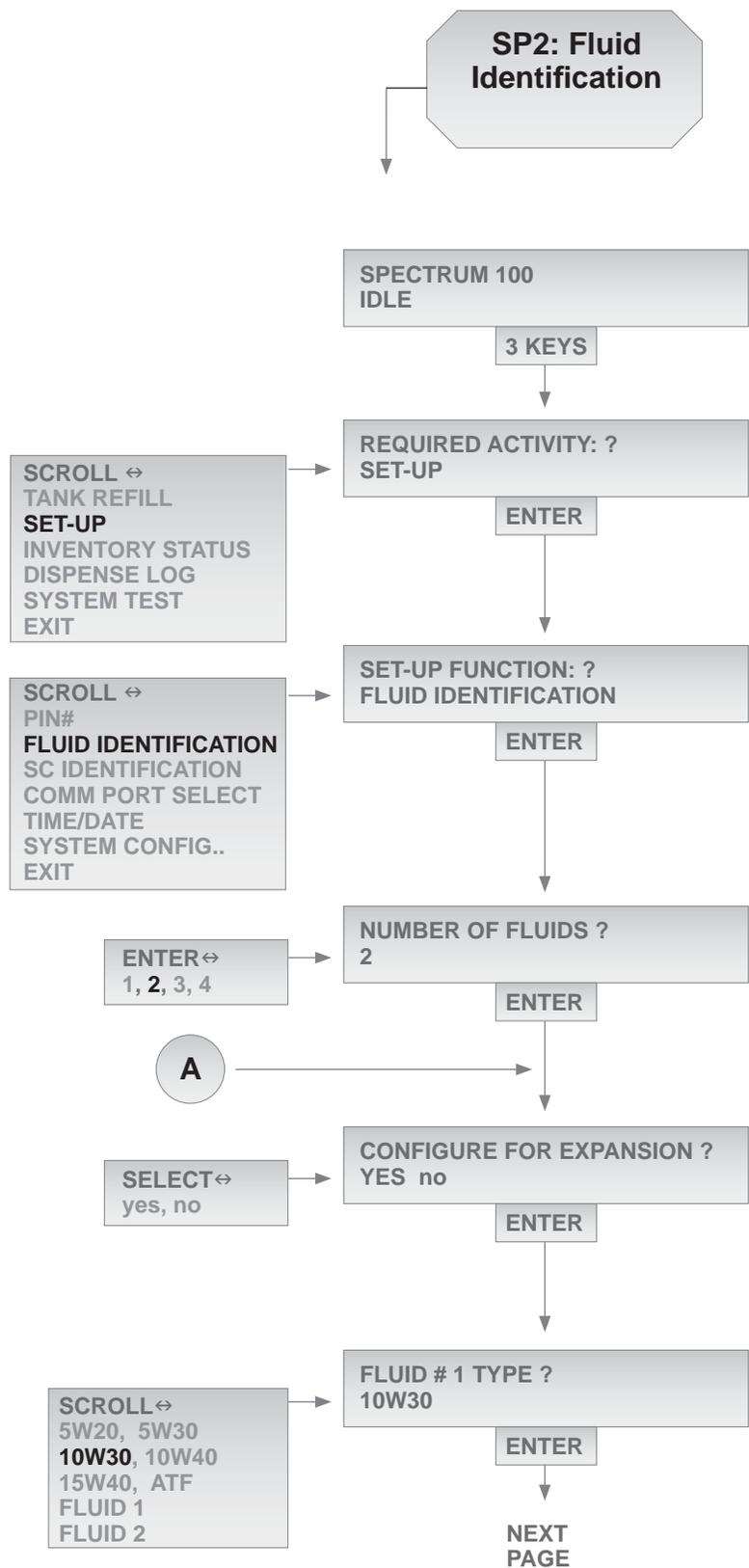
2 The next prompt will ask you to choose the required management activity: "SCROLL" to select "SET-UP", then press "ENTER".

3 The next prompt will ask you to select a type of set-up activity: "SCROLL" to select "FLUID IDENTIFICATION", then press "ENTER".

4 Next, the display will ask for the number of fluids to be used. Use number keys to place or edit the correct numerical value, which corresponds to the number of Spectrum impulse meters to be used in the pump room, then press "ENTER" to continue.

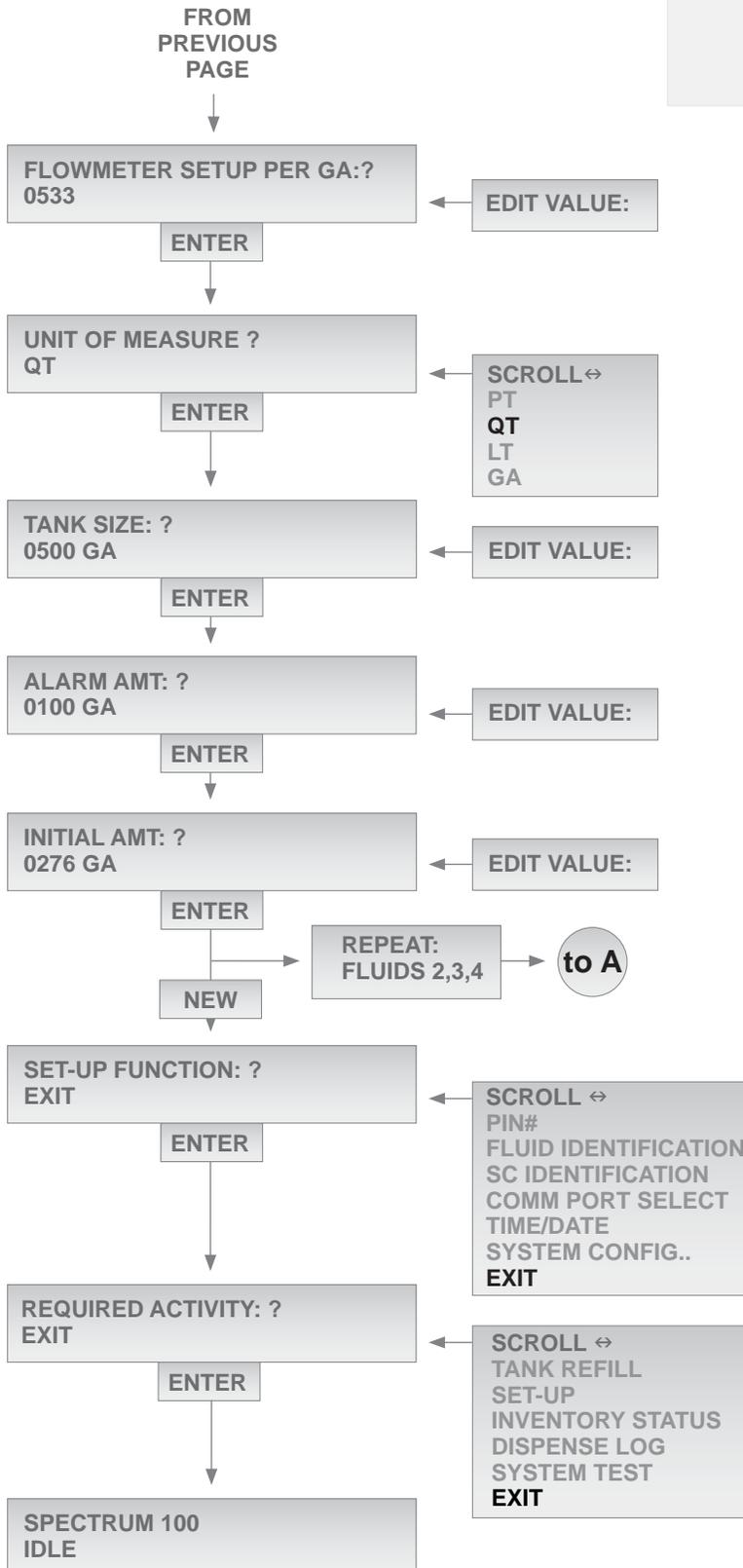
5 If you selected 1 or 2 fluids, the next screen allows use of the "EXPANSION CONFIGURATION" setup option. Choose "Yes" to configure the system to use one smart controller per station; Choose "No" to configure for use of the minimum number of smart controllers, where users do not intend to add more fluids at a later date. This choice should match the "SYSTEM CONFIGURATION WORKSHEET" for the installation. If you choose future expansion, the program will automatically enter dummy tank and fluid information for fluid 3. This may be edited if and when the user eventually adds the third system fluid.

6 Next, select the correct fluid type for the displayed fluid number by scrolling right or left. Stop when the correct fluid type is highlighted. Select the default "FLUID 1", "FLUID 2" etc., if your fluid type does not appear on the scroll list. Then press "ENTER" to continue.



Special Procedure SP2: Fluid Identification, cont'd

NOTE: Failure to load fluid meter calibration factor (pulses per gallon) for each meter into Spectrum™ operating software will result in substantial dispense quantity errors.



7 Next, enter the meter calibration factor for the impulse meter measuring the selected fluid, in pulses per gallon (PPG). The default for the model 3120-103 impulse meter is 0390 PPG. Then press “ENTER” to continue.

8 Next, enter the desired unit of measure for the selected fluid: “SCROLL” to highlight the correct choice: pint, quart, liter, gallon. Then press “ENTER” to continue.

10 Next, enter the fluid capacity (in gallons or liters) of the tank where the selected fluid is stored. Then press “ENTER” to continue.

11 Next, enter the fluid low level limit (in gallons) for the selected fluid. *In operation, fluid use will automatically trigger a low level prompt message on the display when fluid in the tank is depleted below the selected amount.* Press “ENTER” to continue.

12 Finally, enter the current amount of fluid stored (in gallons or liters) in the reservoir of the selected fluid. Then press “ENTER” to continue.

The program will either loop back to gather information on the next fluid, or, if all fluid set-ups are complete, will return you to the “SETUP FUNCTIONS” scroll menu.

13 The next prompt will return you to the setup screen and ask you to select a type of set-up function: “SCROLL” to select “EXIT”, then press “ENTER”.

14 The next prompt will ask you to choose the required management activity: “SCROLL” to select “EXIT”, then press “ENTER”. The program will return to home position, displaying “SPECTRUM 100, IDLE”.

Special Procedure SP3: SC Identification

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SET-UP", then press "ENTER".

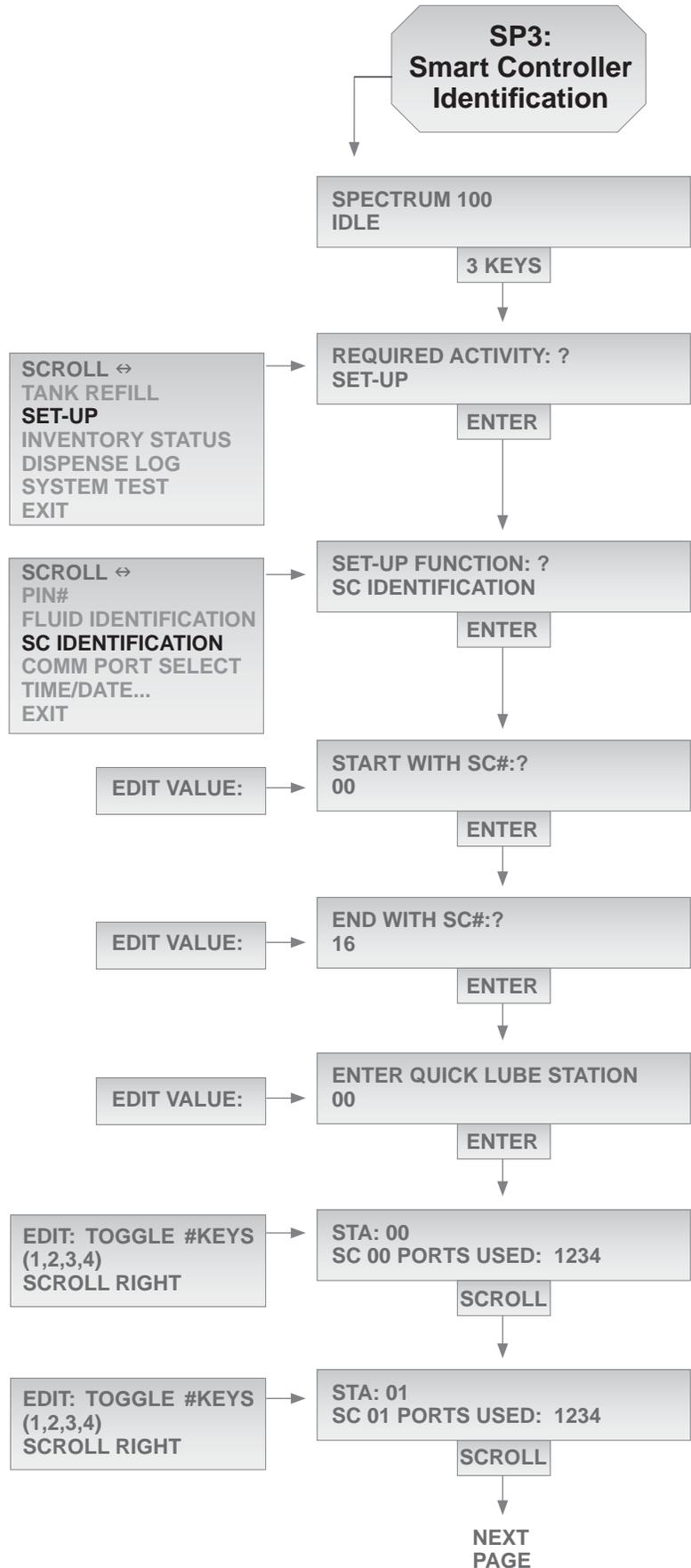
3 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "SC IDENTIFICATION", then press "ENTER".

4 Next, identify the starting fluid controller number by text-editing the number on line 2. This should be "00" for a new system and "00" must be the SC used for the air solenoids. Then press "ENTER" to continue.

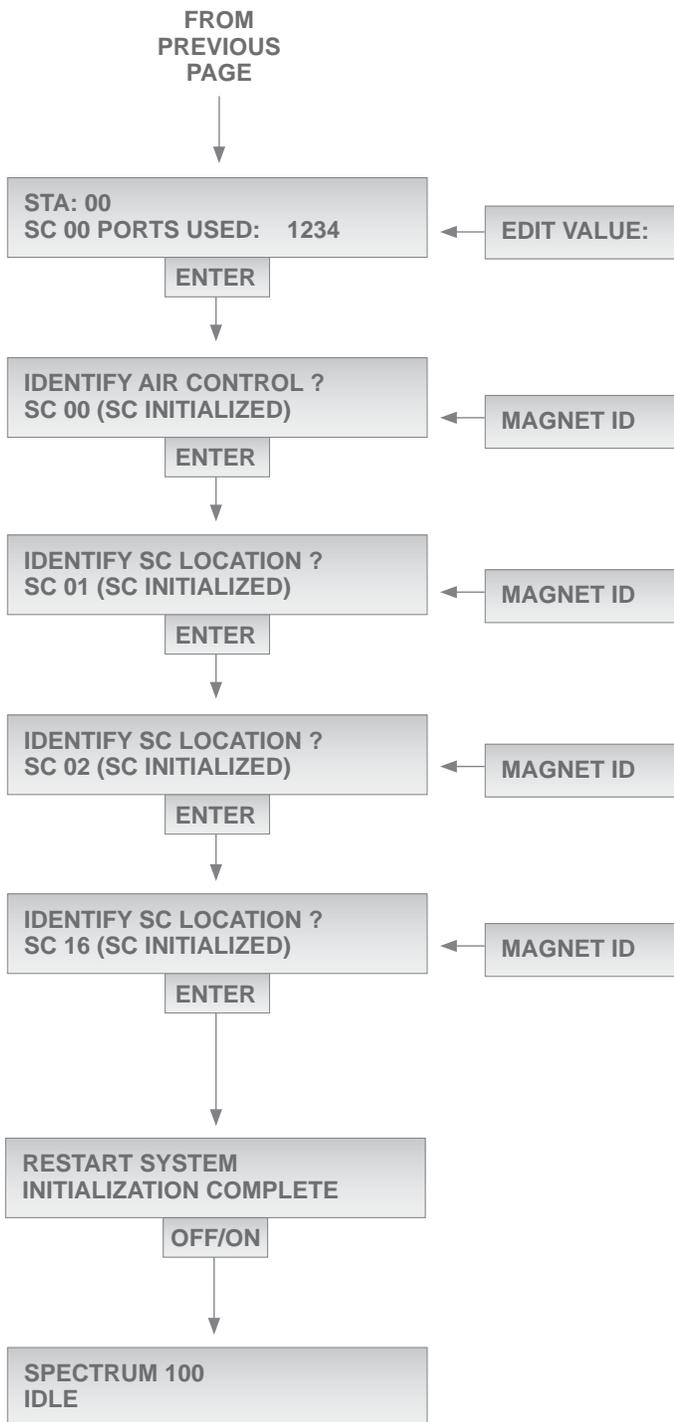
5 Next, identify the final fluid controller number in the system by text-editing the number on line 2. Then press "ENTER" to continue.

6 Next, if you want a priority quick lube station, edit number to show the station. Use "00" if you do not want this option. Then press "ENTER" to continue.

7 Next, a series of screens will prompt you to identify the valve ports which are to be **not used** at each station. **Begin with Station 00:** if you have two system fluids **and** you selected future expansion in procedure SP2, then "turn off" port 3 by pressing the "3" key; if you have one system fluid **and** you selected future expansion in procedure SP2, then "turn off" port 2 and port 3. If you did not select future expansion, then **make no changes** to ports at Station 00. Right-scroll one time to see the next station. For stations 01 and higher, use number keys to toggle the numbers "1234" **off** wherever specific dispense ports will **not** be used. Proceed similarly until inactive ports at all stations are correctly "turned off".



Special Procedure SP3: SC Identification, cont'd



8 When all stations have been through the port review scroll, the display will return to a view of Station 00. Make one more scroll-pass through the displays to be sure that all ports are correctly set. Then, upon returning to the view of Station 00, press “ENTER” to continue.

9 Next, a prompt will ask you to identify a fluid controller to be designated as SC 00. To do this, pass a magnet over the central LED (nearest mounting screw) location on that installed fluid controller.

When the magnetic identification is successfully made, the second line of the display will read “SC00 (SC INITIALIZED)” for 3 seconds. Then the program will move to the next bay number and will repeat the magnetic identification process. This will continue until all dispensing bays in the system are identified.

10 When all fluid controllers are properly identified, including the air valve controller, the prompt line displays the message “RESTART SYSTEM, INITIALIZATION COMPLETE”.

Cycle the power switch off, then back on. After a brief self test, the display will return to home position: “SPECTRUM 100, IDLE”.

Special Procedure SP4: Comm Port Selection

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SET-UP", then press "ENTER".

3 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "COMM PORT SELECT", then press "ENTER".

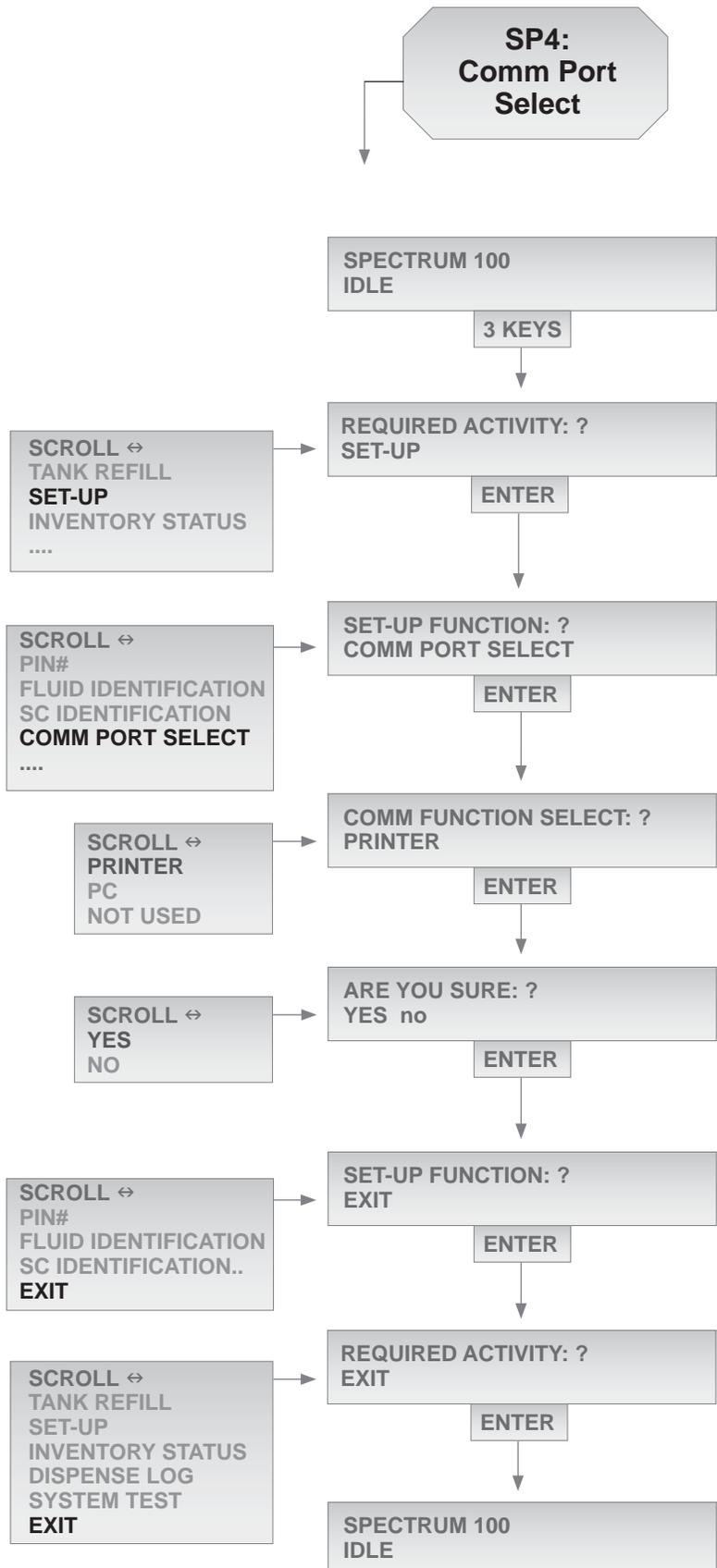
4 The display will then show two choices for external communications. "SCROLL" to highlight printer if you wish to connect the Spectrum ticket printer. "SCROLL" to highlight PC if you wish to send data to a host PC which contains a "Spectrum PC Report" program. Press "ENTER" after highlighting a selection.

5 The next prompt will ask you to confirm the communications choice: select "YES" to continue, "NO" to back up to the previous step.

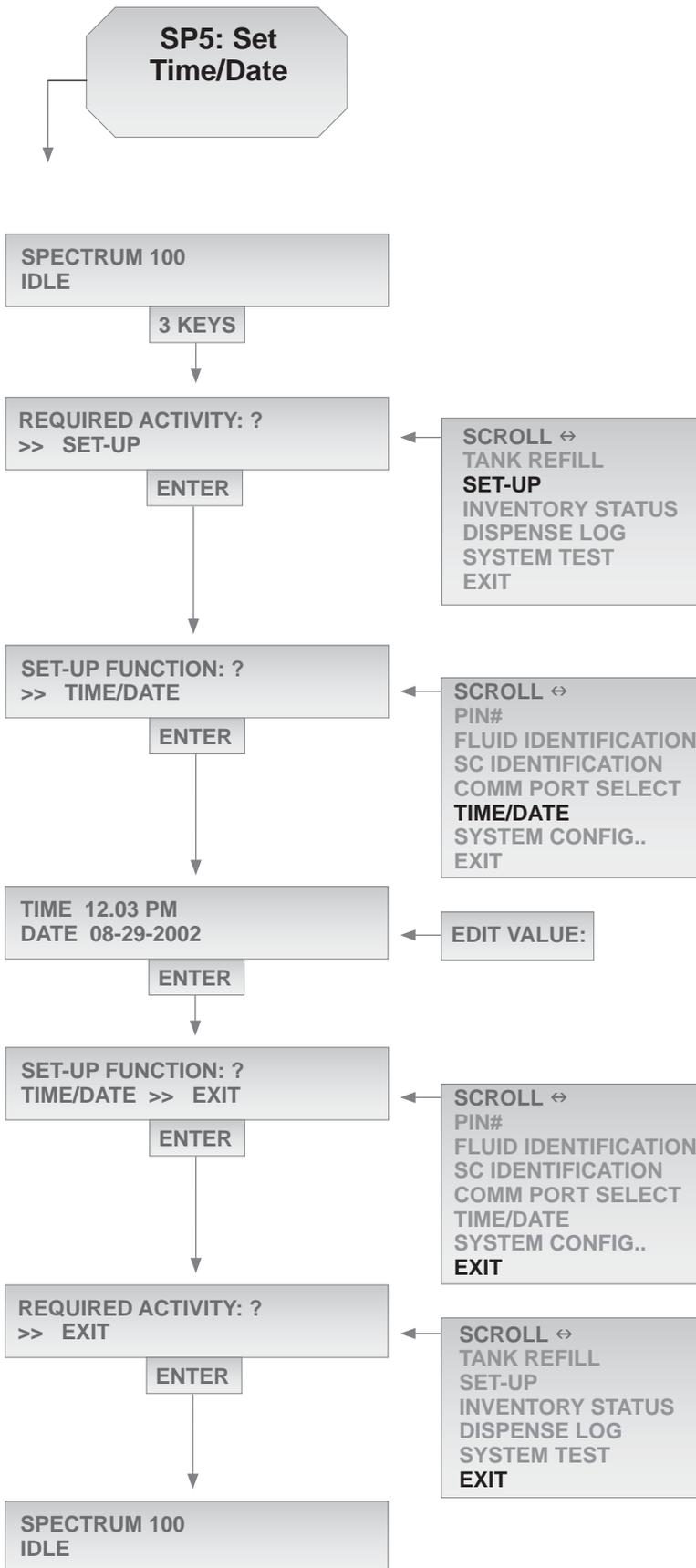
6 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "EXIT", then press "ENTER".

7 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "EXIT", then press "ENTER".

8 Next, the system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.



Special Procedure SP5: Set Time/Date



1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SET-UP", then press "ENTER".

3 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "TIME/DATE", then press "ENTER".

4 The display will then display the current time and date, as stored in processor memory. "SCROLL" and text edit the time and date entries to obtain corrected values. Press "ENTER" to load these corrected values when editing is completed.

5 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "EXIT", then press "ENTER".

6 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "EXIT", then press "ENTER".

7 Next, the system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.

Special Procedure SP6: System Configuration

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SET-UP", then press "ENTER".

3 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "SYSTEM CONFIGURATION", then press "ENTER".

4 The display will then display "SAVE/READ PARAMETERS" on the first line and selection choices on line 2. To save console parameters, choose "SAVE"; to recall saved parameters into the memory of a new or replacement console, select "READ". Press "ENTER" when completed.

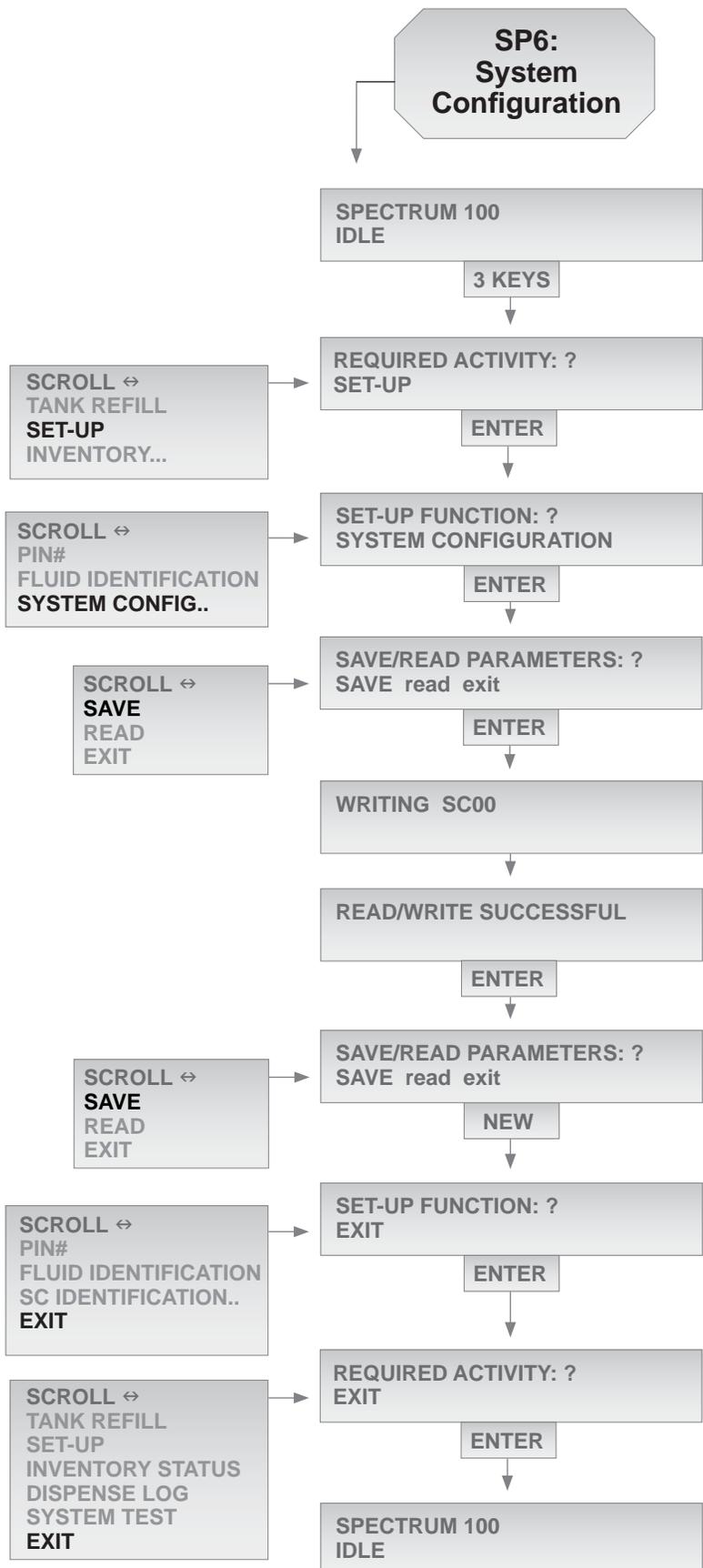
5 The display will briefly show the message "WRITING TO SC00" or "READING SC00".

6 If no errors occur during the process, the display will then pause and report the message "READ/WRITE SUCCESSFUL". Press "ENTER" to continue.

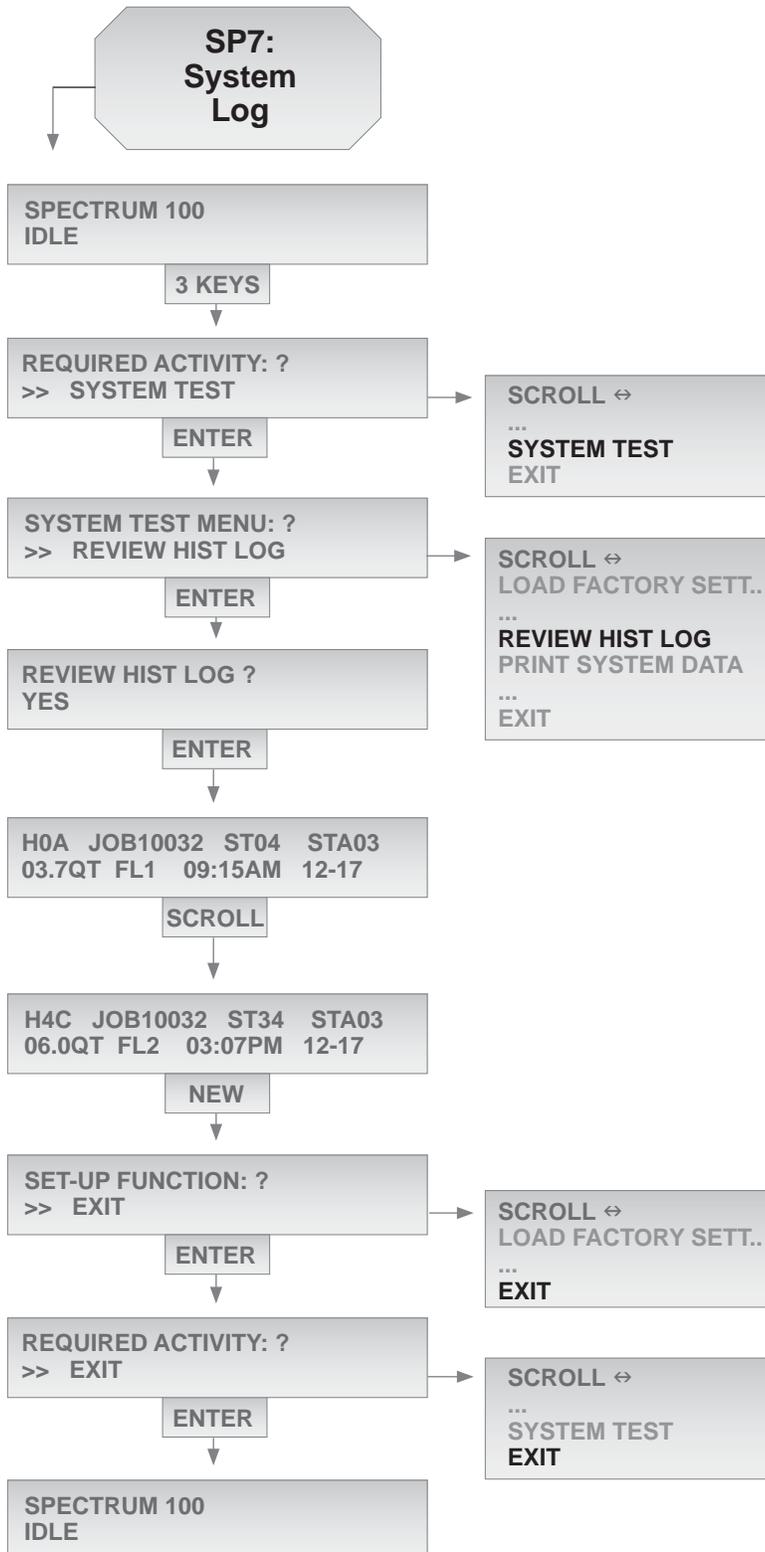
7 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "EXIT", then press "ENTER".

8 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "EXIT", then press "ENTER".

9 Next, the system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.



Special Procedure SP7: System Log



1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SET-UP", then press "ENTER".

3 The next prompt will ask you to select a type of set-up activity: "SCROLL" to highlight "SYSTEM TEST", then press "ENTER".



CAUTION: Proceed carefully with the next step. Always "SCROLL" right, do not press "ENTER" until the "REVIEW LOG HISTORY" choice appears. An incorrect key sequence can disrupt Spectrum programming, requiring a lengthy re-setup.

4 The next prompt will ask you to select a type of system test: "SCROLL" to highlight "REVIEW LOG HISTORY", then press "ENTER".

5 The next display job will show data for the first job history record in console memory. Refer to of page 45 for explanation of screen information. Right-scroll to see successive records. There are 255 records, after which the screen will scroll back to record 1. When inspection of job records is completed, press "NEW" to escape from the subroutine.

6 The next prompt will ask you to choose the required set-up function: "SCROLL" to highlight "EXIT", then press "ENTER"

7 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "EXIT", then press "ENTER"

8 Next, the system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.

Special Procedure SP8: Test All SC's

1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SYSTEM TEST", then press "ENTER".

3 The next prompt will ask you to select a type of system test: "SCROLL" to the right to highlight "TEST ALL SC'S ?", then press "ENTER".

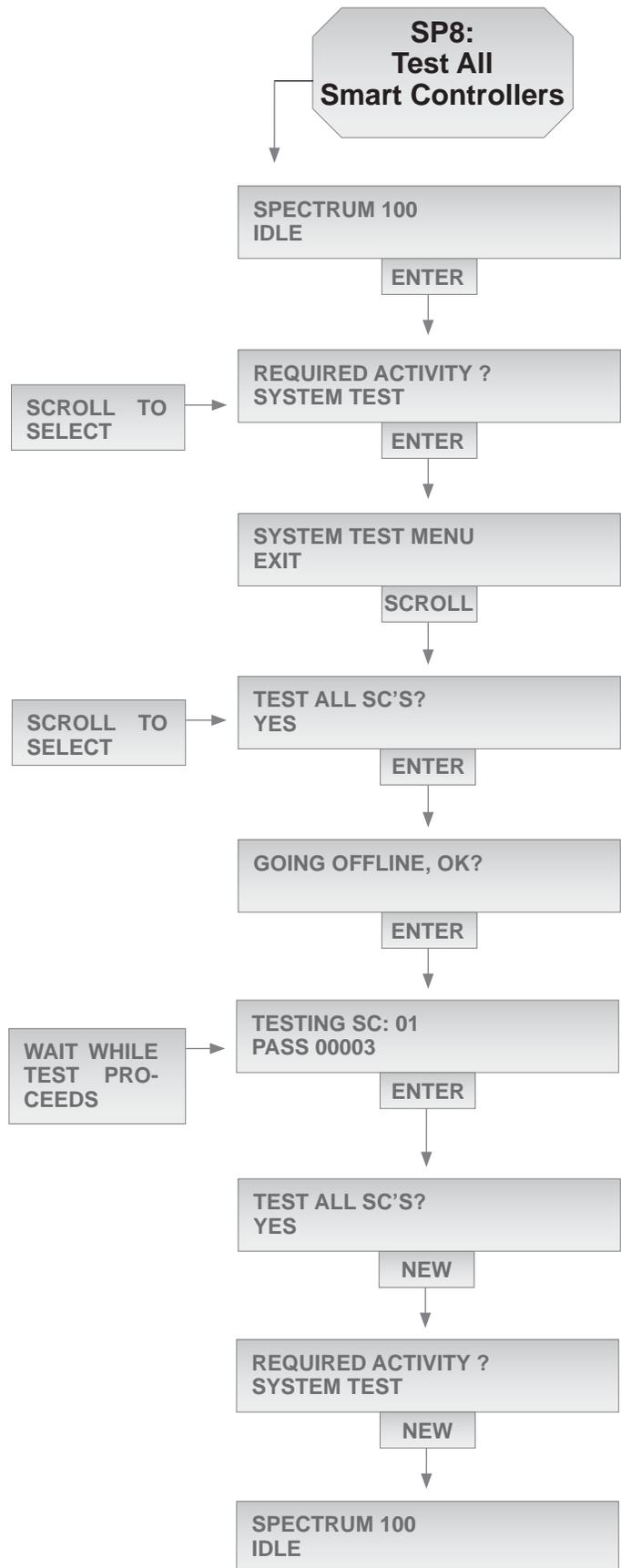
4 During the test process, the system must be "offline": no dispenses may be active. A prompt asks if you are prepared to go offline. If yes, press ENTER; if not, press NEW, close all dispense jobs then resume SP8 from the beginning.

5 The system will now run continuous functional tests to verify proper operation of Smart Controller electronics and their communications to / from the console. It will sequence from SC to SC, displaying the station number currently in test. When it completes a round of tests, it will repeat the procedure. The pass number indicates the number of completed system test cycles. Press "NEW" to discontinue further test cycles.

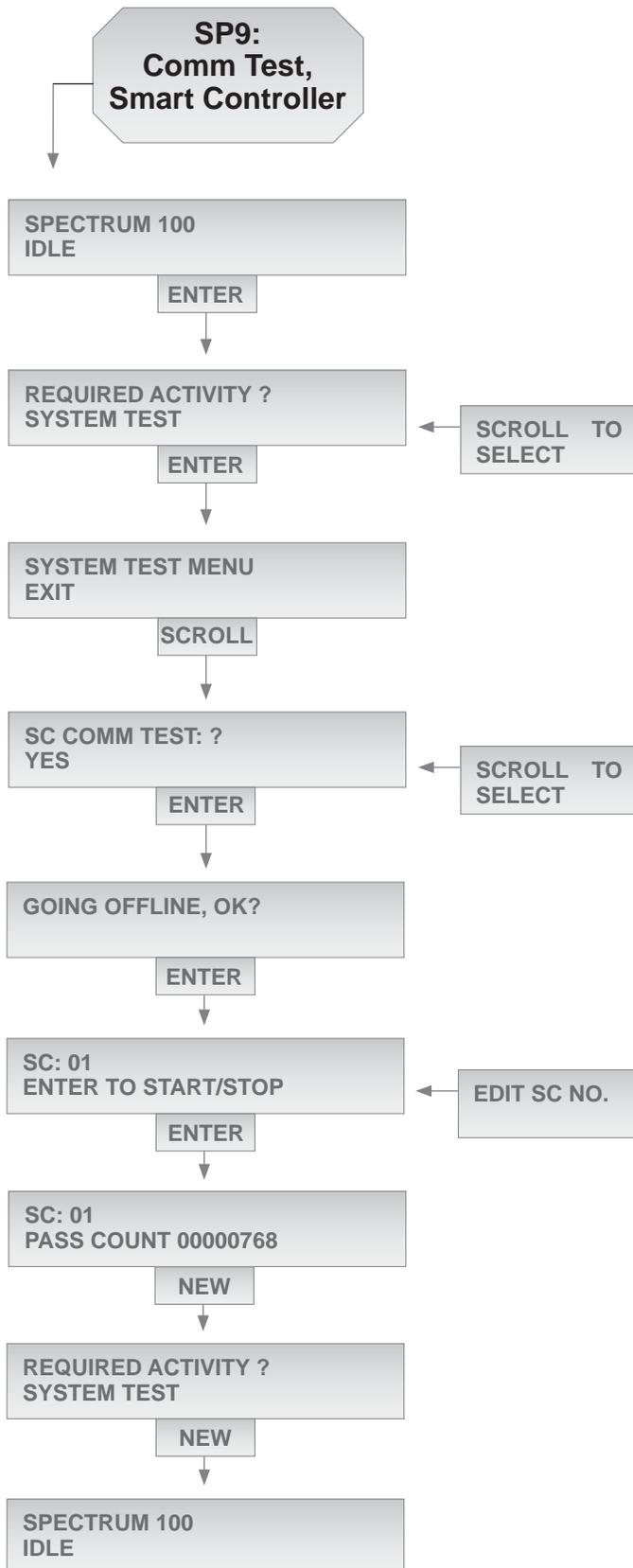
6 The display will change to "TEST ALL SC'S ?" on the first line, OR, if faults were detected, one or more error messages will be displayed. Write down error messages if they occur. Trace error correction steps using the Diagnostics section, [pages 47-56]. Then press "NEW" to continue.

7 The display will change to "REQUIRED ACTIVITY?" on the first line. The system is automatically resored to online status. Press "NEW" again to continue.

8 The system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.



Special Procedure SP9: SC Comm Test



1 Begin with the program at home position: "SPECTRUM 100, IDLE". Press the three-key simultaneous entry for management routines ("NEW"+"ENTER"+"STATUS")

2 The next prompt will ask you to choose the required management activity: "SCROLL" to highlight "SYSTEM TEST", then press "ENTER".

3 The next prompt will ask for a system PIN number. Do not enter a number. Press "ENTER" and proceed.

4 The next prompt will ask you to select a type of system test: "SCROLL" to the right to highlight "TEST ALL SC'S ?", then press "ENTER".

5 During the test process, the system must be "offline": no dispenses may be active. A prompt asks if you are prepared to go offline. If yes, press ENTER; if not, press NEW, close all dispense jobs then resume SP9 from the beginning.

6 The system will now run a continuous functional test to verify proper operation of the selected Smart Controller electronics and their communications to / from the console. When it completes a round of tests, it will repeat the procedure until you press enter. The pass number indicates the number of completed system test cycles. Press "NEW" to discontinue further test cycles. Respond to any displayed error messages with remedial action per pages 47-56.

7 The display will change to "TEST ALL SC'S ?" on the first line, OR, if faults were detected, one or more error messages will be displayed. Write down error messages if they occur. Then press "NEW" to continue.

8 The display will change to "REQUIRED ACTIVITY?" on the first line. The system is automatically resored to online status. Press "NEW" again to continue.

9 The system will display "SPECTRUM 100 IDLE". The console is now ready for other operations.

Guide to Status Code Diagnostics, Pages 48-56

The Spectrum system is equipped to detect most types of operating errors and malfunctions. It performs a self-test cycle each time the power is turned on. It also monitors the condition of valves and controls during operations.

If a normal transaction is completed or if an error is detected, a status code is assigned and reported. It may be displayed on the LCD screen at startup or immediately after a problem occurs. Status codes are always displayed in the form "STXX", where XX is a status code number.

Status codes are also recorded in memory as part of the SYSTEM HISTORY LOG. This log may be displayed sequentially on screen, item by item, by following the procedure "TROUBLE-SHOOTING PROCEDURES: SYSTEM LOG" on page 44.

Use the history log, the corrective action tables on pages 46-52, and the following procedure, to identify and fix operational problems:

1 Scroll through the history log records and look for any instance of a Status Code ≥ 30 . Codes below 30 are for normal operations and do not indicate a problem. For each instance, write down the complete display information.

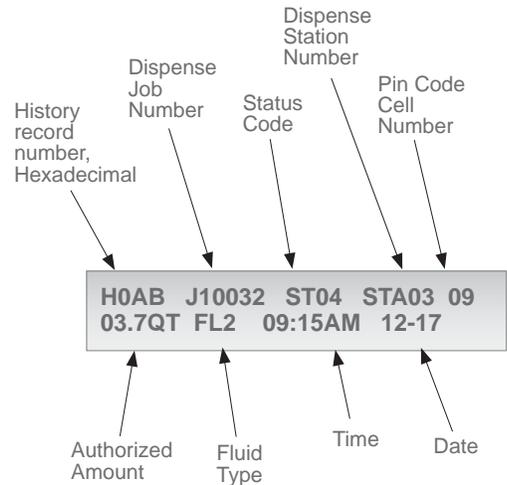
2 Now, Look at the list you have written. Attempt to associate a particular record in the history log, or set of records, to the beginning instance of Spectrum system malfunction. Use the time and date, or job numbers, to make this association.

3 After selecting apparent "cause" records from the history log, refer to the diagnosis and corrective action tables, pages 48-56.

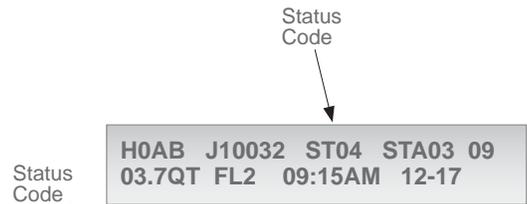
4 Execute the corrective action for the "causal" status code, step by step. Observe system operation after each step and follow instructions in the tables.

5 If causes of the operational problem cannot be determined using status codes, or repairs are not effective, contact Balcrank Customer Service for assistance.

Interpreting the History Log Screen



Example from History Log

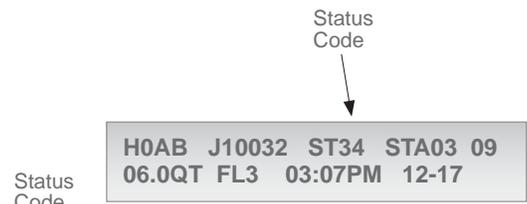


Corresponding Example from Corrective Action Tables, pages 48-56

Code 04
Successful Dispense Job

The fluid dispense was successfully completed.

Example from History Log

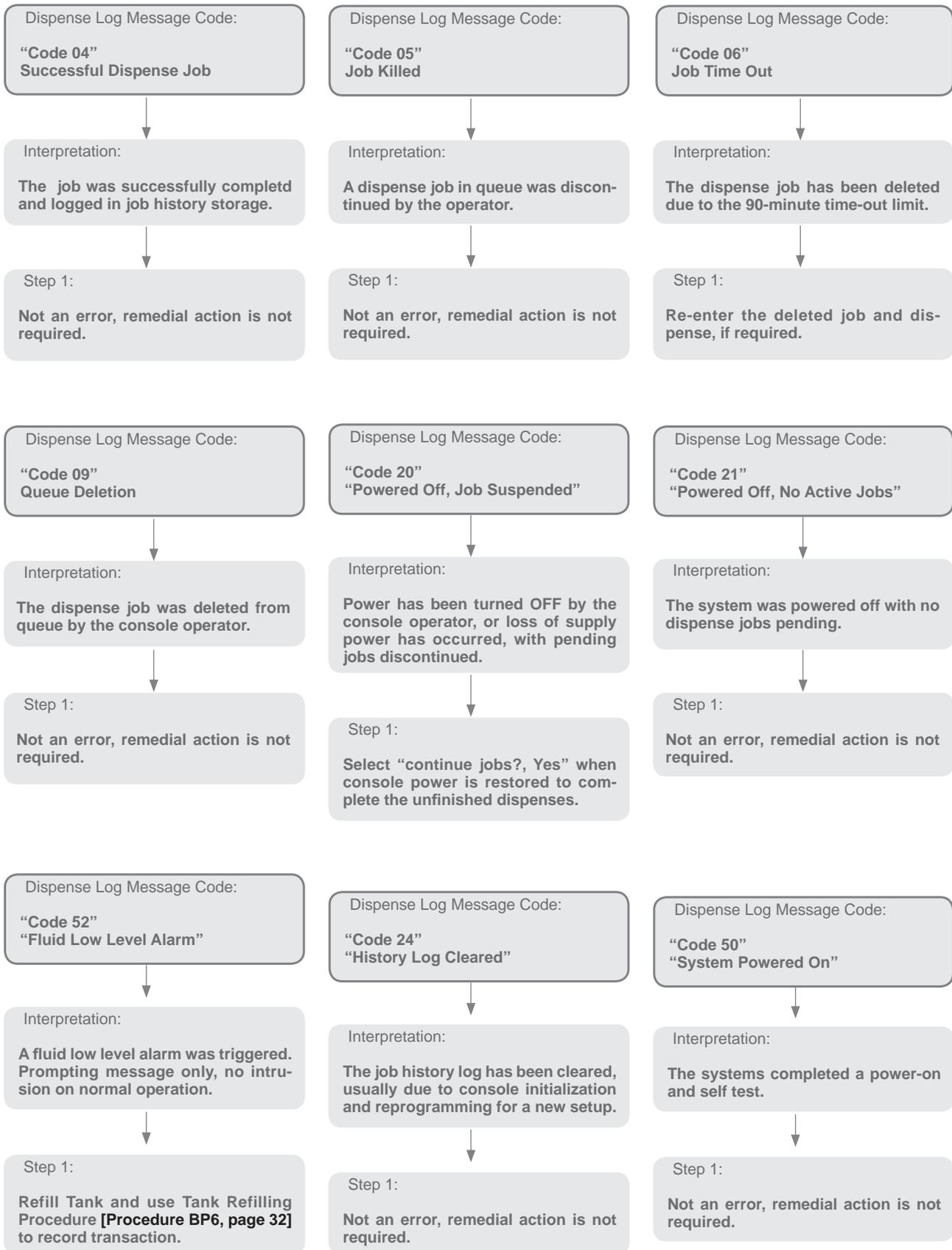


Corresponding Example from Corrective Action Tables, pages 47-56

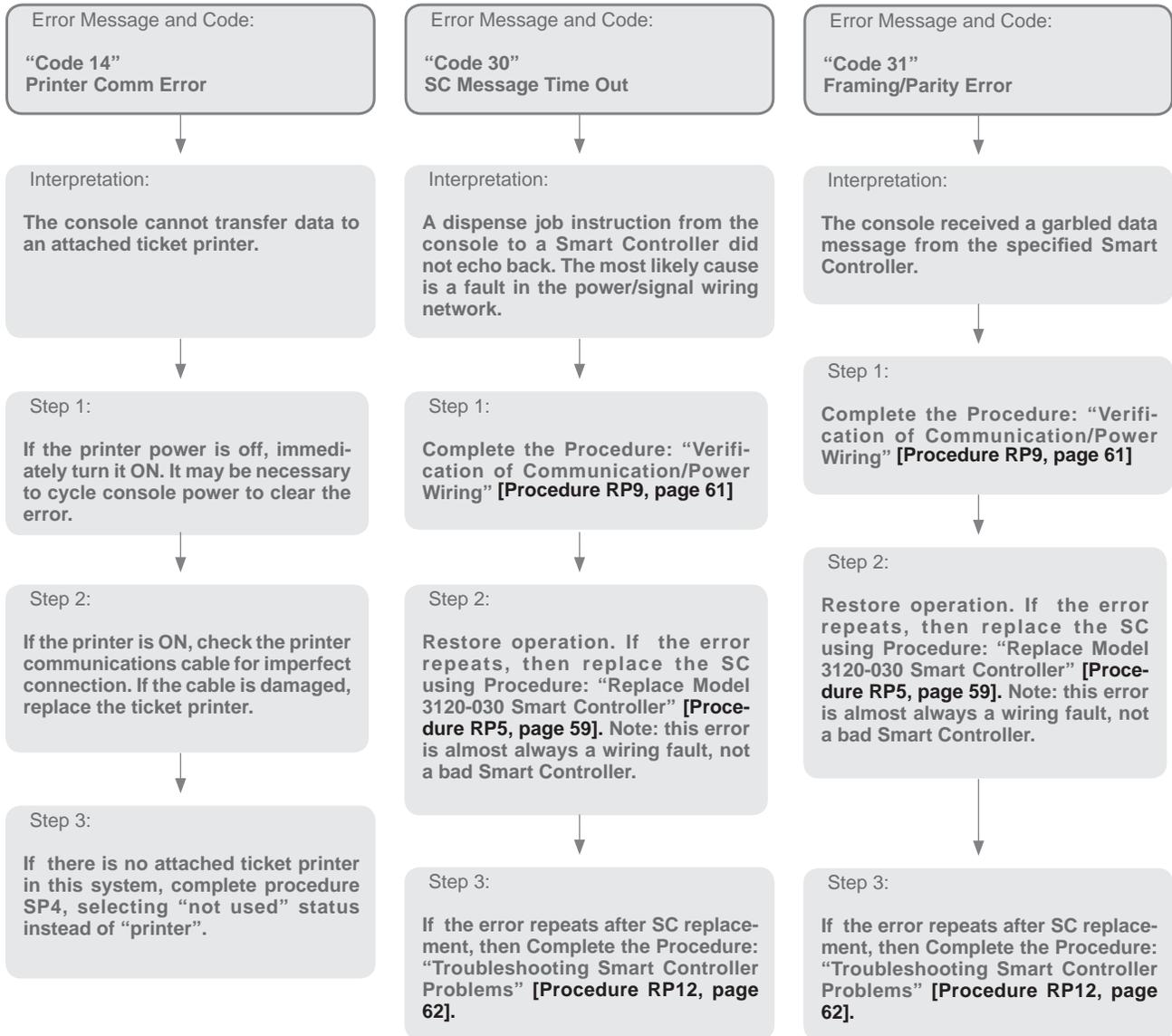
Code 34
Electrical Short in Valve

The Smart Controller reports a wiring or coil short connected to a port at station 03.

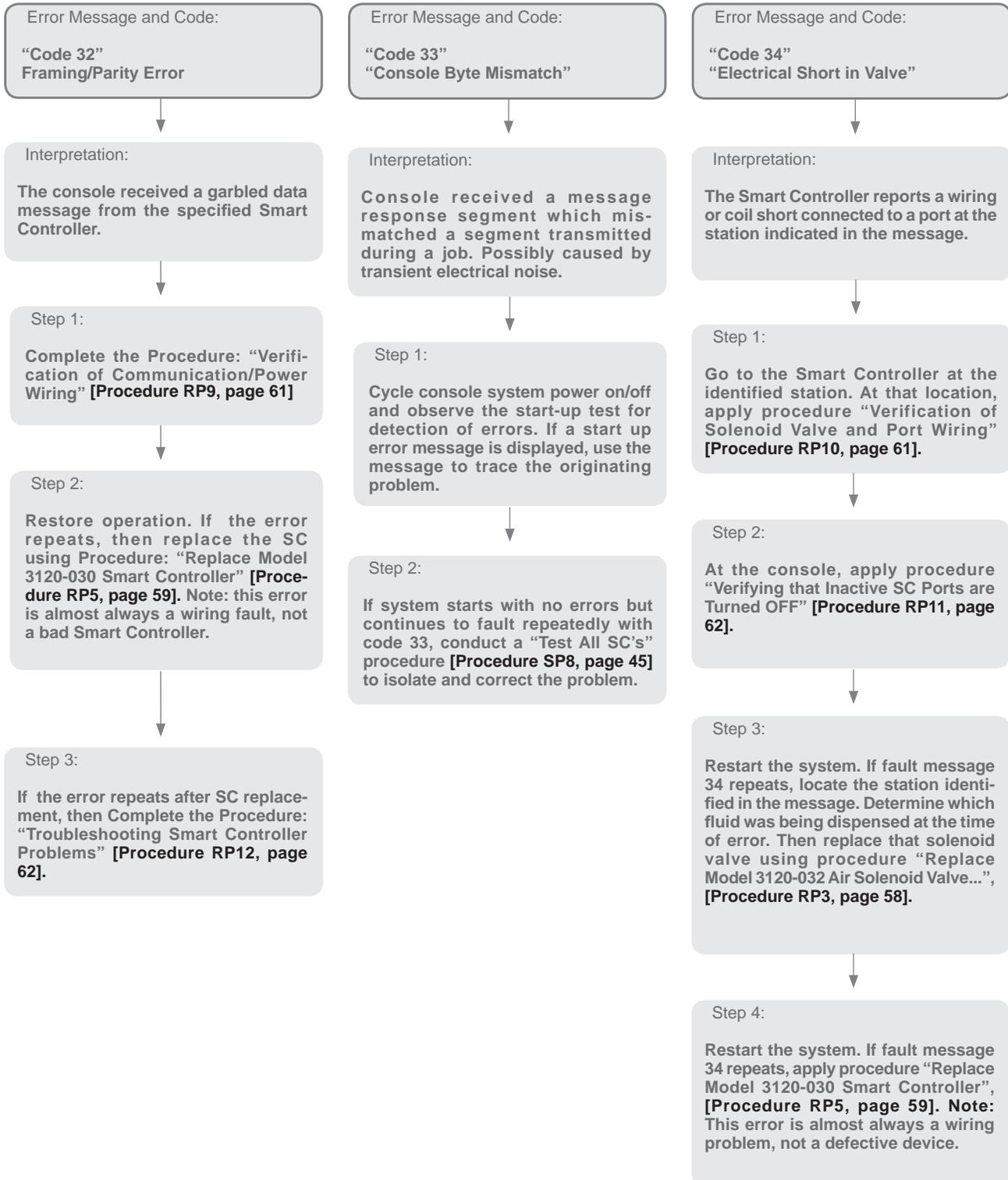
Diagnostic: Non-Fault Codes and Messages



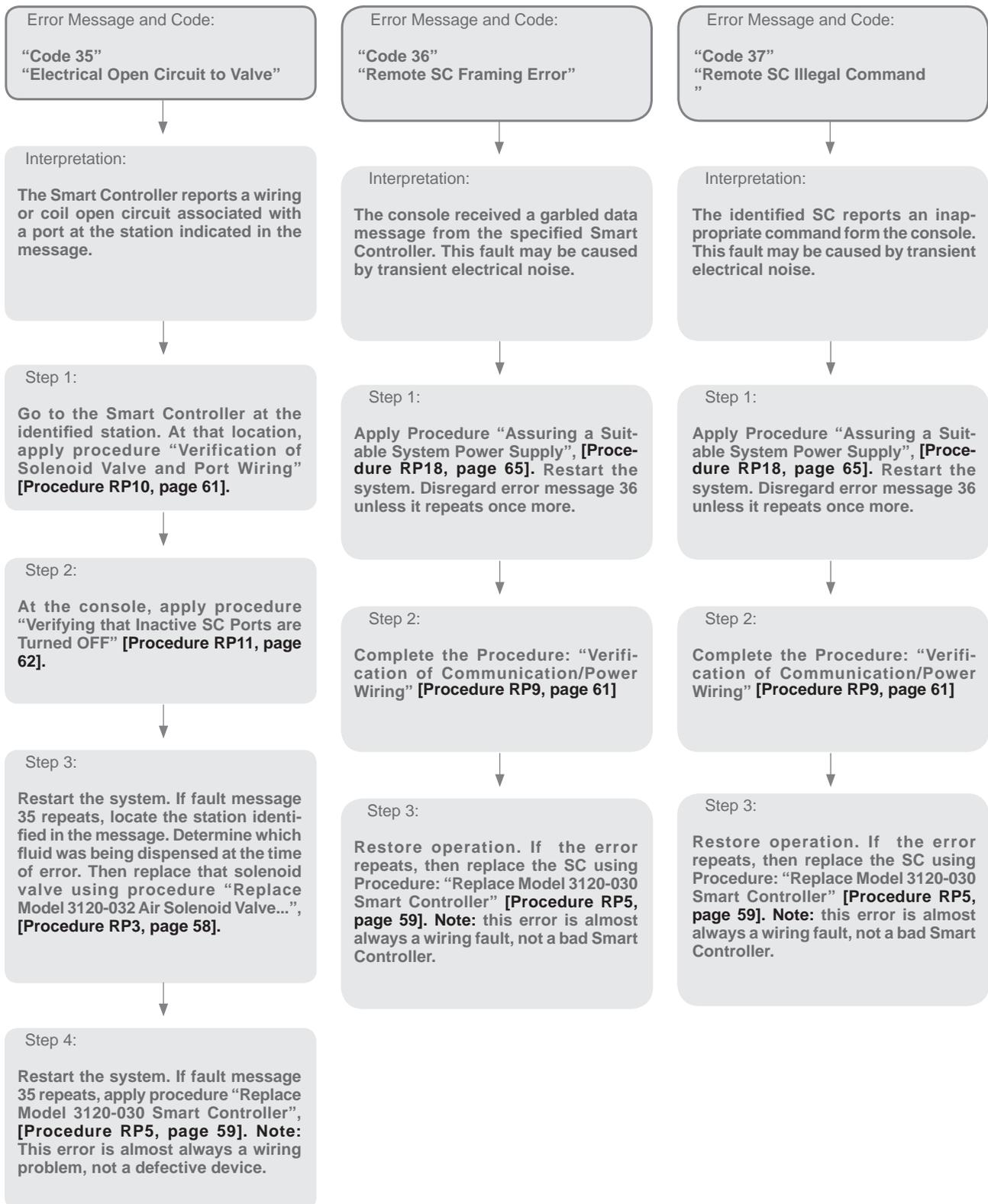
Diagnostic: Non-Fault Codes and Messages



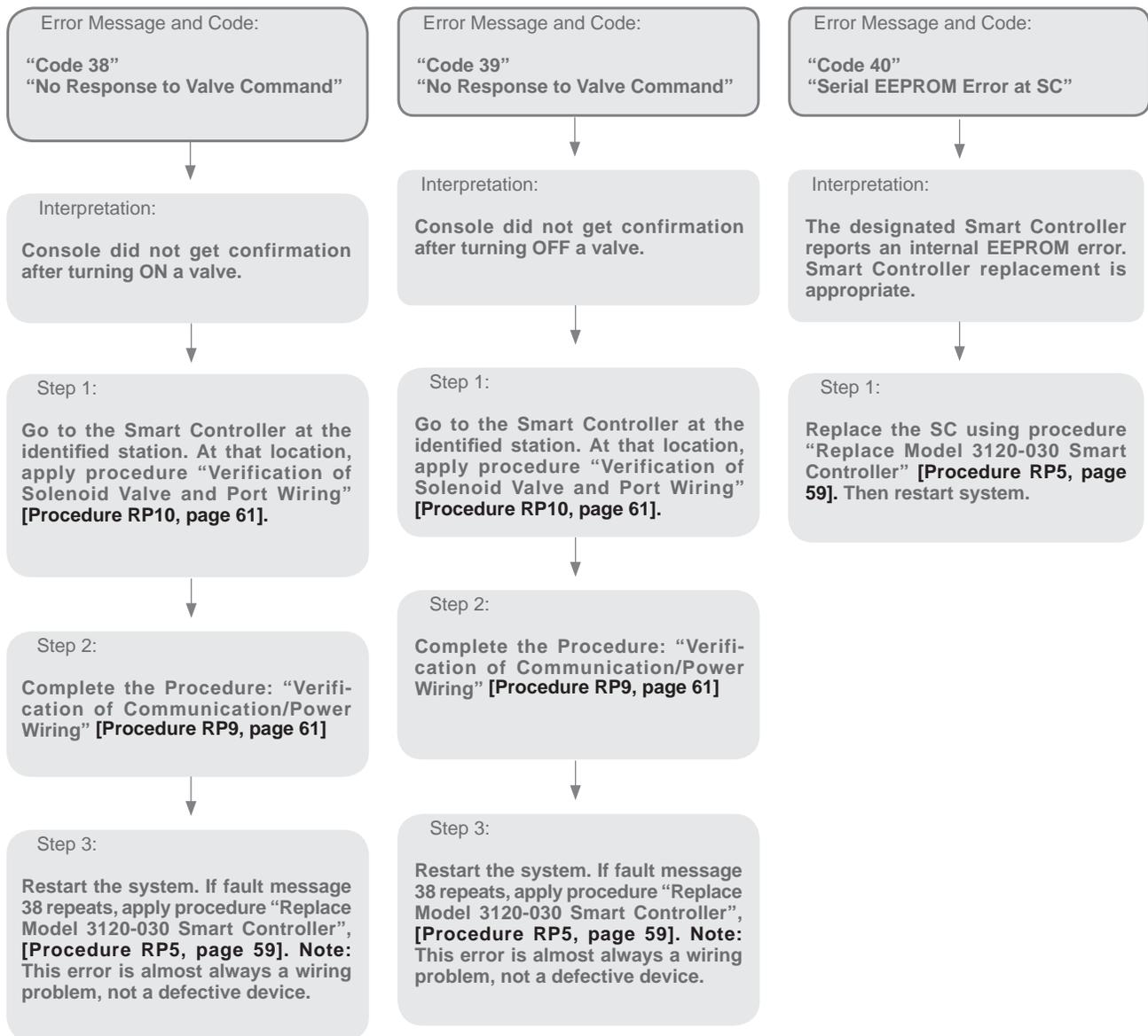
Diagnostic: Error Codes and Messages



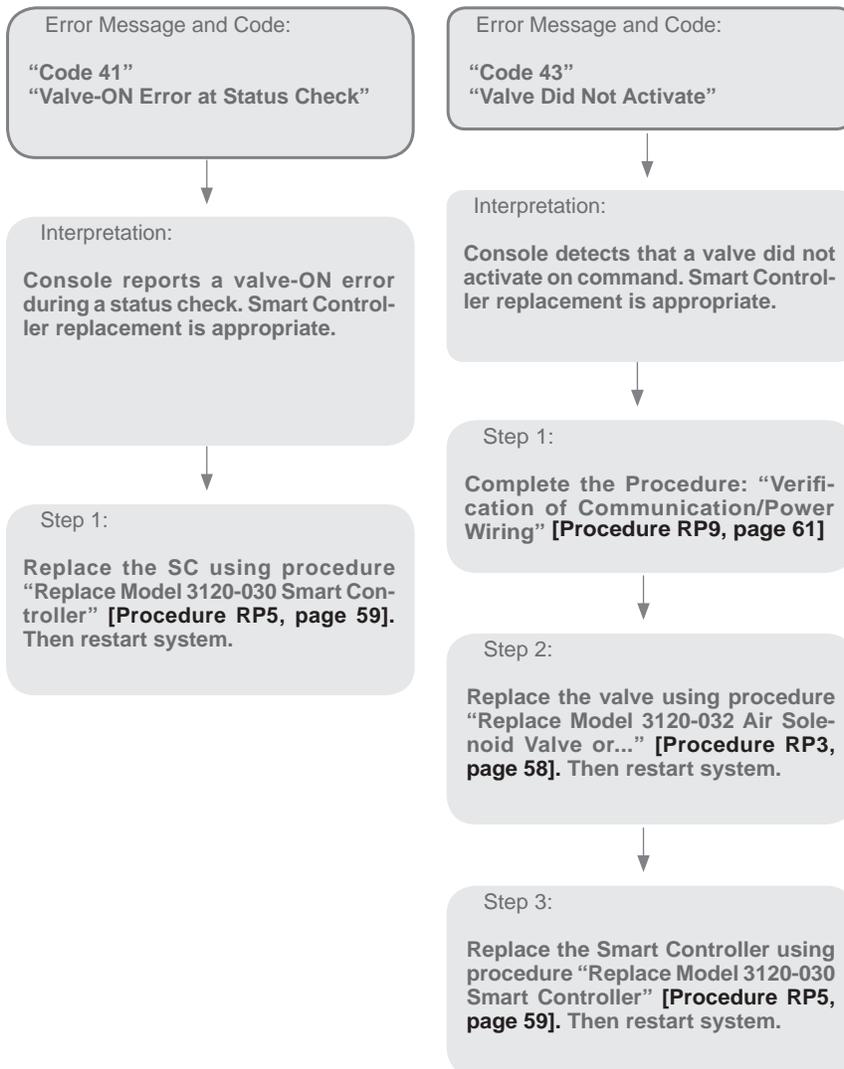
Diagnostic: Error Codes and Messages



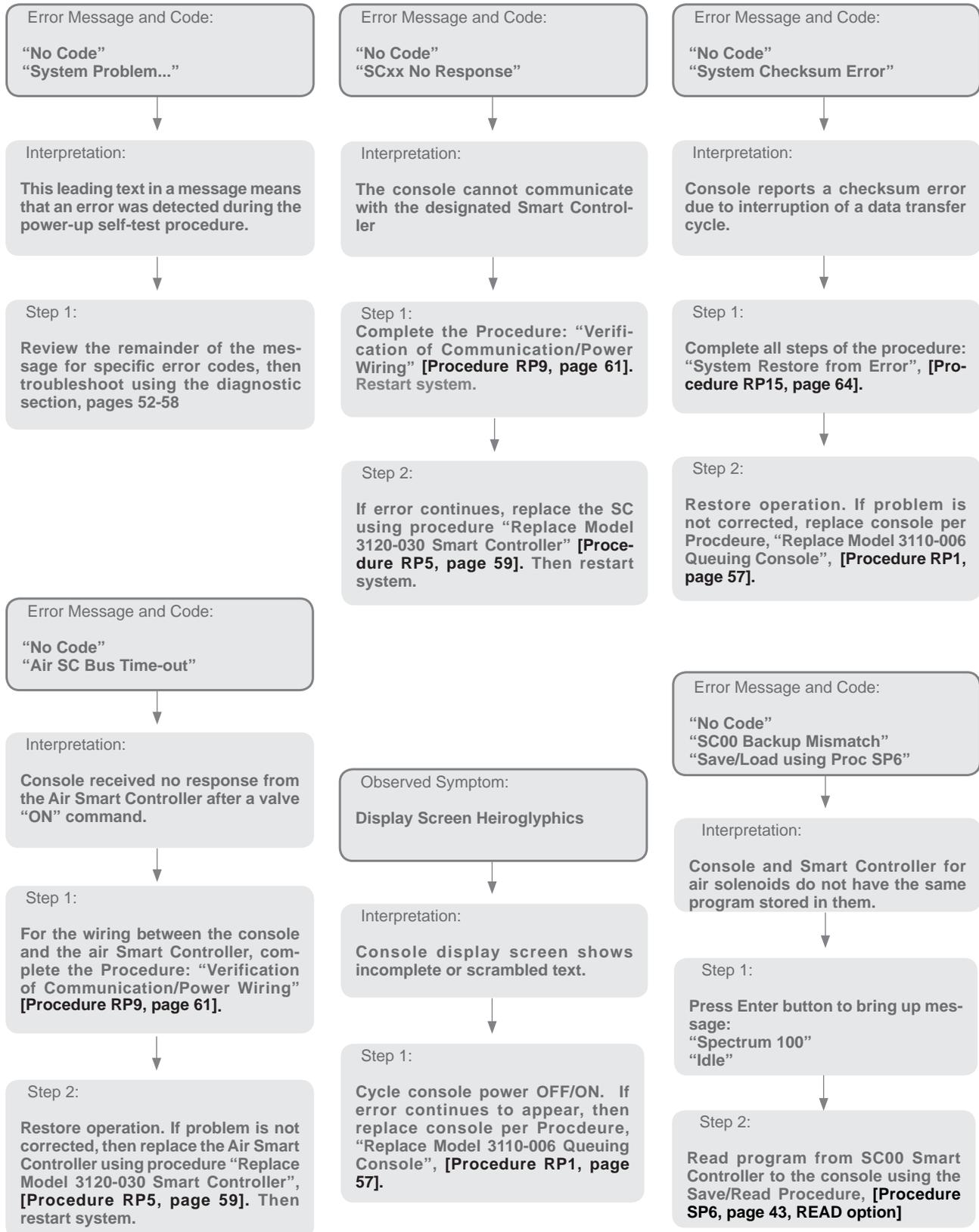
Diagnostic: Error Codes and Messages



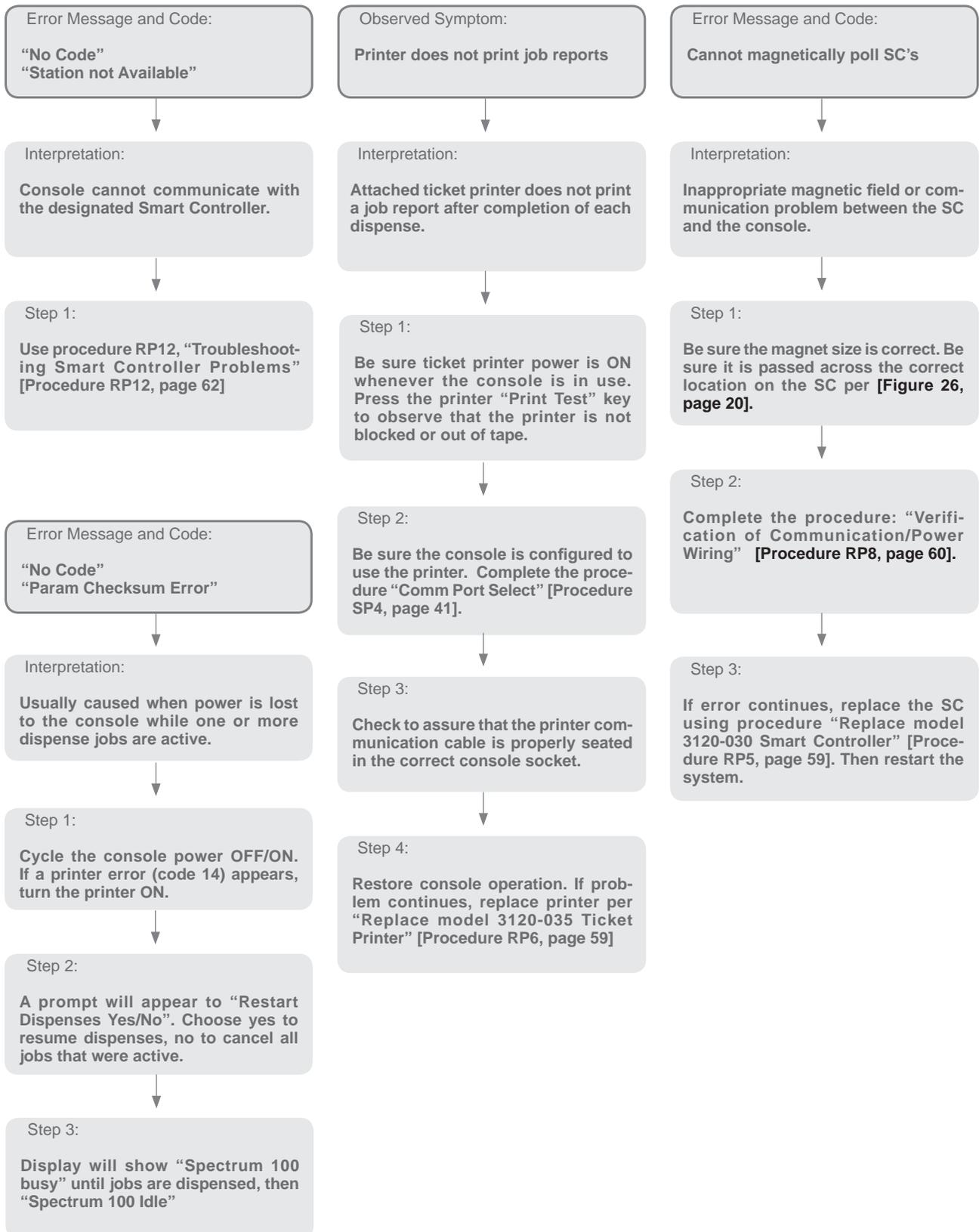
Diagnostic: Error Codes and Messages



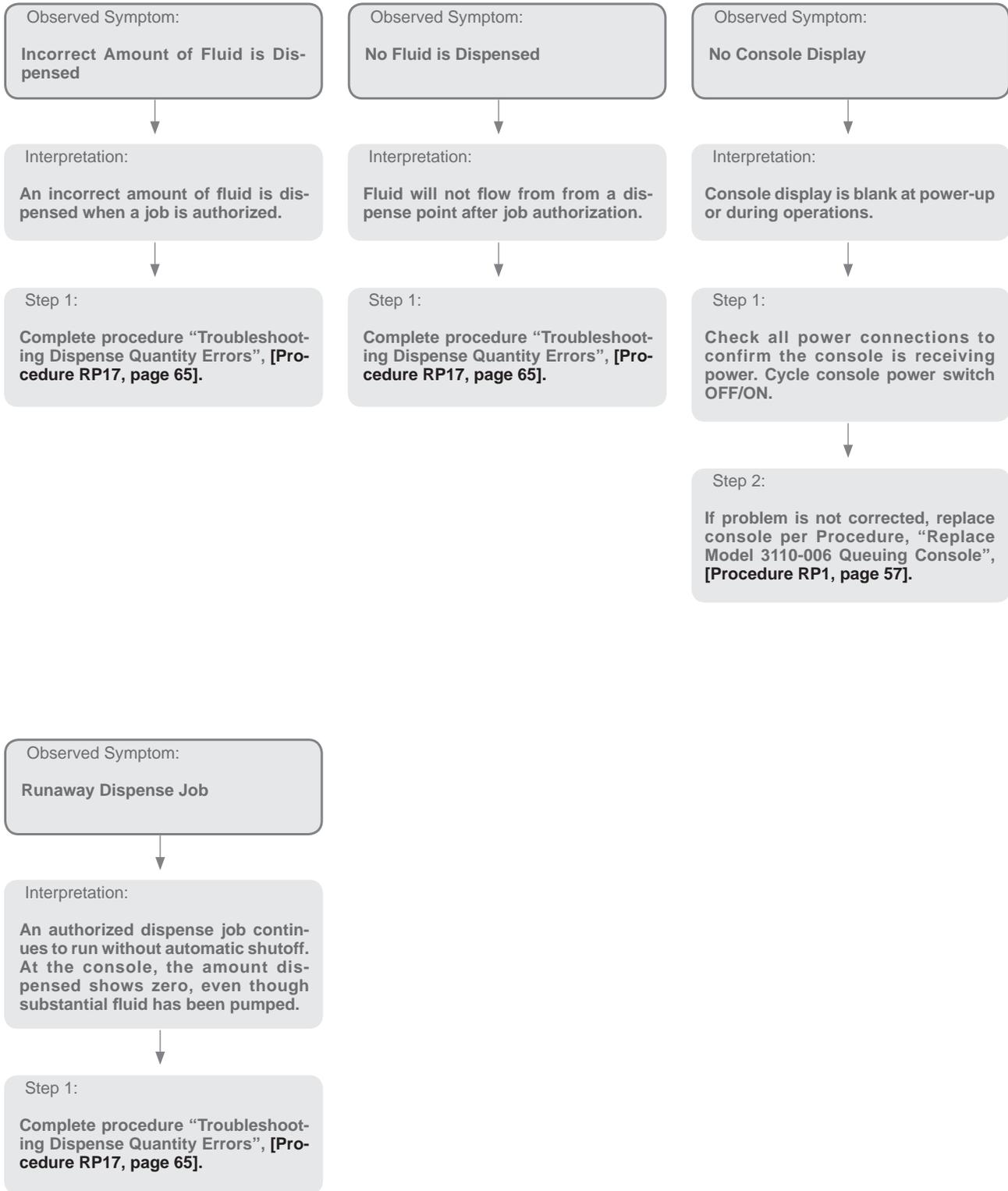
Diagnostic: No-Code Errors and Other Symptoms



Diagnostic: No-Code Errors and Other Symptoms



Diagnostic: No-Code Errors and Other Symptoms



Repair Procedures (RP): System Repair or Expansion

RP1 Replace Model 3110-006P Queuing Console:

1 This repair will temporarily interrupt Spectrum dispense capability for approximately 1 hour. Set up an alternate dispensing method for temporary use: portable drums with hand pumps, bottled oil, etc.

2 On a sheet of paper, make note of all PIN codes in memory, along with their memory cell locations. Use the “PROCEDURES: PIN Entry/Revision” [Procedure BP9, Page 35], to inspect and obtain PIN code data.

3 At the existing (old) queuing console, conclude or cancel all dispenses in queue. Then turn OFF the power switch on the back of the console. Remove the power connector from the back of the console for the duration of the repair.

4 On the existing (old) queuing console, disconnect all other connectors. Remove the multi-pin connector with particular care: ease it out gently. Set aside the old console.

5 Place the new console into position. Apply fluid labels to the console face (these are included in the box of the new console), being sure to match the labeling on the old console. Connect the console power cable, but leave all other connectors detached.

6 Turn ON the console power switch and allow the system to complete a self-test cycle. This may result in an error message, which should be ignored, because the console is not yet initialized.

7 Complete the “PROCEDURE: INITIALIZATION” [Procedure SP1, Page 36]. Cycle power switch OFF/ON then allow the self-test cycle to complete. Display should show “SPECTRUM 100, IDLE”.

8 Turn OFF the power switch on the back of the console, then reconnect all of the console connectors.

9 Turn ON the power switch on the back of the console, then download system setup parameters from the Air Smart Controller, using the “PROCEDURE: SYSTEM CONFIGURATION, [Procedure SP6, Page 43].

10 Referring to the PIN code list created in step 2, reload all PIN codes into memory using the

“PROCEDURES: PIN Entry/Revision” [Procedure BP9, Page 35].

11 Confirm the system is correctly dispensing by authorizing a 1-quart sample job to EACH dispense point. Observe the ready light to confirm correct transmittal, then cancel each job.

12 Remove the alternate dispensing method for temporary use prepared in step 1.

RP2 Replace Model 3120-103 Impulse Meter:

1 This repair will temporarily interrupt Spectrum dispense capability for approximately 1 hour. Set up an alternate dispensing method for temporary use: portable drums with hand pumps, bottled oil, etc.

2 At the queuing console, conclude or cancel all dispenses in queue. Then turn OFF the power switch on the back of the console. Remove the power connector from the back of the console for the duration of the repair.

3 In the pump room, disconnect the two wire leads on the existing (old) digital impulse meter.

4 Close the hand valve supplying air to the pump where the meter is to be replaced. Close the fluid hand valve on the pump outlet line. Then remove the old meter from the pipeline.

5 Install the new meter in the pump outlet pipeline.

6 Connect the two wire leads on the new digital impulse meter to the ends of the impulse meter cable. Be sure connecting wires are clean, not frayed and tightly secured with wire crimp lugs or screw caps. Secure cable with wire ties as needed. Reopen the hand valves on the fluid line and the air supply line at the pump.

7 At the console, Turn ON the power switch and allow the system to complete a self-test cycle. Display should show “SPECTRUM 100, IDLE”.

8 At the console, enter the “PROCEDURES: FLUID IDENTIFICATION” [Procedure SP2, Page 37]. Step

Repair Procedures (RP): System Repair or Expansion

through entries without changing values until you reach the pulses per gallon entry for the meter being replaced. At that step, edit the PPG value to the default value of 0390 PPG. Continue procedure SP2 to the end without changing other values.

9 To purge air from the system, dispense several 1-gallon jobs at a convenient bay, into a hand measure container. Match the fluid type to the fluid meter being replaced. Observe the dispensed 1-gallon quantity to confirm correct operation of the new meter and removal of all air in the fluid line.

10 Remove the alternate dispensing method for temporary use prepared in step 1.

RP3 Replace Model 3120-032 Air Solenoid Valve or 3120-033 Fluid Solenoid Valve:

1 Locate the smart Controller associated with the valve under repair. At that controller, disconnect the wire connector plug at the port matching the repair valve. This will allow the Spectrum system to continue dispensing at all stations except the one under repair.

2 Disconnect the two wire leads on the solenoid valve to be replaced (old).

3 Close the hand shutoff valve adjacent to the solenoid valve to isolate from the system. Then remove the old valve from the fluid piping.

4 Install the new valve into the fluid piping. Reopen the hand shutoff valve when ports are connected and tight.

5 Connect the two wire leads on the new solenoid valve to the open wire ends of the solenoid cable. Be sure connecting wires are clean, not frayed and tightly secured with wire crimp lugs or screw caps. Secure wiring with wire ties as needed.

6 At the smart controller, reconnect the port plug which was removed in step 1.

7 At the queuing console, conclude or cancel all dispenses in queue. Then cycle the power switch on the back of the console OFF/ON and allow the self test routine to cycle. The display should then show

“SPECTRUM 100, IDLE”.

8 To purge air from the system, dispense two 1-gallon jobs at the repaired dispense point, into a hand measure container. Observe the dispensed 1-gallon quantity to confirm correct operation of the new valve and removal of air.

RP4 Replace Model 3120-031 Ready Light:

1 Locate the smart Controller associated with the Ready Light to be replaced. At that controller, disconnect the wire connector plug at the port matching the defective Ready Light. Refer to “WIRING DETAIL, SMART CONTROLLER”, [Figure 26, Page 20]. This will allow the Spectrum system to continue dispensing at all stations except the one under repair.

2 Disconnect the two wire leads on the Ready Light to be replaced (old), at the junction with solenoid valve wires and wire ends of the solenoid power cable. If needed, refer to “WIRING DETAIL, FLUID SOLENOID VALVE AND READY LIGHT”, [Figure 29, Page 21].

3 Remove the old ready light by hand-pushing it out of its 1/2” mounting hole.

4 Install new ready light into the vacant 1/2” hole, feeding connection wire in first.

5 Connect the new ready light wires at the wire junctions where they were removed in step 2. If needed, refer to [Figure 29, Page 21]. Secure with wire ties as needed.

6 At the smart controller, reconnect the port plug which was removed in step 1.

7 At the queuing console, conclude or cancel all dispenses in queue. Then cycle the power switch on the back of the console OFF/ON and allow the self test routine to cycle. The display should then show “SPECTRUM 100, IDLE”.

8 To check operation of the new light system, dispense a 1-quart job the repaired dispense point. Observe the Ready Light for proper function, then cancel the job at the console.

RP5 Replace Model 3120-030 Smart Controller:

- 1 This repair will temporarily interrupt Spectrum dispense capability for approximately 1 hour. Set up an alternate dispensing method for temporary use: portable drums with hand pumps, bottled oil, etc.
- 2 At the queuing console, conclude or cancel all dispenses in queue. Then turn OFF the power switch on the back of the console. Remove the power connector from the back of the console for the duration of the repair.
- 3 At the Smart controller to be repaired, disconnect the 8 wire-end plugs from the controller and remove the old controller from its mounting. On a sheet of paper, make note of the smart controller number in the system and the exact solenoid ports which are in use on the card.
- 4 Mount the new smart controller in place, using hardware provided in the controller packing box. If needed, refer to "INSTALLATION DETAIL, SMART CONTROLLER", [Figure 21, Page 16].
- 5 Transfer all wiring from old connector plugs to the new ones supplied with the controller. Then attach the new plugs to the smart controller card.
- 6 At the console, restore the power connector, turn ON the power switch and allow the system to complete a self-test cycle. This may result in an error message, which should be ignored, because the new smart controller is not yet initialized.
- 7 Set up the console program to recognize the new smart controller by using the "PROCEDURES: SC IDENTIFICATION", [Procedure SP3, Page 39]. When prompted "START WITH SC#:" and "END WITH SC#:", respond both times with the fluid controller number being replaced, using notes taken in step 3. Be sure to include magnetic identification of the new card when prompted by the procedure. Continue through procedure SP3 to its conclusion.
- 8 After installation of the new smart controller, confirm correct dispensing by authorizing a 1-qt sample to EACH dispense point. Observe ready light, then cancel each job.

- 9 Remove the alternate dispensing method for temporary use prepared in step 1.

RP6 Replace Model 3120-035 Ticket Printer:

- 1 This repair will temporarily interrupt Spectrum dispense capability for approximately 1 hour. Set up an alternate dispensing method for temporary use: portable drums with hand pumps, bottled oil, etc.
- 2 Discontinue all dispense jobs and turn off the console power switch. Remove the new Ticket Printer from its shipping box. Install the paper print tape and shaft. Attach the power plug to a 110V AC source. If you are using an Uninterruptable Power Supply for the console, then plug the printer power adapter into the UPS.
- 3 Attach the printer communication cable into the "PTR" port on the console. Use care, be sure pins are aligned and securely installed.
- 4 Turn on printer. If needed, line-feed paper tape into position. Then turn ON the console power switch.
- 5 Complete the procedure: "Comm Port Selection", [Procedure SP4, Page 41]. In the procedure, choose "Printer".
- 6 Cycle console power OFF/ON. Authorize a test dispense job [Procedure BP2, Page 28]. Confirm that the printer correctly reports the test job when it is completely dispensed.

RP7 Add One or More Stations to an installed system:

- 1 Fill out a system PLANNING WORKSHEET, [Figure 17, Page 9]. represent both existing and new equipment. You may continue to operate the existing Spectrum system until step 5.
- 2 Install the new hoses reels, shutoff valves, control handles, and fluid piping. Do not break into active fluid lines until the Spectrum system is closed down in step 5.
- 3 Mount all of the new ready lights and solenoid valves in location. Leave their wiring unattached.
- 4 Mount all of the new smart controllers. If needed, refer to "INSTALLATION DETAIL, SMART CON-

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TROLLER”, [Figure 17, Page 9].

5 The remainder of this repair will temporarily interrupt Spectrum dispense capability for approximately 2-4 hours. Set up an alternate dispensing method for temporary use: portable drums with hand pumps, bottled oil, etc.

6 At the queuing console, conclude or cancel all dispenses in queue. Then turn OFF the power switch on the back of the console. Remove the power connector from the back of the console for the duration of the repair.

7 Run power/signal cables in the upper wall area, between each of the added smart controllers and back to the last controller of the existing system. If needed, refer to “SYSTEM WIRING DIAGRAM”, [Figure 24, Page 18]. Secure cable with wire ties.

8 Run solenoid cables from the new smart controllers to each new fluid solenoid valve at the dispense points. Attach to valves and ready lights.

9 At the console, turn ON the power switch and allow the system to complete a self-test cycle. This may result in an error message, which should be ignored, because the new smart controller is not yet initialized.

10 Set up the console program to recognize the new smart controller by using the “PROCEDURE: SC IDENTIFICATION”, [Procedure SP3, Page 39]. When prompted “START WITH SC#:?” and “END WITH SC#:?”, respond with the *beginning* fluid controller number *being added*, and concluding with the *final* additional fluid controller number. Be sure to provide magnetic identification of the new smart controllers when prompted by the procedure.

11 To purge air, dispense several 1-gallon jobs to each new dispense point. Observe 1 gallon qty. to confirm correct operation of the new meter.

12 After installation of the new smart controller, confirm correct dispensing by authorizing a 1-qt sample to EACH dispense point. Observe ready light, then cancel each job.

13 Remove the alternate dispensing method for temporary use prepared in step 1.

RP8 Adding another Fluid to an installed System:

1 Fill out a system PLANNING WORKSHEET, [Figure 17, Page 9]. Represent both existing and new equipment. You may continue to operate the existing Spectrum system until step 8.

2 Install the new hoses reels, shutoff valves, control handles, and fluid piping.

3 Install the pump for the new fluid, along with air solenoid valve, air filter and regulator, air shutoff valve, digital impulse meter, fluid shutoff valve and pressure relief kit.

4 Run a length of Solenoid cable from the Smart controller in the pump room to the air solenoid valve on the new pump. Secure with cable ties as required.

5 Locate new impulse meter wiring in the meter cable which is routed from the pump room to the queuing console. Be sure the selected cable wires match the color codes in WIRING DETAIL, DIGITAL IMPULSE METERS, [Figure 31, Page 23].

6 Mount all of the new ready lights and solenoid valves in location. Leave their wiring unattached.

7 Mount all of the new smart controllers. If needed, refer to “INSTALLATION DETAIL, SMART CONTROLLER”, [Figure 21, Page 16].

8 This repair will temporarily interrupt Spectrum dispense capability for approximately 2-4 hours. Set up an alternate dispensing method for temporary use: portable drums with hand pumps, bottled oil, etc.

9 At the queuing console, conclude or cancel all dispenses in queue. Then turn OFF the power switch on the back of the console. Remove the power connector from the back of the console for the duration of the repair.

10 Run power/signal cables in the upper wall area, between each of the added smart controllers and back to the queuing console. If needed, refer to “SYSTEM WIRING DIAGRAM”, [Figure 24, Page 18]. Secure cable with wire ties.

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11 Run solenoid cables from each new smart controller to each new fluid solenoid valve at the dispense points. attach wires to valves and ready lights.

12 At the console, turn ON the power switch and allow the system to complete a self-test cycle. This may result in an error message, which should be ignored, because the new smart controllers are not yet initialized.

13 Use the "PROCEDURE: FLUID IDENTIFICATION", [Procedure SP2, Page 37], to "add" information for the new fluid, meter and reservoir.

14 Set up the console program to recognize all new smart controllers by using the "PROCEDURES: SC IDENTIFICATION" [Procedure SP3, Page 39]. When prompted "START WITH SC#:" and "END WITH SC#:", respond with the *beginning* fluid controller number *being added*, and concluding with the *final* fluid controller number being added. Be sure to provide magnetic identification of the new smart controllers when prompted by the procedure.

15 To purge air, dispense several 1-gallon jobs to each new dispense point. Observe 1 gallon qty. to confirm correct operation of the new meter.

16 After installation of the new smart controller, confirm correct dispensing by authorizing a 1-qt sample to EACH dispense point. Observe ready light, then cancel each job.

17 Remove the alternate dispensing method for temporary use prepared in step 8.

RP9 Verification of Communications / Power Wiring

1 Failure to use authentic Balcrank Communications / Power Cable (model 3121-xxx) can result in Spectrum system malfunction and error messages. If a cable material substitution has been made, check to be sure that all cables used conform to the wire and cable specifications on page 66.

2 At each Smart Controller in the system, review the color codes of each attached wire from the Communications / Power Cables to assure that wires are attached to the correct terminal position per "Wiring Detail, Smart Controller" [Figure 26, Page 20]. Similarly,

review wire attachments at the console and compare to Figure 25, "Wiring Detail, Spectrum Queuing Console" [Figure 25, Page 19].

3 Imperfections in wire end terminations on the Communications/Power Cables (model 3121-xxx) may cause system errors. Wire ends should be stripped to 1/4-inch bare wire length. Ends should be inserted deeply in Smart Controller terminal plugs and secured by the clamping screws. If any wire end condition is uncertain, remove wire ends, then carefully re-strip and re-install.

4 All terminal plugs on each Controller should be checked to be sure they are firmly seated in their socket and clean of oil or dust.

5 Tail-end resistors (one is mounted on each SC when shipped) should be installed on the Air Smart Controller and on the last Fluid Smart Controller in the wiring chain. Refer to "Tail End Resistor Mounting" [Figure 26, Page 20].

6 Always inspect all lengths of Communications/Power Cables for cuts or damage during installation or when troubleshooting.

RP10 Verification of Solenoid Valve & Port Wiring

1 Failure to use authentic Balcrank Solenoid Cable (model 3123-xxx) can result in Spectrum system malfunction and error messages. If a cable material substitution has been made, check to be sure that all cables used conform to the wire and cable specifications on page 66.

2 At the Smart Controller associated with the error message, review the color codes of each attached wire on output ports 1 through 4 to assure that wires are attached to the correct terminal position per "Wiring Detail, Smart Controller".

3 Be sure that the correct valve is wired to each fluid port, per your System Planning Sheet.

4 Imperfections in wire end terminations on the Solenoid Cables (model 3123-xxx) may cause system errors. Wire ends should be stripped to 1/4-inch bare wire length. Ends should be inserted deeply

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in Smart Controller terminal port plugs and secured by the clamping screws. If any wire end condition is uncertain, remove wire ends, then carefully re-strip and re-install.

5 Ready lights must be wired according to color code to function properly. Refer to “Wiring Detail, Fluid Solenoid valve and Ready Light”, [Figure 29, Page 21].

6 Check wire nut or crimp connections at the solenoids. Re-strip and fix any poorly crimped or attached wiring.

7 Check fluid solenoid valves for correct fluid port connections: 1=out, 2=in.

8 Check Air Solenoid Valve wiring to see that it correctly matches the diagram in “Wiring Detail Air Solenoid”, [Figure 28 and 28B, Page 21].

RP11 Verifying that Inactive SC Ports are Turned Off

1 At the queuing console, conclude or cancel all dispenses in queue. Then turn OFF the power switch on the back of the console.

2 Turn ON the power switch on the back of the console. After the display shows “SPECTRUM 100 IDLE”, Proceed to SC IDENTIFICATION [Procedure SP3, Page 39]. Complete steps 1 through 7. In step 7, check to be sure that the active valve ports displayed correctly match your intended fluid setup at each station. If no changes are required, press “NEW” to immediately escape the routine. Else, turn ports ON or OFF as needed and complete the remainder of the procedure, including magnetic identification of SC’s.

3 At the queuing console, turn the power switch on the back of the console OFF and then ON.

4 The display will show SPECTRUM 100 IDLE after completing a self-test cycle. If you made any active port changes, they are now updated in console memory.

5 Save console setup changes to back-up memory in the AIR SC by completing the entire PROCEDURE: SYSTEM CONFIGURATION [Procedure SP6, Page 43].

6 At the queuing console, turn the power switch on the back of the console OFF and then ON. The display will show SPECTRUM 100 IDLE after completing a self-test cycle. It is ready to resume dispense operations.

RP12 Troubleshooting Smart Controller Problems

1 If you experience difficulty with the magnetic polling process during Smart Controller installation, refer to the flow chart titled “Cannot Magnetically Poll SC’s” [Page 55], and complete the specified procedures.

2 Smart Controller malfunctions are frequently caused by imperfect wiring in the Power/Signal cable segments. Complete the procedure: “Verification of Communications/Power Wiring”, [Procedure RP9, Page 61]

3 Crossed wiring at solenoid valve ports can result in failure to dispense fluid when authorized or in loss of ability to end a dispense job. Be sure that valve wiring for fluid 1 is attached to port 1, valve 2 to port 2, etc. Refer to the Configuration Worksheet which has been prepared for your system.

4 Transient errors may occur during system operations that are not quickly reproduced when testing. Use the procedure: “Test All SC’s”, [Procedure SP8, page 45] to run an extended test of Spectrum network communications. If a fault occurs, the test will generate an error message which can then be used in the diagnosis charts.

5 In an installed system it may be difficult to determine the address of a smart controller. Use the “SC Comm Test”, [Procedure SP9, page 46] to send test signals to a specific controller. Then, in the service bays, look for the SC with lighted LED’s. The test is also useful for extended testing of a single Smart Controller. If a fault occurs, the test will generate an error message which can then be used in the diagnosis charts.

6 At any installed and operating Smart Controller the voltage across incoming terminations Power (+) to Power (-) will be 15 to 24 volts DC. See [Figure 26, page 20].

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7 It may be useful to magnetically “identify” Smart Controllers prior to their installation into the operating wiring network in the bays. In this way, Smart Controllers can be assigned their SC location numbers and verified as “good”, independent of system wiring faults. Refer to the procedure: “Ground-Level SC Identification Process”, [Procedure RP13, page 63].

RP13 Ground-Level SC Identification Process

1 Set up, assemble and wire the temporary arrangement shown in “Ground Level SC Identification Setup”, [Figure 30, page 22]. Complete the “Fluid Identification Procedure”, [Procedure SP2, page 37], for the system.

2 Install the first fluid Smart Controller, SC01, at the set-up position, by temporarily substituting the wired cable plugs in place of the originally installed plugs from SC01.

3 Temporarily install resistor plugs in each of the output ports on SC01, as shown in lower Figure 26.

4 Turn on console power. Complete the “Procedures: SC Identification”, [Procedure SP3, page 39], using these program conditions: start with SC00 and end with SC01. Be sure to turn “OFF” any unused ports on SC01. Refer to your Configuration Planning Worksheet to assure correct port assignments.

5 After the procedure is completed and the Smart Controller is magnetically polled, cycle the power switch Off/ON at the console and allow the system to self-test. Observe for error messages. Use the Status Code Diagnostics section to troubleshoot errors and correct the causes.

6 After the testing step is completed and the Smart Controller is verified to be error free, remove the temporary wired plugs and replace all original plugs supplied with the SC. Using the smart controller ID labels from the Queuing Console box, apply the label SC01 to the center front (potted) face of the controller. Set aside SC01 for later installation mounting.

7 Install the second fluid Smart Controller, SC02, at the set-up position, by temporarily substituting

the wired cable plugs in place of the originally installed plugs from SC02. Install resistors as before.

8 Turn on console power. Complete the “Special Procedure: SC Identification”, [Procedure SP3, Page 39], using these program conditions: start with SC02 and end with SC02. Be sure to turn “OFF” any unused ports on SC02. Refer to your Configuration Planning Worksheet to assure correct port assignments.

9 Repeat steps 3, 4, 5 and 6 using the Smart Controller SC02.

10 Repeat steps 7, 8 and 9 for all other fluid Smart Controllers in the system.

RP14 Setting Up Systems for Future Expansion

1 It is important to work from a reference Configuration Planning Worksheet. If this has not been done, complete a worksheet per [pages 8,9]. To allow for future system expansion, show 3 fluids instead of two. Use dummy values for third fluid tank and meter parameters.

2 Install one smart controller per station, not one per 2 stations as you would normally do for 2 fluids.

3 During Fluid Identification, [Procedure SP2, Page 37] select two fluids and respond yes to “configure for expansion”. The program will then enter dummy values for meter ppg, tank size, low level and current level.

4 When completing Smart Controller Identification, [Procedure SP3, Page 39], be sure to “turn off” port 3 at the air controller, SC00. The program will “turn off” all third ports on the fluid smart controllers because you have previously selected “configure for future expansion” in the Fluid Identification procedure.

5 In operation, the third fluid will appear as an available console fluid key, but will not be selectable for any dispense operations.

RP15 System Restore from Error Condition

Repair Procedures (RP): System Repair or Expansion

1 Whenever error messages are displayed, immediately write down each message exactly and in complete form.

2 To determine corrective action, address each individual message by referring to the troubleshooting guide, [pages 47-56] and following recommended procedures. Look for the error code in the message and match it to an appropriate flow diagram.

3 An error message may be accompanied by the prompt: "CONTINUE?; YES, NO". Generally, select yes. This will direct the Spectrum System to continue operation, but with the malfunctioning component excluded. An **excluded** Smart Controller, for example, will invoke the message "STATION NOT AVAILABLE" if you attempt to dispense a job to one of its ports, but will otherwise allow normal system operation until a remedy is completed.

4 Some errors may be cleared by cycling power at the console to restart the system. This should not be attempted until a) all active dispense jobs are either completed or cancelled, and b) an attempt is made to repair the specific reported error per step 2.

5 Some errors may be cleared by re-loading the console set-up from the Air Smart Controller by completing the procedure, "System Configuration", [Procedure SP6, Page 43].

6 If step 5 fails due to an unsuccessful down load attempt, the entire system setup must be repeated by completing the appropriate procedures [SP1 through SP6, pages 36-43]. Consult with Balcrank customer service before taking this action.

RP16 Troubleshooting SC Magnetic Polling Errors

1 Use a small magnet for the Smart Controller identification process; magnets smaller than 1/2-inch diameter x 3/4" long are preferred. Your Spectrum Queuing Console is shipped with a screwdriver which has a suitable magnet on the handle head.

2 Pass the magnet across the "sweet spot" on the smart controller as shown in [Figure 26, Page 20]. Keep the head of the magnet very close to the face of

the controller. Make multiple passes, back and forth, until the controller's center LED blinks twice.

3 Failure of Smart Controllers to respond to magnet polling is almost always due to a faulty termination in the Power/Communications cables. Refer to the procedure "Verification of Communications / Power Wiring", [Procedure RP8, Page 62], to eliminate wiring faults. All segments of Communications / Power Wiring in the system should be reviewed, not just the wiring near the problem controller.

4 It may be useful to set up Smart Controllers individually using a ground level initializing technique. Follow the written procedure, "Ground-Level SC Identification Process", [Procedure RP12, Page 64]. This method requires a more complex procedure, but allows Smart Controller set-up which is not influenced by wiring faults in the Power/Communications cables. It is therefore easier to isolate and correct installation problems.

5 When all other methods have failed to allow magnetic identification, then replace the Smart Controller and continue with installation. However, remember that defective Smart Controllers are very rare: the cause of magnetic polling failure is almost always associated with a correctable fault in the Power/Communications cables.

RP17 Troubleshooting Dispense Quantity Errors

1 When evaluating dispensed amounts, use a calibrated measuring container only, per "Required Tools and Materials List" [Page 12]. Do not use a metered control handle as a comparison reference.

2 Be sure air is purged completely from the fluid lines in your system. Air in the fluid will cause incorrect meter readings, causing dispenses of less than the authorized amount. Be sure the pump is well-primed and the tank level is not too low. Be sure all hand valves in the line are open and air is supplied to the pump.

3 To evaluate dispense accuracy of one of the fluids, dispense one gallon of that fluid into a certified accurate measuring container. If the dispense quantity

Repair Procedures (RP): System Repair or Expansion

is inaccurate, the meter calibration factor in the console program may need to be adjusted. At the console, repeat procedure: “Fluid Identification”, [Procedure SP2, Page 37]. Be sure meter calibration factors (pulses per gallon) are set to the default value of 0390 PPG.

4 If dispense quantities remain inaccurate after completing step one, the meter calibration factor may be custom calibrated to the exact fluid and conditions of use in your system. Estimate the amount of error by observing the calibration marks on the container. If the amount dispensed was less than one measured gallon, then increase the PPG factor proportionately for that fluid in “Fluid Identification”, [Procedure SP2, Page 37]. Alternately, if the amount of dispensed was excessive, decrease the PPG factor in similar manner.

Example: For fluid 1, 5W20, meter calibration factor was 0390. One gallon is authorized and dispensed into a measure which reads 5 cubic inches less than one gallon. To adjust, increase the program PPG factor to 0395 (increase of one unit per cubic inch of error). Then test-dispense another gallon. Continue to fine-adjust the PPG value up or down until exactly one gallon is dispensed.

5 If a job is authorized and does not shut off automatically at the predetermined amount, check all wiring between the console and the impulse meter for that fluid. Verify correct wire placement per color codes shown [Figure 25, Page 19 and Figure 26, page 20]. If the error occurs at only one station, audit the placement of solenoid wiring: fluid 1 to port 1, fluid 2 to port 2, etc. Be sure wire ends are properly stripped and attached to terminations. Be sure the *correct* black ground wire is used, as cable-wound with each color-coded positive wire.

6 If a fluid dispensed amount remains incorrect and/or varies substantially from job to job, and if all other troubleshooting steps have been applied without resolution, then replace the impulse meter per procedure: “Replace Model 3120-103 Impulse Meter”, [Procedure RP2, Page 57].

1 The AC power adapters supplied with the Spectrum Queuing Console and Ticket Printer will provide adequate, well-conditioned power to the system in almost all installation sites. However, additional power handling equipment may provide more reliable operation if the site has: (a) incoming voltage outside the range of 110-120 VAC, or (b) frequent power disturbance due to electrical storms or (c) frequent power transients due to a heavily loaded site power network.

2 Balcrank recommends the installation of an Uninterruptable Power Supply (UPS) device, such as those used for personal computers, with an output rating of 80 Watts or more, particularly where power source risk factors exist as identified in step 1, above. Operate the UPS from the site power receptacle, and plug the console AC power adapter cord and ticket printer power cord into the UPS.

3 Output power within the Spectrum System may be checked using a voltmeter. Voltage will be 23 to 25 volts DC at the Queuing Console and 16 to 24 volts at the most distant Smart Controller or Solenoid Valve.

RP18 Assuring a Suitable System Power Supply

Reference: Cable Substitution

Balcrank Spectrum cables have been specified and configured to allow the simplest, most trouble-free installation of equipment and the most reliable, assured peak performance in operation. In some situations, it may be necessary to use cable other than Balcrank's. It is the installer's responsibility to assure that any cable substitutions conform with or exceed the requirements of our original equipment cables. Use the detail descriptions below to be sure that all substitutions meet our requirements. Failure to use our cables, or our specified equals, may jeopardize the Balcrank warranty for the installed Spectrum system.

Use "Substitute Impulse Meter Cable" specifications below to replace Model 3122-xxx. Note that 3122-xxx contains 4 wire pairs (for 4 meter), whereas the substitute requires one cable run for each installed meter. Additionally, cables must be pre-identified with a tag (meter 1, meter 2, etc) before making wire runs to be sure correct attachments are made at the console. Unique wire color coding in our own Model 3122-xxx prevents this necessity and risk.

Substitute Impulse Meter Cable (console to meter, run one cable per impulse meter)
18 gage, 2 conductor; unshielded stranded copper wire; 300 V 80 deg C; color code black, red;
30 mil PVC wire cover, 30 mil PVC grey cable jacket, UV resistant for outdoor service.

Use "Substitute Solenoid Cable" specifications below to directly replace Model 3123-xxx.

Substitute Solenoid Cable (smart controller to solenoid valves, run one cable per valve)
18 gage, 2 conductor; unshielded stranded copper wire; 300 V 80 deg C; color code black, red;
30 mil PVC wire cover, 30 mil PVC grey cable jacket, UV resistant for outdoor service.

Use "Substitute Power Cable" and "Substitute Signal Cable" specifications below in combination to replace Model 3121-xxx.

Substitute Power Cable (console to smart controllers and between smart controllers)
16 gage, 2 conductor; unshielded stranded copper wire; 300 V 80 deg C; color code black, red;
30 mil PVC wire cover, 30 mil PVC grey cable jacket, UV resistant for outdoor service.

Substitute Signal Cable (console to smart controllers and between smart controllers)
18 gage, 2 conductor shielded twisted pair; stranded copper wire;
300 V 80 deg C; color code blue w/white stripe, white w/blue stripe;
conforming to RS-485;
Aluminum mylar shield with 24 gage bare drain wire;
30 mil polyethylene wire cover, 30 mil PVC grey cable jacket, UV resistant for outdoor service.

Reference: PIN Code Record

Pin Code Reference Sheet...cut out and save!

Use this reference sheet to make a written record of PIN code assignments for your Spectrum System. After completing the sheet, tear out and save in a secure location for future reference. **DO NOT LOSE YOUR PIN CODES.** It is very difficult to break into a system if PIN codes are lost.

The first five cells are Management level codes.

Cell	PIN Number	User Name	Cell	PIN Number	User Name
01	<input type="text"/>	<input type="text"/>	19	<input type="text"/>	<input type="text"/>
02	<input type="text"/>	<input type="text"/>	20	<input type="text"/>	<input type="text"/>
03	<input type="text"/>	<input type="text"/>	21	<input type="text"/>	<input type="text"/>
04	<input type="text"/>	<input type="text"/>	22	<input type="text"/>	<input type="text"/>
05	<input type="text"/>	<input type="text"/>	23	<input type="text"/>	<input type="text"/>
06	<input type="text"/>	<input type="text"/>	24	<input type="text"/>	<input type="text"/>
07	<input type="text"/>	<input type="text"/>	25	<input type="text"/>	<input type="text"/>
08	<input type="text"/>	<input type="text"/>	26	<input type="text"/>	<input type="text"/>
09	<input type="text"/>	<input type="text"/>	27	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>	28	<input type="text"/>	<input type="text"/>
11	<input type="text"/>	<input type="text"/>	29	<input type="text"/>	<input type="text"/>
12	<input type="text"/>	<input type="text"/>	30	<input type="text"/>	<input type="text"/>
13	<input type="text"/>	<input type="text"/>	31	<input type="text"/>	<input type="text"/>
14	<input type="text"/>	<input type="text"/>	32	<input type="text"/>	<input type="text"/>
15	<input type="text"/>	<input type="text"/>	33	<input type="text"/>	<input type="text"/>
16	<input type="text"/>	<input type="text"/>	34	<input type="text"/>	<input type="text"/>
17	<input type="text"/>	<input type="text"/>	35	<input type="text"/>	<input type="text"/>
18	<input type="text"/>	<input type="text"/>	36	<input type="text"/>	<input type="text"/>
			37	<input type="text"/>	<input type="text"/>

**For Warranty Information visit:
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SB3028 Rev H 5/12

Service Bulletin Revision Log

<u>Rev</u>	<u>Date</u>	<u>Description</u>
B	11/04	Software Rev 2.3
C	3/05	Software Rev 2.4
D	6/05	Software Rev 2.5
E	12/05	Software Rev 2.6
F	3/07	Added Caution Page 2, regarding jobs left in queue.
G	12/08	Updated warranty statement
H	5/12	Change to new impulse meter